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S3 Leitlinie Lagerungstherapie und Mobilisation von kritisch Erkrankten auf Intensivstationen

Evidenztabellen

#001

Reference, Study Type	Cases and Controls (Participant #, Characteristics) Total	Drop -out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
#001 **Klem 2021** PMID: 34047169 DOI: 10.4045/tidsskr.20.0351 **Specification of study:** systematic review with meta-analysis	17 RCTs (1805 pts) from 2006 to 2020[1-17] **Inclusion criteria:** - ICU patients > 18 years with MV in an ICU - oral intubation or tracheostomy **Exclusion criteria:** - injury or disease-specific muscle wasting -passive or almost exclusively passive intervention -non relevant outcome measures -other publication years -non-English or Scandinavian language -high risk of bias		- respiratory muscle training -active or active-assisted exercises for the extremities - mobilization to the edge of the bed or sitting in a chair -mobilization to a standing or ambulatory position - in-bed cycle ergometry	**different treatment or no treatment**	**Primary endpoints:** -duration of MV -weaning time from ventilator -mortality in the hospital, at 1–3 months, 1–6 months and after 1 year **Secondary Outcomes:** -ICU LOS -hospital LOS -patient safety -adverse events	**Significant differences between groups in:** -duration of MV (EM-intervention, n=4, 335 pts): -1.43 days; 95 % CI -2.68 to -0.18, p = 0.02 - ICU LOS (EM-intervention, n=7, 143 pts): -1.08 days; 95 % CI -1.95 to -0.21, p = 0.02 - hospital mortality (EM-intervention): OR 0.90 (0.61 to 1.33) - 1–3-month mortality (n=1, 200 pts.): OR 0.51 (0.14 to 1.80) - 1-6-month mortality (n=3, 723 pts.): OR 0.95 (0.54 to 1.65) **No significant differences between groups in:** - duration of MV (IMT-intervention, n=2, 146 pts): −0.11 days; 95 % CI −1.76 to 1.53, p = 0.89 - 79 adverse events over the course of 5 675 training sessions (incidence rate of 1.4 %)	1

EM = early mobilization, ICU = Intensive Care Unit, IMT = inspiratory muscle training, LOS = length of stay, MV = mechanical ventilation, pts = patients, RCT = randomized controlled trial

Early mobilization led to a reduced duration of mechanical ventilation and length of stay in the ICU.

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#002

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#002 **Das 2021** PMID: 34045809 DOI: 10.5005/jp-journals-10071-23789 **Specification of study:** Non randomized controlled study	50 pts **Inclusion/exclusion criteria:** not provided. Purposive sampling method was applied!			**Graded early mobilization** protocol: - for 10 sessions (multiple within a day) Phase 1: critically ill; goal: sitting at the edge of bed and initiate standing Phase 2: acute/ subacute phase; initiate re-education of gait with the walker Phase 3: acute/ subacute phase; able to actively participate; independent transfer training with a walker and provide progressive walking re-education Phase 4: subacute phase; promote progressive transfers and walking independence	not further defined	**Primary endpoints:** -FIM -GAD-7 -ICU LOS	**Primary endpoints:** - FIM score: 65.7 ± 12.2 vs. 17.4 ± 4.9; p > 0.001 - GAD-7 score: 7.5 ± 2.6 vs. 19.50 ± 2.7; p > 0.001 - ICU-LOS: 3.1 ± 0.6 vs. 5.6 ± 1.1; p>0.001	4 (downgraded from 3)
	Per Branch							
	25	25						

FIM = functional independence measure scale, GAD-7 = 7 point generalized anxiety depression scale, ICU = intensive care unit; LOS = length of stay, Pts = patients

Early mobilization seems to have a benefit in relation to FIM, GAD-7 and ICU length of stay.

#005

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#005 **Jouffroy 2021** PMID: 33990007 DOI: 10.1016/j.jcrc.2021.04.014 Specification of study: monocentric retrospective observational study.	N= 379 All patients with COVID- 19 admitted to ICU between February 20 and April 24, 2020			**SBPP** at least 3 h 2x/day	**Standard of care**	**Primary endpoints:** -mortality (ICU/Hospital) -intubation -28 days survival	**Primary endpoints:** - ICU mortality 4 (13.3%) vs 94 (32.4%), p= 0.05 - In-hospital mortality: 5 (16.7%) vs 98 (41.4%), p= 0.02 - risk of invasive ventilation: sHR 0.96; 95% CI 0.49; 1.88 - survival at day 28: HR 0.51, 95% CI 0.16-1.16	3
	Per Branch							
	40	339						

COVID-19 = Corona Virus Disease 2019, ICU = Intensive Care Unit, SBPP = spontaneously breathing prone position

SBPP in COVID-19 patients reduced ICU and hospital mortality. It had no effect on intubation risk and mortality at day 28.

#006

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
#006 **Paton 2021** PMID: 33967203 DOI: 10.1097/CCM.0000000000005058 **Specification of study:** Post hoc Secondary Analysis of a Prospective Cohort Study	194 ICU pts from 2 tertiary ICUs **Inclusion criteria:** - pts of "The impact of disability in survivors of critical illness" trial - all pts admitted to the 2 main tertiary hospitals - MV > 24 hours - survivor of critical illness **Exclusion criteria:** - age < 18 years - English language barrier - proven or suspected acute primary brain process likely to result in global impairment of consciousness or cognition - second or subsequent ICU admission for the hospital stay	9 pts (n = 8: records not obtainable n = 1: incomplete outcomes)	Measurement of dosage of mobilization in during the ICU stay (using IMS) Measurement of number of active mobilization sessions performed during the ICU stay.	No	**Primary endpoints:** - change in health status from preadmission to 6-months following ICU admission (the EQ-5D-5L utility score) **Secondary outcome:** - change in the EQ-5D-5L mobility domain from preadmission to 6-months following ICU admission	**Significant differences between groups in:** - EQ-5D-5L utility scores, with every increase in IMS level increasing the EQ-5D-5L utility score by 0.045 ($p < 0.0001$) - effect higher in those with a lower health status pre-admission than those with higher health status pre admission (β = 0.046 [CI, 0.012–0.08] vs. 0.026 [CI, 0.007–0.045], respectively) - health status 6 months following ICU admission (Multivariate analysis; β = 0.022 [CI, 0.002–0.042]; p = 0.033) - EQ-5D-5L mobility domain score 6 months from ICU admission (β = 0.127 [CI, 0.049–0.205]; *p* = 0.001)	4
	Per Branch						

EQ-5D-5L= euro-quality of life-5D-5 Level, ICU = intensive care unit, IMS= intensive care mobility scale, MV = mechanical ventilation, pts = patients

A higher IMS level increased quality of live 6 months after ICU admission.

#008

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#008 **Nydahl 2021** PMID: 33946128 DOI: 10.1111/nicc.12638 **Specification of study:** pilot RCT	46 ICU pts **Inclusion criteria:** - ≥18 years old -RASS ≥ 3 and responsive -could be assessed for delirium -were able to be mobilized out of bed - expected to spend at least 1 night in the ICU **Exclusion criteria:** -expectation of death < 72 hours -no informed consent for the study -pre-existing immobility -contraindication against mobilization - delirium before recruitment -positive pregnancy test -participation in a competitive study with the outcome of delirium			**Mobilization** - to the edge of the bed - between 9pm and 11pm	**Usual care**	**Primary endpoint:** -safety **Secondary Outcomes:** -duration and incidence of delirium -mortality -duration of MV -hospital LOS for 28 days follow-up	**Primary endpoint:** -adverse events: 16.7% (n = 9) without serious consequences - most common event - deviation of systolic blood pressure > 20% (n = 4, 7.4%) -no pts. required re-/insertions of lines or tubes, or cardiopulmonary resuscitation. **Secondary Outcomes:** - duration of delirium, median (IQR) of intervention group: 1.5 (1-2.7) vs. control group: 2 (1-2) days, p = 0.860 - incidence of delirium OR 0.37 (95%CI 0.11-1.26), p = 0.133) - no other significant differences	2
	Per Branch							
	26	20						

ICU = Intensive Care Unit, LOS = length of stay, MV = mechanical ventilation, OR = odds ratio, pts = patients, RASS = Richmond Agitation Sedation Score, RCT = randomized controlled trial

Mobilization in the evening is feasible and safe.

#009

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#009 **Moran 2021** PMID: 33942659 DOI: 10.1177/08850666211014479 **Specification of study:** Multivariate meta-analysis	8 RCTs (2001-2013) with 2607 ARDS pts[1-8]			**Prone position** in moderate-severe ARDS: -PP>12 h -PP<12 h	**SP**	**Endpoints:** Mortality at 28-30 days, 2-3 months and 6-months	Mortality at 28-30 days: PP 1057 vs SP 1004 RR: 0.84 (0.65-1.09), I^2 = 69%, p<0.01 Mortality 2-3 months: PP 1088 vs. SP 1031 RR: 0.85 (0.70-1.03), I^2 = 64%, p<0.01 Mortality 6 months: PP 320 vs. SP 326 RR: 0.99 (0.84-1.17), I^2 = 30%, p=0.23 Mortality: ≥12 hours vs <12 hours PP (RR: 0.75, 95%CI: 0.65, 0.86, P < 0.001)	1
	Per Branch							
	PP 1357	SP 1250						

ARDS = Acute Respiratory Distress Syndrome, pts = patients, PP = prone positioning, SP = supine positioning

Prone positioning does not reduce mortality when compared to supine positioning.

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#011

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
#011 **Waldauf 2021** PMID: 33931570 DOI: 10.1136/thoraxjnl-2020-215755 **Specification of study:** RCT	**Total** 150 pts **Inclusion criteria:** ≥18 years -MV -predicted ICU length of stay ≥7 days **Exclusion criteria:** -primary systemic neuromuscular disease/spinal cord lesion at admission -severe lower limb injury/amputation -bedridden premorbid state -imminent death or withdrawal of medical treatment < 24 h -pregnancy -external fixator or metallic implants in lower limb -open wounds/skin abrasions at electrode application points -presence of pacemaker, implanted defibrillator or another implanted electronic medical device - unable to receive first rehabilitation session < 72 hours of admission - transferred from another ICU after > 24 hours of MV - other conditions preventing the use of FESCE or considered unsuitable for the study **Per Branch** randomised: n = 75 analysed: n = 42 / randomised: n = 75 analysed: n = 46	Intervention: n = 33 / 44% Reasons: - death (n=18 until discharge; n=15 after ICU discharge) Control: n = 29 / 39% Reasons: - death (n=16 until discharge; n=13 after ICU discharge)	**Progressive mobility program** -start the day after randomization - until ICU discharge or day 28 -aiming for 90 minutes of active exercise per day - incorporating functional electrical stimulation and in-bed cycling	**Standard physiotherapy** -2x/day - 6 days a week - when requested by the treating physician	**Primary endpoint:** -SF-36 Physical Component Score 6 month after discharge **Secondary outcomes:** -PFIT -CSD -MRC -NB -VFD at day 28 -NDI -ICP elevations per day of ICP measurement **Not prespecified outcome:** -SF-36 MCS 6 month after discharge -6-Month survival	**Primary endpoint:** -SF-36 score, Median [IQR]: intervention 50 [21 – 69] vs control 49 [26 – 77], p = 0.261 **Secondary outcomes:** P-FIT, median[IQR]: intervention 9.4 [8.0 – 10.8] vs control 9.6 [8.3 – 10.9], p = 0.77 -CSD as difference from baseline (cm), Median [IQR]: intervention -11 [-17 – -6] vs control: -13 [-19 – -7], p = 0.64 -MRC, median [IQR]: intervention 42.4 [39.2 – 45.6] vs control: 39.4 [36.5 – 42.4], p = 0.13 -NB (gN/m2/day), median [IQR]: intervention: Median [IQR] -2.7 [-3.1 – -2.4] vs control -3.4 [-3.7 – -3.0], p = 0.004 -VFD, median [IQR]: intervention 9.3 [6.5 – 12.0] vs control 11.0 [8.2 – 13.8], p = 0.33 -NDI: none -ICP, median [IQR]: intervention: 1.5 [0.2 – 2.9] vs control 0, p = 0.018 **Not prespecified outcome:** -MCS, median [IQR]: intervention 54.8 [37.1 – 69.6] vs control 70.2 [51.5 – 81.3] p = 0.00 -6-month survival, intervention n = 42 (56%) vs control n=46 (61%), p = 0.46	2

CSD = muscle cross sectional diameter, ICU = Intensive Care Unit, ICP = intracranial pressure, MCS = mental component score, MRC = medical research council score, MV = mechanical ventilation, NB = nitrogen balance, NDI = number of dialysis interruptions, PFIT = physical fitness in intensive care test, RCT = randomized controlled trial, SF-36 = 36 item short form survey, VFD = ventilator free days

Functional electrical stimulation and cycle ergometry do not improve physical function 6 months after discharge.

#012

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#012 **Barker 2021** PMID: 33931557 DOI: 10.1136/postgradmedj-2020-139631 **Specification of study:** Retrospective cohort study	20 pts, admitted to the ICU Inclusion criteria: - Age 18 years or over - hypoxic respiratory failure (type 1) requiring oxygen - severe acute respiratory syndrome-coronavirus 2 (SARS-CoV-2) detected by PCR on nasopharyngeal swab - findings of multifocal ground-glass opacities and/or consolidation on imaging Exclusion criteria: - not Covid-19 - previous APP - intubated before		none	**Prone position** - with spontaneous breathing between 30 min and 2 h	**Supine position** or **as usual**	**Primary endpoints:** - 28-day mortality - ISARIC 4C mortality scores - non- invasive ventilation and IMV No sample size calculation (retrospective)	**Significant differences between groups in:** -ICU-LOS, APP group median number of days: 22, IQR 16–41; control: 7, IQR 4–14, p=0.02 -for APP: SpO2/FiO2 most likely to PO2 increase after first episode (before median: 152, IQR 135–185; after: median 192, IQR 156–234, p=0.04) **No significant differences between groups in:** -number of pts requiring non-invasive ventilation and IMV -28-day mortality, APP group: 1; control: 4, p=0.12	4
	Per Branch							
	10	10						

APP = awake prone position, IMV = invasive medical ventilation, LOS = length of stay, pts = patients

Prone positioning reduces ICU-LOS and respiratory parameters.

#013

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
#013 **Ponnapa 2021** PMID: 33927120 DOI: 10.1097/CCM.0000000000005086 **Specification of study:** Systematic review (SR)	25 observational studies[1-25] **Inclusion criteria:** - hypoxemic laboratory-confirmed COVID-19 - adult patients (≥ 18 years) requiring supplemental oxygen - received PP and reported on oxygenation variables (Pao2/Fio2, Pao2, or Spo2) **Exclusion criteria:** - narrative reviews - not reported oxygenation variables - case reports or case series with fewer than five patients **Total** **Per Branch**		**Prone position** with spontaneous breathing		**Primary endpoint:** - Improvement in oxygenation variables **Secondary endpoints:** - Serious adverse events - Intubation rate - mortality	**Significant outcomes:** - improvement in P/F ratio (39), in the ratio of Pao2 to Fio2 (mean difference, 39; 95% CI, 25-54) - PaO_2 (mean difference, 20 mmHg; 95% CI, 14-25), and peripheral oxygen saturation (mean difference, 20 mmHg; 95% CI, 14-25). - respiratory rate decreased after prone position (mean difference, -3.2 breaths/min; 95% CI, -4.6 to -1.9) - intubation and mortality rates were 24% (95% CI, 17-32%) and 13% (95% CI, 6-19%) - no serious adverse events were recorded in the small subgroup of studies that reported them.	1 → 2 (not only RCTs included)

Prone positioning was associated with improvement in oxygenation variables without any reported serious adverse events.

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#015

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
015 Scaramuzzo 2021 PMID: 33900484 DOI: 10.1186/s13613-021-00853-1 **Specification of study:** Retrospective cohort study	191 COVID-ARDS pts in PP **Inclusion criteria:** -positive for SARS-CoV-2 infection ->18 years, receiving invasive mechanical ventilation - >=1 PP, ARDS secondary analysis of patients who participated in a previous prospective study conducted in 15 intensive care units of Italian hospitals between 22 February and 4 May 2020. **Exclusion criteria:** - NIV			**PP** in COVID-ARDS: <u>1. Responders:</u> P/F increase when returning to SP > the median response of the population <u>2. non-Responders:</u> P/F increase less than the median response of the population		**Primary endpoint:** - ICU VFD - ICU mortality - likelihood of liberation from MV at D28 after ICU admission **Secondary endpoints** - tracheostomy - attempted extubation - plateau pressure during the first 5 days - higher static compliance - duration of PP - duration of MV - reintubation following weaning failure - VAP - steroid use - non pulmonary infections - cardiovascular complications - digestive complications - neurologic complications - renal replacement therapy - veno-venous ECMO - ICU LOS	**Significant differences between groups in:** - tracheostomy 46 (47.9%) vs. 67 (70.5%), p = 0.008 - attempted extubation 33 (34.4%) vs. 6 (6.3%), p < 0.001 - VFD at D28 (Mean ± SD) 6.3 ± 8.1 vs. 2.7 ± 5.6, p < 0.001 - ICU mortality 32 (33.3%) vs 51 (53.7%), p = 0.006 - plateau pressure 25 cmH2O vs 26 cmH2O (p=0.04) during the first 5 days - higher static compliance 37 vs 33 ml/cmH2O (p=0.005) during the first 5 days **No significant differences between groups in:** - duration of prone positioning (Median [IQR]) 16 [16-16.7] vs. 16 [16-17], p = 0.757 - duration of MV (Median [IQR]) 18 [10-27] vs. 18 [12-29], p = 0.432 - reintubation following weaning failure: 17 (17.7%) vs 5 (5.3%), p = 0.093 - VAP: 53 (55.2%) vs. 52 (54.7%), p = 0.885 - steroid use 72 (75%) vs. 61 (64%), p = 0.083 - non pulmonary infections: 37 (38.5%) vs. 35 (36.8%), p = 0.882 - cardiovascular complications 13 (13.5%) vs. 18 (18.9%) p = 0.333 - digestive complications 5 (5.2%) vs. 3 (3.2%), 0.721 - neurologic complications 9 (9.4%) vs. 8 (8.4%), p = 1.0 - renal Replacement Therapy: 22 (22.9%) vs. 21 (22.1%), p = 1.0 - veno-venous ECMO 0 (0%) vs 3 (3.2%), p = 0.121 - ICU length of stay (Median [IQR]) 22 [15-35] vs. 21 [14-35] days, p = 0.994]	4
	Per Branch							
	Responders: 96	Non-Responders: 95						

ARDS = acute respiratory distress syndrome, ECMO = extra-corporal membrane oxygenation, ICU = intensive care unit, NIV = non-invasive ventilation, P/F = PaO_2/FiO_2-ratio, PP = prone positioning, pts = patients, SD = standard deviation, VAP = ventilator associated pneumonia, VFD = ventilator-free days; SP=supine position; MV= mechanical ventilation; LOS= length of stay

Sustained oxygenation improvement after first PP session is independently associated to improved survival and reduced duration of mechanical ventilation in critically ill COVID-19 patients.

#017

Reference, Study Type	Cases and Controls (Participant #, Characteristics) Total	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
#017 **Tan 2021** PMID: 33888007 DOI: 10.1177/17534666211009407 **Specification of study:** meta analysis	16 studies (6 cohort studies, 10 case series) with 243 pts [1-16] **Inclusion criteria:** - cohort studies or case series - 18 years or older with AHRF or ARDS in waking state - PP combined with non-invasive respiratory support (non-invasive mechanical ventilation -high flow nasal canula, venturi mask, conventional oxygen therapy - outcomes including at least one of following measures: aggregated mortality rate, intubation rate, tolerability, prior to and following difference of PaO2/FiO2 ratios, peripheral oxygen saturation (SpO2) and respiratory rate **Exclusion criteria:** - not in English or commentaries, reviews, duplicate publications - data could not be extracted by the statistical methods or non-targeted outcomes	**Prone positioning**	**Supine positioning**	**Primary endpoints:** - intubation rate - mortality rate - improvement of PaO2/FiO2 ratio - improvement in SpO2 - changes in respiratory rate - intolerance rate	**Significant differences between groups:** - aggregated intubation rate and mortality rate were 33% [95% CI: 0.26–0.42, I2 = 25%] and 4% (95% CI: 0.01–0.07, I2 = 0%), resprectively - the intolerance rate was 7% (95% CI: 0.01–0.12, *I*2 = 5%) - prone positioning increased PaO2/FiO2 [mean difference (MD) = 47.89, 95% CI: 28.12–67.66; p < 0.00001, I2 = 67%] and SpO2 (MD = 4.58, 95% CI: 1.35–7.80, p = 0.005, I2 = 97%) - prone positioning reduced respiratory rate (MD = −5.01, 95% CI: −8.49 to −1.52, p = 0.005, I2 = 85%) - subgroup analyses: rate of shorter duration prone (⩽5 h/day) and longer duration prone (>5 h/day) were 34% and 21%, and mortality rate of shorter duration prone (⩽5 h/day) and longer duration prone (>5 h/day) were 6% and 0%	1 → 2 (non RCTs included)

AHRF = Acute Hypoxemic Respiratory Failure, ARDS = Acute Respiratory Distress Syndrome, CI = confidence interval, PP = prone position, pts = patients

Prone positioning may improve oxygenation and respiratory rate in patients with AHRF or ARDS.

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#018

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#018 **Güner 2021** PMID: 33884691 DOI: 10.1111/nicc.12633 **Specification of study:** RCT	60 pts. analyzed (87 randomized) **Inclusion criteria:** - ≥18 years of age - admitted to the ICU following orotracheal intubation either in the clinics or the ICU of the study hospital **Exclusion criteria:** - history of endotracheal intubation in previous 30 days - intubation in different hospital before being admitted to study site - hemodynamic instability (mean arterial pressure < 60 mm Hg for 30 min, resistant to colloid therapy or with inotropic support) - obligatory supine position (following trauma or spinal surgery) - post- abdominal surgery - presence of surgical drains (might cause difficulty in positioning) - diagnosis of VAP before admission to ICU - obesity (body mass index [BMI] >30) - pregnancy		< 30°: lost to follow-up (exitus) (n= 5) 30°: lost to follow-up (exitus) (n=4), discontinued intervention (extubation) (n=5), (reintubation) (n=2) 45°: lost to follow-up (exitus) (n=5)	30° and 45° HOB elevation	<30° HOB elevation	**Primary outcomes:** - occurrence of VAP - timing of VAP	**Primary outcomes:** - frequency of VAP was significantly lower in the 45° compared with the <30° group (p= 0.022) - no significant differences between the <30° and 30°(p=0.053) as well as the 45° and 30° (p=0.705) groups - the timing of the VAP (early or late) was not dependent on the degree of HOB elevation (p=0.703)	2
	Per Branch							
	<30° group (n=20) 30° group (n=20)	45° group (n=20)						

HOB = head of bed, ICU = intensive care unit, pts = patients, RCT= randomized controlled trial, VAP = ventilator associated pneumonia

Placing and keeping the mechanically ventilated patients in semi recumbent position as close to 45° as possible can help prevent VAP.

#020

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
#020 **Samimian 2021** PMID: 33870210 DOI: 10.22037/aaem.v9i1.106) **Specification of study:** Cohort study	76 pts admitted to ICU **Inclusion criteria:** - age > 18 years - RASS score equal to -4 or –5 - MV for at least 24h - no spinal cord damage - normal intracranial pressure - without recent bladder surgery - without nasogastric tube and Foley catheter **Exclusion criteria:** - intolerance to HOB elevation		IAP measurement was performed every 8 hours for 24 hours using the KORN method in three different degrees of the head of bed (HOB) elevation (0◦ , 15◦ , 30◦)	No control group	**Primary endpoints:** - IAP measuring in relation to HOB	**Primary outcome:** - prevalence of intra-abdominal hypertension = 18.42% - mean ± standard deviation (SD) of IAP = 8.44 ± 4.02 mmHg for HOB angle 0°, 9.58 ± 4.52 for HOB angle 15°, 11.10 ± 4.73 for HOB angle 30°(p = 0.0001) - mean IAP = 8.44 ± 4.02 mmHg in 0◦, 9.58 ± 4.52 mmHg in 15◦, and 11.10 ± 4.73mmHg in 30◦ of HOB (p < 0.001) - normal IAP prevalence = reduced from 0° (81.6%) to 15° (65.8%) and 30°(57.9%), grade III IAH prevalence was increased from 0◦ to 30◦ (3.9%)	3
	Per Branch						

HOB = head-of-bed, IAH = intra-abdominal hypertension, IAP = intra abdominal pressure, ICU = intensive care unit, MV = mechanical ventilation, pts = patients, RASS = Richmond Agitation Sedation Scale

Elevation of HOB angle from 0° to 30° significantly increases IAP.

#026

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop -out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#026 **Tonelli 2022** PMID: 33824084 DOI: 10.1016/j.pulmoe.2021.03.002 **Specification of study:** Retrospective 2-centre cohort study	114 COVID patients with ARDS between March 1st and June 1st ,2020. **Inclusion criteria:** - 18 - 80 years - RR > 30 - SaO_2 <93% - PaO_2/FiO_2 < 300mmHg - Lung infiltrates > 50% of lung **Exclusion criteria:** - intubation within 24h - no maximal therapy - DNI - missing core data			**Self-pronation** with assistance for 3h for 1-4x/day + **standard care**	**Standard care**	**Primary outcome**: - ETI rate **Secondary outcomes:** - in-hospital mortality - time to ETI - tracheostomy rate - length of RICU and hospital stay **Power analysis:** Estimated ETI rate of 70% and presumed reduction by 40% in those receiving pronation α = 0.05, power 80% and an enrollment ratio of 1:2 = 93 pts.	**Significant differences between groups:** - ETI rate: HR = 0.59 95% CI [0.3−0.94], p = 0.03 - VFD: PP 15 (2−22) vs. SP 20 (2−24), p= 0.03 - LOS in RICU: PP 15 (3−26) vs. SP 10 (3−21), p= 0.02 - hospital LOS: PP 24 (3−45) vs. SP 20 (3−41), p= 0.03 **No significant differences between groups:** - in-hospital mortality - rate of tracheostomy	4
	Per Branch							
	38	76						

ARDS = acute respiratory distress syndrome; DNI = do not intubate; ETI = endotracheal intubation; ICU = intensive care unit; LOS = length of stay; pts = patients; RICU = respiratory intensive care unit, RR= respiratory rate; VFD = ventilator-free days

Awake prone positioning reduces the rate of intubation, length of stay in ICU and hospital and increases the ventilator free days.

#027

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#027 **Langer 2021** PMID: 33823862 DOI: 10.1186/s13054-021-03552-2 **Specification of study:** Retrospective multicenter cohort study	1057 ventilated COVID-19 pts between February 22 and June 14, 2020. **Inclusion criteria**: - laboratory confirmed SARS-CoV-2 infection - ICU admission for ARDS **Exclusion criteria:** - < 18 years - pts. treated for non-respiratory disease - missing data on PP			**PP** at least once during ICU stay	**SP**	**Primary outcomes**: - ICU mortality - hospital mortality - ICU-LOS - hospital LOS - duration of invasive MV	**Significant differences between the groups:** - ICU mortality: PP 262 (41%) vs SP 112 (28%), p< 0.001 - Hospital mortality: PP 278 (45%) vs SP 127 (33%), p< 0.001 - ICU-LOS: PP 16 (11–28) vs. SP 12 (7–21), p < 0.001 - Hospital LOS: PP 30 (17–49) vs. SP 26 (16–40), p=0.008 - duration of invasive MV: PP 16 (10–30) vs. SP 10 (6–19), p < 0.001	4
	Per Branch							
	648	409						

ARDS = Acute Respiratory Distress Syndrome, ICU = Intensive Care Unit; LOS = length of stay, MV = mechanical ventilation, PP = prone positioning, pts= patients, SP = supine positioning

Patients receiving at least one PP session during their ICU stay have a higher ICU and hospital mortality and longer ICU and hospital stay as well as a longer duration of mechanical ventilation.

#028

Reference, Study Type	Cases and Controls (Participant #, characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#028 **Dong 2021** PMID: 33781259 DOI: 10.1186/s12890-021-01461-2 **Specification of study:** RCT	80 pts **Inclusion criteria:** - prolonged MV (>72 h) - stable oxygen saturation, fraction of inspired oxygen≤55%, and positive end expiratory pressure ≤8 cmH2O - dose of dopamine<10 μg/kg/min and dose of epinephrine < 0.4 μg/kg/min - mean arterial pressure>75 mHg and urine output>1 mL/kg/h - good healing of the incision after surgery - normal cognitive function - no history of chronic mental illness or chronic obstructive pulmonary disease **Exclusion criteria:** - inability to perform physical activities - long-term MV prior to admission - neurological comorbidities involving muscles - irreversible disorders with a 6-month mortality rate of>50% according to APACHEII) - unsound limbs - administration of glucocorticoids (prednisone or other corticosteroid dose equivalents>20 mg/day) for at least 20 days prior to admission - cardiopulmonary resuscitation before admission to the ICU - radiotherapy or chemotherapy within the previous 6 months - presence of comorbidities, including acute myocarditis, deep venous thrombosis/embolism, and cerebrovascular accident - unstable fractures			**Rehabilitation therapy from day 2 until day 4** included six levels of rehabilitation exercises. - Level 0, turning over once every 2 h, for unconscious pts with unstable vital signs - Level 1, maintaining joint range of motion - Level 2, sitting in bed for 20 min 3 times a day - Level 3, additionally sitting on the edge of the bed - Level 4, additional standing up or sitting in a chair for at least 20 min a day - Level 5, pts actively moved from the bed and walked to bedside.	**standard care**	**Primary endpoint:** - DE - DTF **Secondary outcomes:** - time on MV - intubation duration	**Primary endpoint:** - DE at day 1: 1.43 ± 0.47 vs. 1.41 ± 0.59, p= 0.851 - DE at day 4: 1.33 ± 0.39 vs. 1.27 ± 0.48, p= 0.541 - DTF in rehabilitation vs. control group, 0.15 vs 0.12 p=0.008 - decrease of DTF: rehabilitation 0.017 vs control 0.034 p = 0.026 **Secondary Outcomes:** - time on MV: 7.49±2.59 days vs. 9.41±5.32 days, p-value=0.045 - duration of intubation: 8.31±2.80 days vs. 10.37±5.32 days, p=0.037	2
	Per Branch							
	39	41						

APACHE II = Acute Physiology and Chronic Health Evaluation II, DE = diaphragmatic excursion, DTF = diaphragmatic thickening fraction, LOS = length of stay, MV = mechanical ventilation, pts = patients, RCT = randomized controlled trial

Early rehabilitation has a positive effect on the diaphragmatic thickening fraction but not on the diaphragmatic excursion.

#030

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#030 **Rodriguez-Huerta 2022** PMID: 33725746 DOI: 10.1111/nicc.12606 **Specification of study:** Retrospective cohort study	44 consecutive pts. **Inclusion criteria:** - COVID-19 ARDS - undergoing MV - ≥1 PP session during ICU stay			**PP** without standardized protocol		**Primary endpoints**: - total number of PP maneuvers - total number of PP maneuvers per patient - duration of each PP session (hours) - total cumulative number of hours spent in PP per patient **Secondary outcome**: - AEs		4
	Per Branch							

AEs = adverse events, ARDS = Acute Respiratory Distress Syndrome, COVID-19 = Corona Virus Disease 2019, ICU = intensive care unit, MV = mechanical ventilation, PP = prone positioning; pts = patients

Despite the large number of maneuvers and the long time spent in the PP, no serious AEs occurred. Time spent in PP and number of PP sessions was associated with a higher risk for skin lesion.

#032

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#032 **Sryma 2021** PMID: 33686973 DOI: 10.4103/lungindia.lungindia_794_20 **Specification of study:** Prospective study	45 pts with COVID-19 acute hypoxemic respiratory failure receiving non-invasive oxygen therapy **Inclusion criteria:** - nasopharyngeal swab RT-PCR-confirmed COVID-19 - room air pulse oxygen saturation (SpO2) <94% **Exclusion criteria:** - hypercapnic respiratory failure, hemodynamic instability - altered sensorium - immediate tracheal intubation of hypoxia - hospitalization for > 12 h - BMI >30 kg/m2 - PaO2/FiO2 <100 - on NIV/HFNC - intolerance to PP			**Prone position**	**Supine position**	**Primary outcome:** - rate of intubation **Secondary outcomes:** - ROX index 30min after start of PP - ROX index at 12h - days to recovery of hypoxia (SpO_2 > 93% at room air) - mortality	**Primary outcome:** - rate of intubation: PP 2 (6.7 %) vs. SP 5 (33.3%), p=0.02 **Secondary outcomes**: - ROX index 30 min before PP: PP 10.7 ± 3.8 vs. SP 6.7 ± 2.6, p<0.001 - ROX index after 12h: RR 12.4 (4.5) vs. SP 6.4 (3.0), p< 0.001 - days to recovery: n.s. - mortality: PP 2 (6.7%) vs. SP 4 (26.7%), p=0.06	3 → 4 Bias in group allocation (definitions missing)
	Per Branch							
	30	15						

HFNC = high flow nasal cannula, NIV = non-invasive ventilation, PP = prone position, ROX = respiratory rate - oxygenation, SP = supine position

Prone positioning seems to reduce the rate of intubation and mortality but has no effect on the time to recovery.

#033

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
#033 **Patterson 2021** PMID: 33675753 DOI: 10.1016/j.ajo.2021.02.019 **Specification of study:** Systematic review with meta-analysis	**Total** 11 RCTs with 2247 patients[1-11] **Inclusion criteria:** - >18 years - hospital inpatients in critical care (Level 2 in National Health Service Critical Care Service Framework) - English language - published between January 1, 1990 and July1, 2020 **Exclusion criteria:** - conference abstracts **Per Branch**		PP	SP	**Primary outcome:** - incidence of ocular injuries	**Primary outcome:** - incidence of ocular injuries (across all studies)[1-11]: OR: 1.02 (95% CI: 0.82–1.26), I^2= 0% - incidence of ocular injuries (only studies with low risk of bias)[2,3,5] : OR: 0.79 (95% CI: 0.11–44)	1

PP = prone positioning, RCT = randomized controlled trial, SP = supine positioning

Prone positioning does not seem to increase the incidence of ocular injury.

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#036

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#036 **Nauka 2021** PMID: 33615236 DOI: 10.1097/CCE.0000000000000348 **Specification of study:** Retrospective case-control study	41 spontaneously breathing COVID-19 pts with respiratory insufficiency **Inclusion criteria:** - > 18 years - laboratory-confirmed COVID-19 (PCR) **Exclusion criteria:** - DNI Cases= pts that met the endpoint IMV or in-hospital mortality Controls = pts that were alive and not intubated at index time (death or intubation of case), matched 2:1 by age, gender, admission date (within 2 weeks) and hospital LOS.			nPP	No nPP	**Primary outcomes:** - risk of invasive MV - inhospital mortality adjusted for Charlson comorbidity index, BMI, worst S/F ratio and SOFA score.	**Primary outcome:** - risk of invasive MV: nPP: unadjusted HR 2.57; 95% CI 1.17–5.64; p = 0.02 adjusted HR 0.92; 95% CI 0.34–2.45; p = 0.86 - in-hospital mortality: adjusted HR 0.92; 95% CI 0.90–0.94; p < 0.001	4
	Per Branch							
	Cases: n=200	Controls: n=400						

BMI = Body Mass Index, COVID-19 = Corona Virus Disease 2019, DNI = do not intubate, IMV = invasive mechanical ventilation, MV = mechanical ventilation, nPP = non-intubated PP, PCR = Polymerase Chain Reaction, PP = prone positioning, pts = patients S/F= SpO_2 / FiO_2, SOFA = Sequential Organ Failure Assessment

COVID-19 patients receiving non-intubated prone positioning did not have a significantly higher risk of mechanical ventilation and had a significantly lower in-hospital mortality when adjusting for BMI, oxygenation and disease severity.

#037

Reference, Study Type	Cases and Controls (Participant #, Characteristics) Total	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
#037 **Wiart 2021** PMID: 33653912 DOI: 10.4187/respcare.08461 **Specification of study:** Retrospective 2-center cohort study	39 consecutive pts with a total of 113 PP sessions **Inclusion criteria:** - >18 years - moderate and severe ARDS - PP > 12h during first 72h of admission No exclusion		**ARDS related to COVID-19**	**ARDS unrelated to COVID-19**	**Not defined**	**Significant differences between the groups:** - duration of MV: COVID-19: 26 days (13–43) vs. non-COVID-19: 13 days (6–23), p=0.01 - ICU-LOS: COVID-19: 27.5 days (15–70) vs. non-COVID-19: 18 days (9–28), p=0.02 - number of PP sessions in PSV: COVID-19: 45 (66) vs. non-COVID-19: 39 (87), p=0.01 - number of PP sessions/ subject: COVID-19: 4 (2–4) vs. non-COVID-19: 2 (1–4), p=0.02 **No significant differences between the groups:** - 28d-mortality - ICU mortality - VFD on day 28	4

ARDS = Acute Respiratory Distress Syndrome, COVID-19 = Corona Virus Disease 2019, ICU = Intensive Care Unit, LOS = length of stay, MV = mechanical ventilation, PP = prone position, PSV = pressure support ventilation, pts = patients, VFD = ventilator-free days

COVID-19 patients receiving at least one prone session have a longer duration of mechanical ventilation and longer stay in the ICU and received fewer prone sessions on PSV and per patient.

#038

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#038 **Simioli 2021** PMID: 33646105 DOI: 10.5152/TurkThoracJ.2021.20158 **Specification of study:** single-center case-control study	29 COVID pts with resp. insufficiency involving pts with severe COVID-19 infection **Inclusion criteria:** - adults - moderate-to-severe ARDS owing to COVID-19 - NIV - awake		11 pts (no complaints to PP)	**Prone position** with spontaneous breathing for approx. 10 h/d	**Usual care**	**Primary Endpoints:** - consolidation/atelectasis - P/F-ratio - duration of respiratory failure	**Significant differences between groups in:** - P/F during PP increased compared with noncompliant controls (288 vs. 202; p=0.0002) - Total duration of respiratory failure was shorter in pts with PP (14 vs. 21 days; p=0.002)	4
	Per Branch							
	18	11						

COVID-19 = Corona Virus Disease 2019, NIV = noninvasive ventilation, P/F = pO2/FiO2 ratio, PP = prone position, pts = patients

PP has a documented substantial effect on pO2/FiO2 ratio when started early and for at least 10 h/d.

#043

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#043 **Mathews 2021** PMID: 33595960 DOI: 10.1097/CCM.0000000000004938 **Specification of study:** Large retrospective COVID-19 cohort study	2338 of critically ill adults with coronavirus disease 2019 admitted to 68 U.S. hospitals **Inclusion criteria:** - admitted to an ICU between March 4 2020 and May 15 2020 - proning used for least one STOP-COVID patient - adult pts(≥ 18 years old) - moderate-to-severe hypoxemia (Berlin criteria: Pao2/Fio2 ratio ≤ 200 mm Hg) - within the first 2 days of ICU admission - receiving invasive MV **Exclusion criteria:** - Pao2/Fio2 ratio less than or equal to 200 mm Hg in the first 2 days of ICU admission - pts who received ECMO on ICU day 1 - experienced cardiac arrest or severe arrhythmia on ICU day 1 - pregnancy			**Prone position** Within the first 2 days of ICU	**Usual Care**	**Primary outcome:** - mortality - time to in-hospital death - censored at hospital discharge - last follow-up	**Primary outcome :** - mortality HR : 0.84 (95% CI, 0.73–0.97) - proned patients had a higher occurrence of shock on ICU day 1 vs. non-proned patients (114 [26.2%] vs. 208 [12.7%]) - total of 1.017 patients (43.5%) were discharged alive; 1.101 (47.1%) died (327 of pp pts., 46,6%; 774 of usual care pts., 47.3), 220 (9.4%) remained hospitalized at last follow-up (unadjusted HR, 0.89 [95% CI, 0.79–1.02]) - median follow-up patients was 34 days (IQR, 25–46 d) and 30 days (IQR, 20–42 d), respectively; 31 days (IQR, 22–43 d) overall	4 → 3 (large cohort)
	Per Branch							
	n = 702 prone positioning < 48 h	n = 1.636 not in prone position < 48 h						

ECMO= extracorporeal membrane oxygenation, HR= hazard ratio, ICU = Intensive Care Unit, pp= prone positioning, pts = patients, STOP-COVID= Study of the Treatment and Outcomes in Critically Ill Patients with Coronavirus Disease

In-hospital mortality was lower in mechanically ventilated hypoxemic patients with coronavirus disease 2019 treated with early proning compared with patients whose treatment did not include early proning.

#044

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
#044 **Lai 2021** PMID: 33590997 DOI: 10.1097/CCM.0000000000004849 **Specification of study:** Prospective monocentric study	22 ventilated pts with ARDS **Inclusion criteria:** -presence of ARDS - decision taken by the attending physicians to perform PP and monitoring of CI with calibrated pulse contour analysis **Exclusion criteria:** - ≤ 18 years old - extracorporeal membrane oxygenation - impossibility to perform EEXPO test		**PP**	**SP**	**Primary outcome** hemodynamic effects of PP (measurements taken before and 15 min after PP maneuver)	**Significant differences between measurements in SP and PP in preload responsive patients:** - cardiac index L/min/m^2: PP 3.5 (3.3–4.5) vs. SP 2.9 (2.7–3.5), p<0.05 - global end-diastolic volume index mL/m^2 : PP 780 (648–840) vs. SP 649 (556–754), p<0.05 - Pms mmHg: PP 34 (28–39) vs. SP 16 (15–21), p<0.05 - CVP mmHg: PP 14 (10–18) vs. SP 8 (8–12) - Pms – CVP mmHg: PP 19 (17–23) vs. SP 8 (6–12) - Rvr mm Hg/min/L: PP 3.0 (2.6–3.7) vs. SP 1.7 (1.5–1.9) - IAP mmHg: 15 (14–17) vs. 10 (9–15) **No significant differences:** - PaO_2 /FiO_2 - respiratory system compliance - total positive end-expiratory pressure - plateau pressure - heart rate - arterial pressure	4
	Per Branch						

CO = cardiac output, CVP = central venous pressure, EEXPO = end-expiratory occlusion, IAP = intra-abdominal pressure, Pms = mean systemic pressure, PP = prone positioning, Rvr = resistance to venous return, SP = semirecumbent positioning

Prone positioning induces an increase in cardiac index, global end-diastolic volume index, mean systematic pressure, central venous pressure, and intra-abdominal pressure.

#045

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop -out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#045 **Ohbe 2021** PMID: 33561986 DOI: 10.3390/jcm10040618 **Specification of study:** observational study	30568 eligible pts **Inclusion criteria:** - underwent CABG - admitted to the ICU > 3 consecutive days from the date of CABG **Exclusion criteria:** - aged <18 years - received cardiopulmonary resuscitation within 3 days of their CABG			**any rehabilitation program** within 3 days of CABG	**usual care**	**Primary Endpoint:** - Barthel Index score at discharge **Secondary Outcomes:** - in-hospital mortality - ICU LOS - hospital LOS - total hospitalization costs	**Significant differences between groups in:** - Barthel Index scores at discharge in the early rehabilitation group were significantly higher than usual care group (difference: 3.2; 95% confidence interval: 1.5–4.8); <0.001 - in-hospital mortality, % (difference: -1.8 (CI 95%: -2.6 to -1.0); p<0.001) - ICU LOS (difference: -0.5 (CI 95%: -0.8 to -0.3); p<0.001) - hospital LOS (difference: -3.7 (CI 95% : -5.2 to -2.2); p<0.001)	**4 → 3** (upgrade, large cohort and consistent results)
	Per Branch							
	17418	13150						

CABG = coronary artery bypass grafting, CI= confidence interval, ICU = Intensive Care Unit, LOS = length of stay, pts = patients

An early rehabilitation program seems to have a benefit in relation to the Barthel score, in-hospital mortality, ICU LOS and hospital LOS in CABG patients.

#050

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#050 **Ozyemisci Taskiran 2021** PMID: 33448757 DOI: 10.23736/S1973-9087.21.06551-5 **Specification of study:** observational study	35 pts **Inclusion criteria** - admission to ICU with a diagnosis of ARDS according to Berlin definition secondary to COVID-19 ->18 years old			**Rehabilitation program** - began ≥5 days of the ICU stay and ≥10 days after the onset of COVID symptoms - passive and active ROM **NMES (Compex Rehab 400, Compex, Ecublens, Switzerland)**	**Standard ICU care**	**Primary endpoints:** - duration of MV - ICU LOS - mortality rates - handgrip strength - MRC score - range of joint motion - health-related quality of life was assessed with 36-item Short Form Survey	**Primary endpoints:** - no significant differences in all outcomes	3
	Per Branch							
	18	17						

ARDS = Acute Respiratory Distress Syndrome, ICU = Intensive Care Unit, LOS = length of stay, MRC = Medical Research Council Scale, MV = mechanical ventilation, NMES = neuromuscular electrical stimulation, pts = patients, ROM = range of motion

A late rehabilitation program including NMES showed no difference in relation to the predefined outcomes.

#051

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#051 **Ibarra 2020** PMID: 33446462 DOI: 10.1016/j.bjps.2020.12.057 **Specification of study:** Monocentric case-control study	74 COVID pts during MV treated with pronation therapy **Inclusion criteria:** - COVID-19+ disease confirmed by polymerase chain reaction - invasive mechanical ventilation - treated with PP therapy **Exclusion criteria:** - noninvasive ventilation - patients not treated with PP			**Recording the pressure damage** cases were defined as those who presented prone-positioning pressure sores (PPPS) such as ulcers on the forehead, cheek, ala nasi, lip, chin, chest, knee, leg or toe	controls were classified as those who met inclusion criteria but **did not present any PP pressure injuries**	**Primary endpoints:** presence, location, and severity of PPPS over bony prominences, as well as the injuries related to a medical or other device	**Primary results:** - total number of 136 PPPS - face was the most affected region (69%) - severity stage II was most frequent - increased risk of PPPS were the total number of days under pronation cycles and PP maintained for more than 24 h	4
	Per Branch							
	57	17						

PP = prone positioning, PPPS = prone-positioning pressure sores, pts = patients

PPPS are related to the characteristics of the maneuver and the previous nutritional state. The implementation of improved positioning protocols may enhance results in critical patient caring.

#053

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#053 **Clarke 2021** PMID: 33422143 DOI: 10.1186/s13104-020-05426-2 **Specification of study:** prospective monocentric cohort study	20 COVID-ARDS pts with mechanical ventilation **Inclusion criteria:** - > 18 years of age - confirmed SARS-CoV-2 infection - invasively ventilated in the ICU - met the Berlin criteria for the diagnosis of ARDS - underwent PP as part of their management		1 patient (treated in an area without an electronic health record system)	**PP** (16 h)	Supine position (before PP)	**Primary endpoints:** - ICU free days and ventilator free days (VFDs) - PaO2/FiO2 ratio before and after PP **Secondary endpoints:** - 28-day-mortality - compliance	- median improvement in the PaO2/FiO2 ratio of 132 in the prone position compared to the supine position (IQR 67–228) - no significant difference in respiratory system static compliance - 28-day mortality rate of 15% - median number of ventilator free days at 28 days: 16 (IQR, 0–21) - median number of ICU free days at 28 days: 14.5 (IQR, 0–20)	3
	Per Branch							
	20							

ARDS = Acute Respiratory Distress Syndrome, COVID = Corona Virus Disease, ICU = intensive care unit, PP = prone positioning, pts = patients

Prone positioning should be considered in patients with SARS-CoV-2 ARDS.

#054

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#054 **Scheffenbichler 2021** PMID: 33416257 DOI: 10.1097/CCM.0000000000004808) **Specification of study:** International, multicenter, prospective cohort study	150 surgical ICU pts **Inclusion criteria:** - age ≥ 18 years - Barthel Index ≥ 70 - admission to ICU < 48 h prior to screening **Exclusion criteria:** - transfer from other hospitals, long term rehabilitation facilities or nursing homes with a preceding stay > 48 h - lower extremity amputation - comfort care - high risk of persistent brain injury (motor component of the GCS < 5 and traumatic brain injury) - pregnancy - neurodegenerative diseases - paraplegia - tetraplegia		- n = 2 ICU follow up incomplete - n = 2 tissue edema rectus femoris muscle	none		**Primary outcome:** - adverse discharge dispositions (loss of the ability to live independently) **Secondary outcomes:** - association between dose of mobilization and ICU length of stay, hospital length of stay, and 30-day mortality. - association between dose of mobilization and mmFIM - effect of dose of mobilization on DASI 3 months after hospital discharge. **Sample size calculation:** Estimated correlation between dose of mobilization and discharge disposition of 0.25, thus a sample size of 150 patients provides a power of 0.88 to identify a significant effect (alpha error of 0.05) for the primary outcome.	pts divided in low dose (LD) of mobilization (MQS ≤ 6.5) and high dose (HD) of mobilization (MQS > 6.5) **Primary outcome:** - adverse discharge: LD 55 (74%) vs. HD 37 (51%), p< 0.001 **Secondary outcomes:** - ICU-LOS: aIRR 0.72; 95% CI 0.57-0.92; p=0.009 - hospital LOS: aIRR 0.79; 95%CI 0.64-0.98; p=0.035 - 30-day mortality: aOR 0.14; 95%CI 0.05-0.40; p<0.001 - mmFIM at ICU discharge: aIRR 2.45; 95%CI 1.94-3.08; p<0.001 - mmFIM at hospital discharge: aIRR 1.92; 95%CI 1.52-2.43; p<0.001 - DASI at 3-month FU: coefficient 9.82; 95%CI 3.88-15.75; p=0.001	3
	Per Branch							
	74	72						

CI = confidence interval, DASI = Duke Activity Status Index, GCS = Glasgow Coma Scale, ICU= Intensive Care Unit, IRR = incidence rate ratio, mmFIM = minimal modified functional independence measure, MQS = Mobilization Quantification Score, OR = odds ratio

High dose mobilization protects patient's ability to live independently after discharge.

#056

Reference, Study Type	Cases and Controls (Participant #, Characteristics) Total	Drop -out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
#056 **Menges 2021** PMID: 33407707 DOI: 10.1186/s13054-020-03446-9 **Spezification of study:** systematic review with meta-analysis	- 12 RCTs [1-12] **Inclusion criteria:** - studies conducted in adult ICU pts -aged ≥ 18 years - requiring invasive or non-invasive MV at enrollment or during the ICU stay **Exclusion criteria:** - studies that enrolled relevant proportions (≥ 10%) of pts with burn injuries, neurological conditions or transplant pts, - postoperative pts requiring MV for < 24 h on average **Per Branch**		**Systematic early mobilization** - any physical or occupational therapy targeting muscle activation - initiated within 7 days after ICU admission - with a clearly defined protocol or specific clinical criteria	**Late mobilization** - initiated 7 days or more after ICU admission **Standard early mobilization** - initiated within 7 days but less systematically **No mobilization** - sham intervention or no rehabilitative intervention	**Primary endpoints:** 1) MRC-SS 2) ICUAW 3) Function **Secondary outcomes:** - quality of life - mortality - LOS - safety	**Significant differences between groups in:** - SF-36 PFS at 6 months after hospital discharge (MD 12.3; 95% CI 3.9–20.8; *p* = 0.004; one study; very low certainty) - improvement in SF-36 PCS when comparing systematic early to late mobilization (MD 3.4; 95% CI 0.01-6.8; p=0.050) **No significant differences between groups in:** - SF-36 PCS compared to standard early mobilization (MD -2.4; 95% CI -6.1 to 1.3; p=0.20) - MRC-SS at ICU discharge (MD 5.8; 95% CI -1.4 to 13.0; p=0.12) - incidence of ICUAW (RR 0.62; 95% CI 0.38-1.02; p=0.06) - no conclusive evidence for quality of life, cognitive and mental health outcomes, length of ICU or hospital stay, duration of MV or in-hospital or post-discharge mortality - Adverse effects n.s.	1

ICU-AW = ICU-acquired weakness, ICU = intensive care unit, LOS= length of stay, MRC-SS = Medical Research Council Sum Score, n.s. = not significant, , pts = patients, SF-36 PCS = SF-36 physical health component score, SF-36 PFS = SF-36 physical function domain score

Systematic early mobilization seems to have a benefit for the functional outcome compared to late mobilization (>7 d) but not standard early mobilization.

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#057

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
#057 **Douglas 2021** PMID: 33405409 DOI: 10.1097/CCM.0000000000004818 **Specification of study:** Retrospective single-center study	**Total** 61 pts with COVID-19 between March 1, 2020 and May 30, 2020 **Inclusion criteria:** - COVID-19 pneumonia/ARDS - requiring intubation - MV - PP **Exclusion criteria**: - No ICU admission - Not intubated **Per Branch** PP = 61		**PP**		**Primary endpoint**: - pressure wounds by grade (1-4) **Secondary outcomes**: - rate of facial and limb edema - hospital-acquired infection - device displacement - LOS	**Primary endpoint** - Pressure ulcers grade 1-3: 38 (71.7%) - Pressure ulcers grade 4: 2 pts. **Secondary outcomes** - rate of facial and limb edema: “common” no calculations - hospital-acquired infections: 3 (4.9%) - device displacement: not stated - ICU-LOS in survivors: 16.5 d (10–25.8 d) - hospital-LOS in survivors: 28 days (18–42 d)	4

ARDS = Acute Respiratory Distress Syndrome, ICU = Intensive Care Unit, LOS = length of stay, MV = mechanical ventilation, PP = prone positioning, SP = supine positioning

Patients in prone position were likely to develop pressure ulcers.

#058

Reference, Study Type	Cases and Controls (Participant #, Characteristics) Total	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
#058 **Gutiérrez-Arias 2021** PMID: 33402382 DOI: 10.4187/respcare.08363 **Specification of study:** Systematic Review	12 RCTs with 530 pts Meta analysis for 10 RCTs[1-10] **Inclusion criteria:** - RCTs - adult subjects - invasive MV - no restrictions regarding admission diagnosis ICU type or language - neuromuscular or functional electrical stimulation compared to no intervention (i.e., usual care or physical therapy) or placebo of neuromuscular or functional electrical stimulation **Exclusion criteria:** - published only in conference proceedings - applied another intervention to only 1 of the 2 groups		**Neuromuscular or functional electrical stimulation**	**No intervention** or **Placebo stimulation**	**Primary endpoint:** - duration of invasive MV in days **Secondary outcomes:** - adverse events	**Significant differences between groups in:** - duration of MV, mean difference (95%CI): -2.68 (-4.35 - -1.02), p = 0.002 adverse events: no meta-analysis	1

CI = confidence interval, ICU = intensive care unit, MV = mechanical ventilation, pts = patients, RCT = randomized controlled trial

Neuromuscular electrical stimulation reduces duration of mechanical ventilation in a meta-analysis including 2 out of 12 studies in this systematic review.

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#059

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#059 **Shearer 2021** PMID: 33389768 DOI: 10.1002/lary.29374 **Specification of study:** Retrospective 2-centre cohort study	263 patients **Inclusion criteria:** - age > 18 years - diagnosed with COVID-19 - requiring intubation			**pp**	**Supine positioning**	**Primary endpoints:** - developing facial injuries - average duration of prone positioning	**Primary outcome:** **-** pp group: n=68 (47.6%) developed pressure injuries (head and neck) -supine group: n=2 (1.2%) with pressure injury - average duration of prone positioning for patients that developed pressure injuries was significantly longer (6.79 days vs. 3.64 days, P < .001) - mean duration of proning : 5.14 days (4.27%) (range: 1-26), with pressure injury: 6.79 days (4.87%), without pressure injury: 3.64 days (2.96.%)	4
	Per Branch							
	Prone position n=143	Supine position N=120						

ICU = intensive care unit, pp = prone positioning, pts = patients

Longer duration of prone positioning was correlated with the development of pressure injuries, but early supination may not be a feasible option.

#061

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
061 Shelhamer 2021 (PMID: 33380236 DOI: 10.1177/0885066620980399) Prospective Cohort Study	261 pts **Inclusion criteria:** - >17 years of age - intubated - not undergone PP - met criteria for PP (PaO2: FiO2 < 150 mm Hg, PEEP ≥ 10 cm of water and FiO2 ≥ 0.6) - confirmed SARS-CoV-2 infection by real-time reverse transcription-polymerase chain nasal swab - from March 25 through May 2, 2020			**Prone positioning** by a specialized proning team	**Usual care**	**Primary outcome:** in-hospital mortality	**Primary outcome:** - unadjusted SHR (95%CI): 0.51 (0.39 – 0.66), p < 0.005 - multivariate adjusted SHR (95%CI): 0.57 (0.42 – 0.76), p< 0.005 - stabilized doubly robust IPTW SHR (95%CI): 0.61 (0.46 – 0.80), p< 0.005	3
	Per Branch							
	62	199						

IPTW = inverse probability treatment weight, PEEP = positive end expiratory pressure, PP = prone position, pts = patients, SHR = sub-distribution hazard ratio

Prone positioning may reduce in-hospital mortality in COVID-19 patients. Limited significance due to baseline differences and insufficient adjustment.

#065

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
065 Cao et al 2020 (PMID: 33343939 DOI: 10.1155/2020/4973878) Systematic Review with Meta-Analysis	12 publications (RCTs)[1-12] **Inclusion Criteria:** - adults with ARDS - intervention: prone position - control: supine position - outcomes: efficacy outcomes including mortality, mechanical ventilation duration, and ICU stays, and the safety outcomes, including any adverse events reported ≥2 studies - study design: RCT		**PP**	**SP**	**Primary outcomes:** - mortality - duration of MV - ICU LOS - adverse events	**Significant outcomes:** - mortality - subgroup lung protective ventilation, RR (95%CI): 0.77 (0.63 – 0.93), p = 0.006 - mortality - < 70% male pts, RR (95%CI): 0.70 (0.58 – 0.85), p < 0.001 - pressure sores, RR (95%CI): 1.23 (1.07–1.42), p = 0.003 **Non-significant outcomes:** - morality, RR (95%CI): 0.87 (0.75 – 1.00) , p= 0.055 - ICU LOS, mean difference (95%CI): -0.39 (-2.70 – 1.91), p = 0.738 - duration of MV, mean difference (95%CI): -0.22 (-3.14 – 2.70), p = 0.883 - displacement of tracheal tube, RR (95%CI): 1.35 (0.47–3.84), p = 0.579 - displacement of a thoracotomy tube, RR (95%CI): 3.14 (1.02–9.69), p = 0.047 - unplanned extubation, RR (95%CI): 1.02 (0.73–1.43), p = 0.906 - selective intubation, RR (95%CI): 2.64 (0.26–26.73), p = 0.411 - endotracheal tube obstruction, RR (95%CI): 2.45 (1.42–4.24), p = 0.001 - loss of venous access, RR (95%CI): 1.52 (0.22–10.26), p = 0.669 - hemoptysis, RR (95%CI): 0.85 (0.35–2.05), p = 0.717 - cardiac arrest, RR(95%CI): 0.71 (0.40–1.26), p = 0.245 - pneumothorax, RR(95%CI): 0.86 (0.58–1.29) , p = 0.471 - ventilator-associated pneumonia, RR (95%CI): 1.34 (0.65–2.76), p = 0.427	1 → 2 high risk of bias
	Per Branch						

CI = confidence interval, ICU = intensive care unit, LOS = length of stay, MV = mechanical ventilation, PP = prone position, pts = patients, RCT = randomized controlled trial, RR = risk ration, SP = supine position

Overall, prone positioning in comparison to supine position could not show a benefit regarding mortality, duration of mechanical ventilation or length of ICU stay. Beneficial effect in terms of lower mortality in subgroups and the high heterogeneity as well as publication bias in the funnel plots warrant further large-scaled RCTs.

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#068

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
068 Hernandez-Rubio 2020 (PMID: 33326484 DOI: 10.1371/journal.pone.0243968) Prospective cohort study	70 pts **Inclusion criteria:** - adult pts - positive PCR for COVID-19 - admission to the ICU with at least one of the following: RR > 30 breaths/minute, severe dyspnea, use of accessory muscles or SpO2 <92% despite FiO2 >0.5 oxygen therapy **Exclusion criteria:** - pts transferred from the ICU to undergo weaning			**Self-/Awake-proning**	**Usual care**	**Primary endpoint:** incidence of endotracheal intubation	**Primary outcome:** - Cox proportional hazard model for incidence of endotracheal intubation, adjusted OR (95%CI): 0.05 (0.005 – 0.54, p = 0.00)	3
	Per Branch							
	32	38						

ICU = intensive care unit, OR = odds ratio, PCR = polymerase chain reaction, pts = patients, RR = respiratory rate

Awake prone positioning reduced risk for endotracheal intubation.

#069

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
069 Berney 2020 (PMID: 33323480 DOI: 10.1136/thoraxjnl-2020-215093) Specification of study: multicentre RCT	**Inclusion criteria:** - mechanically ventilated in ICU - > 18 years - sepsis or severe sepsis - expected to require MV > 48h - expected ICU stay > 4 days **Exclusion criteria:** - pts that did not meet safety criteria - primary neurological diagnosis - not expected to survive ICU discharge		6: Intervention 5, Control 1 (withdrew consent or developed exclusion criteria after randomisation)	60 min of FES-cycling >5days/week while in ICU + Standard care	Standard care	**Primary outcomes:** - quadriceps muscle strength at hospital discharge - cognitive impairment at 6-month follow-up **Secondary outcomes**: - all-cause mortality - incidence and duration of delirium - hand grip strength - PFIT - FSSI - SPPB - 6-MWT - Katz Index - LIAoDL - HADS - SF-36 - EQ-5D	**Primary outcomes:** - quadriceps muscle strength at hospital discharge (Nm): 57.3 (SD: 21.6) vs. 53.1 (SD: 24.1) MD: 4.7 (95% CI: −4.7 to 14.1) - cognitive impairment at 6-month follow-up: 9 (41%) vs 6 (40%), OR 1.1 95% CI 0.30 - 3.8) p= 0.929 **Secondary outcomes**: - PFIT: 6.4 (SD: 2.4) vs. 5.1 (SD: 3.0) MD 1.3 (95% CI 0.4 to 2.3) - FSSI: 20.4 (SD 9.7) vs. 15.9 (SD 10.0) MD 4.5 (95% CI 1.1 to 8.0) - all-cause mortality: n.s. - incidence of delirium: no calculation - duration of delirium: n.s. - hand grip strength: n.s. - SPPB: n.s. - 6-MWT: n.s. - Katz Index: n.s. - LIAoDL: n.s. - HADS: n.s. - SF-36: n.s - EQ-5D: n.s.	2
	Per Branch							
	80	82						

EQ-5D = european quality of life 5 dimensions, FES-cycling= functional electrical stimulation-assisted cycling, FSSI = functional status score for ICU, HADS = hospital anxiety and depression scale, ICU= intensive care unit, LIAoDL = Lawton's instrumental activities of daily living, PFIT = physical function in ICU-Test, SF-36 = short form health survey 36, SPPB = short physical performance battery, 6-MWT= 6-minute walking test

Additional FES-cycling does not improve quadriceps muscle strength or cognitive impairment.

#070

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
070 Chaplin 2021 (PMID: 33303317 DOI: 10.1016/j.aucc.2020.10.011) Retrospective cohort study	72 patients on VV-ECMO based on whether they received periods of prone positioning during the ECMO run **Inclusion criteria:** - adults who received vvECMO at CVICU in Auckland,NZ, between July 1 2014 an July 9 2019 **Exclusion criteria:** -lung transplant			**PP** values were recorded immediately before pronation, immediately before the end of the pronation episode, and 4-6 h after the end of the pronation episode	**Supine position**	**Primary outcomes:** - alive at 6 months - duration of ECMO (hours) **Secondary outcome:** **-** significant differences	**Primary outcomes:** - ECMO outcome (alive after 6 month): proned n=9 (69.2), nonproned n=41 (69.5) - pts in prone position: longer ECMO treatment than supine group with a median (IQR) time of 599 h (522±738) vs 230 h (133±404), respectively ($p < 0.0002$) **Secondary outcome:** Significant differences in PaCO2, MABP, VT: - before proning: PaCO2= 43.5 (40.7±46.9), before deproning: paCO2= 43.2 (40.5±46.3), 4-6h after supination: paCO2= 42 (39.8±46.3) (p-value < 0.0001) - before proning :MABP (mmHg)= 70 (65±75), before deproning: MABP= 75 (65±83.8), 4-6h after supination: MABP = 70 (65±75) (p-value<0.03) - before proning: VT (ml/kg)= 102 (33±120), before deproning: VT= 97.5 (48.8±138), 4-6h after supination: VT= 86 (32±138) <0.0001	4
	Per Branch							
	prone positioning n= 13	Supine positioning n = 59						

CVICU= cardiothoracic and vascular intensive care unit, ECMO = extra corporeal membrane oxygenation, MABP= mean arterial blood pressure, PaCO2 (in mmHG) = partial carbon dioxide pressure, PP = prone position, pts = patients, VT = tidal volume, vvECMO = venous venous extra corporeal membrane oxygenation

Proning patients on ECMO appears to incur no further complications. Whether it has a clinical benefit needs further investigation.

#072

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
072 Segers 2021 (PMID: 33285371 DOI: 10.1016/j.jcrc.2020.11.018) Specification of study: RCT	50 pts **Inclusion criteria:** - 18 years or older - ≥ 48 hours but ≤ 96 hours since ICU admission - predicted ICU LOS ≥7 days **Exclusion criteria:** - transfer from another ICU or other hospital - re-admission to the ICU - prognosticated lethal outcome - presence of a pacemaker - pregnancy - pre-existing neurological or neuro-muscular disease - intracranial pressure > 20cmH_2O - abnormal musculoskeletal and skin conditions that could interfere with the stimulation (e.g., femur fracture, burn injury on the thigh, skin disease)	3 pts withdrew consent	**Standardized physiotherapy** and **early mobilization** + unilateral **neuromuscular electrical stimulation** for 60 minutes daily for 7 days (M. vastus medial; M. vastus lateralis)	**Standardized physiotherapy** and **early mobilization**	**Primary outcome:** thickness of the M. rectus femoris via ultrasound **Secondary outcomes:** - MRC - quadriceps strength via HHD	difference between stimulated muscle and unstimulated muscle of the same patient: **Primary outcome:** - average decline in intervention vs. control: 0.13 cm (95% CI 0.04 – 0.22), p = 0.007 **Secondary outcomes:** - MRC Median [IQR], Control: 4 [4–5] vs Intervention: 4 [4–5], p = 0.317 - HHD: Mean ± SD: control 101 ± 62 vs intervention 106 ± 72, p = 0.48	2 → 3 Intraindividual only
	Per Branch						

HHD = handheld dynamometry, ICU = intensive care unit, LOS = length of stay, MRC = medical research council score, pts = patients, RCT = randomized controlled trial

Neuromuscular electrical stimulation reduced loss of muscle mass.

#075

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
075 Braune-Olsen 2020 (PMID: 33259044 DOI: 10.1186/s13613-020-00776-3) prospective observational study	115 pts consecutive critically ill patients on ECLS **Inclusion criteria:** pts treated with ECLS for severe circulatory and/or respiratory failure			**Active mobilisation (IMS ≥ 3)**	**No active mobilisation (IMS < 3)**	**Primary outcome**: - ECLS-associated complications during **Secondary outcomes:** - length of ECLS treatment - ICU-LOS - Hospital-LOS - ICU-mortality	332 active mobilisation sessions **Primary outcome:** - circuit malfunction: blood flow <2l/min: 3 (0.9%) - blood flow < 0,5l/min: 1 (0.3%) - SpO_2 < 85%: 63/ 332 (19%) - MAP < 50mmHg: 25/332 (7.5%) - HR > 140/min: 19/332 (5.7%) - bleeding from cannula: 3/43 (6.9%) vs. 11/72 (15.3%) - cannula displacement: 1/332 (0.3%)	3
	Per Branch							
	43	72						

ECLS = extracorporeal life support, HR = heart rate, IMS = ICU mobility scale, LOS = length of stay, MAP = mean arterial pressure, SpO_2= peripheral oxygen saturation

Active mobilisation of critically ill patients on ECLS is feasible and safe.

#076

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
076 Liang 2020 (PMID: 33250403 DOI: 10.1016/j.aucc.2020.10.004) Systematic review and meta-analysis	34 studies with 7159 pts (10 RCTs, 8 controlled clinical trials, 16 before-and-after studies) studies on early mobilisation n= 7[1-7] **Inclusion criteria:** - ICU patients > 18 years **Exclusion criteria:** - studies including patients with history of a neurologic condition such as dementia, traumatic brain injury, stroke, or hepatic encephalopathy or who had undergone neurosurgery		**Early mobilisation**	**Standard care**	**Outcomes:** - incident of delirium - duration of delirium - ICU-LOS - mortality - psychological outcomes (level of anxiety, quality of recovery) - family satisfaction of care provided	**Outcomes:** - incidence of delirium[1,2,5-7]: OR 0.33 95% CI 0.24 - 0.46, p<0.0001, I^2=24% - duration of delirium[3-6]: MD: -1.24 95% CI -1.43 - -1.04, p<0.0001, I^2 =0% - ICU-LOS[3,4]: MD: -1.02 95% CI –2.88 - 0.84 p= 0.28, I^2 =54%	1 → 2 (downgraded as not only RCTs are included)
	Per Branch						

ICU = intensive care unit, LOS = length of stay, RCT = randomized controlled trial

Early mobilisation reduces the incidence and duration of delirium and length of stay in the ICU.

1. Huang, S. B., Luo, Q. X., Yuan, Q. Y., Chen, Z. M., & Ou, H. H. (2014). The effect of early activity for delirium of mechanical ventilation patients in ICU. *Today Nurse*, *8*, 3.
2. Karadas C, Ozdemir L. The effect of range of motion exercises on delirium prevention among patients aged 65 and over in intensive care units. GeriatrNurs 2016;37(3):180e5.
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4. Schweickert WD, Pohlman MC, Pohlman AS, Nigos C, Pawlik AJ, Esbrook CL,et al. Early physical and occupational therapy in mechanically ventilated,critically ill patients: a randomised controlled trial. Lancet 2009;373(9678):1874e82.
5. Wang YN, Gao XM, Chen B, Liu WT, Jiang JH, Hu QQ. Clinical study of early exercise to prevent delirium in patients with ICU mechanical ventilation. J ClinNursing'sPract2016;1(8):3.https://doi.org/10.3969/j.issn.2096-2479.2016.08.120.
6. Huang F, Liao C, Feng H, Zhang M, Hu S, Tong J. The clinical effect of early mobilisation on delirium among ICU mechanical ventilation patients. GenPract Nurs 2017;(21):2565e7.
7. Dou YR, Dai XM, Guo XJ, Pan CF, Guo LX. Study on the effect of early pedaling exercises in bed on the delirium patients with mechanical ventilation in ICUor EICU wards. Mod Clin Nurs 2018;17(10):6

#077

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
077 Goldfarb 2021 (PMID: 33247593 DOI: 10.1093/ageing/afaa253) Before/after QI project to implement nurse-driven mobility program on a cardio-surgical ICU	412 pts **Inclusion criteria**: - ≥ 80 years **Exclusion criteria:** - incomplete data and cardiac surgery during hospital admission			nurse-driven **EM program** - twice daily mobilization activities - based on level of function, 0=immobile, 5 = able to walk > 20 m)	- **usual mobility care**	**Primary endpoint:** - discharge home **Secondary outcomes:** -LOS - in-hospital mortality - emergency room visits after discharge within 30 days - hospital readmission within 30 days of discharge	**Primary outcome** -return home 74.4%(n=234) vs. 65.7%(n=178), p = 0.047 -lower mortality in hospital 6.4%(n=234) vs. 14.6%(n=178), p = 0.006 **Secondary outcome** **-** LOS in days: n=234 3.0 ± 2.4, n=178 2.7 ± 3.4, p-value = 0.43 - in-hospital-death: Intervention= 15 (6.4%), Control=26 (14.6%), p-value= 0.006 - ER visits: Intervention = 45 (19.2%), Control= 39 (21.9%), p-value= 0.50 -readmission: Intervention= 21 (9.0%), control= 21 (11.8%) , p-value=0.35	4
	Per Branch							
	N= 234	N= 178						

EM = early mobilization, ER = emergency room, ICU = intensive care unit, LOS = length of stay, pts = patients, QI = quality improvement

A nurse-driven EM program seems to have a benefit in relation to return home and a lower in hospital mortality

#079

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
079 Scheffenbichler 2020 (PMID: 33239045 DOI: 10.1186/s13054-020-03346-y) prospective observational study	200 pts **Classified into 3 groups:** Low acuity = APACHE II <13 Moderate acuity = APACHE II 14-20 High acuity = APACHE >21			**Early goal-directed mobilization**	**Standard care**	**Primary outcome:** - functional independence at hospital discharge (defined at mmFIM score of 8) **Secondary outcome:** - speed of mobility progress (change in SOMS level)	**Primary results** High acuity: - intervention n= 10 (31%) - control n= 8 (26%) P=0.632 Moderate acuity: - intervention n= 14 (41%) - control n= 3 (11%) P=0.001 Low acuity: - intervention n= 20 (53%) - control n= 14 (39%) P=0.234 **Secondary results:** • not significantly higher in intervention group p=0.18 • Moderate acuity: significantly higher speed in intervention group p=0.018 • Low acuity: not significantly higher in intervention group =0.30	4
	Per Branch							
	104	96						

mmFIM = minimal modified functional independence measure, pts = patients, SOMS = speed of mobility scale

Early, goal-directed mobilization is a resource-intensive intervention that cannot be applied to all ICU patients. Focusing time and effort on patients benefitting most is probably more cost-effective.

#080

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
080 Nieto-García 2021 (PMID: 33236855 DOI: 10.1111/iwj.13516) A systematic review and meta-analysis	7 publications , prospective or retrospective two-group comparative and pre-post quasi-experimental research, n= 7520 patients **Inclusion criteria** - edited in English or Spanish - assessment of the effects of an EMP in an ICU - included PI rates - published in a peer-reviewed journal - involving adult pts(≥18 years old) - hospitalised in the ICU - implemented early mobility protocol - EM compared to usual care - prospective or retrospective observational studies or clinical trials **Exclusion criteria** - pediatric pts - languages other than English or Spanish - data from editorials, letters to editors, reports of expert committees, and opinions of respected authorities		**Early mobilization protocol/program**	**Usual care**	**Primary endpoint:** effect of early mobilization in the prevention of hospital-acquired pressure injuries	**Primary outcomes** - five quasi-experimental studies were significantly heterogeneous ($p = 0.02$ for Q test and 66% for I^2), odds ratio = 0.97 (95% CI: 0.49-1.91) with a non-significant statistical difference between both groups ($p = 0.9$)	1 → 2 (not only RCTs)
	Per Branch						

EM = early mobilization, EMP = early mobility program, HAPI = hospital-acquired pressure injury, ICU = intensive care unit, LOS = length of stay, pts = patients

The effect of an implementation of an early mobility program on the incidence of pressure injuries in critically ill patients remains inconclusive.

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2. Clark DE, Lowmann JD, Griffin RL, Mattews HM, Reiff DA. Effectiveness of an early mobilization protocol in a trauma and burns intensive care unit: a retrospective cohort study. Phys Ther. 2013;93(2):186-196. https://doi.org/10.2522/ptj. 20110417.
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6. Klein K, Mulkey M, Bena JF, Albert NM. Clinical and psychological effects of early mobilization in patients treated in a neurologic ICU: a comparative study. Crit Care Med. 2015;43(4): 865-873. https://doi.org/10.1097/CCM.0000000000000787
7. Titsworth WL, Hester J, Correia T, et al. The effect of increased mobility on morbidity in the neurointensive unit. J Neurosong. 2012;116(6):1379-1388. https://doi.org/10.3171/2012.2.JNS111881.

#082

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
082 Gatty 2020 (PMID: 33228448 DOI: 10.1080/09593985.2020.1840683) non-randomized controlled trial	63 pts **Inclusion criteria:** - both sexes, - aged 18 years or older referred for physiotherapy **Exclusion criteria:** - unstable fractures or any other injuries - deep vein thrombosis - seizure disorders - myocardial infarction - severe LV dysfunction at admission			**Structured early mobilization protocol**	**Usual mobilization**	**Primary endpoint** - Perme ICU mobility score **Secondary outcomes:** - ICU LOS - MV duration	**Primary endpoint** - significant increase from the first day of rehabilitation to the last day of rehabilitation between groups (23; 12) (p < .001) **Secondary outcomes:** - no significant differences for other outcomes	3
	Per Branch							
	32	31						

ICU = intensive care unit, LOS = length of stay, LV = left ventricle, MV = mechanical ventilation, pts = patients

A structured early mobilisation protocol in a general population of critically ill patients showed a benefit in relation to the Perme ICU mobility score.

#083

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
083 Yagi 2021 (PMID: 33213824 DOI: 10.1016/j.apmr.2020.09.389) Retrospective cohort study	- 29.982 pts with EM **Inclusion criteria:** - aged 20 years and older - admitted to an ICU within 2 days of hospital admission - started MV within 2 days of admission - started rehabilitation within 3 days of starting MV - discharged hospital from April 2010 to March 2016 - continued MV for ≥3 days **Exclusion criteria:** - missing data on rehabilitation, diagnosis, or hospital information - patients who discharged from hospital within 5 days of admission -pts who were liberated from MV within 5 days of admission			**Intensive rehabilitation -** ≥1 unit/day	**Less intensive rehabilitation** <1 unit/day	**Primary endpoint:** in-hospital mortality **Secondary outcomes:** liberation from MV	**Primary outcome** - in-hospital mortality after propensity score matching (risk difference: -3.4%;95%CI, -4.9 to -1.9%; p<0.001) **Secondary outcome** - median of time to liberation from MV (14.0d [range, 8.0-26.0d] vs 13.0d [range, 8.0-25.0d], p<0.001) - higher proportion of liberation from mechanical ventilation (subdistribution hazard ratio, 1.08; 95% CI, 1.03-1.13) compared to control group	4 → 3 large cohort
	Per Branch							
	N= 7745	N= 22237						

CI = confidence interval, d = days, EM = early mobilization, ICU = intensive care unit, MV = mechanical ventilation, pts=patients

Intensive rehabilitation may offer a benefit in relation to in-hospital mortality and liberation from MV in a general population of critically ill patients.

#085

Reference, Study Type	Cases and Controls (Participant #, Characteristics)			Drop-out Rate	Intervention		Control	Optimal Population	Primary Results	Evidence Grade
	Total									
085 Matsuki 2020 (PMID: 33163685 DOI: 10.2490/prm.20200027) **Specification of study:** Retrospective Cohort Study	patients who were admitted to the emergency ICU for more than 48 h from July 2014 to June 2018 and who underwent rehabilitation in the ICU **Exclusion criteria:** - orthopedic disease - central nervous system disease - acute myocardial infarction - those who had undergone elective cardiovascular surgery - mental illness - patients requiring palliative care - no rehabilitation indicated, - bedridden before hospitalization - died during ICU stay				**Re-habilitation protocol group with dedicated PT**	**Re-habilitation protocol group without dedicated PT**	**Usual Care**	**Outcomes:** - ICU and hospital LOS - MRC-score - FSS-ICU - incidence of delirium - duration of MV - discharge to home - FIM score	**Significant differences between groups in:** PT + Protocol group vs. Usual care: - ICU LOS (d) 4.5±3.9; 9.4±6.3; p<0.05 - hospital LOS (d) 38.5; 67.1; p=0.028 - MRC score at ICU discharge 49.7; 20.9; p=0.001 - FSS-ICU at ICU discharge 16.7; 7.7; p=0.001 Protocol vs. Usual care: - MRC score at ICU discharge 48.1; 20.9; p=0.001 - FSS-ICU at ICU discharge 15.4; 7.7; p=0.003 **No significant differences between groups in:** - incidence of delirium - duration of MV - discharge to home - FIM at hospital discharge	4
	Per Branch									
	Protocol: n=32	Protocol and PT: n=37	Usual care: n=18							

d = days, FIM = functional independence measure, FSS-ICU = functional status score for the intensive care unit, h = hours, ICU = intensive care unit, LOS = length of stay, MRC = medical research council, MV = mechanical ventilation, PT = physical therapist

A rehabilitation protocol group with and without dedicated therapist (PT) seems to have a benefit in relation to ICU and hospital LOS, MRC and FSS-ICU scores.

#088

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
088 Jonkman 2020 (PMID: 33126902 DOI: 10.1186/s13054-020-03352-0) RCT + pooled analysis with another trial with a similar intervention protocol	40 pts in pooled analysis **Inclusion criteria:** -≤ 72h after intubation **Exclusion criteria:** - expected duration of MV < 72h - congenital myopathies or neuropathies - cardiac pacemaker - refractory epilepsy - abdominal surgery in the last 4 weeks - BMI > 35 kg/m^2 - inadequate contractile response to NMES			**Expiratory muscle functional electrical stimulation:** - 30 minutes 2x daily 5 days per week - the first 5 days consecutively until weaning from MV or week 6 and - standard weaning protocols	**Sham stimulation** + standard weaning protocol	**Primary endpoint:** feasibility **Secondary outcomes:** - abdominal expiratory muscle thickness - duration of MV - ICU LOS	**Primary endpoint:** - non-serious AEs in control: 3 (2.9% of sessions) vs intervention: 13 (7.7% of sessions) - compliance rate = 91.1% **Secondary outcomes:** pooled analysis - abdominal expiratory muscle thickness (mm), Mean difference (95%CI): 2.25 (0.34 – 4.16), p=0.02 - duration of MV (days) median, control: 52 vs intervention: 10, p=0.07 - duration of MV for those successfully extubated in the ICU n.s. - ICU LOS (days) median, control: 54 vs intervention: 12, p=0.03 - ICU LOS for those successfully extubated and discharged alive from the ICU n.s. - ICU mortality n.s.	3 (down grade from 2 due to pooled analysis)
	Per Branch							
	Intervention n = 20	Control n = 20						

AE = adverse event, BMI = body mass index, ICU = intensive care unit, IQR = interquartile range, LOS = length of stay, MV = mechanical ventilation, NMES = neuromuscular electrical stimulation, pts = patients, RCT = randomized controlled trial, VI = confidence interval

Electrical muscle stimulation of the expiratory muscles is safe.

#091

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
091 Ribeiro 2021 (PMID: 33103326 DOI: 10.1002/pri.1882) RCT	49 pts undergoing CABG **Inclusion criteria:** - score of 15 on the Glasgow Coma Scale - musculoskeletal and cardiopulmonary conditions suitable for accomplishment of the proposed activities - absence of neurological sequelae and/or neurodegenerative diseases **Exclusion criteria:** - previous cardiac surgeries - hemodynamic instability that prevented protocol performance - breathing discomfort - invasive ventilatory support - oxygen saturation below 90% - coagulation disorders - infections in any of the systems -nonperformance of the whole protocol			**Early mobilisation on POD 1-3: (n=16)** -usual care + cycle ergometer exercises and ambulation or **EM+ virtual reality on POD 1-3: (n=17)** - Nintendo Wii games for upper and lower limbs	**Usual care:** - on POD 1-3 - respiratory physiotherapy - foot and ankle exercises	**Primary outcomes** - heart rate variability - hospital and ICU LOS - MV duration	**Primary outcomes** - hospital LOS (days): EM (10.2±3.5) vs. VR (8.1±1.6) ; CG (16±7.3), p=0.03 - ICU-LOS: EM = 2.5 ± 1.8 vs VR =4.3 ±1.4 , control =4.1 ± 2.3 , p=0.25 - MV duration (in h): EMG= 11.2 ±5.5, VRG = 11.2 ± 5.5, control= 9.3± 3.1, p-value= 0.10	2 → 3 (high risk of bias)
	Per Branch							
	N=33	N=16						

CABG = Coronary artery bypass grafting, CG = control group, EM = early mobilization, EMG= early mobilization group, ICU = intensive care unit, LOS = length of stay, MV = mechanical ventilation, POD = postoperative day, pts = patients, VR = virtual reality, VRG= virtual reality group

Early mobilization and virtual reality in postoperative CABG patients seem to shorten hospital LOS.

#095

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
095 Hayes 2021 (PMID: 33039302 DOI: 10.1016/j.aucc.2020.07.008) secondary analysis of RCT (#3121)	15 pts **Inclusion criteria:** - pts aged 18 y or older - anticipated ECMO duration of > 24 h **Exclusion criteria:** - > 72 h on ECMO or 5 d in the ICU before recruitment - preexisting musculoskeletal or neurological impairments - any current cancer or chemotherapy - pre-existing mobility impairment - pre-existing cognitive impairment - language barrier - imminent death - physiotherapist was unavailable			**Early, intensive rehabilitation:** - up to 1 hour per day - minimum time of 20 min for passive and 30 min for active exercise	**Usual physiotherapy**	**Primary endpoints:** - time for exercising **Secondary outcomes:** - in-hospital mortality - ventilation days - ICU and hospital LOS	**Primary endpoint:** - time for exercising (n = 7 vs. n = 8): mean = 28.7 vs. 4.2 min, p < 0.0001) **Secondary outcomes** - in-hospital mortality: intervention=3(42.9)vs. Control=1(12.5), p = 0.46 - ICU-LOS in days : intervention = 12.9 d (7.2-16.7) vs. Control = 21.4d (15.5.-38.5), p = 0.05 - hospital-LOS: intervention= 41.9d (34.3-56.4) vs control=34.4d (29.3-87.2), p = 0.85 - ventilation days: intervention = 6.3±2.5 vs. Control = 9.2± 3.8, p = 0.33	4
	Per Branch							
	N= 7	N=8						

ECMO = extracorporeal membranous oxygenation, d = days, h = hours, ICU = intensive care unit, IMS = incidental medical services, LOS = length of stay, pts = patients, RCT = randomized controlled trial, y = years

Early intensive rehabilitation in (veno-venous, veno-arterial) ECMO patients seems to be safe in terms of physiological parameters.

#096

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
096 Ferrando 2020 (PMID: 33023669 DOI: 10.1186/s13054-020-03314-6) Prospective multicenter cohort study	199 COVID-19 patients with acute respiratory failure **Inclusion criteria:** - age ≥ 18 years - confirmed SARS-CoV-2 infection - no previous invasive MV or NIV use before starting HFNO - peripheral oxyhemoglobin saturation (SpO2) < 93% with a non-rebreather face mask at 15 L/min **Exclusion criteria:** - non-confirmed SARS-CoV-2 infection - no data on ventilation strategies			**HNFO + Awake Prone Positioning**	**HNFO**	**Primary outcomes:** - ICU LOS - 28-day mortality - risk of intubation	**No significant differences between groups in:** - ICU LOS (days) median [IQR]: control= 7.5 [4-14] vs. intervention=8 [5-14], p = 0.276 - 28-day mortality, hazard ratio (95%CI): 2.411 (0.556 – 10.442), p = 0.23 - intubation, hazard ratio (95%CI): 1.002 (0.531 – 1.890), p = 0.60 - trend for delay in intubation: Intervention group vs. Control group: [median 1 (interquartile range, IQR 1.0–2.5) vs 2 IQR 1.0–3.0] days (p = 0.055), but awake-PP did not affect 28-day mortality [RR 1.04 (95% CI 0.40–2.72), p = 0.92]	3
	Per Branch							
	N= 55	N= 144						

ARF= acute respiratory failure, CI = confidence interval, HFNO = high-flow nasal oxygen, ICU = intensive care unit, IQR = interquartile range, LOS = length of stay, MV = mechanical ventilation, NIV = non-invasive ventilation, PP=prone position, pts = patients

Awake proning in COVID-19 patients receiving HFNO did not reduce ICU length of stay, mortality or need for intubation. In patients with COVID-19 ARF treated with HFNO, the use of awake-PP did not reduce the need for intubation or affect mortality.

#098

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
098 Collinsworth 2020 (PMID: 33003078 DOI: 10.1097/CCM.0000000000004609) **Specification of study:** prospective observational multicenter study	2953 pts admitted to ICU from July 2013 to June 2015 **Inclusion criteria:** - age ≥ 18 years - ICU admission > 24 h - MV > 24 hours and < 14 d **Exclusion criteria:** - on comfort care - awaiting a transfer order to a non-ICU bed - primary diagnosis of brain tumor - mental disorder - stroke - intracranial injury-intoxication - hospital stay > 30 days			**ABCDE bundle ≥ 60%**	**ABCDE bundle adherence ≤ 60%**	**Primary endpoint:** - in-hospital mortality **Secondary outcomes:** - LOS - home discharge ´ - direct costs of hospital care (cost difference) - costs and QALYs for pts 1 year follow up	**Primary endpoint** - In-hospital mortality (%) : control =684 (54.7) vs. intervention= 318 (18.4) , Adjusted (95% CI) OR 0.28 (0.24–0.34); P< 0.001 **Secondary outcomes:** - LOS (days): mean (sd) control= 9.9 (7.0) vs. intervention= 12.3 (6.8), Adjusted (95% CI) 0.57 (0.45–0.69); p< 0.001 - discharge (%): control= 206 (16.5) vs. Intervention= 637 (37.3); Adjusted (95% CI) OR=2.46 (2.02–2.89); p < 0.001 - Cost difference ($) n (%): control= 25.685 (26.370) vs. Intervention = 31.170 (33.109), adjusted (95% CI) 4.067 (989–7.144); p< 0.001 - 1 year follow up: control= $34.181 (cost per patient), 0.2237(Inpatient Survival Rate), $152.799 (Cost/ Effectiveness) - intervention= $39.130 (cost per patient), $4.949 (incremental cost), 0.3412 (inpatient survival rate), 0.1175 (Incremental Effectiveness), $115.088 (Cost/ Effectiveness), $42.120 (Incremental Cost Effectiveness Ratio)	3 → 4 (mobilization evaluated as part of bundle)
	Per Branch							
	N = 1710	N= 1243						

ABCDE= awakening and breathing, coordination, delirium monitoring/management, early exercise/mobility, CI= confidence interval, ICU= intensive care unit, LOS = length of stay, MV= mechanical ventilation, OR= odds ratio, pts= patients, QALY= quality-adjusted life-years, SD= standard deviation

The ABCDE bundle appears to be a cost-effective means to reduce in-hospital and 1-year mortality for patients in the ICU.

#099

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
099 Mayer 2020 (PMID: 33001619 DOI: 10.1097/CCM.0000000000004526) Systematic Review	15 publications[1-15] including 437 patients **Inclusion criteria:** - adult pts (≥ 18 years old) explicitly receiving CRRT located in the ICU - received physical therapy or occupational therapy, physical rehabilitation, active mobilization, or exercise while on CRRT - data on AEs or "potential safety events" - reasons for early termination of activity or presafety screening were reported **Exclusion criteria:** - review articles, conference abstracts, and non–peer-reviewed articles		**Physical therapy, occupational therapy, active mobilization or exercise while on CRRT**		**Primary endpoint:** - AEs per total number of rehabilitation sessions - feasibility measured by implementation rate and level of physical activity/mobilisation achieved.	**Primary endpoint:** no meta-analysis	1 → 2 (downgraded due to inclusion of non-RCTs)
	Per Branch						

AE = adverse events, CRRT = continuous renal replacement therapy, ICU = intensive care unit, pts = patients

Mobilisation seems to be safe in relation to AEs by patients with CRRT in the ICU.

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#109

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
109 Deng 2020 (PMID: 32919363 DOI: 10.1016/j.jcrc.2020.08.019) Specification of study: Systematic review and meta-analysis	**Total** n = 26 studies included in the meta analysis (n = 7035 pts)[1-14] **Inclusion criteria:** - RCTs or cohort studies - pts >18 years - admitted to an ICU - non-pharmacological interventions for prevention of ICU delirium - peer-reviewed - assessment of incidence of delirium, delirium duration, ICU LOS or hospital mortality **Exclusion criteria:** - case reports - protocol study **Per Branch**		**EP**	**Standard of Care**	- delirium incidence - delirium duration - hospital mortality - ICU length of stay	**Significant differences between groups in:** - delirium incidence: o CHI (RR 0.55, 95% CI 0.34-0.89, p < 0.001) o FP (RR 0.41, 95% CI 0.28-0.60, p < 0.001) o MLT (RR 0.57, 95% CI 0.48-0.67, p < 0.001) o FP superior to PEI (RR 0.21, 05% CI 0.09-0.57, p < 0.001) o FP superior to SR (RR 0.19, 95% CI 0.07-0.5, p < 0.001) o MLT superior to PEI (RR 0.47, 95% CI 0.38-0.81, p < 0.001) o MLT superior to SR (RR 0.43, 95% CI 0-25-0.74, p < 0.001) - hospital mortality: Reduction EP vs. standard of care (HR 0.16, 95% CI 0.03–0.84, p < 0.001) o EP (SUCRA = 97.2%) ranked the most effective in decreasing in-hospital mortality o EP superior to SR (RR 0.08, 95% CI 0.00-0.79, p < 0.001) o EP superior to standard of care (RR 0.08, 95%, CI 0.00-0.68, p < 0.001) **No significant differences between groups in:** - delirium duration: o FP superior to PEI (MD -0.04, 95% CI -3.28-3.27) o MLT superior to PEI (MD -0.92, 95% CI -3.38-1.55) o FP superior to SR (MD -0.48, 95% CI -4.27-3.3) o MLT superior to SR (MD -1.37, 95% CI -4.51-1.55) - ICU LOS o SR resulted in shorter LOS than EP (MD 0.69, 95% CI -2.52-4.41) o SR resulted in shorter LOS than standard of care (MD -0.31, 95% CI -2.98-2.42)	1 → 3 (downgraded for imprecision, heterogeneity/ risk of bias, not exclusively RCTs)

CHI = cerebral hemodynamic improving, CI = confidence interval, EP = exercise program, FP = family participation, HR = hazard ratio, ICU = intensive care unit, LOS = length of stay, MD = mean difference, MLT = multicomponent studies, PEI = physical environment intervention, pts = patients, RCT = randomized controlled trial, RR = risk ratio, SR = sedation reducing, SUCRA = surface under the cumulative ranking curve

Physical exercise in an ICU-environment leads to improved delirium incidence and survival.

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#111

Reference, Study Type	Cases and Controls (Participant #, characteristics) Total	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
111 Yang 2021 (https://pubmed.ncbi.nlm.nih.gov/32900917/) Specification of study: systematic review	- 24 studies[1-24] **Inclusion criteria:** - no study type restrictions - original studies - >18y, admitted to ICU and MV for >24h **Exclusion criteria:** - articles with only active in-bed mobilization and no out-of-bed mobilization		**- early mobilization**	**- usual ICU care**	**Primary Endpoints:** - safety assessment criteria	**Primary Results:** - safety assessment criteria: 17 variables and 48 parameters - 4 criteria included in flow diagram: - consciousness: S5Q ≥3; RASS -2 - +2 or SAS 3-4 - cardiac reserve: heart rate: 40-130 beats/min; blood pressure: MAP 65-110mmHg and SBP 90-200 mmHg, <20% fluctuation; low/medium level of single vasoactive medication and no increase in the past 2h - respiratory reserve: F_{iO2} ≤0.6 and PEEP ≤10; 5-40 breaths/min; S_{pO2} ≥88% and fluctuation <4%; P_{aO2}/F_{iO2} ≥200; No ventilator dysynchrony - muscle strength: upper limbs: MRC ≥III or Lovett >3; Bilateral quadriceps strength: MRC ≥III or Lovett ≥2	1 → 3 (not only RCTs, no metanalysis)

y=years; ICU=Intensive care unit; h=hours; S5Q=standardized 5 ques-tions for cooperation; RASS=Richmond Agitation Sedation Scale; SAS=Sedation-Agitation Scale; MAP=mean arterial pressure; SBP=systolic blood pressure; MRC=Medical Research Council

Yang et al defined safety criteria for early mobilization based on their systematic review.

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#112

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
112 Nakanishi 2020 (PMID: 32897665 DOI: 10.1097/CCM.0000000000004522) **Specification of study:** Multicenter RCT	**42 pts** **Inclusion criteria:** - expected to be MV ≥ 48 h - expected stay in the ICU ≥ 5 days **Exclusion criteria:** - <18 years - trauma or amputation of upper and lower limbs -primary neuromuscular disease - systolic blood pressure < 80 mmHg even with inotropic or vasopressor support - HR < 40 or > 140 beats/min - peripheral oxygen saturation < 88% with ventilatory support		Intervention: 4 pts (14%) (1 died before day 5; 2 no muscle contraction; 1 withdrawn due to pain) Control: 2 pts (died before 5th day)	**Neuromuscular electrical stimulation:** - 30 min for 5 days and - standardized progressive mobilization	**Standardized progressive mobilization**	**Primary endpoint:** - muscle thickness via ultrasound **Secondary outcomes:** - cross sectional area via ultrasound - muscle strength MRC score - ICU mobility scale - hospital LOS - ventilator-free days - ICU-free days - IMS at ICU discharge	**Primary endpoint:** -muscle thickness M. biceps brachii (difference in % between day 1 and 5, mean ± SD), control -11.2 ± 2.1 vs intervention -1.9 ± 2.4, p = 0.007 **Secondary outcomes:** - muscle cross sectional area M. biceps brachii (difference in % between day 1 and 5, mean ± SD), control -10.0 ± 1.5 vs intervention -2.7 ± 2.6, p = 0.03 - muscle thickness M. rectus femoris (difference in % between day 1 and 5, mean ± SD), control -14.7 ± 2.7 vs intervention -0.9 ± 3.1, p = 0.003 - muscle cross sectional area M. rectus femoris (difference in % between day 1 and 5, mean ± SD), control -10.4 ± 2.8, intervention -1.7 ± 2.9, p = 0.04 - MRC score day 5(median [IQR]), control 52 [35 – 59] vs intervention 55 [50 – 58], p = 0.53 - hospital LOS (median [IQR]), control 40 [26 – 64] vs intervention 23 [19 – 34], p = 0.04 - ventilator-free days (median [IQR]), control 22 [10 – 24] vs intervention 23 [19 – 25], p = 0.45 - ICU-free days, median [IQR], control 20 [9 – 23] vs intervention – median [IQR]: 21 [12 – 23], p = 0.97 - IMS (median [IQR]), control 2 [1 - 3] vs intervention 3 [1 - 4], p = 0.42	2
	Per Branch							
	21	21						

ICU = intensive care unit, IMS = ICU mobility scale, IQR = interquartile range, LOS = length of stay, MRC = medical research council, MV = mechanical ventilation, pts = patients, RCT = randomized controlled trial

Neuromuscular electrical stimulation decreased muscle thickness loss between day 1 and 5.

#122

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
122 Chin-Ming 2019 (PMID: 32767475 DOI: 10.1111/nicc.12530) Specification of study: retrospective, observational, before-and-after outcome study	173 pts **Inclusion criteria:** - ICU patients > 18 years - with MV admitted to a medical center ICU in Taiwan			**Implementation of quality improvement program**: multidisciplinary team performed **ABCDE bundle** Mobilization: - EM within 72 hours of MV - twice daily (each 30 min), 5 days/ week in co-operation with family members - 4-step mobilization program: Level I (passive extremities movement for unconscious pts), Level II (active extremities movement), Level III (sitting on edge of bed) Level IV (chair)	Pts on ICU on MV **before implemention of ABCDE** - not further defined (Standard of care)	**Primary endpoints:** - duration of ICU and hospital LOS - duration of MV - intra-hospital mortality - costs before and after ABCDE bundle care **Secondary outcome:** -APACHE II <u>sample size calculation:</u> no power calculation reported	**Primary endpoints:** - intervention group had lower mean ICU LOS (8.0 vs 12.0 days) - similar MV duration (170.2 vs 188.1 hours) and hospital stay (21.1 vs 23.3 days) - intervention group caused lower costs (22.1 vs 31.7x10^4 New Taiwan Dollars) and intra-hospital mortality (8.3 vs 36.6%). **Secondary outcome:** Apache Score II before intervention 23.4+/- 9.4 vs after intervention 19.8+/-6.9 p=0.004 adverse events: n/a	4
	Per Branch							
	72	101						

ABCDE bundle = daily awakening, breathing trial, drug co-ordination, delirium survey and treatment, early mobilization, APACHE II = acute physiology and chronic health evaluation II, ICU = intensive care unit, LOS = length of stay, MV = mechanical ventilation, pts = patients

The ABCDE care bundle improved the outcome of acute renal failure patients with MV, especially shortening ICU stays, lowering medical costs and hospital mortality.

#124

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
124 Worraphan 2020 (PMID: 32750371 DOI: 10.1016/j.apmr.2020.07.004)) Specification of study: Systematic Review with Network-Meta analysis	18 RCTs investigating the effect of IMT, EM, or CPT on MV duration and the weaning duration in patients with MV (934 patients) **Inclusion criteria**: - aged > 18 years - received MV via an endotracheal or tracheostomy tube **Exclusion criteria**: - had a successful simple weaning process - received combined intervention treatments (EM and IMT) - presence of neurologic conditions - previous musculoskeletal conditions		**EM or CPT + IMT or IMT**	**CPT**	**Primary outcomes:** - duration of MV - weaning duration	**Primary outcome** -MV duration, EM was more effective than CPT (MD; 95% CI) (-2.00; -3.57 to -0.44) -MV duration (-2.01; -3.81 to -0.221), (P=0.45) - IMT+CPT significantly reduced the weaning duration compared to CPT (mean difference; 95% confidence interval) (-2.60; -4.76 to -0.45), (P=0.02)	1
	Per Branch						

CPT = conventional physical therapy, EM = early mobilization, IMT = inspiratory muscle training, MD= mean difference, MV = mechanical ventilation, NMA = network-meta-analysis, pts = patients, RCT = randomized controlled trial

EM shows a benefit for MV duration.

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Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
127 Semsar-kazerooni 2021 (PMID: 32739452 DOI: 10.1016/j.cjca.2020.03.038) **Specification of study:** Retrospective cohort study	**Total** 1.489 pts admitted to CICU **Inclusion criteria:** - consecutive patients admitted to the CICU from February 1, 2018, to June 30, 2019 **Exclusion criteria:** - incomplete data - pts undergoing cardiac surgery during admission **Per Branch** N= 852 / N=637		**Nurse-driven EM program**	**Historic control before implementation of EM program**	**Primary outcome** - discharge home **Secondary outcomes** - CICU and hospital LOS - in-hospital mortality - emergency room (ER) visit and hospital readmission within 30 days of discharge	**Primary outcome** - discharge home: 83.9% (n=852) vs 78.3%(n=637), P < 0.007 **Secondary outcome** - in-hospital mortality 36 (4.2%), 43 (6.8%); p=0.04 - no difference in CICU or hospital length of stay between the groups (P = 0.63 and P = 0.54, respectively) - ER visit: intervention= 144 (13.5%) vs. Control=122 (19.2%), p= 0.003 - hospital readmission: Intervention= 55 (6.5%) vs. Control= 56 (8.8%), p= 0.14	4

CICU = cardiovascular intensive care unit, EM = early mobilization, ER = emergency room, ICU= intensive care unit, LOS = length of stay, pts = patients

A nurse-driven EM program resulted in lower in-hospital mortality in cardiac ICU patients.

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Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
128 Wang 2020 (PMID: 32736250 DOI: 10.1016/j.ijnurstu.2020.103708) Specification of study: Systematic Review with meta analysis	39 RCTs with a total of 3837 pts [1-39] **Inclusion criteria:** - RCTs - age >18 years - pts in ICU - intervention: EM and rehabilitation - control: daily nursing care		**EM and rehabilitation** - including a range of active or passive physical exercises	**Daily nursing care** - no exercise intervention or only respiratory PT treatment)	**Primary endpoints:** - ICUAW rate - duration of MV - ICU LOS - ICU mortality **Secondary outcomes:** - MRC score - handgrip strength (kg) - Barthel index score - delirium rate - hospital LOS - mortality - ventilator-associated pneumonia rate (VAP) - DVT rate Pressure sore rate - post-hospital discharge	**Significant differences between groups in:** - ICU-AW (RR 0.49 [0.32, 0.74]; p=0.0008, I^2>50%) - length of MV (MD -2.10 [-2.47, -1.73]; p<0.001; I^2>50%) - ICU LOS (MD -2.74 [-3.52, -1.97]; p<0.001, I^2>50%) - MRC Score (MD 5.99 [3.22, 8.76]; p<0.001, I^2>50%) - Barthel index score (MD 12.78 [2.71, 22.85]; p=0.01, I^2>50%) - hospital LOS (MD -3.71 [-5.70, -1.71]; p=0.0003, I^2>50% - VAP (RR 0.68 [0.49,0.94]; p=0.02) - DVT (RR 0.16 [0.06, 0.47]; p= 0.0007) - pressure sore rate (RR 0.17 [0.06,0.49] p=0.001) **No significant differences between groups in:** - ICU mortality (RR 0.003 [-0.08, 0.03]; p=0.36) - hospital mortality n.s. - delirium rate n.s. - handgrip strength n.s.19.	1
	Per Branch						

DVT = deep vein thrombosis, EE = effect estimate, ICU = intensive care unit, ICU-AW = ICU- acquired weakness, LOS = length of stay, MD = mean difference, MRC = medical research council score, MV = mechanical ventilation, n.s. = not significant, PT = physio therapy, pts = patients, RCT = randomized controlled trial, RR= relative risk, VAP = ventilator-associated pneumonia

Early mobilization and rehabilitation seems to have a benefit in relation to ICU-AW, length of MV, ICU LOS, MRC score, Barthel Index and hospital LOS.

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Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
130 Bento 2020 (PMID: 32695996 DOI: 10.1097/CCE.0000000000000131) Specification of study: retrospective observational cohort study	206 pts **Inclusion criteria:** - 18 years or older - admitted to CVICU or SICU, receiving CRRT **Exclusion criteria:** - CRRT care on a different unit			CRRT + PT		**Primary endpoint:** - therapy data (IMS, Number of PT sessions) - safety and feasibility of PT	**Primary endpoints:** - IMS median 5 - 1517 PT sessions, 377 included ambulation - ambulation mean of 4,83/d; daily average of 150,61 feet - in-hospital mortality highest for pts. with no therapy (73,53%) and lowest for pts. who ambulated (17,95%) - one safety event (0,0007% of all PT sessions)	4
	Per Branch							
	206							

CRRT = continuous renal replacement therapy, CVIVU = cardiovascular ICU, IMS = ICU mobility scale, PT = physical therapy, SICU = surgical ICU

Physical therapy, including ambulation, while on CRRT is feasible and safe.

No detailed assessment was carried out further because higher-quality evidence is available on this topic.

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Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
131 Miguel 2020 (PMID: 32695988 DOI: 10.1097/CCE.0000000000000119) Specification of study: Comparative effectiveness cohort study	5 ICUs at a tertiary care hospital; 541 pts **Inclusion criteria:** - ICU pts > 18 years with MV within 2014-2015 - critical ill patients (diagnosis-related group 3 or 4 (3:requiring ECMO or MV > 96h + major operating room procedure; 4: tracheostomy placement with MV >96h) **Exclusion criteria:** - imminent death/ comfort care - active bleeding or risk of bleeding - emergent vitals such as extreme HTN			**Included patients in 2014**	**Included patients in 2015**	**Primary endpoints:** - average LOS for diagnostic related group 3,4 coded pts - days until initiation of physical therapy **Secondary outcome:** - no. of physical therapy follow-up consults	**Significant differences between groups in:** - mean ICU LOS (34.4d control vs. 30.5d; $p < 0.05$) - overall LOS (52.7d vs. 43.3d; $p < 0.002$) - days until initiation of physical therapy (20.09d vs. 14.78d; $p<0.001$) - increased no. of physical therapy follow-up consults 6.14 vs. 7.7; $p<0.05$)	4
	Per Branch							
	N=280	N= 261						

ECMO = extracorporeal membrane oxygenation, HTN = hypertension, ICU = intensive care units, LOS = length of stay, MV = mechanical ventilation, pts = patients

Mobilizing individuals in an intensive care setting decreases length of stay and hospital costs.

No detailed assessment was carried out because higher-quality evidence is available on this topic.

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Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
132 Liu et al. 2020 (PMID: 32685621 DOI: 10.1016/j.ijnss.2020.03.002) Systematic Review + MA	**11 RCTs with 576 pts** **Inclusion criteria:** - ICU pts - ≥ 18 and < 85 years of age - duration of MV > 24 hours - RCTs **Exclusion criteria:** - primary neuromuscular disease limb deformity - metal prosthesis - orthopedic injury - pregnancy history of cardiac arrest - participation in other trials		11 included studies in total, for some endpoints only 2-6 included in the analysis	**NMES**	**Sham NMES or routine care**	**Primary endpoints:** - MRC duration of MV - ICU LOS - total LOS **Secondary outcomes:** - Barthel index - FSS-ICU - MIWD - GCS **Not prespecified outcomes:** - mortality	**Significant differences between groups in:** - MRC, MD (95%CI):1.78 (0.44 – 3.12) , p = 0.009 - MV duration, MD (95%CI): -0.65 (-1.03 – -0.27) p<0.001 - ICU LOS, MD (95%CI): -3.41 (-4.58 – -2.24), p<0.001 - total LOS, MD (95%CI): -3.97 (-6.89 – -1.06), p = 0.008 - Barthel index, MD (95%CI): 0.09 (0.45 – 1.35), p<0.001 - FSS-ICU, MD (95%CI): 9.14 (-1.14 – 19.43), p = 0.08 - MIWD, MD (95%CI): 239.03 (179.22 – 298.85), p <0.001 - GCS, MD 0.78 (-0.07 – 1.62), p = 0.07 **No significant differences between groups in:** Mortality, RR (95%CI): 1.07 (0.62 – 1.84), p = 0.80	1
	Per Branch							
	294	282						

ICU = intensive care unit, LOS = length of stay, MD = mean deviation, MRC = medical research council, MV = mechanical ventilation, NMES = neuromuscular electric stimulation, pts = patients, RCT = randomized controlled trial

Neuromuscular electrical stimulation increased muscle strength, reduced duration of mechanical ventilation, ICU length of stay and total length of stay in a meta-analysis including 3 to 6 out of 11 studies.

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#135

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
135 Takaoka 2020 (PMID: 32628501 DOI: 10.1513/AnnalsATS.202001-059OC) Specification of study: Systematic Review and Meta-analysis	- 14 publications (12 randomized, 2 non-randomized, 926 pts)[1-14] **Inclusion criteria:** - examining critically ill pts - >18 y, admitted to an ICU for at least 24h - leg-cycle ergometry in the ICU - compared with no leg-cycle ergometry			**Leg-cycle ergometry**	**No leg-cycle ergometry**	**Primary outcomes:** - physical function - duration of MV - LOS - mortality - QoL	**No significant differences between groups in:** - hospital discharge: 3 RCTs; n = 225; standardized MD, 0.07 [95% CI, 20.38 to 0.53]; very low certainty - MV duration: 9 RCTs; n = 676; MD, 0.01 [21.04 to 1.07] days; moderate certainty - ICU LOS: 10 RCTs; n = 511; MD, 0.23 [21.44 to 1.89] days; moderate certainty - hospital LOS :7 RCTs; n = 393, MD 20.07 [23.87 to 3.73] days; moderate certainty - QoL at 6 months after hospital discharge: 2 RCTs; n = 103; MD, 9.13 [13.80 to 32.05] points higher; very low certainty - hospital mortality: 7 RCTs; n = 710; RR 1.09 [0.82 to 1.46]; moderate certainty	2 (downgraded due to inclusion of non-RCTs)
	Per Branch							

LOS = length of stay, MD = mean difference, MV = mechanical ventilation, pts = patients, QoL = quality of life, Y = years

Leg-cycling could not show a benefit in relation to physical function, duration of MV, LOS, mortality, QoL, muscle strength.

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#136

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
136 Nickels 2020 (PMID: 32585438 DOI: 10.1016/j.jcrc.2020.05.008) Specification of study: RCT	**74 pts** **Inclusion criteria:** - expected to be MV for > 48h - recruited within 96h after ICU admission - expected to remain in the ICU for > 48h **Exclusion criteria:** - <18y old - pre-existing condition that impaired mobility - neurological disorder - injuries precluding in-bed cycling - >135kg body weight - pregnant - uncontrolled seizures or status epilepticus - unlikely to survive the current hospital admission		**Intervention group:** 6 (1 did not receive allocated intervention; 1 died, 4 discharged from acute hospital prior to assessment) **Control group:** 6 (1 excluded as ineligible; 1 died, 4 discharged from acute hospital prior to assessment)	**Daily assessment of routine physiotherapy + 30 minutes in-bed cycling** -once daily (MOTOmed Letto2 (RECK-Technik GmbH & Co. KG, Betzenweiler, Germany)	**Daily assessment of routine physiotherapy**	**Primary outcome:** - muscle atrophy in RF_{CSA} at day 10 post-study enrolment **Secondary outcomes:** - RFT and VIT thickness - MRC_{SUM} - HGS - functional status score - 6MWT - ICU mobility score - functional milestones - delirium incidence - EQ5D-5L **Sample size calculation:** - 68 pts (34 per group)	**Primary endpoint:** - no significant between-group differences (p=0.52) **Secondary outcomes:** - no significant between-group differences in any secondary outcome	3 (dowgraded as under-powered)
	Per Branch							
	37	37						

H = hours, HGS = handgrip strength, ICU = intensive care unit, MRC_{SUM} = medical research council sum score, pts = patients, RCT = randomized controlled trial, RF_{CSA} = rectus femoris cross-sectional area, RFT = rectus femoris thickness, VIT = vastus intermedius thickness, y = years, 6MWT = six-minute walk test

In-bed cycling in addition to early mobilization showed no benefit in relation to muscle atrophy. The study was underpowered.

#143

Reference, Study Type	Cases and Controls (Participant #, characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
Jochmans 2020 (https://pubmed.ncbi.nlm.nih.gov/32449068/) Specification of study: Prospective cohort study	103 patients performing 231 PP sessions **Inclusion criteria:** - PP was indicated in case of moderate-to severe hypoxemia with PaO2/FiO2 < 150 despite a set PEEP of at least 10 cmH2O and the use of NMBA **Exclusion criteria:** - severe hemodynamic instability or withdrawal of life sustaining treatments		- severe hemodynamic compromise (*n*=5), missing data at inclusion (*n*=3), therapeutic limitation decision (*n*=1)	**Prone position**		**Primary Endpoint:** - time sufficient to obtain the maximum improvement in several physiological respiratory parameters in the first PP session and in all PP sessions **Secondary Endpoint:** - physiological parameters related to patient survival in PP	**Primary Result:** - pooled responder sessions showed beneficial physiological effect continued after 16 h of PP and at least up to 24 h **Secondary Result:** Before PP vs 2h after PP Increase in: - pH 7.26 ± 0.1 vs 7.29 ± 0.1 (p<0.05) - static compliance 39±16 vs 40±15 [mL/cmH2O] (p>0.05) - PaO2/FiO2 129±52 vs 189±79 (p<0.05) - PaO2 77±32 vs 99±60 [mmHg] (p<0.05) Decrease in: - PaCO2 54±13 vs 51±15 [mmHg] (p<0.05) - decrease in Δ*P* was the only parameter significantly associated with an increase in PaO2/FiO2 > 50%	3
	Per Branch							
	103	-						

PP=prone position; ICU=intensive care unit; PEEP=positive endexpiratory pressure; NMBA=neuromuscular blocking agents; h=hours

PP sessions should be prolonged at least 24 h and be extended if the PaO2/FiO2 ratio at 24 h remains below 150, especially since no criteria can predict which patient will benefit or not from it.

#150

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
150 Boyd 2020 (PMID: 32349888 DOI: 10.1016/j.aucc.2020.02.004) Specification of study: a prospective observation	20 patients after cardiac surgery who were receiving vasoactive therapy **Inclusion criteria:** - > 18 years - undergoing elective open-heart surgery - postoperatively receiving low, moderate, or high levels of vasoactive support **Per Branch** N=20		**Positional changes:** - supine - high sitting (60 degrees) - sit on the edge of bed - standing - marching on the spot - sit on the edge of bed - high sitting (60 degrees) - supine 1-minute-per-position		**Primary endpoints:** - cardiac output - cardiac index - stroke volume **Secondary outcomes:** - heart rate - rhythm, - arterial systolic and diastolic blood pressure - mean arterial pressure - respiratory rate, - oxygen saturation - adverse events	**Primary outcome:** - mean arterial pressure, upright positioning caused significant increases (p=0.018) values increasing from baseline (supine) from 72.31 (11.91) mmHg to 77.44 (9.55) mmHg when back in supine. **No significant differences in:** - cardiac output, heart rate, stroke volume, or cardiac index with upright positioning	3 → 4

pts = patients

Low-level exercise in patients after cardiac surgery receiving vasoactive medication was well tolerated with a low incidence of adverse events and led to significant increases in MAP. Upright positioning and low-level exercise appeared safe and feasible in this patient cohort.

No detailed assessment was carried out further because higher-quality evidence is available on this topic.

#151

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
151 Waldauf 2020 (PMID: 32345834 DOI: 10.1097/CCM.0000000000004382) Systematic Review mit MA	43 studies (RCTs) with 3.548 pts **Inclusion criteria:** - RCTs - critically ill pts			**Rehabilitation** - protocolized physical rehabilitation - neuromuscular electrical stimulation - supine cycling	**No intervention** or **Placebo stimulation**	**Outcomes:** - ICU mortality - end of study mortality - duration of MV - ICU LOS - hospital LOS - long-term functional outcome	**Significant differences between groups in:** ICU LOS Mean difference: (95%CI): -1.2 (-2.5 – 0.0) PPR - mean difference (95%CI): -2.02 (-3.49 - -0.56) NMES - mean difference (95%CI): -0.23 (-2.45 – 1.98) Cycling - mean difference (95%CI): 1.10 (-1.59 – 3.80) effect influenced by exposure to the intervention early initiation of the therapy had no effect duration of mechanical ventilation mean difference: (95%CI): -1.7 (-2.5 - -0.8 PPR - mean difference (95%CI): -2.0 (-3.3 - -0.7) NMES - mean difference (95%CI): -2.1 (-3.7 - -0.6) cycling - mean difference (95%CI): -0.1 (-2.1 – 1.8) effect influenced by ICU length of stay measured as duration of mechanical ventilation **No significant differences between groups in:** - ICU mortality, OR (95%CI): 1.02 (0.84 – 1.24) - mortality end of study, OR (95%CI): 0.94 (0.79 – 1.12) -hospital LOS, MD: (95%CI): -1.6 (-4.3 – 1.2) - SF-36 Physical Component Score, MD: (95%CI): 1.5 (-2.1 – 5.1)	1
	Per Branch							

ICU = Intensive care unit, LOS = length of stay, MV = mechanical ventilation, NMES = neuromuscular electric stimulation, RCT = randomised controlled trial, pts = patients

Rehabilitation interventions in critically ill patients do not influence mortality and are safe. Protocolized physical rehabilitation significantly shortens time spent on mechanical ventilation and in ICU, but this does not consistently translate into long-term functional benefit. Stable patients with lower Acute Physiology and Chronic Health Evaluation II at admission (<20) and prone to protracted ICU stay may benefit most from rehabilitation interventions.

#155

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
155 Franca 2020 (PMID: 32294698 DOI: 10.1590/1414-431X20208770) **Specification of study:** RCT	35 pts **Inclusion criteria:** - ≥21 years - intubated ≥ 24 h - adequate cardiac reserve (demonstrated by variability o20% heart rate at rest) - systolic blood pressure between 90 and 180 mmHg - normal electrocardiogram - peripheral capillary oxygen saturation > 90% - fraction of inspired oxygen < 60% - respiratory rate < 25 bpm - hemoglobin > 7 g/dL - platelets > 20,000 cells/mm^3 - without sepsis **Exclusion criteria:** - unable to walk without assistance before ICU - pregnant - BMI > 35 kg/m^2 - preexisting neuromuscular disease, vascular disease or stroke - skin lesions at electrode locations - unconsolidated fracture - pacemaker - signs of low or high blood pressure - clot at blood collection site		Intervention: 4 pts (did not receive allocated intervention) Control: 3 (did not receive allocated intervention)	**3 Intervention groups:** **- NMES:** - M. rectus femoris/vastus lateralis 20 min **- PCE:** 20 min **- NMES+PCE**	**Physio-therapy**	**Outcomes**: - ICU LOS - duration of MV	**Outcomes:** - ICU LOS (days), mean ± SD: control 4.7 ± 2.45 vs NMES 7.22 ± 5.91, NMES+PCE 4.57 ± 1.27, PCE 7.78 ± 3.96, p = 0.108 - duration of MV (days), mean ± SD: control 4.90 ± 2.80 vs NMES 5.67 ± 3.35, NMES+PCE 4.29 ± 1.38, PCE 6.44 ± 3.64, p = 0.174	2 → 3 (high risk of bias)
	Per Branch							
	PCE = 9 FES = 9 PCE + FES = 7	control = 10						

ICU = intensive care unit, FES = Functional electrical stimulation, LOS = length of stay, MV = mechanical ventilation, NMES = neuromuscular electric stimulation, PCE = passive cycle ergometry, RCT = randomized controlled trial, pts = patients

Neuromuscular electrical stimulation and passive cycle ergometry did not influence ICU length of stay or duration of mechanical ventilation.

#156

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
156 Schujmann 2020 (PMID: 32205595 DOI: 10.1097/CCM.0000000000004181) Specification of study: RCT	- 135 pts **Inclusion criteria:** - ≥ 18 years - Barthel index of 100 in the 2 weeks prior to ICU admission **Exclusion criteria:** - previously hospitalized at other hospitals - neurologic alterations - stayed< 4 days in the ICU - amputees upon admission - contraindications for mobilization - cognitive impairment with an inability to understand commands and perform tests		intervention: n= 18 (7 died; 1 discharge before evaluation, 10 discharge ICU before 3 days) control: n= 18 (11 died; 2 discharge before evaluation; 5 discharge ICU before 3 days)	**- PPR** **- NMES** **- Cycling** all patients in intervention groups started physical therapy care within 48 hours of ICU admission	**conventional physiotherapy**	**Primary endpoint:** - functional status (BI scores) after ICU discharge **Secondary outcomes:** - respiratory, muscular, and physical activity - ICU and hospital LOS	**Primary endpoint:** - Barthel Index at discharge 97±5; 76±20; p< 0.001 - ICU Mobility Scale in discharge moment 9.8±0.4; 7±2; p< 0.001 **Secondary outcomes** Physical activity (% of the time) - inactive 92.3±2.8; 95.7±2; p< 0.001 - light 6.4±2.4; 3.85±1.9; p< 0.001 - moderate 1.012±0.6; 0.3±0.2; p< 0.001 - intense 0.15±0.10; 0.03±0.02; p=0.002 Muscular function - sit and stand (repetitions) 8±3; 5±3; p< 0.001 - stationary walk (repetitions) 53±22; 25±21; p< 0.001 - timed up and go (s) n.s. - handgrip strength (kgf) n.s. ICU LOS (days) -5 (4–7); 8 (5–12); p=0.003 Hospital LOS n.s. -functional independence (using BI) at 3 months after discharge 39 (97,5%) VS. 29 (74,4%), p = 0.03 -no adverse events that would require intervention were reported	2
	Per Branch							
	68	67						

d = days, ICU = intensive care unit, LOS = length of stay, NMES = neuromuscular electrical stimulation, n.s. = not significant, PPR = protocolized physical rehabilitation, RCT = randomized controlled trial

An early and progressive mobility program seems to have a benefit in relation to Barthel Index, ICU Mobility Score, physical activity and shortens the ICU length of stay.

#159

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
159 Kim 2019 (PMID: 32166241 DOI: 10.1097/CCE.0000000000000060) Specification of study: Retrospective cohort study	183 pts **Inclusion criteria:** - ICU pts - > 18 years - receiving EM - admitted to hospital from home **Exclusion criteria:** - ineligible ICU admission (discharged to hospice or transferred to another hospital) - LOS > 45d, NICU LOS > 21 d - history of limb amputation - no surviving until hospital discharge			**None** ICU-related and mobilization-related factors were tested for their association with discharge home		**Primary endpoint:** -discharge home **Secondary endpoint:** - adverse events **Sample size calculation:** no power calculation reported	**Primary endpoint:** - incremental increase in the maximum level of mobility was associated with 46% greater odds of discharge home (odds ratio, 1.46; 95% CI, 1.13-1.88). - increased age was associated with 5% decreased odds (odds ratio, 0.95) and each additional day of hospitalization with a 5% decrease (odds ratio, 0.94) was associated with decreased odds of discharge home Adverse events: n/a	4
	Per Branch							
	183							

ICU = intensive care unit, LOS = length of stay, pts = patients

Among medical ICU patients who resided at home prior to their ICU admission, the maximum level of mobility achieved in the medical ICU was the factor most strongly associated with discharge back home.

No detailed assessment was carried out further because higher-quality evidence is available on this topic.

#160

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
160 Yu 2019 (PMID: 32156142 DOI: 10.21037/apm.2020.02.12) Spezification of study: RCT	- 112 pts were enrolled - 107 pts included for final analysis **Inclusion criteria:** **-** MV within 48 h after admission - GCS = 15 before admission - ARF was the main cause of ICU - Barthel score ≥61 before admission - ≥18 y - APACHE II score ≥10 **Exclusion criteria:** - pregnant women - diseases that may cause long-term muscle weakness - risk of severe bleeding - history of myocardial ischemia, malignant arrhythmia, blood purification treatment and ECMO assist		- 5 (due to being transferred to another hospital due to the change in disease condition or discharge from the hospital)	**Routine ICU treatment + in-bed cycling** **-** (MOTOmed letto2 , Germany) with upper limb passive joint activity - passive and active cycling	**Routine ICU treatment**	**Outcomes:** - ICU-AW - adverse events - MV time - ICU LOS - Barthel Index	**Outcomes:** - ICU LOS [d] (11.87±2.00, 13.24±2.32, p = 0.001) - MV time [h](200.57±25.97, 248.10±39.43, p<0.001) - Barthel Index (41.04±7.016, 33.70±8.81, p<0.001) - incidence of ICU-AW (16 (30.2%), 32 (59.3%), p=0.003) - no serious adverse events in both groups	2 → 3 (downgrade: high risk of bias in RoB)
	Per Branch							
	55	57						

ARF = acute respiratory failure, y = years, APACHE II score = acute physiology and chronic health score, d = day, GCS = Glasgow coma scale, h = hours, ICU-AW = intensive care unit acquired weakness, ICU LOS = intensive care unit length of stay, MV = mechanical ventilation, pts = patients, RCT = randomized controlled trial

In-bed cycling seems to have a benefit on ICU-AW, MV time, ICU LOS and Barthel Index in relation to usual ICU care.

#162

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
162 Anekwe 2020 (PMID: 32135387 DOI: 10.1016/j.physio.2019.12.004) Specification of study: systematic review	**Total** 9 publications (RCTs) including 948 pts **Inclusion criteria:** - conducted in the ICU - RCTs - adult pts - evaluated the effect of EM or NMES - reported the incidence of ICUAW or assessed muscle strength using the MRC **Exclusion criteria:** - pts already diagnosed with ICUAW **Per Branch**		**EM and/or NMES**	**Usual care**	**Primary endpoint:** - incidence of ICUAW measured at any time point after initiation of intervention **Secondary outcomes:** - length of time spent on MV(ventilator-free days and duration of MV) - discharge location - ICU and hospital LOS - acute mortality (defined as death in the ICU or hospital)	**Primary outcome** - random effect model OR 0.63 (95% CI: 0.43 to 0.92) (screened population) 0.71(95% CI: 0.53 to 0.95) (total population randomized) - the fixed effect model had the same results. significantly more pronounced effect of EM in patients with longer ICU-LOS. -NMES had a greater effect on ICUAW than EM (0.71 vs. 0.26) -EM <72h is more effective than EM >72h (0.7 vs. 0.75) **Secondary outcomes** - acute mortality: no difference between groups (OR 1.19; 95% CI: 0.79 to1.80) - ICU LOS no meta analysis - MV Duration no meta analysis - discharge home OR 1.69 (95% CI: 1.04 to 2.75) in favour of rehabilitation for being discharged home - only two studies favoring discharge home in the intervention group (p = 0.06 and 0.0007)	1

EM = early mobilization, ICU-AW = ICU-acquired weakness, ICU = intensive care unit, LOS = length of stay, MRC = medical research council scale, NMES = neuromuscular electrical stimulation, pts = patients

EM and/or NMES shows a benefit in relation to the incidence of ICU-AW.

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#170

Reference, Study Type	Cases and Controls (Participant #, characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
170 Ding 2020 PMID: 32000806 DOI: 10.1186/s13054-020-2738-5 **Specification of study**: a multi-center prospective cohort study	**Total** 20 pts. Between January 2018 and April 2019 **Inclusion criteria:** - Non-intubated moderate to severe ARDS patients - arterial blood gas analysis after a PEEP of 5 cmH2O supported by NIV (CPAP/BiPAP mode) with FiO2 0.5 for at least 30 min → PaO2/FiO2 was less than 200 mmHg **Exclusion criteria:** -signs of respiratory fatigue (RR > 40/min, PaCO2 > 50 mmHg/pH < 7.30, and obvious accessory respiratory muscle use) - immediate need for intubation (PaO2/FiO2 < 50 mmHg, unable to protect airway or change of mental status) - inability to collaborate with PP with agitation or refusal **Per Branch**		**Interventions:** (1) HFNC, high-flow nasal cannula support alone. (2) HFNC+PP, high-flow nasal cannula therapy combined with prone positioning. (3) NIV, non-invasive ventilation support alone. (4) NIV+PP, non-invasive ventilation combined with prone positioning.		No sample size calculation **Primary endpoints:** - rate of avoidance for intubation. **Secondary endpoints:** - increase in PaO2/FiO2 from HFNC alone to HFNC+PP, to NIV alone, and to NIV+PP - threshold of PaO2/FiO2 for successful PP cases - time duration (tolerance) for each PP therapy session	**Primary endpoints:** - 11/20 pts, 55% avoided intubation → success group. -9/20 intubated, 3 needed ECMO, 1 died → failure group **Secondary endpoints:** -PaO2/FiO2 showed a trend of increase in transitions from HFNC to HFNC+PP, to NIV, and to NIV+PP (no p value) -in the success group: ○ PaO2/FiO2 higher in HFNC+PP than in HFNC (130 ± 35 mmHg vs 95 ± 22 mmHg, P = 0.016). ○ PaO2/FiO2 upward trend when PP was added to NIV (166 ± 12mmHg vs 140 ± 30 mmHg, P = 0.133) -in the failure group: ○ PaO2/FiO2 were significantly higher in NIV+PP compared to NIV (111 ± 20 mmHg vs 77 ± 14 mmHg, P = 0.011) - PaO2/FiO2 in those evaluated on HFNC+PP was significantly higher in the success group than in the failure group (125 ± 41 mmHg vs 119 ± 19 mmHg, P = 0.043) - No significant difference in total days, frequency, and duration of PP between the successful and the failure groups was demonstrated	3 → 4

Pts. =patients; ARDS= acute respiratory distress syndrome; PEEP= end-expiratory positive airway pressure; NIV=non-invasive ventilation; HFNC= high-flow nasal cannula; PP=prone position

Early application of PP with HFNC, especially in patients with moderate ARDS and baseline SpO2 > 95%, may help avoid intubation.

#171

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
171 Gama Lordello 2020 (PMID: 31994405 DOI: 10.1177/0269215520901763) Specification of study: RCT	- 234 pts randomized **Inclusion criteria:** - ⩾18y - submitted to cardiac surgery - either elective myocardial revascularization or valve surgery by median sternotomy with extracorporeal circulation **Exclusion criteria:** - difficulty understanding the activities - motor or neurological impairment that would prevent them from using a cycle ergometer or from walking independently - discontinued the protocol on the ward for return to the ICU		6 pts, return to ICU: 3 interventions, 3 control)	**Rehabilitation program:** -start 6 to 8 hours after extubation - twice in a 24-hour period using only the **cycle ergometer** (Delta-Sport Handelskontor GmbH Nr. AT-2154, version 08/2015; Hamburg, Germany) - 10 minute sessions	**Standard mobilization:** -6 to 8 hours after extubation - 10 minutes sessions - active exercises for lower and upper limbs - each movement repeated 10 times in an open kinetic chain	**Primary endpoint:** - difference in total number of steps recorded on pedometer over 3 days of use **Secondary outcomes:** - mobility - reasons that prevented pts from walking during phase I cardiac rehabilitation **Sample size calculation:** - 216 pts, 108 in each group	**Primary endpoint:** - no significant difference (p=0.167) **Secondary outcomes:** - higher motivation to walk in intervention group (37,6%, 25,2%, p=0.04) - no significant differences in other outcomes	2
	Per Branch							
	114	120						

ICU = intensive care unit, pts = patients, Y = years

In-bed cycling seems to have no benefit in relation to number of steps on pedometer after intervention.

#173

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
173 Windmoller 2020 (PMID: 31988253 DOI: 10.4187/respcare.06919) **Specification of study:** RCT	**Total** 42 pts enrolled, 31 analyzed **Inclusion criteria:** - 40–70 years - underwent myocardial revascularization surgery **Exclusion criteria:** - unable to understand and follow the research procedures - had complications postoperative **Per Branch** 21 / 21	11pts (6 Intervention, 5 Control; 6 for cardiac arrhythmia, 1 for surgical reintervention, 2 not reassessed and 2 for death)	Step program in immediate postoperative period + **cycle ergometer with CPAP:** 1 daily session from the 2nd to the 4th postoperative day	**Physiotherapeutic program (step program):** 2 daily sessions with an average duration of 25 min	**Primary endpoint:** - 6MWT **Secondary outcomes:** - respiratory muscle strength - lower limbs muscle resistance - MV time - ICU LOS - hospital LOS **Sample size calculation:** - 30 (15 intervention and control)	**Primary endpoint:** - 6MWT, no significant difference (p=0.16) **Secondary outcomes:** - significantly lower ICU LOS [d] (2.5±0.5, 2.9 ± 0.7, p=0.05) - no significant differences in other outcomes	2

CPAP = continuous positive airway pressure, d = days, ICU = intensive care unit, LOS = length of stay, MV = mechanical ventilation, pts = patients, RCT = randomized controlled trial, 6MWT = 6 minute walk test

In-bed cycling with CPAP seems to have a small benefit on ICU LOS in comparison to a standard physiotherapeutic program.

#174

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
174 Coles 2020 (PMID: 31972758 DOI: 10.1097/TA.0000000000002588) **Specification of study**: retrospective pre-post study	526 critically ill trauma pts **Inclusion criteria:** - adult trauma pts (>18 years old) - admitted to ICU at a Level I trauma center over a 2-year period prior to and following EMP implementation (with a 1-year transition period) - admitted during study period. **Exclusion criteria:** - pediatric pts(<18 years) - any trauma pts admitted to ICU during the transition period (April 1, 2014 to March 3 , 2015)			**Multidisciplinary, stepwise approach to patient mobilization with a new Early Mobilization Protocol** - ICU clinicians evaluate pts readiness for participation in mobilization activities using a 4-level system - for unconscious pts mobility sessions consist of passive ROM activities	**Usual care** - prior to EMP implementation	**Primary endpoint:** - in-hospital mortality **Secondary outcomes:** - ICU mortality - ICU LOS - hospital LOS - ventilator-free days	**Significant differences between groups in:** - in-hospital mortality, n (%): 41 (17.5); 74 (25.3); p=0.031 - ICU mortality n (%) 30 (12.8); 63 (21.6); p=0.009 **No significant differences between groups in:** - ICU LOS n.s. - hospital LOS n.s. -ventilator-free days n.s.	4
	Per Branch							
	234 post-EMP	292 pre-EMP						

EMP = early mobilization protocol, ICU = intensive care unit, LOS = length of stay, n.s. = not significant, pts = patients, ROM = range of motion

A multidisciplinary, stepwise approach to patient mobilization seems to have a benefit in relation to in-hospital and ICU mortality.

#176

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Recommendations
	Total	
176 Aquim 2019 (PMID: 31967216 DOI: 10.5935/0103-507X.20190084) Specification of study: National Guideline	28 publications (16 RCTs, 3 SRs, and 9 prognostic cohort studies) **Inclusion criteria:** - adult pts ≥ 7 days hospitalized in the ICU - receiving MV - early mobilization - full texts available - RCTs - prognostic cohort studies - SRs with or without meta-analysis **Definition of EM** **Early physical therapy** - for critically ill pts - starting in the first 48 hours after the institution of MV	1. Early mobilization is safe. Adverse events are mainly related to hemodynamic and/or respiratory changes, are low-frequency and are reversible with the interruption of the intervention. Adverse events are not frequent or severe, and early mobilization is considered safe 2. Early mobilization is indicated for adults in the ICU, preferably those under spontaneous breathing, who cooperate and who do not have intracranial hypertension. Mechanical ventilation and noncooperation may be considered limitations for early mobilizations, but not contraindications. 3. Early mobilization is contraindicated for terminal patients with systolic hypertension (systolic blood pressure > 170mmHg) or intracranial hypertension, unstable fractures, recent acute myocardial infarction and open abdominal wounds. 4. The appropriate dose of early mobilization is defined by clinical efficacy and individual tolerance. The doses are as follows: - passive mobilization: approximately 10 to 20 mobilizations per selected joint, up to two times/day. - active exercises: 1 hour per day, up to two 30-minute sessions. The following constitute positioning and progression: - assisted verticalization with an orthostatic board: up to 1 hour per day, up to twice a day. - passive ergometer cycling: 20 minutes, 20 cycles/minute. - active ergometer cycling: two 10-minute sessions per day. 5. The care and safety criteria for early mobilization do not require specific monitoring, and hemodynamic and respiratory stability characterize a safe intervention model. 6. The prognostic indicators include an assessment of the risk of functional decline, weight, functional range, muscle strength, hemodynamic instability, respiratory dysfunction, recent extubation, protective factors, sedation, length of stay in the ICU and duration of mechanical ventilation.

#177

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
177 Mayer 2019 (PMID: 31922059 DOI: 10.1016/j.ekir.2019.10.003) Specification of study: A quality Improvement Study	N = 67 **Inclusion criteria:** - adult pts - requiring CRRT **Exclusion criteria:** - RASS > 2 or ≤ 2 - high ventilation settings (FiO2 > 70%, PEEP >8) - 2+ vasopressors - hemodynamic instability			**<u>Mobility progression scheme of early rehabilitation:</u>** Level 1 & 2 (PT or OT): Level 1: passive activity in bed Level 2: active activity in bed Monitor CRRT access/return pressure alarms <u>Level 3 (PT, OT and RN)</u> Edge of Bed activity Monitor CRRT access/ return pressure alarms <u>Level 4 (PT, OT & RN (RT if MV)):</u> Standing and Transfer CRRT fluid removal paused for 15-20 minutes <u>Level 5 (PT, OT, & RN (RT if MV)):</u> Ambulation CRRT machine in recirculation mode if filter life < 36h	No control group	**<u>Primary outcomes:</u>** - feasibility - safety **<u>Secondary outcome:</u>** - clinical outcomes	**<u>Primary outcomes:</u>** feasibility: - 112 rehabilitation sessions were performed of 152 attempts (74% completion rate) Safety: - no major adverse events **<u>Secondary outcome:</u>** Clinical outcomes: - patients achieving higher levels of mobility were more likely to be alive at discharge (p = 0.076). - number of completed rehabilitation sessions directly correlated with MV days, hospital LOS, ICU LOS, and CRRT days (r ¼ 0.392, 0.254, 0.384, 0.467)	4
	Per Branch							
	112 complete rehabilitation sessions	40 attempted rehabilitation sessions						

*CRRT = continous renal replacement therapie, MV = mechanical ventilation, OT = occupational therapie, PT = physical therapy, RN = registered nurse, RT = respiratory therapist

The provision of early rehabilitation in critically ill patients requiring CRRT is safe and feasible.

#181

Reference, Study Type	Cases and Controls (Participant #, Characteristics) Total	Drop -out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
181 Okada 2019 (PMID: 31867111 DOI: 10.1186/s40560-019-0413-1) Specification of study: systematic review	11 publications 1322 pts [1-11] **Inclusion criteria** - RCTs - adult pts ≥18 y admitted to ICU		**Early mobilization** - physical and/or occupational therapy - start within 1 week of ICU admission, - initiated earlier than usual care or control	**Usual care or mobilization** - started later than the intervention	**Primary endpoints:** - in-hospital mortality - ICU/hospital LOS - SF-36 or EQ-5D **Secondary outcomes:** - physical function - cognitive function - mental disorders such as depression or anxiety - all adverse events	**Significant outcomes:** - in-hospital mortality: OR (95% CI: 0.80 to 1.58) - ICU-LOS: OR -1.54 (95% CI: -3.33 to -0.25) - hospital LOS: OR -2.86 (95% CI -5.51 to -0.21, I 2 = 85%) - MRC: MD 4.84 (95% CI: 0.36-9.31) **Not significant outcomes:** - PFIT, handgrip and AE n.s. - SF-36 PF: MD 4.65 (95% CI: -16.13 to -25.43) - EQ-50: MD 0.29 (95% CI: -11.19 – 11.78)	1

AE = adverse events, EQ-5D = EuroQol 5 dimension, ICU = intensive care unit, LOS = length of stay, MRC = Medical Research Council Scale for Muscle Strength, n.s. = not significant, PFIT = physical function in ICU Test, pts = patients, QOL = quality of life, RCT = randomized controlled trial, SF-36 = short form health survey 36-item, y = years

Early mobilisation seems to have a benefit in relation to a shorter length of hospital stay and muscle strength.

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#183

Reference, Study Type	Cases and Controls (Participant #, characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
183 Saha 2020 PMID: 31812562 https://doi.org/10.1053/j.jvca.2019.10.055 **Specification of study:** Retrospective analysis	1 institutional database between October 2016 and October 2018→ 24 pts., 6 pts. undergoing PP during ECMO therapy. **Inclusion criteria:** -PP for the treatment of ARF after cardiac surgery **Exclusion criteria:** -not stated		**PP** Data before, after (6h), at the end of PP and after SP (6h)	Patients acted as their own control	No sample size calculation (retrospective study) **Outcomes:** - respiratory conditions (e.g., HI) - ECMO support	**Results:** -increase in HI at the end of PP ($p < 0.001$) as well as 6h after SP ($p < 0.001$) -a significant reduction of ECMO support from 3.0 (2.2-5.6) liters/min to 2.5 (2.0-4.6) liters/min ($p = 0.023$) in pts. undergoing PP and ECMO	4
	Per Branch						
	6						

PP=Prone position; pts=patients; ARF=acute respiratory failure; ECMO= extracorporeal membrane oxygenation; SP=supine position; HI=Horowitz index

PP can be considered for the treatment of ARF after cardiac surgery to improve short-term respiratory conditions and possibly facilitate ECMO weaning.

No detailed assessment was carried out because higher-quality evidence is available on this topic.

#185

Reference, Study Type	Cases and Controls (Participant #, characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
#185 Lucchini 2020 (PMID: 31789984 DOI: 10.1097/DCC.0000000000000393) **Specification of study:** Retrospective study	**Total** ARDS patients with invasive mechanical ventilation and prone position in a general ICU 170 pts enrolled from January 2008 – December 2018 **Inclusion criteria:** - Patients with ARDS undergoing invasive mechanical ventilation in prone position **Exclusion criteria:** - Patients with noninvasive ventilation **Per Branch** 170	- none	**Prone Position maneuvers** (patients with pressure sores)	**Prone Position maneuvers** (patients without pressure sores)	No sample size calculation (retrospective study) **Outcomes:** - incidence of pressure sores - modifications of the PaO_2/FiO_2 mmHg ratio induced by PP	**Results** - 23 (14%) of pts developed pressure sores - 31 pressure sores related to PP on these 23 pts **Significant differences** - difference in the PaO_2/FiO_2 mmHg ratios observed in 4 time frames (before PP: 109mmHg (IQR 80-148, after 1h: 144mmHg (IQR 96-200), before placed in supine position: 158mmHg (110-213), after 1h supine position: 131mmHg (95-175); p<0.0001)	4

ARDS = acute respiratory distress syndrome ; ICU = intensive care unit; pts = patients; PP = prone position

The overall incidence of pressure sores under PP was low. The PaO_2/FiO_2 mmHg ratio could positively influenced by PP.

No detailed assessment was carried out because higher-quality evidence is available on this topic.

#186

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
186 Schieren, 2020 (PMID: 31757469 DOI: 10.1016/j.injury.2019.11.009) retrospective matched-pair cohort study	60 pts **Inclusion criteria**: - ≥18 y, ventilated with thoracic trauma (abbreviated injury scale (AIS)Thorax ≥3) **Exclusion criteria**: - no/minor chest trauma (AISThoraxA 2) - secondary hospital admission >24 hours from accident - duration of mechanical ventilation <72 hours		Exclusion during data collection (16 patients) (incomplete/illegible records (8 patients), exclusion of corresponding partners (8 patients))	**CLRT:** - with a rotational arc of up to 124°	**Conventional therapy:** - manually turning pts from side-to-side in 2-4 h intervals with the head of the bed elevated	**Outcomes:** - depth of sedation - level of agitation - pneumothorax/ pleural infusion/ pulmonary infiltrates on X-ray - Lung injury score - paO2/FiO2 ratio - incidence in pneumonia, sepsis, liver or kidney failure - ICU and hospital LOS	**Significant differences between groups:** - deeper Sedation in control (RASS -3.6 vs. 4.0, p = 0.01) - more agitation (RASS ≥2) after intervention (41% v. 9%, p = 0.01) **No significant differences between groups in:** - visibility of pneumothoraxes or pulmonary infiltrates or pleural effusion on chest X-Ray - change in Lung Injury Score - development of severe respiratory dysfunction - paO2/FiO2 ratio - incidence in pneumonia, sepsis, liver or kidney failure - ICU and hospital LOS	4
	Per Branch							
	30	30						

CLRT = continuous lateral rotation therapy, ICU = intensive care unit, LOS = length of stay, pts = patients

In this well-matched sample, the use of CLRT did not seem to translate into relevant clinical benefits in patients with thoracic trauma in the setting of modern ICU care with the widespread implementation of lung protective ventilation. Agitation was more likely in the CLRT group. ***No detailed assessment was carried out because higher-quality evidence is available on this topic.***

#189

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop -out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
189 Kim 2019 (PMID: 31700866 DOI: 10.21037/atm.2019.08.117) Specification of study: case control Study	n = 516 pts **Inclusion criteria**: - adults (≥18 years) with sepsis - admitted at ICU **Exclusion criteria**: - no abdominal CT within 24h of ICU admission - scoliosis - died within 48h of ICU admission			**Rehabilitation** - 30 minutes daily - stretching, strengthening exercises, NMES, dysphagia therapy for pts with swallowing difficulty, nutrition therapy	**No Rehabilitation**	**Primary Endpoints:** - hospital stay - ICU stay - in-hospital mortality - discharge to home - 6-month mortality - 1 year mortality	**Comparison between low skeletal mass and non-low skeletal mass groups** - hospital mortality: no significant difference between groups - 6-months mortality higher in the low skeletal muscle mass group(44.9% vs. 26.3%, p=0.001) - 1-year mortality higher in the low skeletal muscle mass group (50.1% vs. 32.6%, p=0.002) - rate of discharge to home lower in the low skeletal muscle mass group(39.4% vs. 58.9%, p=0.001) **Low skeletal mass group, rehabilitation vs control**: - urinary tract infection higher in the rehabilitation group (15.3% vs. 7.8%, p=0.015) - mean hospital LOS higher in the rehabilitation group (73.2 vs. 35.5 days, p<0.001) - mean ICU LOS higher in the rehabilitation group(22.5 vs. 15.9 days, p=0.004). - hospital mortality lower in the intervention group (26% vs. 39.8%, p=0.003) - 6-month mortality lower in the rehabilitation group(38.6% vs. 51.5%, p=0.008) - rate of discharge to home higher in the rehabilitation group (43.3% vs. 35.4%, p=0.011 - no differences in the non-low skeletal muscle mass group.	4
	Per Branch							
	Low skeletal muscle mass: n = 421 (Intervention: 215, Control: 206)	Non-low skeletal muscle mass: n = 95 (Intervention: 52, Control: 43)						

CT = computer tomography, ICU = intensive care unit, LOS = length of stay, NMES = neuromuscular electric stimulation, pts = patients

ICU rehabilitation was independently associated with reduced 1-year mortality from sepsis among low skeletal muscle mass patients, but not among non-low skeletal muscle mass patients. Therefore, the delayed initiation of ICU-rehabilitation should be avoided, especially in low skeletal muscle mass patients.

#190

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
190 Shimogai 2019 (PMID: 31698814 DOI: 10.3390/ijerph16224324) Specification of study: Retrospective cohort study	**Total** 155 pts selected from an ICU **Inclusion criteria:** - ≥ 20 y - rehabilitation was performed - medical patients admitted to ICU **Exclusion criteria:** - rehabilitation started in general ward - rehabilitation was prescribed in the ICU but was not performed while the patient was in the ICU - death - cerebrovascular disease - patient declined rehabilitation - missing data in the variable of interest **Per Branch** 155		- data collection - evaluating ADL before admission - assessment of muscle strength - assessment of disability		**Primary outcomes:** - factors affecting discharge to home from ICU (Age, APACHE-II-Score, Independence at home before admission, standing within 5 days of admission)	**Significant outcomes:** - age (p=0.001, OR= 1.06 95%CI=1.02 – 1.09) - APACHE II score (p=0.002, OR=1.12, 95%CI= 1.04 – 1.20) - independence at home before admission (P=0.008, OR=7.10, 95%CI=1.65 – 30.44) - standing within 5 days of admission (p<0.001, OR=6.58, 95% CI=2.60 – 16.61)	4

ADL = activities of daily life, CI = confidence interval, ICU= intensive care unit, OR = odds ratio, Pts = patients, y = years

Independence of home life before admission and early start of standing were identified as factors strongly related to discharge to home. The degree of independence in living before hospital admission and progress toward early mobilization are helpful when considering an ICU patient's discharge destination.

No detailed assessment was carried out because higher-quality evidence is available on this topic.

#194

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
194 Ding 2019 (PMID: 31589642 DOI: 10.1371/journal.pone.0223151) Specification of study: systematic review with network meta-analysis	15 publications[1-15] 1.726 pts **Inclusion criteria:** - pts aged > 18 years - had undergone MV - RCTs published in English and Chinese **Exclusion criteria:** - abstracts, letters, case reports, non-RCTs, expert opinions, reviews, repeated literature - did not specify the time of mobilization initiation or related outcomes		**Early mobilization** - initiated at various time points, as follows: within ≤ 24h, 24–48h, 48–72h, 72–96h, and > 96 h of MV, and > 5 and > 7 days after ICU admission	**Usual nursing care**	**Outcomes:** - ICU-AW (MRC) - duration of MV - ICU LOS	**Significant differences between groups between:** - incidence of ICU-AW, in mobilization within 72–96 h and 24–48 h of MV, with the former leading to a greater reduction in ICU-AW - duration of MV, in mobilization within ≤ 24 h, 48–72 h, > 96 h, and 24–48 h of MV, with shorter durations for pts mobilized at ≤ 24h, 48–72h, and > 96 h relative to 24–48 h - mobilization within ≤ 24 h or > 96 h of MV and > 5 days after ICU admission, with ≤ 24 h or > 96 h leading to shorter durations **No significant differences between groups in:** - ICU LOS among the 7 initiation times	1
	Per Branch						

ICU-AW = ICU-acquired weakness, ICU = intensive care unit, MRC = medical research council, MV = mechanical ventilation, NMA = network meta-analysis, pts = patients, RCT = randomized controlled trial

Mobilization within 48–72 h of mechanical ventilation may be optimal for improvement of clinical outcomes.

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#195

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
195 Zhang 2019 (PMID: 31581205 DOI: 10.1371/journal.pone.0223185) Specification of study: systematic review	- 23 publications[1-23] **Inclusion criteria:** - English publications - pts ≥18y - RCTs **Exclusion criteria:** - pts with neurological conditions - inclusion of ineligible interventions, such as, NMES, continuous lateral rotation of the bed, lateral positioning in bed, inspiratory muscle training / diaphragmatic electrical stimulation/breathing exercises, chest physiotherapy/airway clearance, massage therapy, and stroke rehabilitation - exercises performed after ICU discharge - pediatric, animal or cell-based studies			**Early mobilization**	Standard of care	**Outcomes:** - muscle strength - functional mobility capacity - duration of MV - ventilator-free days - mortality rates (28-day, ICU, and hospital) - discharged-to-home rate - adverse events	**Significant differences between groups in:** - ICUAW at hospital discharge (RR: 0.60, 95% CI [0.40, 0.90]; *p* = 0.013, *I2* = 0.0%) - number of ventilator-free days (SMD: 0.17, 95% CI [0.02, 0.31]; *p* = 0.023, I^2 = 35.5%) - discharged-to-home rate (RR: 1.16, 95% CI [1.00, 1.34]; *p* = 0.046) **No significant differences between groups in:** - no change in MRC (n.s.) - ICUAW at ICU discharge n.s. - MV duration n.s. (SMD -0.33; 95% CI: -0.66 to -0.00; p= 0.051; I^2 = 89.1%) - handgrip force n.s. - quadriceps force n.s. - mortality n.s - no meta-analysis on functional mobility capacity	1
	Per Branch							

CI = confidence interval, EM = early mobilization, ICU-AW = ICU-acquired weakness, ICU = intensive care unit, MV = mechanical ventilation, NMES = neuromuscular electric stimulation, pts = patients, RCT = randomized controlled trial, RR = relative risk, SMD = standardized mean difference, y = years

Early mobilization seems to have a benefit in relation to muscle strength, ventilator free days and discharge to home rate.

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#198

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
198 Nakamura 2019 (PMID: 31544949 DOI: 10.2340/16501977-2594) RCT	**Total** Randomised: 94 Analysed: n = 37 **Inclusion criteria:** - ICU pts **Exclusion criteria:** - scheduled operation - mild cases or expected discharge from the ICU within 3 days - died by day 2 - second admission to our ICU - < 20 years old - pregnant or believed pregnant - extracorporeal membrane oxygenation - multiple-drug-resistant bacteria - lower extremity event - pacemaker - neuromuscular diseases - CT not performed on the first day - do not attempt resuscitation - unable to obtain informed consent - included in other clinical trials **Per Branch** 47 | 47	N = 57 (60,6%) NMES: 26 (6 died, 18 discharged early, 2 CT unable) Control: 31 (7 died, 17 discharged early, 7 CT unable)	**Early rehabilitation:** - for 20 min per day **NMES:** - lower extremities 20 min per day until day 10	**Early rehabilitation:** - for 20 min per day	**Primary endpoint:** - femoral muscle volume cia CT **Secondary outcomes:** - ICU LOS - hospital LOS - 28-day survival - duration of MV - Barthel index	**Primary endpoint:** - femoral muscle volume change day 1 to 10 (%), control – MD (95%CI): -17.7 (-11.9 – -23.5) vs intervention - MD (95%CI): -10.4 (-5.8 – 15.1), p = 0.04 **Secondary outcomes:** - ICU LOS, control: Mean ± SD: 10.6 ± 4.7 vs intervention: Mean ± SD: 9.9 ± 5.7, p = 0.71 - hospital LOS, control: Mean ± SD: 20.6 ± 8.9 vs intervention: Mean ± SD: 17.4 ± 9.9 p = 0.32 - duration of MV (days), control: Mean ± SD: 8.5 ± 4.5 vs intervention: Mean ± SD: 9.9 ± 6.2, p = 0.50 - Barthel index, control: Mean ± SD: 29.0 ± 18.8 vs intervention: Mean ± SD: 50.4 ±31.6, p = 0.16 - 28-day survival, control: %: 51.5 vs intervention: %: 49.2, p = 0.63	2 → 3 (downgraded due to high drop-out rate)

CT = computer tomography, ICU = intensive care unit, LOS = length of stay, MV = mechanical ventilation, NMES = neuromuscular electrical stimulation

Belt electrode electrical muscle stimulation reduces muscle loss in the ICU.

#199

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
199 Pang 2019 (PMID: 31537777 DOI: 10.12659/MSM.916210) Specification of study: RCT	42 pts **Inclusion criteria:** - cerebral hemorrhage or traumatic brain injury - APACHE II score ≥15 - age 18–80 y - onset of disease for the first time - signed informed consent **Exclusion criteria:** - long-term inability to move independently prior to onset of disease - advanced stage of malignant tumors or underwent radiotherapy or chemotherapy of tumors within the last 6 months - imperfect limbs and new fracture - long-term MV due to neuromuscular diseases - heart rate exceeded the 70% maximum allowable for age - family members did not agree			**Early rehabilitation therapy:** - performed at 2 days after the pts became stable - once daily, 6 times per week for 10 days - awaking therapy, hyperbaric oxygen therapy , comprehensive sensory stimulation therapy, and fastigial nucleus stimulation , therapeutic exercise (such as intelligent rehabilitation training system for lower limbs , passive activity training/active assistant activity training), and electrical stimulation therapy	- monitored for respiratory functions and blood oxygen - provided nutritional support therapy - placed in supine position or lateral decubitus position. - bed sores were prevented by turning over, slapping the back, and massaging skin, and sputum was drained to avoid asphyxia. - rehabilitation in usual care	**Derived endpoints:** - incidence rates of ICU-AW - incidence rate of DVT/pneumonia - APACHE II scores/MRC scores prior to and after treatments - MV time - hospital stay in ICU - total hospital stay no power analysis	**Derived outcomes:** - APACHE II after treatment (8.90±2.07; 10.24±2.19; p<0.05) - MRC post treatment (52.95±3.99; 50.10±4.21; p<0.05) - improved GCS (GCS>9; 86% vs 76%; p<0.05, GCS>12; 48% vs 24%; p<0.05, GCS = 15; 24% vs 9.5%; p< 0.05) - incidence of complications (ICUAW, DVT, pneumonia) 19%; 43%; p<0.05 - ICU- LOS (11.76±2.63; 14.00±2.19; p<0.05) - hospital stay (31.38±4.006; 35.24±5.059; p<0.05) - MV duration (3.00±0.71; 5.17±0.75; p<0.05)	2 → 4 (downgraded due to high risk of bias and and low number of pts)
	Per Branch							
	21	21						

APACHE II = acute physiology and chronic health evaluation, DVT = deep vein thrombosis, DVT = deep venous thrombosis, GSC = Glasgow coma scale, ICU-AW = intensive care unit – acquired weakness, ICU = intensive care unit, IV = intravenous, LOS = Length of stay, MRC = medical research council, MV = mechanical ventilation, pts = patients, y = years,

Early rehabilitation therapy seems to have a benefit in relation to APACHE II, MRC, consciousness rate, adverse events, ICU and hospital length of stay and MV time compared to Control Group.

#200

Reference, Study Type	Cases and Controls (Participant #, characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
Seo 2019 PMID: 31522973 https://doi.org/10.1016/j.aucc.2019.07.005 **Specification of study:** Retrospective study	157 SICU patients between January 1 to December 31, 2016 **Inclusion criteria:** - treated in the SICU for at least three days and have received more than one active rehabilitation session **Exclusion criteria:** - Pts with incomplete medical record - Pts with liver transplantation			< 65 years of age	≥ 65 year of age	No sample size calculation (retrospective study) **Endpoints:** - rehabilitation characteristics (activity level) - functional recovery - AM-PAC scores - safety events	**Results:** - Activity level of session (Level II (AROM): 59 (17.6); 38 (8.5), Level III (sitting): 145 (43.3); 189 (42.5), Level IV (standing): 84 (25.1); 162 (36.4), Level V (walking <10m): 13 (3.9); 12 (2.7), Level VI (walking - no significant differences in functional recovery were seen between the age groups - AM-PAC scores increased from the beginning of rehabilitation to the time of ICU discharge (from 11.6 ± 0.4 to 13.9 ± 0.4, p < 0.01) - AM-PAC scores increased in both age groups (from 12.4 ± 4.9 to 14.8 ± 4.9 in those aged < 65 years and from 111.1 ± 4.1 to 13.1 ± 4.8 in those aged ≥ 65 years) -During the 780 rehabilitation sessions, 23 potential safety events (3.0%), most common dyspnoea (n = 7), patient refusal (n = 4), and tachycardia (n = 3)	4
	Per Branch							
	68	89						

SICU = surgical intensive care unit; pts = patients; AROM = active range of motion; pts. =patients; AM-PAC= Activity Measure for Post-Acute Care

Active rehabilitation in critically ill surgical is feasible and sage regardless of age.

#201

Reference, Study Type	Cases and Controls (Participant #, characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
201 Grunow 2019 PMID: 31506074 https://doi.org/10.1186/s13054-019-2540-4 **Specification of study:** Secondary analysis of RCT	21 pts admitted to two ICUs within the Charité – Universitätsmedizin Berlin receiving NMES were considered in this sub-analysis branched into Responders and Non-Responders **Inclusion criteria:** - ≥ 18 y - SOFA Score ≥ 9 - Admitted to the ICU < 72h **Exclusion criteria:** - Prior hospital treatment for longer than 7 days - illness prohibiting early mobilization - pre-existing neuromuscular disease - insulin-dependent diabetes mellitus - Body Mass Index > 35 kg/m2 - not ambulating before admission - poor prognosis with a high likelihood of death within the next hours		- none	**Responders** Defined as >50% contractile response to NMES during the first 7 days of the study intervention	**Non-Responders** with ≤ 50% contractile response to NMES during the first 7 days of the study intervention	**Sample Size calculation:** None for sub-analysis **Endpoints:** -contractile response -SOFA score -necessary electrical current	**Primary Endpoint:** - Significantly greater proportion of stimulations leading to an adequate contractile response in responders vs non-responders **Significant difference:** - Significantly higher SOFA score in non-responders. - The electrical current necessary for a muscle contraction in responders was significantly lower (38.0 [32.8/42.9] vs. 54.7 [51.3/56.0] mA, p< 0.001). Muscle strength showed higher values in the upper extremities of responders at ICU discharge (4.4 [4.1/4.6] vs. 3.3 [2.8/3.8] MRC score, p=0.036).	4
	Per Branch							
	8	13						

ICU = Intensive Care Unit; NMES = Neuromuscular electrical stimulation SOFA = Sepsis-related organ failure assessment; MRC=Medical Research Council; ICU=intensive care unit

Patients show a differential contractile response to NMES, which appears to be dependent on the severity of illness and also relevant for potential outcome benefits.

No detailed assessment was carried out because higher-quality evidence is available on this topic

#203

Reference, Study Type	Cases and Controls (Participant #, characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
203 de Figueiredo 2020 PMID: 31466922 DOI: 10.1016/j.burns.2019.07.037 **Specification of study**: Prospective cohort study	74 pts. From April 2014 to March 2015 → 32 pts. Evaluated at hospital discharge **Inclusion criteria:** -older than 16 years admitted to the burn ICU **Exclusion criteria:** -- no data on admission - ICU death - refusal of performing tests - discharge before evaluation - Transference	N=28 (ICU death); n=14 (excluded from post-ICU analysis) due to refused to perform all the tests (n=4); discharge before evaluation (n=9); transference (n=1)	**Routine physiotherapy care:** -<u>respiratory therapy</u> (airway clearance maneuvers, lung expansion techniques, oxygen therapy and NIMV -<u>mobility therapy</u> (20 min of positioning, general limb (passive, active or resistive) and trunk exercises, SOEOB, SOOB, standing up and walking away from the bed)	-	No sample size calculation **Primary endpoints:** -MRCS -6MWT -handgrip **Secondary endpoints:** -mobility practice -barriers -addition of a mobility session (12h-shift v. 24h-shift) -mobility level and outcomes (IMS)	**Primary endpoints:** - no improvement in the MRCS scores at hospital discharge compared to the MRCS scores at ICU discharge (57.5 [9] vs 55 [7]; p = 0.368). - positive relationship between the 6MWT and handgrip strength (r = 0.555; p = 0.04) - negative correlation between length of hospital stay and handgrip strength (r =0.444; p = 0.03). **Secondary endpoints:** -mobility therapies (3088 sessions) ○ IMS=0 1048/3088 (34%) ○ IMS 1-3 1596/3088 (51%) ○ IMS>4 444/3088(14%) -barriers: ○ hemodynamic instability in 71 events (2% of sessions) ○ limited time for assistance in 49 events (1% of sessions) -addition of a mobility session: ○ no difference founded in any clinical (ICU LOS, MV duration and mortality) or functional outcomes (6MWD, handgrip strength, maximum mobility level) - mobility level and outcome: ○ association between IMSmax and mortality (p < 0.001 OR: 0.5, 95%CI: 0.36–0.68)	3
	Per Branch						

ICU = intensive care unit ; LOS = length of stay ; MRCS = Medical Research Council Scale ; TBSA = total burn surface area; 6MWT= 6-minute walking test; SOEOB= sitting on the edge of the bed; SOOB= sitting out of bed; NIMV= noninvasive mechanical ventilation;

Mobilization therapy of patients with burns in the ICU was characterized by a low mobility level during MV with a low functional status at hospital discharge

#209

Reference, Study Type	Cases and Controls (Participant #, characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
209 Griffiths 2019 https://doi.org/10.1136/bmjresp-2019-000420 **Specification of study:** National Guidelines	14 publications from 1999-2015 (14 systematic reviews, 12 with meta-analysis)[1-14] (number of pts., inclusion criteria, intervention and control not specified) **Inclusion criteria:** Systematic reviews comparing prone positioning to standard of care in ARDS patients		PP	Standard of Care	No primary endpoint defined **Endpoints extracted:** - Mortality (n = 8 studies with 2141 patients) - Treatment harms a. Pooled analysis (n = seven studies with 7377 participants) b. Subgroup analysis of cardiac events (n = three studies with 1599 participants) c. Subgroup analysis of endotracheal tube displacement (n = five studies with 1597 participants) d. Subgroup analysis of ventilator-associated pneumonia (n = four studies with 1007 participants) e. Subgroup analysis of pressure sores (n = two studies with 1095 participants) f. Subgroup analysis of incidence of pneumothorax (n = four studies with 1160 participants) g. Subgroup analysis of loss of venous access (n = two studies with 646 participants)	**Results:** - Mortality (defined as overall mortality at the longest available follow-up) was reduced by PP (RR 0.9; 95% CI 0.82 – 0.96) a. Subgroup analysis based on lung-protective ventilation (low tidal volume, 6-8 ml/kg/body weight): PP in combination with lung-protective ventilation reduced mortality RR 0.73; 95% CI 0.62 – 0.86) compared to PP without lung-protective ventilation (RR 1.01; 95% CI 0.9 – 1.13) b. Subgroup analysis based on the duration of intervention: PP > 12 hours reduced mortality (RR 0.75; 95% CI 0.65 – 0.87) compared to PP < 12 hours (RR 1.03, 95% CI 0.91 – 1.17) - Treatment Harms a. Pooled risk of adverse events was increased by PP (RR 1.10; 95% CI 1.01 – 1.12) b. PP increases the risk of cardiac events (RR 1.01; 95% CI 0.87 – 1.17) c. PP increases the risk of endotracheal tube displacement (RR 1.33; 95% CI 1.02 – 1.74) d. PP reduces the risk of ventilator-associated pneumonia (RR 0.88, 95% CI 0.71 – 1.17) e. PP increases the incidence of pressure sores (RR 1.23; 95% CI 1.07 – 1.41) f. PP reduces the incidence of pneumothorax (RR 0.87; 95% CI 0.59 – 1.30) g. PP increases the incidence of loss of venous access (RR 1.98; 95% CI 1.11 – 3.55)	1
	Per Branch						

Pts = patients, ARDS = acute respiratory distress syndrome, PP = prone positioning, RR = risk ratio, CI = confidence interval, P/F ratio = partial pressure of oxygen in relation to fraction of inspired oxygen

Use of prone positioning for at least 12 hours per day is strongly recommended for patients with moderate and severe ARDS (P/F ratio ≤ 20 kPa).

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#210

Reference, Study Type	Cases and Controls (Participant #, Characteristics) Total	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
210 Zang 2020 (PMID: 31219229 DOI: 10.1111/nicc.12455) **Specification of study:** systematic review	15 publications[1-15] incl. Chinese database, 1.914 pts **Inclusion criteria:** - RCTs - adult pts admitted to the ICU - paper outcomes: ICU-AW, mortality rate, length of ICU stay, hospital LOS, MRC score, Barthel Index score, ventilator-free days, handgrip strength, deep vein thrombosis, VAP, and pressure sores **Per Branch**		**Early mobilization or rehabilitation**	**Standard physical care or daily nursing care**	**Derived outcomes** - ICU-AW - ICU mortality rate - length of ICU stay - length of hospital stay - handgrip strength - MRC score - ventilator free days - Barthel Index - VAP - deep vein thrombosis - pressure sores	**Significant differences between groups in:** - incidence of ICU-AW (RR = 0.49, 95% CI: 0.26, 0.91; p = 0.025), I^2= 89.8% - ICU LOS (WMD = −1.82 days, 95% CI: −2.88, −0.76; p = 0.001), I^2= 95.9% - length of hospital stay (WMD = −3.90 days, 95% CI−5.94, −1.85; p < 0.001), I^2= 10.4% - MRC score (WMD = 4.47, 95% CI: 1.43, 7.52; p = 0.004), I^2 = 10.4% - Barthel Index score at hospital discharge (WMD = 21.44, 95% CI: 10.97, 31.91; p < .001) - incidence of VAP (RR = 0.26, 95% CI: 0.11, 0.63; p = 0.003), I^2= 0.6% incidence of deep vein thrombosis (RR = 0.16, 95% CI: 0.04, 0.59; p = 0.0006), I^2= 0.0% - incidence of pressure sores than control (RR = 0.14, 95% CI: 0.04, 0.44; p =0.001), I^2= 0.0% **No significant differences between groups in:** - ventilator-free days n.s. - handgrip strength n.s. - ICU mortality n.s.	1

ICU-AW = ICU-acquired weakness, ICU = intensive care unit, LOS = length of stay, MRC = medical research council, n.s.= not significant, RCT = randomized controlled trial, RR = risk ratio, pts = patients, VAP = ventilator-associated pneumonia; WMD = weight mean difference

Early mobilization showed a benefit in relation to ICU-AW, length of ICU and hospital stay, MRC score, Barthel Index, deep vein thrombosis and pressure sores.

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#211

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
211 Liu 2019 (PMID: 31162197 DOI: 10.1097/CCM.0000000000003850) **Specification of study:** Retrospective before-after cohort study	**Total** 391 pts **Inclusion criteria:** - admitted to ICU - 18 years or older **Exclusion criteria:** - acute cardiovascular disease - acute cerebrovascular disease - progressive neuromuscular disease - post cardiopulmonary arrest syndrome - condition limiting mobilization including unstable pelvic fractures - discharged from the ICU within 48 hours **Per Branch** 187 / 204		**The Maebashi EM Protocol:** progressive goal-directed EM program	Historical control with **routine care**, not well defined	**Primary endpoint:** - hospital mortality - total hospital costs **Secondary outcomes:** - % of pts who achieved each rehabilitation level - days from ICU admission to achievement of each rehabilitation level - adverse effects - duration of MV - ICU and hospital LOS - % of pts who ambulate at hospital discharge - discharge destination - functional independence measure value - SOFA Score and subscores at ICU admission, maximum during the ICU stay and at ICU discharge, the change between ICU admission and maximum, ICU admission and ICU dis- charge, and maximum and ICU discharge	**Primary endpoints:** - hospital mortality: was reduced in intervention group (adjusted hazard ratio, 0.25; 95% CI, 0.13–0.49; p < 0.01) , declined from 24% to 11% - mean hospital costs : (from $29,220 to $22,706), estimated effect of the intervention was $–5,167 per patient (95% CI, 1,069–8,304; *p* = 0.02) **Secondary outcomes:** **Significant differences** - intervention group: 78% of pts could get out of bed within 3 days (median, 2.0 d; IQR, 1.3–2.9 d) - length of MV decreased by 40%, and the ICU LOS decreased by 17% - hospital LOS reduced by 17% - SOFA score at ICU discharge significantly decreased after introduction of the protocol (3.0 vs 2.0; *p* < 0.01) **No significant difference between :** - SOFA score and subscores at admission and at maximum - functional independence measure sum and motor values at hospital discharge improved	4

CI = confidence interval, EM = early mobilization, ICU = intensive care unit, IQR = interquartile range, LOS = length of stay, MV = mechanical ventilation, pts = patients, SOFA = sequential organ failure assessment

This single-center historical quality comparison study shows that hospital mortality and total hospital costs are significantly decreased after the introduction of a progressive EM program in the ICU.

#212

Reference, Study Type	Cases and Controls (Participant #, Characteristics) Total	Drop -out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
212 Zayed 2020 (PMID: 31160215 DOI: 10.1016/j.aucc.2019.04.003) **Specification of study:** Systematic Review with Meta-Analysis	6 publications[1-6] 718 pts **Inclusion criteria:** - RCTs - ICU pts - ≥ 18 years of age		**Neuromuscular electrical stimulation**	**Usual care**	**Primary outcome:** - MRC **Secondary outcomes:** - ICU mortality - ICU LOS - duration of MV	**No significant differences between groups in:** - MRC, MD (95%CI): 0.45 (-2.89 – 3.80), p = 0.79 - ICU Mortality, RR: (95%CI): 1.30 (0.95 – 1.78), p = 0.10 - ICU LOS, MD: (95%CI): -3.06 (-9.79 – 3.68), p = 0.18 - duration of MV, MD: (95%CI): -2.07 (-5.06 – 0.92), p = 0.37	1

ICU = intensive care unit, LOS = length of stay, MD = mean difference, MRC = medical research council, MV = mechanical ventilation, pts = patients, RCT = Randomized controlled trial

Neuromuscular electrical stimulation had no effect on muscle strength, ICU mortality, ICU length of stay or duration of mechanical ventilation

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#214

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
214 Nydahl 2019 (PMID: 31125163 DOI: 10.1111/nicc.12438) **Specification of study:** cluster-randomized pilot study	274 pts **Inclusion criteria** - ICU pts ≥ 18 y and order for mobilization present **Exclusion criteria** - palliative state - had an immobility order - mobilisation was not documented		2 (intervention group; lost to follow up)	period of usual care and a protocol for **early mobilisation** intervention in a stepwise manner, based on ICU mobility scale	**Usual care**	**Primary endpoint:** - percentage of pts with at least one active out-of-bed mobilization, defined as ≥ level 3 on the ICU Mobility Scale **Secondary outcomes** - presence/duration of MV - delirium, ICU / hospital LOS - adverse events **Power analysis:** using five ICUs and steps with 12 included pts per prevalence survey and per ICU (=360 pts overall), and with an assumed intra-class correlation coefficient 35 of 0.05, the pilot study would have a power of 50% to find significant results.	**Primary endpoint:** - no significant difference in relation to percentage of out-of-bed mobilization (p = 0.106) **Secondary outcomes:** - no significant differences - adherence to the protocol was >90% - unwanted safety events were rare	4
	Per Branch							
	122	152						

ICU = intensive care unit, LOS = length of stay, MV = mechanical ventilation, pts = patients, y = years

Implementation of a protocol for early mobilization seems to have no benefit in relation to percentage of out of bed mobilization.

No detailed assessment was carried out because higher-quality evidence is available on this topic.

#215

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
215 Ferreira 2018 (PMID: 31090853 DOI: 10.5935/0103-507X.20190017) **Specification of study:** Systematic Review	20 observational studies (cohort, cross-sectional, case control, case report, or case series including studies) in Portuguese & Spanish, 317 pts **Inclusion criteria:** - observational studies (cohort, cross-sectional, case control, case report, or case series) - pts aged ≥ 18 years - hospitalized in ICUs on ECMO - underwent PT using multimodal protocols (respiratory, motor, and/or electrophysical interventions, including light, sound, thermal, or electrical stimulation) during ECMO support - with or without comparison - in English, Portuguese and Spanish			**Physical therapy during ECMO support**	**Usual care (no PT) during ECMO support**	**Primary endpoint:** - safety of PT (evaluated according to the mortality rate, adverse events, oxygen perfusion characteristics, hemodynamic stability) **Secondary outcomes:** - the length of MV - length of ECMO support - ICU LOS - hospital LOS	**Primary outcome** - 8 studies provided data on the number of deaths, which ranged from 1-16 - mortality in patients: IG vs. CG (odds ratio, 0.19; 95% confidence interval, 0.04 - 0.98), (IG=1, CG=7) **Secondary outcome** length of MV: - 3 studies reported significant differences (IG vs. CG) , length of MV in IG > CG - (Rehder et al.) mean MV times in IG= 1.75 and CG= 0.77 days - (Munshi et al.)reported significant differences: IG vs. CG (median [interquartile range] of 3 [0.87 - 7.00] and 1.16 [0.33 - 4.00] days - (Bain et al) IG= 12days (5 - 15) vs. CG= 1 (1 - 5) day hospital LOS /ICU LOS: - (10 studies) IG=8 [6 - 22] vs. CG=45 [34 - 56] days - (2 studies) PT reduced hospital LOS - (Rehder et al.) mean total hospital stay was 26 days in the IG (n = 4) and 80 days in the CG (n = 3), mean length of ICU stay : IG= 11 days , CG= 45 – (Keibun) mean total hospitalization time IG= 22 days (n = 10) and 60 days in the CG (n = 13), mean ICU stay IG= 14 days vs. CG= 42 days length of ECMO support(in days): - (Bain et al.) IG=9 (5-14), CG= 1.5(1-9) - (Munshi et al.) IG= 13(10-19), CG=8 (7-10) - (Rahimi et al.) IG= 12 , CG=30 - (Rehder et al.)IG= 8.75, CG= 2.17(mean) - (8 studies) 5-125	1 → 5 (no RCTs, no meta-analysis)
	Per Branch							
	N = 259	N = 58						

CG = control group, ECMO = extracorporeal membrane oxygenation, ICU = intensive care unit, IG = intervention group, LOS = length of stay, MV = mechanical ventilation, PT = physical therapy, pts = patients

This review demonstrated that physical therapy using respiratory techniques, early progressive mobilization (standing and ambulation), and functional electrical stimulation cycling is feasible and safe for patients on extracorporeal membrane oxygenation support regardless of the type of cannulation used.

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#217

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
217 McWilliams, 2014 (PMID: 25316527 DOI: 10.1016/j.jcrc.2014.09.018) **Specification of study:** quality improvement project	582 pts **Inclusion criteria**: - invasively ventilated for at least 5 days **Exclusion criteria:** - significant neurologic injury - orthopedic injury with a contraindication to mobilize - significant burn - poor preadmission mobility levels (<10 yards) reported by the pts family on admission			invasively ventilated for at least 5 days in the previous 12 months	ventilated for at least 5 days in the 12 months after the introduction of the rehabilitation team	**Primary endpoints:** - mobility level at ICU discharge (assessed via the Manchester Mobility Score) - mean ICU LOS - post-ICU LOS - ventilator days - in-hospital mortality	**Primary outcome** - MMS on ICU discharge, median (IQR): Intervention(n=202) = 3 (2-5), control group(n=225) = 5 (3-6), p=0.05 **Significant differences between groups in:** - ICU LOS (16.9 vs 14.4 days, p=0.007) - ventilator days (11.7 vs 9.3 days, P <0.05) - total hospital LOS (35.3 vs 30.1 days, p< 0.001) - in-hospital mortality (39% vs 28%, p<0.05)	4
	Per Branch							
	n=290	n=292						

ICU = intensive care unit, IQR = interquartile range, LOS = length of stay, MMS= Manchester mobility score, pts= patients

The implementation of a new rehabilitation team with a focus on early and enhanced rehabilitation was associated with a significant reduction of mortality, ICU and hospital LOS and increase of mobility at discharge.

#218

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
218 Wollersheim 2019 (PMID: 31016887 DOI: 10.1002/jcsm.12428) **Specification of study:** randomized controlled trial	50 pts **Inclusion criteria:** - pts on MV ≥18 years of age - sepsis related MODS indicated by a sepsis-related organ failure - assessment (SOFA) score ≥9 within the first 72 h after ICU admission **Exclusion criteria:** - pre-existing neuromuscular disease, illness prohibiting early mobilization - insulin-dependent diabetes mellitus, prior treatment for longer than 7 days - body mass index > 35 kg/m2 - not ambulating before admission - with a poor prognosis - prone to die within the next hours			Muscle activating measures such as: **NMES and/or WBV** - in addition to **protocol-based physiotherapy**	**Protocol-based physiotherapy**	**Derived endpoints:** - muscle strength evaluated by MRC score and handgrip dynamometry on the 1st day the pts became awake, at ICU discharge, at a 12 month in-hospital follow-up - FIM at ICU discharge and at a 12-month follow-up - 6 min walking test at the 12 month in-hospital follow-up	**Significant differences between groups in:** - muscle strength from the 1st day pts became sufficiently awake until ICU discharge (control group p=0.008, intervention group = 0.009) **No significant differences between groups in:** - MRC score, handgrip Strength, FIM score at ICU discharge - MRC score and function (minimal modified FIM) compared with common physiotherapeutic practice - 6 min walking test at 12 month follow up	2
	Per Branch							
	33	17						

FIM = Functional Independence Measurment, ICU = intensive care unit; MODS = multiple organ dysfunction syndrome, MRC = medical research council, MV = mechanical ventilation, NMES = neuromuscular electrical stimulation, WBV = whole-body vibration

In patients with sepsis at high risk for ICU-acquired weakness, muscle activating measures in addition to early protocol-based physiotherapy did not improve muscle strength or function at first awakening, ICU discharge, or 12-month follow-up.

#219

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop -out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
219 Hsieh 2019 (PMID: 30985390 DOI: 10.1097/CCM.0000000000003765) **Specification of study:** Prospective cohort study	1.855 pts **Inclusion criteria:** **-** on MV **-** ≥18 years - admitted for ≥ 24 h			**Full bundle ICU:** - Baseline: B - Period 1: A + D - Period 2: E + C	**Partial bundle ICU:** - Baseline: B - Period 1:A + D	**Primary endpoint:** -hospital LOS **Secondary outcomes:** - ICU-LOS - duration of MV **Cost outcomes:** **-** total hospital and ICU cost **Clinical quality outcomes:** - ICU restraint use, prevalence of ICU-acquired pressure ulcers	**Significant differences between groups in:** -implementation of the full (B-AD-EC) reduced hospital LOS (−7.8%, 95% CI −8.7% to −6.9%, p=0.006) - MV duration (−22.3%, 95% CI −22.5% to −22.0%, p <0.001) in full bundle - ICU LOS (−10.3%, 95% CI −15.6% to −4.7%, p=0.028) in full bundle **-** total ICU and hospital cost reduced by 24.2% (95% CI −41.4% to −2.0%, p=0.03) and 30.2% (95% −46.1% to −9.5%, p=0.007) **-** ICU-acquired pressure ulcers and physical restraint use decreased (period 1 vs 2: 39% vs 23% of pts; 30% vs 26% pts days, respectively, p<0.001 for both)	3
	Per Branch							
	1.036	819						

ABCDE-Bundle = awakening, breathing trials, coordination, delirium, early mobilization, CI = confidence interval, ICU = intensive care unit, LOS = length of stay, MV = mechanical ventilation, pts= patients

The implementation of (E)arly Mobilization and (C)oordination in addition to spontaneous (B)reathing trials, (A)wakening and (D)elirium management can have a positive impact on hospital and ICU LOS, duration of MV and costs.

#222

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
222 Defosse 2019 (PMID: 30923850 DOI: 10.1007/s00063-019-0565-8) **Specification of study:** retrospective cohort study	1.476 pts from the trauma register in 2002-2005 **Inclusion criteria:** - lung injury (AIS Thorax ≥3) - ≥ 4 days ventilated **Exclusion criteria:** - transferred ≥ 2 days after injury to a supraregional trauma center - in a hospital with > 10% treated with CLRT			**CLRT**	**Conventional therapy**	**Retrospective – no determination of primary endpoint** Derived endpoints, rates of: - organ and multi-organ dysfunction - incidence of sepsis - ICU and hospital LOS - duration of MV - ventilation-free days - discharge to home or rehabilitation facility - hospital mortality - duration of CLRT	**Significant differences between groups:** - less secondary relocation in CLRT (%11.3; 17.6 p<0.016) - longer duration of ventilation in CLRT (17 (10-26); 14 (8-22) p < 0.001) - less ventilator free days (10 (0-19); 14 (3-21) p < 0.002) - longer ICU stay (23 (14-32); 19 (13-28) p < 0.002) **No significant differences between groups:** - organ and multi-organ dysfunction - incidence of sepsis - hospital LOS - discharge to home or rehabilitation facility - hospital mortality	4
	Per Branch							
	239	1237						

AIS = abbreviated injury scale, CLRT = continual-lateral rotation therapy, ICU= intensive care unit, LOS= length of stay, MV= mechanical ventilation

In thoracic trauma CLRT has no clinical benefit but but duration of ventilation and ICU length of stay) in a retrospective analysis.

#225

Reference, Study Type	Cases and Controls (Participant #, Characteristics) Total	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
225 Jahani 2018 (PMID: 30894882 DOI: 10.25122/jml-2018-0028) **Specification of study:** single group clinical trail	58 pts in single group trial **Inclusion criteria:** - ARF - 18 – 60 y - tracheal intubation > 6h - synchronized intermittent mechanical ventilation - hemodynamically stable - no pressure ulcers - no ICP **Exclusion criteria**: - HR < 6o or > 100 - blood pressure > 140 or < 60 - SpO_2 < 80% - ventricular tachycardia - asystole - ventricular fibrillation - need for variation of ventilation mode	4 (HR > 100, removal of MV equipment, RR = 32, hypotension)	**prone position** for 2h repeated for 3 days	**supine position** for 2h repeated for 3 days	**Outcome:** - Physiological signs after 1h and 2h - ABG at 2h	**Significant differences:** - SpO_2: Day 1: PP: 93.76±7.56 vs. SP: 95.46±7.33; p< 0.05 Day 2: PP: 97.82±7.49 vs. SP: 95.69±7.48; p< 0.05 Day 3: PP: 99.45±7.83 vs. SP: 97.73±7.74; p < 0.05 - PaO_2: Day 1: PP: 92.24±2.008 vs. 93.74±1.82; p < 0.05 Day 2: PP 95.40±1.23 vs. SP: 93.92±1.46; p < 0.05 Day 3: PP: 96.72±1.12 vs. 95.27±1.17; p < 0.05 **No Significant differences:** - Systolic blood pressure - Diastolic blood pressure - Respiratory rate	4

ABG = arterial blood gas, ARF = acute respiratory failure, HR = heart rate, ICP = intracranial pressure, MV = mechanical ventilation, PP = prone positioning, SP = supine positioning

Prone positioning improved SpO_2 and PaO_2 on day 2 and 3 compared to supine positioning.

#226

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
226 Bonizzoli 2019 (PMID: 30871301 DOI: 10.23736/S0375-9393.19.13287-7) **Specification of study:** Retrospective observational study	n = 101 **Inclusion criteria:** - adults with refractory ARDS on vv-ECMO support - admitted to an ICU of a tertiary ECMO referral center - submitted to physiotherapy from 2009 - 2016			**Early PT**		**Primary endpoint:** - ICU mortality **Secondary outcomes:** - LOS - duration of MV	**Primary outcome:** ICU mortality (early physiotherapy (within the first week) vs. delayed physiotherapy) 12 vs 14 (p>0.05) *Multivariable logistic regression analysis*: BMI was an independent predictor of in-ICU mortality (OR 0.899, 95% CI 0.823 – 0.981, p = 0.017) **Secondary outcomes:** Time from ECMO start to first physiotherapy session showed a significant relation with LOS: 12 (7.25-21) days vs 25 (18.75-36.25) (r^2 = 0.48, p < 0.001) Duration of MV: 11 (5-17.75) vs 23 (13.75-33.25) (P=0.001)	4 → 5
	Per Branch							
	n = 33 Time from ECMO start to first physiotherapy session within the first week	n = 68 Time from ECMO start to first physiotherapy session after the first week						

ICU = intensive care unit, LOS = length of stay, MV = mechanical ventilation, SAPS II = simplified acute physiology score, T = physiotherapy, vvECMO = veno-venous extracorperal membrane oxygenation

In patients with VV-ECMO support, physiotherapy is feasible and safe and the early physiotherapy, initiated within the first week from ECMO start, is associated with shorter duration of ECMO support and ICU length of stay.

#227

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
227 Chiarici 2019 (PMID: 30796918 DOI: 10.1016/j.apmr.2019.01.015) **Specification of study:** Observational prospective cohort study, with retrospective controls	275 pts **Inclusion criteria:** - admitted to ICU **Exclusion criteria:** - died/transferred within 24 hours of admission			**Rehabilitation care pathway based on:** - interdisciplinary teamwork - early customized and goal-oriented rehabilitation - daily functional monitoring and treatment revision - agreed discharge policy - continuity of care - treatment was customized to pts' clinical condition in terms of training content and duration	**Usual care**	**Primary endpoint:** - ICU LOS - proportion of ventilator-free days out of the total ICU stay **Secondary outcomes:** - feasibility - safety **Power analysis:** the number of pts who should be included is 126 for each group (with alpha error <0.05 and beta error <0.10	**Significant differences between groups in:** - proportion of ventilator free days: increased from 30% to 48% (p<0.0006) in the total sample and from 30% to 62% (p<0.0001) in those who underwent rehabilitation - ICU LOS in postoperative subgroups, decrease from 22.9±12.9 to 7.0 ± 7.9 (p<0.0001) in retrospective group and from 55.3±15.4 to 21.2±16.6 (p=0.01) in prospective group **No significant differences between groups in:** - adverse effects - ICU LOS, comparison of the total retrospective and prospective cohorts(p=0.089) **Skewed evidence**: The rehabilitation team assessment was performed in 100% of cases in the prospective cohort, against 28% of cases in the retrospective group p<0.0001)	4
	Per Branch							
	152	133						

ICU = intensive care unit, LOS = length of stay, pts = patients

An early interdisciplinary rehabilitation in the ICU reduces the hospital LOS and increases ventilator-free time with greater benefits for postoperative patients.

#228

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
228 Chou 2018 (PMID: 30789023 DOI: 10.1177/14799731188203 10) **Specification of study:** Retrospective case control study	105 pts **Inclusion criteria:** - COPD pts admitted at ICU - required an invasive MV using an endotracheal tube for 48 hours - prepared for a scheduled extubation			**Early rehabilitation:** **-** within 72 hours of MV in hemodynamically and respiratory stable pts - provided twice daily, 5 days per week.	Matched pts with **no early rehabilitation**	**Primary endpoints:** - duration of MV - ICU and hospital LOS - medical costs	**Primary endpoint**: - MV duration (hours): intervention = 137.3 ± 136.9 , control = 160.1 ± 125.7; p= 0.396 - ICU stays (days): intervention= 5.8 ± 6.1, control = 9.2 ± 8.3, p= 0.033 - hospital LOS (days): intervention= 17.9 ± 14.6, control= 25.4 ± 24.0; p= 0.095 - medical costs (x $10.000): intervention= 15.2 ± 13.6, control = 22.9 ± 21.7; p=0.058	4
	Per Branch							
	35	70						

COPD = chronic obstructive lung disease, ER = early rehabilitation, ICU = intensive care unit, LOS = length of stay, MV = mechanical ventilation, pts = patients

Early rehabilitation for patients in the ICU with COPD with acute respiratory failure shortened the duration of their MV.

#234

Reference, Study Type	Cases and Controls (Participant #, characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
234 Trethewey 2019 PMID: 30673625 https://doi.org/10.1016/j.jcrc.2019.01.008 **Specification of study:** Systematic review	22 RCTs (n = 2792 pts)[1-22] **Inclusion criteria:** -RCTs investigating interventions to preserve muscle mass and/or function in critically ill patients -pts. admitted to a HDU or ICU for level 2 or level 3 care		**improving or maintaining muscle mass/size and/or muscle function (strength or performance)** **Subgroups:** 1. NMES 2. Exercise-based 3. nutrition-based 4. combined	**usual care or placebo /sham intervention**	**Primary Endpoint:** -measure of muscle mass/size and muscle function **Secondary Endpoints:** -ICU/hospital LOS -days with MV -rate of hospital readmission -mortality	**Primary Endpoint:** -measure of muscle mass/size and muscle function ○ NMES: MRC-Score, HGS, Quadriceps MLT, Leg and thigh circumference, ankle joint movement, leg or arm circumference, bicep thickness, quadriceps muscle fibre CSA; Quadriceps CSD, quadriceps muscle volume ➔ 1 study: greater preservation of muscle strength (MRC-Score) (median [range]: 58points [33-60 points] vs. 52 points [2-60 points], p=0.04) ○ EB: no study assessed muscle mass/size; 6MWT; incremental shuttle walk Test; quadriceps force; Functional Independence Measure; maximum walking distance; IMS Scale; PFIT; Functional Status Score in ICU test; SPPB, HGS ➔ 1 study: daily cycle ergometer sessions until ICU discharge had greater 6MWT (median [range]: 196m [126-329m] vs.143m [37–226m], p<0.05) and improved self-reported physical performance (median [range]: 21 points [18–23 points] vs. 15 points [14–23 points], p<0.01) ➔ 1 study: daily physical and occupational therapy greater return to independent functional status (number [%]: 29 [59%] vs. 19 [35%], p=0·02), greater maximum walking distance at hospital discharge (median [range]: 33·4m [0–91·4m] vs. 0m [0–30·4m], p=0·004) ○ NB: HGS, femoral volume, FEV1; FVC; maximal inspiratory pressure, Mid-arm muscle circumference; muscle wasting and fat loss (subjective) ➔ 1 study: Greater impairment of post-op FEV1 and FVC in intervention group. (no p-value) ➔ 1 study: Higher maximum ICU mobility scale score in intervention group (no p value) ➔ 1 study: Increased return to independent functional status, maximum walking distance (no p value) ➔ 1 study: Faster initial rate of improvemen t in MRC score in intervention group (no p value) ➔ 1 study: Greater 6MWT, SF-36 PF and improvement in quadriceps force at hospital discharge in the intervention group (no p value) ○ CINT: 6MWT, MRC, HGS, Muscle strength score, ACIF, PFIT, Fat-free mass ➔ 1 study: NMES and early, targeted physical rehabilitation improvement in HRQoL in the domains of 'physical function' (mean score ±SD: 81.8 ±22.2 vs. 60.0 ±29.4, p=0.04) and 'physical role' (mean score ±SD: 61.4 ±43.8 vs. 17.1 ±34.4, p=0.005) measured at 6 months post-ICU discharge in treatment group ➔ 1 study: greater improvement in 6MWT at 3 months in the exercise plus nutrition intervention group (no p value)	1 → 2 (no meta-analysis)
	Per Branch						

							Secondary Endpoints: -ICU/hospital LOS ○ NMES: no difference mentioned ○ EB: 1 study 2x daily intensive physical therapy resulted in shorter ICU LOS (no p-value) ○ NB: no difference mentioned ○ CINT: 1 study: Shorter ICU LOS in the exercise + placebo group (no p-value) -days with MV ○ NMES: 1 study shorter duration of weaning from MV (median [range]: 1 day [0-16 days] vs. 4 days [0-44 days], p=0.003) and a shorter time off MV (median [range]: 4 days [0-16 days] vs. 6 days [0-41 days], p=0.003) ○ EB: 1 study: daily physical and occupational therapy greater number of ventilator-free days (median [range]: 23·5 days [7·4–25·6 days] vs. 21·1 days [0·0–23·8 days], p=0·05) ○ NB: 1 study: early parenteral nutrition (starting day 1 of ICU admission) continued until ICU discharge compared with usual care resulted in a shorter duration of invasive mechanical ventilation (number of days, adjusted for duration of ICU stay: 7.26 vs. 7.73 days per 10 patient x ICU days, p=0.01) ○ CINT: no difference mentioned -rate of hospital readmission ○ NMES: no difference mentioned ○ EB: no difference mentioned ○ NB: no difference mentioned ○ CINT: no difference mentioned -mortality ○ NMES: no difference mentioned ○ EB: no difference mentioned ○ NB: no difference mentioned ○ CINT: no difference mentioned	

RCT=randomized controlled trial; pts. =patients; HDU=high dependency unit; ICU=intensive care unit; LOS=length of stay; MV=mechanical ventilation; MRC=Medical Research Council; MLT=muscle layer thickness; HGS=hand grip strength; 6MWT=6-minute walking test; TUAG= timed up-and-go test; HRQoL= health related quality of life; EB=exercise-based; SPPB=short physical performance battery; NB=nutrition-based; CINT=combined intervention; ACIF= acute care index of function; PFIT=physical function ICU test; CSA= cross sectional area; CSD= cross sectional diameter; IMS= ICU Mobility Scale

NMES and exercise-based interventions may preserve muscle mass and function in patients with critical illness, but there is a lack of consistency seen in the effects of these interventions.

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#236

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
236 Schaller 2019 (PMID: 30666366 DOI: 10.1007/s00134-019-05528-x) **Specification of study:** Secondary analysis of RCT	200 pts on MV **Inclusion criteria**: - ≥ 18 years - MV < 48 h and expected to require MV for > 24 h at the time of screening - functional independent at baseline with a Barthel Index Score ≥70 at 2 weeks before admission to the surgical ICU **Exclusion criteria**: - admission to the hospital > 5 days before screening - motor component of the immediate post-injury GCS < 5 - irreversible disorder with expected 6-month mortality of > 50% - evidence of increased ICP, cardiopulmonary arrest, unstable fractures - recent acute myocardial infarction - lower extremity amputation - rapidly developing neuromuscular disease - pregnant - ruptured or leaking aortic aneurysm		Inter-vention: 7 Total: 7 (3,5%)	**SOMS-guided mobility treatment with a facilitator**	**Standard care**	**Primary outcome** - functional independence at hospital discharge **Secondary outcome** - average achieved mobility level during the ICU stay (SOMS level) - functional status at hospital discharge (mmFIM range 0–8) **Power analysis** - based on the number of patients enrolled in the SOMS trial with GCS≤8 and >8 (60 and 140 patients, respectively) and the effect size of early, goal-directed mobilization observed in the SOMS cohort on functional GCS group (binary; high>8/low≤8)	**Primary outcome** - immediate postrandomization GCS had no effect on the effects of EM (likelihood ratio test: p = 0.40, general linear model: p = 0.53 for the interaction GCS × intervention) - EM significantly increased the functional independence at hospital discharge in patients with both low and high GCS (odds ratio (OR) 3.67; 95% confidence interval (95% CI) 1.02–13.14, p=0.046 for GCS≤8; OR 2.29, 95% CI 1.11–4.71, p=0.025 for GCS > 8) **Secondary outcome** - no significant results for mean achieved mobilization level - GCS had no influence on the effect of EM on functional status at hospital discharge	3
	Per Branch							
	104	96						

EM = early goal directed mobilization, GCS= Glasgow coma scale, ICU = intensive care unit, ICP = intracranial pressure, MV= mechanical ventilation, SOMS = surgical optimal mobilization score

Early, goal-directed mobilization in patients with an impaired initial conscious state (GCS≤8) is not harmful but effective.

#237

Reference, Study Type	Cases and Controls (Participant #, Characteristics)			Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total								
237 Young 2019 (PMID: 30659467 DOI: 10.1007/s12028-019-00670-2) **Specification of study:** prospective observational cohort study with historical control	n=56 **Phase 0:** - patients with SAH admitted to the Neuro ICU at the quaternary academic medical center from 2013 to 2014 - patients with perimesencephalic SAH or those for whom comfort measures or hospice care were initiated were not included **Phase 1 and phase 2**: prospectively enrolled inclusion/ exclusion criteria not further defined			not reported	**Phase I:** use of a PT/OT-driven protocol. Mobilization during formal PT/OT sessions with continuous presence of both the therapist and the bedside nurse **Phase II:** nurse-driven protocol	**Phase 0:** retrospectively enrolled control either Phase 0 or Phase 1 depending on analysis	**Primary endpoint:** - frequency of patient mobilization **Secondary outcomes** - ICU and hospital length of stay - rate of tracheostomy and ventriculoperitoneal shunt placement - discharge disposition - ventilator days - Safety outcomes: elevation of ICP, acute onset of headache during mobilization, and acute focal/worsening of neurologic deficits **No power analysis was conducted**	**Primary results:** - Phase I (n=24), first mobilization occurred 14 days earlier (hospital day 6 versus hospital day 20; $p < 0.0001$) - Phase II mobilization occurred on average 1 day earlier than with the therapy-driven protocol (p=0.099). **Secondary results concerning safety:** - four sessions in Phase I were aborted mid-session due to pain, increased ICP, and hypotension. In Phase II, one session was stopped mid-session due to elevated ICP. - no falls, incidental medical device dislodgement, acute hypoxia, new onset arrhythmias, prolonged elevated ICP, or neurologic changes occurred in association with early mobilization. No significant differences in **secondary outcomes** (Table 2)	4
	Per Branch								
	Phase 0 n = 15	Phase 1 n = 24	Phase 2 n = 17						

ICP = intracranical pressure, OT = occupational therapy, PT = physical therapie, SAH = subarachnoid haemorrhage

Nurse-driven mobilization for patients with EVDs is safe, feasible, and leads to more frequent ambulation compared to a therapy-driven protocol. Nurse-driven mobilization may be associated with improved discharge disposition, although exact causation cannot be determined by these data.

#238

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
238 Ragland 2019 (PMID: 30642773 DOI: 10.1016/j.iccn.2018.12.005) **Specification of study:** Retrospective before-after cohort study	56 ICU pts undergoing RRT **Inclusion criteria:** - acute kidney injury or chronic kidney failure with IHD, DVVH, or CRRT **Exclusion criteria:** - in process of withdrawing care - not passing the safety screening - ordered transfer out of ICU - RRT patients after first mobility evaluation remaining on ICU for longer than a week			**Mobility plan** following introduction of a stepwise **mobility protocol**	before implementation of **mobility protocol**	**Primary outcome:** - compliance to the mobility plan **Secondary outcomes:** - safety/adverse advents	**Primary outcome:** compliance to mobility before vs after introduction of the protocol: 12.5% vs 62.5% (overall increase of 400%) **Secondary outcome:** <u>adverse events:</u> no adverse events during the project	4
	Per Branch							
	Pre Protocol 31	Post protocol 25						

CRRT = continuous renal replacement therapy, DVVH = daily venonenous filtration, ICU = intensive care unit, IHD = intermittent heamodialysis, pts = patients, RRT = renal replacement therapy

The use of a step-wise mobility protocol was an effective and safe strategy to increase mobility in the renal replacement therapy patient population.

#242

Reference, Study Type	Cases and Controls (Participant #, characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
242 Yatabe 2018 PMID: 30541003 https://doi.org/10.1159/000495213 **Specification of study:** A Multicenter Observational Study	13 hospitals in Japan (10 university hospitals and 3 public hospitals) between April 2015 and March 2016 -> 389 pts. **Inclusion criteria:** -MV for at least 24 h -in the ICU for >72 h **Exclusion criteria:** -aged <20 years -on their second or subsequent readmission to the ICU during the study period -refused the use of their data **Total** **Per Branch** 223 GG: 105 PG: 118	n=107 (ICU < 7days)	No intervention (observational study) <u>Divided for analysis of secondary endpoint by physical status:</u> GG: more than end sitting. PG: bed rest and sitting.	/	**Sample Size calculation:** - minimum of 240 pts., because number of potential factors that affected physical status=10 → 360 pts. , predicted that two thirds of all pts. remained in the ICU for ≥7 day **Primary Endpoint:** - calorie and protein intake in the ICU on days 3 and 7, and at ICU discharge **Secondary Endpoints:** - physical status at ICU discharge in patients who remained in the ICU for ≥7 days	**Primary Endpoint:** -Day 3, 44% pts. received EN, 86% PN and median amount of protein intake via EN and PN: 0.2 (0–0.5) g/kg/day -Day 7, 66% pts. received EN, 10% PN and median amount of protein intake via EN and PN: 0.4 (0.1–0.8) g/kg/day -ICU discharge, median amount of protein intake via EN and PN: 0.3 (0–0.7) g/kg/day **Secondary Endpoint:** -CIN on day 3 in the PG higher than in GG (10.1 [5.8, 16.2] vs. 5.2 [1.9, 12.4] kcal/kg/day, $p < 0.001$). - pts. received higher rehabilitation in the GG than in the PG (92 vs. 63%, $p < 0.001$) -orally fed on day 7 and at ICU discharge in GG higher than in PG (21%, 6%; $p = 0.001$ and 42%, 16%; $p < 0.0001$, respectively) <u>multivariate analysis:</u> - CIN (day 3) and rehabilitation in ICU, use of ventilator at ICU discharge as independent factors that affect physical status (OR 1.19; 95% CI 1.05-1.34; $p = 0.005$ and OR 0.07; 95% CI 0.01-0.34; $p = 0.001$ and OR 20.4; 95% CI 4.36–95.2; $p < 0.001$, respectively); -initiation of rehabilitation during ICU stay and oral intake at ICU discharge, independent factors affecting physical status (OR 0.07; 95% CI 0.02–0.29; $p < 0.0001$ and OR 0.20; 95% CI 0.06–0.74; $p = 0.02$, respectively)	3

Pts.=patients; MV=mechanical ventilation; ICU=Intensive Care Unit; GG=Good Group; PG=Poor group; EN=enteral nutrition; PN=parenteral nutrition; CIN=caloric intake; CI= Confidence interval

Critically ill patients might benefit from low caloric intake (less than 10 kcal/kg/day) until day 3 and rehabilitation during ICU stay.

#244

Reference, Study Type	Cases and Controls (Participant #, characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
244 Chohan 2018 PMID: 30515467 https://doi.org/10.1136/bmjoq-2018-000339 **Specification of study:** Retrospective study	Introduction of safe early mobilization. Project was carried out in an adult ICU located in a hospital in an urban area **Inclusion criteria:** - responsive to verbal stimulation and obeying commands - PEEP < 8 and FiO2 <50% an CV stable - Vasopressor/Inotrope Infusions have not increased in the last 2 hours - no active volume resuscitation - controlled arrhythmias - no active myocardial ischemia **Exclusion criteria:** - bony/soft tissue injury requiring immobilization - abdominal compartment syndrome - Vac dressing or Sengstaken tube - BMI > 45 - Difficult Airways			**Achieve 95% reliability with a standardized mobilization process.**	**No population**	No sample size calculation (retrospective study) **Endpoints:** - Reliability - Delirium Rates -Length of stay and adverse events	**Results:** - reliability of 87% (median) was achieved - PDSA (Plan, Do, Study, Act) cycles allowed development of the process and achieved a median of 87% reliability - Delirium rates fell from 54,1% to 28,8% - no change in average length of stay and adverse events	4 → 5
	Per Branch							
	Not specified	Not specified						

AE = adverse events ; BMI = body mass index ; CAM-ICU = confusion assessment method for the ICU ; CV = cardiovascular ; ICU = intensive care unit ; LOS = length of stay ; PDSA = Plan, Do, Study, Act

Team learning from Plan, Do, Study, Act (PDSA)cycles, as well as feedback from both staff and patients, allowed us to develop the process and achieve a median 87% reliability.

No detailed assessment was carried out because higher-quality evidence is available on this topic

#246

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
246 Eggmann 2018 (PMID: 30427933 DOI: 10.1371/journal.pone.0207428) **Specification of study:** parallel, two-arm, assessor-blinded, randomized controlled trial	115 pts **Inclusion criteria:** - adults 18 years - expected stay on MV for ≥72h - had been independent before the onset of critical illness **Exclusion criteria:** - previous muscle weakness - contraindications to cycling - enrolment in another intervention study - palliative care - admission diagnosis excluding possibility of walking at hospital discharge - did not understand German or French		Total 9 pts: intervention: 4 lost to follow up control: 5 lost to follow-up	**Early endurance (motor-assisted bed-cycle) and resistance training combined with mobilization**	**Standard physiotherapy including early mobilization**	**Primary endpoint:** - functional capacity (6-MWD) **Secondary outcome:** - FIM and muscle strength at ICU discharge Sample size determination was based on the 6MWD to show a difference of 54m and a mean walking distance of 301m (SD 81). A statistical power of 80% and an α-level of 0.05 required a sample size of 72 pts in total(36 per group).	**Primary endpoints:** - 6-MWD (experimental 123m (IQR 25–280) vs control 100m (IQR 0–300); p = 0.542 - or functional independence (98 (IQR 66– 119) vs 98 (IQR 18–115); p = 0.308 **Secondary endpoints:** - no differences found, except a trend towards improved mental health in the experimental group after 6 months (84 (IQR 68–88) vs 70 (IQR 64–76); p = 0.023 - adverse events: rare (0.6%) and without consequences	2
	Per Branch							
	58	57						

FIM = functional independence measurement, ICU = intensive care unit, IQR = interquartile range, MV= mechanical ventilation, pts = patients, SD = standard deviation, 6-MWD = 6-minute walking distance

Early endurance and resistance training in mechanically ventilated, intensive care patients does not improve functional capacity or independence at hospital discharge compared to early standard physiotherapy but may improve mental health 6-months after critical care discharge.

#247

Reference, Study Type	Cases and Controls (Participant #, characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
247 Koutsioumpa 2018 (https://doi.org/10.4037/ajcc2018311) **Specification of study:** prospective, open-label RCT	80 pts. in a university hospital **Inclusion criteria:** -aged 18 years or older -ICU stay of 96h or more -MV for 96h or more **Exclusion criteria:** -known vasculopathies if these conditions had induced myopathy		Not specified	**TENMS group:** conventional physical therapy + TENMS	**Control group:** conventional physical therapy	No sample size calculation specified **Primary Endpoint:** - incidence of histologically diagnosed myopathy on the 14th ICU day **Secondary Endpoints:** - incidence of histologically diagnosed myopathy on the 4th ICU day -MRC-Score on the 14th ICU day -ICU LOS -ICU mortality	**Primary Endpoint:** - incidence of histologically diagnosed myopathy on the 14th ICU day (P=0.3) **Secondary Endpoints:** - incidence of histologically diagnosed myopathy on the 4th ICU day (P=0.6) -MRC-Score on the 14th ICU day (P<0.001) -ICU LOS (P=0.01) -ICU mortality (n.s)	2 → 3 (high risk of bias)
	Per Branch							
	38	42						

Pts.=patients; ICU=Intensive Care Unit; MV=Mechanical Ventilation; TENMS=transcutaneous electrical neuromuscular stimulation; MRC=Medical Research Council Score; LOS=Length of stay; n.s.=not significant

TENMS had no significant impact on myopathy in the critically ill patients in this study.

No detailed assessment was carried out because higher-quality evidence is available on this topic.

#249

Reference, Study Type	Cases and Controls (Participant #, characteristics) Total	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
249 Yataco 2018 PMID: 30357597 DOI: 10.1007/s12028-018-0632-7 **Specification of study:** Retrospective study	NSICU at Mayo Clinic in Jacksonville, Florida between 1. January 2013 and May 16. 2016. →153 pts. **Inclusion criteria:** - all patients in NSICU who underwent placement of an EVD - hemodynamically and medically/neurosurgically stable **Exclusion criteria:** - femoral sheath or recent removal of femoral vascular sheath - hemodynamic instability, active bleeding or angioedema - heart rate greater than 120 beats per minute - ICP higher than 25 mm Hg or as deemed unstable by the treating NSICU/neurosurgery team - a cerebral perfusion pressure lower than 50 mm Hg - resting heart rate of 50% age-predicted maximum or less, - systolic blood pressure lower than 90 or higher than 180, diastolic blood pressure higher than 105 - peripheral oxygen saturation of 90% or less - marked diaphoresis, facial pallor, intense anxious or painful facial expression (especially in patients who were aphasic) - active bleeding from lines, catheters, or wounds **Per Branch** 153		**patients received EVD**	Population was its own control	No sample size calculation (retrospective study) **Endpoints:** - principal diagnosis - survival to discharge - LOS - discharge disposition - mobilized or reason not mobilized - completed mobilization activities - time from EVD placement to first mobilization - degree of required mobility assistance - AE with mobilization	**Results:** - SAH was the most common diagnosis (61.4%) - 127 survived to discharge - median LOS was 18 days (range, 2-106) - 117 patients were mobilized and median time from EVD placement to initial mobilization was 38h (range 4-537) - mean time from EVD placement to initial mobilization was 83h - 36 patients not mobilized: most common reason was decreased patient responsiveness (23 – 63%) - The highest level of patient mobility activity achieved by the group was ambulation for 51 patients (43.6%), followed by transferring from supine to sitting for 36 patients (30.8%), from bed to a chair for 20 patients (17.1%), and from sitting to standing for 10 patients (8.5%). The peak distance mobilized during ambulation was 120 feet (range, 1–1080) - only 6.9% of patients experienced any sort of AE	4

AE = adverse events; EVD = external ventricular drain; ICP = intracranial pressure; LOS = length of stay; NSICU = Neurosurgical intensive care unit; LOS=length of stay;

#251

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
251 Dos Santos 2020 (PMID: 30321084 DOI: 10.1080/09593985.2018.1490363) **Specification of study:** RCT	51 pts **Inclusion criteria:** - ≥ 18 years of age 18 - MV < 72 h - no known neuromuscular disease **Exclusion criteria:** - cardiopulmonary arrest - end stage malignancy - Increased ICP - obstacles that did not allow the use of NMES - prolonged MV (> 21 days)		N=18 (35%) Died	**NMES:** 2x daily for 55 min **Exercise (Ex):** structured assisted/active exercise program	**Usual care**	**Sample size calculation:** calculated (G*power version 3.1.4, Franz, Universitat Kiel, Germany) based on the first RCT about early physical therapy in ICU patients (Schweickert et al. 2009), resulting in a total sample size of 52 patients (α = 0.05, β = 0.80) **Primary endpoints:** - duration of MV **Secondary endpoints:** -duration of sedation -ICU LOS	**Primary endpoints:** - overall comparison, duration on MV was significantly shorter (p = 0.007) in the NMES + EX group (5.7 ± 1.1 days) and NMES group (9.0 ± 7.0 days) in comparison to CG (14.8 ± 5.4 days) **Secondary endpoints:** - duration of sedation, statistical significance only survival's analysis in comparisons among NMES + EX (0.6 ± 1.0) and EX (0.4 ± 0.5) groups with CG (5.83 ± 5.1) -ICU LOS mean Standard deviation: NMES+EX:11.4 (9.8), EX:10.3(8.7), NMES: 13.8 (6.9) and CG: 14.2 (9.7) (p=0.03)	2 → 3 (high risk of bias)
	Per Branch							
	Ex: 13 NMES: 11 NMES+Ex: 12	15						

ICP = intracranial pressure, ICU = intensive care unit, LOS = length of stay, MV = mechanical ventilation, NMES = neuromuscular electrical stimulation

Neuromuscular electrical stimulation reduced duration of mechanical ventilation. The impact on ICU mortality and ICU length of stay is not clear.

#252

Reference, Study Type	Cases and Controls (Participant #, characteristics) Total	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
252 Kang 2018 PMID: 30300863 https://doi.org/10.1016/j.jcrc.2018.09.032 **Specification of study:** systematic review and meta-analysis	35 publications from 2007 - 2016 (11 RCTs, 20 cohort studies, one CBA study and one CCT with n = 25283 pts)[1-35] (one article divided in two substudies)[19,20] **Inclusion criteria:** - age ≥ 18 years - ICU treatment - non-pharmacological intervention for delirium prevention compared to usual care and assessed for occurrence or duration of delirium - English language - published in a journal between 2007 and 2016 **Exclusion criteria:** - case reports - protocol studies - non-accessible studies **Per Branch**		**Non-pharmacological interventions for delirium prevention:** - multicomponent intervention - physical environment intervention - daily interruption of sedation intervention	**Standard of Care**	**Endpoints:** - occurrence of delirium - duration of delirium - ICU LOS - ICU mortality	15 articles included in meta-analysis. **Significant differences between groups:** - total-effect-size-analysis: a. occurrence of delirium is reduced by non-pharmacological interventions (OR 0.66, 95% CI 0.50 – 0.86, p = 0.002). b. duration of delirium is reduced by non-pharmacological interventions (OR 0.31, 95% CI 0.10 – 0.94, p = 0.039). - effect-size-per-intervention-analysis: effects of multicomponent intervention on delirium occurrence were significant (OR 0.48, 95% CI 0.35 – 0.65, p < 0.001) - sensitivity analysis: effect size of the included studies investigating duration of delirium was significant (OR 0.67, 95% CI 0.52-0.86, p = 0.002; n = 4) - publication bias analysis (Egger's coefficient): occurrence of delirium (p = 0.018) (Trim-and-Fill: difference between effect size before adjustment (OR 0.66, 95% CI 0.50-0.86) and effect size after adjustment [addition of three effect sizes, OR 0.71, 95% CI 0.55 – 0.93] > 10% and therefore with possible impact on validity of the findings) **Non-significant differences between groups:** - total-effect-size-analysis: a. ICU LOS (OR 0.85, 95% CI 0.67 – 1.09, p = 0.194) b. ICU mortality (OR 0.92, 95% CI 0.83 – 1.01, p = 0.138) - effect-size-per-intervention-analysis: a. effects of multicomponent intervention on duration of delirium (OR 0.20, 95% CI 0.04 – 1.14, p = 0.071) b. effects of multicomponent intervention on ICU LOS (OR 0.87, 95% CI 0.66 – 1.15, p = 0.326) c. effects of physical environment intervention on delirium occurrence (OR 0.77, 95% CI 0.36 – 1.55, p = 0.469) d. effects of daily interruption of sedation intervention on delirium occurrence (OR 0.89, 95% CI 0.68 – 1.16, p = 0.38) - subgroup analysis: a. effect sizes of multicomponent and physical environment interventions were not different between studies using delirium occurrence as the outcome variable (OR 0.45 vs. 0.83, p = 0.418) b. effect sizes of studies investigating the entire body of ICU pts and those investigating only a specific group of patients within the ICU were not different (OR 0.61 vs. 0.69, p = 0.669) c. effect sizes of studies that used SCCM-recommended tools (i.e. CAM-ICU and ICDSC) were not different (OR 0.73 vs. 0.43, p = 0.170) d. effect sizes of RCTs compared to other study designs were not different (OR 0.70 vs. 0.58, p = 0.821) - sensitivity analysis: a. effect size of the included studies investigating occurrence of delirium was not significant (OR 0.80, 95% CI 0.57-1.13, p = 0.206; n = 6) b. effect size of the included studies investigating ICU LOS was not significant (OR 0.87, 95% CI 0.66-1.15, p = 0.326; n = 4) - publication bias analysis (Egger's coefficient): a. duration of delirium (p = 0.113) (Trim-and-Fill: no difference before and after adjustment) b. ICU LOS (p = 0.770) (Trim-and-Fill: no difference before and after adjustment) c. ICU mortality (p = 0.147) (Trim-and-Fill: less than 10% difference before [OR 0.85, 95% CI 0.67-1.08) and after adjustment [addition of two extra effect sizes; OR 0.78, 95% CI 0.63-0.98] and therefore impact on validity of the findings not likely	1

Pts = patients, RCT = randomized controlled trials, CBA = controlled before and after, CCT = controlled clinical trial, ICU = intensive care unit, LOS = length of stay, SCCM = Society of Critical Care, CAM-ICU = Confusion Assessment Method for the Intensive Care Unit, ICDSC = Intensive care Delirium Screening Checklist

Non-pharmacological interventions in critically ill patients can reduce duration and occurrence of delirium.

#256

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
256 Barbalho 2019 (PMID: 30246555 DOI: 10.1177/0269215518801440) **Specification of study:** a within-patient randomized trial	34 pts **Inclusion criteria:** - admitted to ICU sector of 2 reference hospitals in Belém, from September to October 2017 - admitted to the passive mobilization protocol, with the following parameters: partial pressure of oxygen/fraction of inspired oxygen (PaO2 / FiO2) > 300, oxygen saturation <140 bpm, systolic blood pressure 90–180 mmHg, arterial blood pressure <60 bpm, arterial blood pressure (PaO2) >90%, diastolic 50–120 mmHg, respiratory rate of up to 30 breaths per minute, absence of uncontrolled electrocardiogram arrhythmias **Exclusion criteria:** - not meeting inclusion criteria - declined to participate - death		n=14 excluded (11 not meeting inclusion criteria, 3 death)	**Experimental blood flow restriction in one limb**	**Limb with no blood flow restriction**	**Primary endpoints:** - thigh muscle thickness and circumference	**Primary outcomes** - muscle thickness: within-subjects analysis showed significant differences ($F = 334.6$, $\eta^2 = 0.90$, $p < 0.001$) between-subjects analysis showed no significant difference ($F = 0.22$, $\eta^2 = 0.01$, $P = 0.64$) - thigh circumference: significant differences in within-subject analysis ($F = 257.81$, $\eta^2 = 0.87$, $p < 0.001$) between-subjects analysis showed no significant difference ($F = 0.23$, $\eta^2 = 0.01$, $P = 0.63$)	4
	Per Branch							
	20	20						

ICU = intensive care unit

The use of blood flow restriction did not present adverse effects and seems to be a valid strategy to reduce the magnitude of the rate of muscle wasting that occurs in intensive care unit patients.

#258

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
258 Whelan 2018 (PMID: 30214949 DOI: 10.4102/sajp.v74i1.450) **Specification of study:** historically controlled interventional trial	26 patients **Inclusion criteria:** - adult pts admitted into trauma ICU - surgical pts admitted into general ICU **Non-inclusion criteria:** - bedbound prior to admission - traumatic brain injury or surgery received for other neurological conditions - placed on bedrest in ICU as a result of complex orthopedic or spinal injuries			**CPAx tool** as part of physiotherapy patient assessment - CPAx tool assesses pts functional ability - rehabilitation goals were modified according to their CPAx score	**Historical control group:** part of standard physiotherapy practice	**Primary endpoint:** ICU LOS	**Primary endpoint:** - no significant difference in median ICU LOS in days between groups (intervention 3.7 [2.3–5.4]; control 2.7 [IQR 1.1–5.2]; p = 0.27).	4
	Per Branch							
	26	26						

CPAx = Chelsea critical care physical assessment, ICU = intensive care unit, LOS = length of stay

Problem-oriented patient rehabilitation informed by the CPAx tool resulted in improvement of physical function but did not reduce ICU or hospital LOS.

#264

Reference Study Type	Cases and Controls (Participant #, Characteristics)			Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total								
264 Leite 2018 (PMID: 30123586 DOI: 10.1155/2018/4298583) **Specification of study:** Pilot study	79 pts. **Inclusion criteria:** - >18 years - >24h MV **Exclusion criteria**: - hemodynamic instability - pregnancy - BMI > 35 kg/m^2 - neuromuscular disease - brain death - peripheral vascular disease - bone fractures - use of internal or external fixators - skin lesions - end-stage cancer - pacemaker - spinal injurie - inability to receive MRC score (cognitive state)			12: 7 QG (4 death, 3 cognitive state), 5 DG (2 death, 3 cognitive state)	**DG:** conventional physical therapy 1x/d + 1x/d session of diaphragm NMES (Neurodyn Multicorrentes^{TM}) **QG:** conventional physical therapy 1x/d + 1x/d quadriceps NMES	**Conventional physical therapy 2x/d**	**Outcomes**: - MIP at discharge - MRC at discharge - MV time - Hospital LOS - FSS-ICU	**Outcomes**: - **MIP (mmHg)**: QG: −40.4 ± 8.71 vs. DG: −37.9 ± 10.31 vs. CG: −25.9 ± 9.59; p= 0.00003 - **MRC:** QG: 48.2 ± 11.48 vs. DG 41.8 ± 11.14 vs. CG: 43.4 ± 6.45; n.s. - **MV time**: QG: 23.3 ± 10.61 vs. DG: 27.5 ± 12.16 vs. CG: 15.8 ± 5.75; p=0.0001 - **Hospital LOS**: QG: 18.2 ± 11.28 vs. DG: 29.3 ± 13.59 vs. CG: 25.4 ± 12.04; p= 0.0031 - **FSS-ICU**: QG: 29.1 ± 12.38 vs. DG: 21.5 ± 10.16 vs. CG 14.6 ± 8.01; p=0.001	3
	Per Branch								
	DG: 24	QG: 29	CG: 26						

BMI = body mass index, CG = control group, DG = diaphragm group; FSS-ICU = functional status score for the ICU, LOS = length of stay, MIP = maximal inspiratory pressure, MRC = medical research council, MV = mechanical ventilation, NMES = neuromuscular electrical stimulation, QG = quadriceps group

NMES of the diaphragm does not improve MRC, MIP, duration of mechanical ventilation or hospital LOS compared to conventional physical therapy. But NMES of the quadriceps exeeds both diaphragmatic NMES and conventional physiotherapy in all the before mentioned outcomes except MRC.

#265

Reference, Study Type	Cases and Controls (Participant #, Characteristics) Total	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
265 Devlin 2018 (PMID: 30113379 DOI: 10.1097/CCM.0000000000003299) **Specification of study:** Guideline for pain, agitation/ sedation, delirium, immobility and sleep	16 RCTs **Inclusion criteria:** - range of motion - mobilisation, including in bed mobility, transfers out of bed, and walking - physical and occupational therapy interventions, including exercises, transfer training, sitting, and ambulation - in-bed cycle ergometry - neuromuscular electrical stimulation **Exclusion criteria:** - continuous lateral rotation of bed - lateral positioning in bed - inspiratory muscle training/diaphragmatic electrical stimulation/breathing exercises - chest physiotherapy/airway clearance - massage therapy - stroke rehabilitation - post-cardiac rehabilitation - any intervention conducted in a long-term acute care hospital or similar facility since		**See inclusion criteria**	**Usual care, a different rehabilitation / mobilization intervention, placebo, or sham intervention**	**Derived outcomes:** - mortality - duration of MV - quality of life	**Duration of mechanical ventilation:** (11 RCTs, 1.128 patients) Significant reduction by 1.31 days (95% CI, –2.44 to –0.19; low quality evidence) (406–409, 411, 413–416) **Quality of life:** (measured using 36-item short form health survey instrument) no statistically significant improvement p>0.05 (SMD, 0.64 [95% CI, –0.05 to 1.34]) Mortality: no effect on hospital mortality was observed	1

MV = mechanical ventilation, RCT = randomized controlled trial

The guideline offeres recommendations to improve pain, agitation/sedation, delirium, immobility and sleep in critically ill patients.

#268

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
268 Taito 2018 (PMID: 30048540 DOI: 10.1371/journal.pone.0201292) **Specification of study:** Systematic review and meta-analysis	2 publications, 75 pts[1-2] **Inclusion criteria:** - published and unpublished prospective RCTs - in adults (aged ≥18 years) with sepsis **Exclusion criteria:** - head or spinal cord injury - unstable fractures contributing to probable immobility			**Protocolised rehabilitation:** - neuromuscular stimulation - passive range of motion exercise, - active exercises - designed to either commence earlier and/or be more intensive than the care received by the control group	**Usual care**	**Primary endpoints:** - QoL - ADL - ICU mortality **Secondary outcomes:** - ICU LOS - Hospital LOS - MRC score - AEs	- QoL very low evidence 21.10 [6.57–35.63] and 44.40 [22.55–66.05] (n=1 RCT) - ICU mortality (RR 2.02 [95% CI: 0.46–8.91], I2 = 0%; (n = 2 RCT) (p>0.05) - ICU LOS/ hospital LOS and muscle strength no meta-analysis. - no meta-analysis for QoL or ADL - no adverse events (n=2 RCT)	1 → 2
	Per Branch							
	44	31						

ADL = activities of daily living, ICU = intensive care unit, LOS = length of stay, MRC = medical research council, pts = patients, QoL = quality of life, RCT = randomized control trial

Earlier or more intensive rehabilitation did not have a significant impact on ICU mortality in sepsis patients.

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#269

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
269 Fossat 2018 (PMID: 30043066 DOI: 10.1001/jama.2018.9592) **Specification of study:** RCT	314 pts **Inclusion criteria:** - ≥18 years or older - admitted to the ICU ≤ 72 hours before randomization - deemed to need ≥ 48h of care in the ICU - independent walking ability within 15 days before ICU admission - Barthel Index ≥ 55 within 15 days before ICU admission **Exclusion criteria:** - pregnant - cardiac arrest was the cause of ICU admission - cardiac arrest before screening - pacemaker or implantable cardioverter-defibrillator - cerebral disease requiring deep sedation for at least 72 hours - acute polyradiculoneuropathy (Guillain-Barré syndrome) - myasthenia - advanced dementia - deep venous thrombosis or pulmonary embolism treated for ≤ 48 hours - contraindication to EMS or leg cycling for musculoskeletal, dermatological, or surgical reasons - contraindication to standing or transfer to a chair		N = 2 (one patient in each group died)	**Standardized early rehabilitation:** - weekdays - 15 min leg cycling exercise - 50 min NMES	**Standardized early rehabilitation** - weekdays	**Primary endpoint:** - MRC **Secondary outcomes:** - ICU mobility scale - Katz Index of independence - Barthel Index - duration of MV (Number of ventilator-free days until day 28) - SF-36 - thickness of the M. rectus femoris via ultrasound - adverseeEvents	**Primary endpoint:** - MRC, MD (95%CI): -3.0 (-7.0 – 2.8) p = 0.28 **Secondary outcomes:** - ICU mobility scale, MD (95%CI): 0 (-1 – 2), p = 0.52 - Katz Index of Independence, MD (95%CI): 0.3 (-1.0 – 1.3), p = 0.57 - Barthel Index at 6-months, MD (95%CI): 0 (-5 – 5), p = 0.90 - duration of MV, MD (95%CI): 1.0 (-2.0 – 3.0), p = 0.24 - SF-36 n.s - thickness of the M. rectus femoris MD (95%CI): -0.5 (-1.0 – 2.4), p = 0.17 - adverse events (7/4159 (0,2%); 12/1190 (1%))	2
	Per Branch							
	159	155						

CI = confidence interval, EMS = electrical muscle stimulation, MD = median difference, MRC = medical research council score, MV = mechanical ventilation, NMES = neuromuscular electrical stimulation, n.s. = not significant, SF-36 = short form 36

Neuromuscular electrical stimulation + in-bed cycling did not increase muscle strength, howeverthe study was underpowered for the primary endpoint.

#272

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
272 Lucchini 2018 (PMID: 30037534 DOI: 10.1016/j.iccn.2018.04.002) **Specification of study:** Retrospective cohort study	45 pts in PP partly with ECMO retrospective analysis of pts: - admitted in general ICU from November 2009 to November 2014 - supported by VV-ECMO - experienced at least one period of PP			**PP and vv-ECMO**	**PP without ECMO**	**Primary endpoint:** - modification on PaO2/FiO2 ratio **Secondary endpoint:** - safety and feasibility	**Primary outcome:** - pre- vs end-prone position (113 mmHg vs 147 mmHg) (p=0.034) **Secondary outcome:** - 45 prone positioning manoeuvres performed (median 8 hours IQR 6-10) - no AEs	4
	Per Branch							
	14	31						

AE = adverse event, PP = prone position, (vv-)ECMO = (veno-venous) ectracorporeal membrane oxygeation

The application of prone position during VV-ECMO has shown to be a safe and reliable technique when performed in a recognised ECMO centre with the appropriately trained staff and standard procedures.

#276

Reference, Study Type	Cases and Controls (Participant #, characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
276 Uğraş 2018 (PMID: 29985278 DOI: 10.1097/JNN.0000000000000386) **Specification of study:** Prospective observational study	30 pts. in a NCU of a university hospital in Istanbul between August 2013 and December 2016 **Inclusion criteria:** -aged 18 years or older -undergone EVD and/or ICP monitoring -intra-arterial catheters -granted permission by a legally authorized representative. **Exclusion criteria:** -neurologically and hemodynamically unstable -do not tolerate a position change (ICP>25 mmHg for 5 minutes after positioning) -diagnosed with brain death -no or irregular ICP waves -undergoing craniotomy in the NCU where the study was conducted	N=16	**HOB positions:** -15°,30°,45° supine; -15°,30°,45° left lateral; -15°,30°,45° - right lateral	Patients acted as their own control	**Sample Size calculation:** Difference between mean pre-and post-positioning (right lateral position HOB 15°) ICP score averages (2.93), Power of 80% and an alpha of 0.05. **Endpoints:** - pre-and post-positioning ICP and CPP values - impact on ICP and CPP in patients with different GCS scores	**Significant differences between groups:** - 15° left lateral position, increased ICP in patients with a GCS score of 13-15 (p=0.024); decreased CPP with GCS score of 3-8 compared to GCS score of 9-12 (p=0.034) - 15° right lateral position, increased ICP in patients with a GCS score of 3-8 (p=0.04), CPP decreased (p=0.007) -right lateral position, HOB 45° with GCS score 9-12 and 13-15 CPP decreased (P=0.018) **No significant differences between groups in:** - Supine positions, left lateral and right lateral with HOB elevations differences were n.s.	3 → 4
	Per Branch						

NCU=neurocritical care units; pts. = patients; EVD= external ventricular drainage; ICP = intracranial pressure; HOB=head of bed; CPP=cerebral perfusion pressure; GCS=Glasgow Coma Scale; n.s. =not significant

Different positions (HOB degree of 15, 30, and 45) led to slight insignificant changes in ICP and CPP.

#278

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
278 Sanchez 2018 (PMID: 29958844 DOI: 10.1016/j.enfi.2018.03.001) **Specification of study:** SR	717 ITS pts in total based on 10 included papers (7/10 prospective observational studies/OS, 2 RCTs and 1 RCT secondary analysis*) **Inclusion criteria:** - primary studies published from 30/04/2009 until present - retrospective observational studies, prospective studies or full text clinical trials performed on critically ill patients in the ICU, aged >15 years, with MV and whose outcome variable was the onset of a polyneuromyopathy **Exclusion criteria:** - systematic reviews - opinion articles - meta-analysis - studies which had been published in languages other than English, Spanish or Portuguese		**Early mobilisation via PT/Ergo** or **Electrical stimulation** or **Early mobilisation together with insulin therapy / euglycemic management**	**Standard of care**	**Outcomes:** - duration of ventilation - ICU length of stay - mortality	**No meta-analysis** statistically significant ($p<0.05$) relationship was observed between ICUAW and - failure in ventilator disconnection - mortality - increase in ICU stay - time that the patients required mechanical ventilation	1 → 4 (downgraded as no meta-analysis and not only RCTs)
	Per Branch						

ICU = intensive care unit, ICUAW = intensive care unit acquired weaknes,s PT = physiotherapie

This systematic review showed a significant relashionship between ICUAW and duration of ventilation, ICU length of stay and mortality. All of this improved in this type of patients with the application of a rehabilitation therapy.

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#279

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
79 Hickmann 2018 (PMID: 29957714 DOI: 10.1097/CCM.0000000000003263) **Specification of study:** RCT	**Total** 21 pts **Inclusion criteria:** - adults with septic shock within 72 hours after ICU admission **Exclusion criteria:** - pre-existing cognitive abnormalities -malnutrition or cachexia - inability to walk independently - leg amputation - fractures -ongoing chemotherapy - long-term corticoid treatment - cardiorespiratory arrest - expected ICU stay less than 7 days - therapy withdrawal - imminent death - consent refusal - pts with hospital stay > 5 days skeletal muscle wasting **Per Branch** 9 | 10	3 (died before 2nd muscle biopsy - 1 intervention group - 2 before group allocation)	intervention with two daily (7/7 days) sessions of both **manual mobilization** and 30 minutes each **passive/ active cycling therapy** (1 h/d)	**manual mobilization** once a day (5/7 days)	**Primary endpoint:** regulation of protein degradation / synthesis pathways during the 1st week following the onset of septic shock **Secondary outcome:** - preservation of the muscle fiber CSA - presence of exercise-induced muscle Inflammation - restoration of neuromuscular function by measuring electrophysiology values and muscle strength - safety - tolerance of the intervention by monitoring hemodynamic/ respiratory values - pts perception	**Primary endpoints:** - catabolic ubiquitin proteasome pathway: no significant difference for a. MARbx: -7.3% ± 138.4% in control vs –56.4% ± 37.4% in intervention group; *p* = 0.23 b. MURF-1: -30.8% ± 66.9% in control vs -62.7% ± 45.5% in intervention group; *p* = 0.15) - autophagy-Lysosomal System better control at D7 a. ULK1 Ser-757: IG 30% ± 59% vs. CG -16% ± 33%, p = 0.01 b. ULK1 Ser-317: IG 20% ± 148% vs. CG 311% ± 703%, p = 0.03 c. LC3b mRNA: IG -21% ± 18% vs. CG 5% ± 47%, p = 0.16 d. Bnip3 mRNA: IG -59% ± 23% vs. CG 27% ± 198%, p = 0.003 e. GabarapL1: IG -16% ± 85% vs. CG 73% ± 174%, p = 0.09 f. unchanged: Cathepsin-L, p62 mRNA, LC3bII/I ratio, p62 protein levels, co-staining LC3b-p62 g. LAMP2/p62 colocalization was decreased at D7 in IG and increased in CG (p = 0.007) - anabolic Akt-mTOR pathway a. Akt(Ser-473) increased D7 in IG (p = 0.04) b. m-TOR downstream unchanged **Secondary results:** - CSA (µm2) was preserved by exercise (all fibers, Type 1 fibers, Type-IIa and Type-IIb fibers all p < 0.05) - markers of inflammation were not modified by the intervention - electrophysiology: too few data to compare - **muscle strength:** Paucity of data did not allow any comparison between the two time points by groups - **safety:** 1 reversible hypotension in intervention group	2

CG = control group, CSA = cross sectional area, IG = intervention group, ICU = intensive care unit, LAMP = lysosomal-associated membrane protein, MARbx = muscle ubiquitin ligases (E3-ligases) muscle atrophy F-box, MURF = muscle ring finger-1, pts = patients, ULK = Unc-51 like kinase

Early physical therapy during the first week of septic shock is safe and preserves muscle fiber cross-sectional area.

#280

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
280 Goldfarb 2018 (PMID: 29879568 DOI: 10.1016/j.jcrc.2018.05.013) **Specification of study:** retrospective analysis frail vs non-frail	264 pts **Inclusion criteria:** - > 60 years in the Cardiovascular ICU - with EM and frailty assessment **Exclusion criteria:** - EM but no frailty assessment - neither EM nor frailty assessment			**Early mobilisation** in frail pts	**Early mobilisation** in non-frail pts	**Primary outcomes:** mean change in LOF at discharge	**Primary outcomes:** - mean LOF improvement was 0.5 ± 0.8 and did not differ based on frailty status - mean LOF increased by 0.37 in frail patients compared to 0.52 in non-frail patients (*p*=0.15)	4
	Per Branch							
	90	174						

CICU = cardiovascular ICU, EM = early mobilization, LOF = level of function

Functional status improved in both frail and non-frail older adults.

#283

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
283 Shah 2018 (PMID: 29747562 DOI: 10.1177/0885066616677507) **Specification of study:** Prospective QI project	90 pts with a total of 185 patient encounters were recorded over a 12-month period. **Inclusion criteria:** - pts with EVD - SAH: - awake and following commands - Lindegaard ratio <3.0 - MCA mean flow velocity <120 cm/s, - MAP> 80 mm Hg - ICP consistently <20 mm Hg - ICH: - stable CT scan after 24h - ICP consistently <20 mm Hg - others (TBI, hydrocephalus, tumor,…): ICP consistently <20 mm Hg **Exclusion criteria:** - pts were delirious using CAM-ICU score or intubated		**Evaluation by PT** **+** **Standardised early mobilisation** (30-60 min ranging from PROM to walking)		**Outcome:** adverse events	AEs: 4 AEs (2.2%)	4
	Per Branch						

CAM-ICU = confusion assessment method for ICU, ICP = intracranial pressure, ICH = intracranial hemorrhage, MAP = mean arterial pressure, MCA = middle cerebral artery, PT = physical therapist, PROM = passive range of motion, QI = quality improvement, SAH = subarachnoid hemorrhage, TBI = traumatic brain injury

Early mobilisation is safe in patients with EVD.

#284

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
284 Fuke 2018 (PMID: 29730622 DOI: 10.1136/bmjopen-2017-019998) **Specification of study:** Systematic review and meta-analysis	6 RCTs with 709 pts[1-6] **Inclusion criteria:** - adult pts admitted to ICU **Exclusion criteria:** - traumatic brain injury - stroke - did not fulfill the PICS criteria			**Early rehabilitation** - start earlier than usual care or - start within 7 days of ICU admission	**Standard care** or **no early rehabilitation**	**Primary endpoints:** - short-term physical related outcome assessed during hospitalization - cognitive related outcomes - mental status related outcomes **Secondary outcomes (long term):** - HRQL (EQ5D) - S F-36 for physical function	**Significant differences between groups in:** - ICUAW (OR 0.42, 95% CI 0.22 to 0.82, p=0.01, I^2= 0% - MRC score (SMD): 0.38, 95% CI 0.10 to 0.66, p=0.009) I^2= 0% **No significant differences between groups in:** - delirium-free days n.s - HADS n.s - EQ5D n.s. - SF-36 n.s.	1
	Per Branch							
	298	292						

EQ5D = european quality of life 5 dimensions, HADS = Hospital Anxiety and Depression Scale; HRQL = health related quality of life, ICUAW = ICU-acquired weakness, MRC = medical research council, n.s. = not significant, PICS = postintensive care syndrome, pts = patients, SF-36 = short form 36, SMD = standard mean difference

Early rehabilitation increases muscle strength but does not influence cognitive and mental outcomes.

1. Brummel NE, Girard TD, Ely EW, *et al*. Feasibility and safety of early combined cognitive and physical therapy for critically ill medical and surgical patients: the Activity and Cognitive Therapy in ICU (ACT-ICU) trial. *Intensive Care Med* 2014;40:370‐9.
2. Hodgson CL, Bailey M, Bellomo R, et al. A binational multicenter pilot feasibility randomized controlled trial of early goal-directed mobilization in the ICU. Crit Care Med 2016;44:1145–52.
3. Jones C, Eddleston J, McCairn A, *et al*. Improving rehabilitation after critical illness through outpatient physiotherapy classes and essential amino acid supplement: a randomized controlled trial. *J Crit Care* 2015;30:901‐7.
4. Kayambu G, Boots R, Paratz J. Early physical rehabilitation in intensive care patients with sepsis syndromes: a pilot randomized controlled trial. *Intensive Care Med* 2015;41:865‐74.
5. Morris PE, Berry MJ, Files DC, *et al*. Standardized rehabilitation and hospital length of stay among patients with acute respiratory failure: a randomized clinical trial. *JAMA* 2016;315:2694‐702.
6. Schweickert WD, Pohlman MC, Pohlman AS, et al. Early physical and occupational therapy in mechanically ventilated, critically ill patients: a randomised controlled trial. Lancet 2009;373:1874–82

#285

Reference, Study Type	Cases and Controls (Participant #, characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
285 Rebel 2019 (PMID: 29703636 DOI: 10.1016/j.aucc.2018.03.004) **Specification of study:** Retrospective study	1 tertiary ICU from October-December, 2016 → 119 pts. **Inclusion criteria:** - adult ICU patient - patients with vasoactive therapy at one or more points during their admission in the study period **Exclusion criteria:** -none	none	**Mobilization with Vasoactive therapy**	Patients acted as their own controls	No sample size calculation (retrospective study) **Primary Endpoint:** - frequency and intensity of mobilization in patients receiving vasoactive therapy **Secondary Endpoints:** - occurrence of adverse events during mobilization	**Primary Endpoint:** - Frequency: Low (76.8%) and moderate (13.7%) dose vasoactive therapies associated with a higher probability of mobilization relative to high (9.4%) dose therapy (OR = 5.50, 95% CI = 2.23-13.59 and OR = 2.50, 95% CI= 0.95-6.59, respectively) -intensity: on vasoactive therapy (n = 72), maximum mobilization intensity was low (IMS = 1-2) in 31%, moderate (IMS = 3-5) in 51%, and high (IMS = 6-10) in 18% of vasoactive days **Secondary Endpoints:** - no SAE - AE: reversible hypotension requiring transient escalation of vasoactive therapy (7.3%), associated with lower mean arterial pressure (p = 0.001)	4
	Per Branch						
	119						

pts. = patients; ICU=Intensive Care Unit; CI= confidence interval; OR= odds ratio; SAE=serious adverse event; AE= adverse event; IMS=ICU Mobility Scale

It appears that the level of vasoactive support may not be an absolute indicator of safety to mobilize.

No detailed assessment was carried out because higher-quality evidence is available on this topic.

#286

Reference, Study Type	Cases and Controls (Participant #, Characteristics) Total	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
286 Medrinal 2018 (PMID: 29703223 DOI: 10.1186/s13054-018-2030-0) **Specification of study:** Randomised cross-over trial	20 pts admitted to ICU were included **Inclusion criteria:** - ≥18 years - intubated for at least 24h - ventilated with "pressure support" - Ramsay score ≥4 - sedated **Exclusion criteria:** - pacemaker - other contraindications for electrical stimulation - ventilated under "assist control ventilation" - were conscious **Per Branch** 19	1 patient excluded from the analysis (missing data)	**PROM, passive cycle-ergometry, quadriceps electrical stimulation and FES cycling** consecutive 10-min sessions with a 30-min rest period		**Primary endpoint:** - cardiac output during the exercises **Secondary outcomes:** - TAPSE - PASP - MAP - expiratory tidal volume - respiratory rate all were measured at baseline and every 3 min during the exercises relative change in: THb in the vastus lateralis muscle, oxyhaemoglobin and oxymyoglobin (HbO2) and deoxyhaemoglobin and deoxymyoglobin (HHb) were continuously recorded **Power calculation:** 19 subjects should be included to detect a difference between groups in mean CO of 1.1 L, and to reject the null hypothesis with power of 90% and associated type I probability error of 0.05.	**Primary results:** - cardiac output increased significantly (+ 1 L/min) after 9 min of FES cycling (7.7 L/min (6.7–8.7)) - no change in cardiac output over time during PROM, passive cycle ergometry or quadriceps electrical stimulation - no differences between the increase in cardiac output during FES cycling in pts with or without cardiorespiratory comorbidities **Secondary outcomes:** - significant increase in heart rate (97b/min (90–104)), TAPSE (2cm (1.8–2.2)) and MAP (91mmHg (85–97)) during FES cycling - MAP increased during passive cycle ergometry (89mmHg (83–95)) - PASP was significantly higher during FES cycling than PROM and quadriceps electrical stimulation (51 (95% CI 36–67) mmHg vs. 45 (95% CI 32–59) mmHg (p = 0.007) vs. 46 (95% CI 35–57) mmHg (p < 0.001)) - respiratory rate was significantly higher during FES cycling than during PROM and quadriceps electrical stimulation (respectively, 24 (95% CI 19–30) c/min vs.20 (95% CI 16–24) c/min (p < 0.001) vs. 21 (95% CI 16–26) c/min (p= 0.005)) - at the end of PROM, level of THb decreased significantly by 23% (95% CI − 41.5 to − 4.9) (p = 0.046), significant reduction in HHb level (− 27% (95% CI − 50 to − 4), HbO2 did not change - end of the passive cycle-ergometry, there was a non-significant increase in THb and nonsignificant increase in HbO2 - non-significant increase in THb, HHb and HbO2 at the end of the quadriceps electrical stimulation - non-significant increase in THb during FES cycling, but significant increase in HHb of 24% (95% CI 1.1–46.7), HbO2 decreased significantly by 13% (95% CI − 31.8 to −4.7)	2

FES = functional electrical stimulation, ICU = intensive care unit, MAP = mean arterial pressure, PASP = pulmonary arterial systolic pressure, PROM = passive range of movements, TAPSE = tricuspid annular plane systolic excursion, THb = total haemoglobin

FES cycling was the only exercise that increased cardiac output and produced sufficient intensity of muscle work. No muscle or systemic effects were induced by the passive techniques.

#289

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
289 Sarfati 2018 (PMID: 29660670 DOI: 10.1016/j.jcrc.2018.03.031) **Specification of study:** Randomized controlled trial	n=145 **Inclusion criteria:** - MV for > 3 days - 18 years or older - no expectation of weaning on the day of screening **Exclusion criteria:** - transfer to another ICU after a stay > 5 days - central nervous system injury - spine, pelvis, and/or lower limb injuries		n= 48 **Intervention**: n=7 did not receive treatment (5 died, 2 transferred to another ICU) n=9 missing data for primary endpoint **Control:** n=13 did not receive treatment (12 died, 1 transferred to another ICU) n=19 missing data for primary endpoint	**TILT-Group** daily: standard care + tilting for at least 1h/d (1 session/d): verticalized on an electrical tilt-table, secured to the table by Velcro straps at the torso and knees and gradually tilted from 30° to 60° in 10° steps	**Standard care:** daily: **≥ 1 TCI:** PROM in-bed exercises and/or active ROM in-bed exercises. **No TCI:** sitting in armchair at least 2h/d (1 session/d)	**Primary endpoint:** - MRC at ICU discharge **Secondary outcomes:** - muscle recovery (median change in MRC from baseline to ICU discharge) - AE - time to ability to stand alone - ICU-LOS - hospital LOS - MV duration - use of sedatives and NMB - hospital mortality - infections - severe ICU complications **Power**: MRC estimated to be 47 (control) vs. 50 (intervention) with SD 8 85% power, 0.05 alpha, optimal n=50 evaluable pts in each group. With 30% attrition (e.g., mortality) = 150 pts	**Primary endpoint:** - MRC: 50 [45-56] vs. 48 [45-56], p = 0.56 **Secondary outcomes:** - muscular recovery: DMRC 14 [10-24] vs. 10 [5-15], p = 0.004 - hospital mortality 0 (0) vs. 6 (10), p = 0.010 - AE: n.s. - time to ability to stand alone: n.s. - ICU-LOS: n.s. - hospital LOS: n.s. - MV duration: n.s. - use of sedatives and NMB: n.s. - infections: n.s. - severe ICU complications: n.s.	2 → 3
	Per Branch							
	72	73						

d = day, MRC = medical research council scale for muscle strength, PROM = passive range of motion, pts = patients, TCI = temporary contraindication for out-of-bed mobilization

1 h passive tilting per day added to standard care did not improve muscle strength at ICU discharge in surgical patients, however, increase of MRC over time until ICU discharge was significant.

#292

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
292 Babouth 2018 (PMID: 29580936 DOI: 10.1016/j.apmr.2018.01.034) **Specification of study:** pragmatic, quasi-experimental, consecutive group comparison study	57 pts **Inclusion criteria:** - admitted to a neurological ICU - with primary ICH - older than 18years **Exclusion criteria:** - secondary ICH after trauma			**Pre-intervention**	**Post-intervention**	**Primary endpoints:** - time of admission to first mobilisation out of bed (without lift, min. 5 sitting or standing). - number of mobilisations **No sample size calculation:** partially retrospective analysis, pre vs. post comparison	**Significant differences between groups in:** - mobilisation on day 7 in pre-algorithm group 8 (29%) vs. post group 16 (55%), p = 0.04 - higher probability of the post-algorithm group to be mobilized on day 7, OR 8.7, 95% CI 2.1 - 36.6; p= 0.003. - mobilisations during NCCU: pre-group 9 (32%) vs. post-group 17 (59%) p = 0.045 **No significant differences between groups in:** - mobilisation on day 1, 3 and 5 - time to first mobilization, MW 2.6 days in both groups.	4
	Per Branch							
	n = 28	n = 29						

ICH = intracranial hematoma/hemorrhage, ICU = intensive care unit, NCCU = neuroscience critical care unit, pts = patients

Implementation of a progressive mobility algorithm was feasible, did not increase the number of adverse events, and was associated with a higher likelihood of mobilisation in the first week after spontaneous ICH for patients admitted to the ICU.

#295

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
295 Watanabe 2018 (PMID: 32789228 DOI: 10.2490/prm.20180003) **Specification of study:** Retrospective cohort	764 consecutive admitted pts screened and 88 pts included **Exclusion criteria:** - duration of mechanical ventilation <24 h - loss of walking independence before hospitalization - death during hospitalization - diagnosis of dementia before hospitalization - unavailability of continuous data - difficulty in performing exercise due to nervous or orthopedic diseases			**Rehabilitation activity in the ICU based on an EM Protocol** and retrospective analysis of patients diagnosed with ICU-AW and those not diagnosed with ICU-AW at hospital discharge		**Primary outcomes:** - rate of walking and number of days needed to achieve walking (minimum of 45m) **Secondary outcomes:** - MV days - rate of ICU-AD, discharge home, FSS-ICU - BI score **Sample size calculation:** estimated on the basis of a threshold walking independence of 35% and an expected walking independence of 50%, with an 80% power level and a one-sided alpha value of 0.05, using the binomial test.	**Primary results:** - walking independence, n(%): non-ICU-AW 35 (87.5), ICU-AW 33 (67.4); p = 0.078 **Secondary results:** - MV duration in days: non-ICU-AW 2, ICU-AW 3; p = 0.385 - ICU-AD, n(%): non-ICU-AW 3 (7.5), ICU-AW 19 (38.8); p = <0.0001 - discharge home, n(%): non-ICU-AW 28 (70.0), ICU-AW 27 (55.1); p = 0.031 - FSS-ICU at ICU discharge: non-ICU-AW 22, ICU-AW 10; p = <0.0001 - BI at Hospital discharge: non-ICU-AW 77.5, ICU-AW 60; p = <0.0001	4
	Per Branch							
	ICU-AW n = 48	non-ICU-AW n = 40						

BI score = Barthel index, EM = early mobilization, FSS-ICU = functional status score ICU, ICU-AD = intensive care unit acquired delirium, ICU-AW = intensive care unit acquired weakness, MV = mechanical ventilation, pts = patients

The amount of daily activity time significantly influenced to walking independence.

#296

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
296 Sawada 2018 (PMID: 29496765 DOI: 10.4037/ajcc2018911) **Specification of study:** retrospective study	8.732 pts **Inclusion criteria:** - pts with pneumonia admitted to the ICU **Exclusion criteria:** - hospital-acquired pneumonia - discharged within 4 days of admission			**Early rehabilitation** (within 2 days of admission)	**No early rehabilitation**	**Primary endpoint:** - in-hospital mortality **Secondary Outcomes:** - length of ICU stay - length of hospital stay - total costs of hospitalization	**Significant difference between groups in :** - in-hospital mortality was lower in the early rehabilitation group (17.9% vs 21.9%, respectively; risk difference, 4.0%; 95% CI, 0.5%-7.6%; number needed to treat, 25; *p* = 0.03) **No significant differences between groups in:** - length of ICU stay (p = 0.51) - length of hospital stay (p = 0.70) - total costs of hospitalization (p = 0.79)	4
	Per Branch							
	n = 990	n = 7742						

CAP = community-acquired pneumonia, ICU = intensive care unit, pts = patients

Early rehabilitation within 2 days of admission was associated with a reduction in the in-hospital mortality of patients with CAP admitted to the ICU.

#297

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
295 Liu 2018 (PMID: 29484188 DOI: 10.1186/s40560-018-0281-0) **Specification of study:** single-center prospective observational study	232 patients **Inclusion criteria:** - 18 years of age or older - unplanned admission to the ICU **Exclusion criteria:** - planned post-operative - acute cardiovascular - acute cerebrovascular disease - progressive neuromuscular disease - post cardiopulmonary arrest syndrome - a condition limiting mobilization such as an unstable pelvic fracture		**Maebashi EM protocol**	**No control**	**Primary outcome:** - incidence rate of adverse events in all rehabilitation sessions **Secondary outcomes:** - number of days to first rehabilitation and the number of days to progress to higher rehabilitation levels - percentage of patients who got out of bed, standing, or ambulating	total of 587 rehabilitation sessions were conducted for 232 patients **Primary results:** - incidence rate of adverse events among all rehabilitation sessions was 2.2% (95% confidence interval [CI] 1.2–3.8%) - no significant difference between the incidence rate in active rehabilitation, (levels 3 to 5, 387 sessions, 11 adverse events, 2.8%; 95% confidence interval [CI] 1.4–5.0%) and the incidence rate for non-active rehabilitation, (levels 1 and 2, 200 sessions, 2 adverse events, 1.0%; 95% confidence interval [CI] 1.0–3.6%), (P = 0.15) **Secondary results:** - median number of days to the first protocolized rehabilitation session was 0.7 (IQR 0.0–0.9) - 62% of patients (n = 143) got out of bed during their ICU stay, and the median time to first getting out of bed was 1.2 (IQR 0.1–2.0) days	3
	Per Branch						

CI = confidence interval, EM = early mobilization, ICU = intensive care unit

Protocolized EM led by ICU physicians can be initiated in the acute phase of critical illness without serious adverse events requiring additional treatment.

#300

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
300 Murat Türk, 2018 (PMID: 29404183 DOI: 10.5152/TurkThoracJ.2017.17036) **Specification of study:** Randomized Controlled Study	81 pts **Inclusion criteria:** - adult pts - acute or acute-on-chronic hypercapnic respiratory failure - SpO2 ≤ 90% and PaCO2 ≥ 55 mmHg - NIV therapy **Exclusion criteria:** - anatomical problem for NIV - terminal stage of their disease - experienced loss of consciousness or clinical unstabilisation at any time during follow-up (shock, need for vasopressor support, GCS < 10, required endotracheal intubation) - couldn't remain in the semi-recumbent or lateral position		19 pts (changed to another ventilation mode or intubated)	**Pressure support** (BiPAP-S mode)	**Average volume targeted pressure support** (AVAPS-S mode)	**Primary endpoints:** - ICU LOS - course of PaCO2 **Secondary endpoints:** - obesity and course of PaCO2 - body positioning effects on the ventilation variables	Primary outcome: (BiPAP-S vs AVAPS-S) - ICU LOS 7.4±2.6 days vs 8.4±3.2 (p=0.17) - PaCO2 62.5±5.8 vs 65.1±7.2 (p=0.12) Secondary outcomes: no significant changes in course of PaCO2 (pts BMI<30 vs pts BMI>30): F=3.245, p=0.053 for BiPAP-S F=2.931, p=0.097 for AVAPS-S body position endpoints: BiPAP-S no significant changes for (semi-recumbent vs lateral): - peak inspiratory pressure (PIP) 17.4±3.5 vs 17.8±3.9 (p=0.87) - mean ventilation 10.3±1.8 vs 10.2±3.3 (p=0.18) - leak 26.9±5.1 vs 29.1±5.8 (p=0.11) - respiratory rate 23.4±4.6 vs 22.1±3.1 (p=0.07) AVAPS-S no significant changes for (semi-recumbent vs lateral): - peak inspiratory pressure (PIP) 22.1±4.9 vs 21.1±5.1 (p=0.42) - mean ventilation 10.2±2.9 vs 10.5±2.6 (p=0.9) - leak 24.8±3.8 vs 26.1±7.4 (p=0.96) - respiratory rate 22.6±4.9 vs 21.8±4.2 (p=0.57)	2 → 3 (downgraded as evaluation of body composition was not primary aim)
	Per Branch							
	33	29						

AVAPS-S = average volume targeted pressure support, BiPAP-S = pressure support, GCS = Glasgow coma scale, LOS = length of stay, NIV = non-invasive ventilation, PIP = peak inspiratory pressure, pts = patients

No significant effect of semi-recumbent vs. lateral position in NIV patients.

#301

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
301 Klein 2018 (PMID: 29396165 DOI: 10.1016/j.iccn.2018.01.005) **Specification of study:** prospective, longitudinal, non-equivalent, three-group comparative study	- 1117 pts. **Inclusion criteria:** - all pts. admitted to Neuro ICU with neurological injury **Exclusion criteria** - depression, anxiety, and hostility - included non-English speaking, - confusion, delirium, combativeness - comatose state and inability to complete the questionnaire due to psychological history - discharged prior to being approached - deceased prior to the psychological health assessment			**Nurse-driven EPM program:** - immediate post intervention (group two) - late post intervention sustainability data (group three)	- pre-intervention (group one), not specified	**Primary outcome:** - sustainability of EPM programme over a 22-month period **Secondary outcomes:** - difference in clinical outcomes (LOS, 30-day mortality, discharge disposition and quality metrics that included DVT, VAP, BSI, and HAPI) and psychological health (depression, anxiety and hostility)	**Primary outcomes:** - in 260 pre-intervention, 377 post-implementation, and 480 12-month post-implementation pts (N = 1.117) walking increased post-implementation and was sustained at the 8-month ($p < .001$) **Secondary outcomes:** -ICU and hospital LOS and psychological distress were reduced compared to the pre-early mobility programs (all $p < .001$) - no differences in discharge disposition mortality or quality metrics	4
	Per Branch							
	377 (Group-two); 480 (Group-three)	260 (Group-one)						

BSI = blood stream infection, DVT = deep vein thrombosis, EPM = early progressive mobility, HAPI = hospital acquired pressure injury, LOS = length of stay, n.s. = not significant, pts = patients, SD = standard deviation, VAP = ventilator associated pneumonia

A nurse-driven EPM program seems to have a benefit in relation to hospital and ICU length of stay.

#302

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
302 Woo 2018 (PMID: 31723855 DOI: 10.4266/acc.2017.00542) **Specification of study:** Case Series – intraindividual design	10 pts **Inclusion criteria:** - ≥ 20 years of age - ≤ 24 hours of MV required **Exclusion criteria:** - no previous history of rehabilitation prior to registration - hemodynamically unstable - unable to cooperate - unable to obey to verbal command - injury on the legs			**In-bed cycling:** -20 min + **FES:** -only left thigh -20 min	**In-bed cycling:** -20 min	**Outcomes** - circumferences M. rectus femoris pre- and post-intervention via ultrasound - cross-sectional area rectus femoris pre- and post-intervention via ultrasound - MRC score	**Significant differences between groups in:** circumference (cm) right side - pre mean ± SD: 47.43 ± 5.79 - post mean ± SD: 48.24 ± 5.56, p = 0.006 left side - pre mean ± SD: 47.83 ± 5.79 - post mean ± SD: 48.75 ± 4.73, p = 0.027 cross-sectional area (cm^2) right side - pre mean ± SD: 5.28 ± 1.89 - post mean ± SD: 6.59 ± 2.23, p = 0.003 left side - pre mean ± SD: 5.28 ± 1.89 - post mean ± SD: 6.59 ± 2.23, p = 0.008 **No significant differences between groups in:** MRC score right side - pre median (IQR): 4 (3.75 – 4.25) - post median (IQR): 4 (4 – 4.25), p = 0.317 left side - pre median (IQR): 4 (3.75 – 4.25) - post median (IQR): 4 (4 – 4), p = 0.368 No difference between the legs regarding all outcomes	3
	Per Branch							
	10 pts (left leg)	10 pts (right leg)						

FES = functional electrical stimulation, pts = patients

In-bed cycling increased surrogate parameters of muscle mass in a before-after design while not affecting muscle strength. No additional effect of NMES could be observed.

#305

Reference, Study Type	Cases and Controls (Participant #, Characteristics) Total	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
305 Conceicao 2017 (PMID: 29340541 DOI: 10.5935/0103-507X.20170076) **Specification of study:** systematic review	37 publications (6.641 pts) (6x RCT, 1x prospective study, 9x retrospective study, 13x case series, 2x independent group design, 2x RCT protocol, 4x care delivery protocol) **Inclusion criteria:** - RCTs - prospective and retrospective studies - case series with at least 10 consecutive pts - with independent or parallel group design - RCT protocols and care delivery protocols - >18 years old - admitted to the ICU - MV for > 24 hours. - in Portuguese, English, Spanish and French **Exclusion criteria:** - safety criteria to start EM not described - review studies, monographs/ dissertations/theses, annals, chapters from books - experts' points of view or opinions		**Mobilization:** - under adequate monitoring and with due safety		**Endpoint** - most widely used safety criteria to start EM for pts under MV and admitted to the ICU	**Outcomes:** - cardiovascular criteria were the most frequently cited, exhibiting the largest number of variables - respiratory criteria, the variables related to MV exhibited the highest concordance diverged in relation to neurological criteria, with lack of consensus mainly for assessment of the level of consciousness	1 → 3 (not only RCTs, no metanalysis)

EM = early mobilization, ICU = intensive care unit, MV = mechanical ventilation, pts = patients

The parameters and variables located in the present systematic review can be used as orientation for safety criteria to start EM.

#307

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
307 Boyd 2018 (PMID: 29246774 DOI: 10.1016/j.hrtlng.2017.11.006) **Specification of study:** Prospective, single-center, cohort study	**Total** 91 pts - pts>18y - MV in the ICU for cardiothoracic surgery **Exclusion criteria:** - pts<18y - no MV - expected death **Per Branch**		**Mobilization:** - on the basis of a traffic light system for risk stratification and for deciding on the type of possible mobilisation		**Outcomes:** -AEs	- 10 (0.0182%) AEs on 549 in- or out-of-bed mobilization units, all minor **<u>In-bed cycling:</u>** - despite red traffic light parameters, mobilization in bed in 2/101 units (1.98%), but no AE - despite yellow traffic light parameters in 72/101 units (71.28%), here 1 AE (1.38%, not considered significant as only bladder catheter disconnect). no AE with in-bed mobilisation under vaso-pressive or inotropic medication, 1 AE (0.87%) with tilt table use despite yellow/red parameters in patients under vaso-active support - higher probability of AE in pts without inotropic support **<u>Out-of bed cycling:</u>** - out-of-bed mobilization despite yellow parameters in 189/448 units (42.18%), here 1 AE (0.52%), - despite red traffic light parameters in 43/448 (9.59%) units, here 4 AE (9.30%) - AE significantly higher with red parameters and out-of-bed mobilisation ($p < 0.01$)	4

AE = adverse event, ICU = intensive care unit, MV = mechanical ventilation

The consensus recommendations are a useful tool in guiding safe exercise rehabilitation of mechanically ventilated patients. No detailed assessment was carried out further because higher-quality evidence is available on this topic.

#308

Reference, Study Type	Cases and Controls (Participant #, Characteristics) Total	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
308 Johnson 2017 (PMID: 29242519 DOI: 10.1038/s41598-017-17624-3) **Specification of study:** retrospective, cross-sectional study	2.568 pts from March 2012 to May 2015 **Inclusion criteria:** - ≥18 years of age **Exclusion criteria:** - pregnant women - prisoners		**Physical therapy**: - evaluation treatment based on consultation from the primary physician service line		**Outcomes:** - days of physical therapy treatment during hospitalization - days requiring mechanical ventilation - time to first physical therapy evaluation - comorbidity score - age during hospitalization - CT ICU LOS - hospital LOS	**Outcomes:** - days of physical therapy treatment during hospitalization: post CABG and Valve surgery had fewer mean days (CABG 3.6 ± 2.6/ Valve surgery 4.1 ± 3.2, no p-value) - days requiring mechanical ventilation: no distinguishable difference was found (no p-value stated) - time to first physical therapy evaluation: with respiratory failure more days than all the other subgroups (no p-value stated) - comorbidity score, post CABG and Valve surgery showed the lowest CCI respiratory failure had a much larger CCI (CABG 4.0 ± 2.8, Valve surgery 3.9 ± 2.7, respiratory failure 5.9 ± 3.2, no p-value stated) - age during hospitalization not stated - post CABG or post Valve surgery have shorter CT ICU LOS (CABG 4.0 ± 2.6, Valve 4.1 ± 2.9) and hospital LOS (statistically significant differences in between: CABG 10.4 ± 6.9, Valve 17.2 ± 16.9, no p-value stated) - with respiratory failure significantly different in hospital LOS (44.9 ± 43.9) and CT ICU LOS (17.6 ± 22.9) (no p-value stated)	4

CCI = Charlson comorbidity score, CT = cardiothoracic, ICU = intensive care unit, LOS = length of stay

Timing and amount of physical therapy in patients with cardiac and respiratory illness differs more based on procedure required during hospitalization than on patient comorbidity and is associated with hospital and CT ICU LOS in this patient population.

#310

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
310 Guerin 2017 (PMID: 29218379 DOI: 10.1007/s00134-017-4996-5) **Specification of study:** international 1-day prevalence study	735 pts **Inclusion criteria:** - ARDS criteria according to the Berlin definition - Age ≥ 18 years. - Intubated or tracheotomized and mechanically ventilated **Exclusion criteria:** - Not intubated on the day of the study - No ARDS on the day of the study even if ARDS criteria had been fulfilled between ICU admission and the study day **Total** **Per Branch** 735		PP	No PP	**Primary outcome:** - prevalence of use of PP in ARDS patients **Secondary outcome:** - physiological effects of PP, and the reasons for not using it	**Primary outcome:** - rate of PP use was 5.9% (11/187), 10.3% (41/399) and 32.9% (49/149) in mild, moderate and severe ARDS, respectively (P = 0.0001) **Secondary outcome:** - before and at the end of the first PP session: PaO2/FIO2 increased from 101 (76–136) to 171 (118–220) mmHg (P = 0.0001); driving pressure decreased from 14 [11–17] to 13 [10–16] cmH2O (P = 0.001); Pplat decreased from 26 [23–29] to 25 [23–28] cmH2O (P = 0.04)	3 → 4

ARDS = acute respiratory distress syndrom, ICU = intensive care unit, PP = prone position, pts = patients

PP was associated with low complication rates, significant increase in oxygenation and a significant decrease in driving pressure.

#312

Reference, Study Type	Cases and Controls (Participant #, Characteristics) Total	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
312 Martinez 2017 (PMID: 29196586 DOI: 10.4037/ccn2017531) **Specification of study:** A before-and-after study	287 pts **Inclusion criteria:** - ICU pts > 18 y **Exclusion criteria:** - refused to participate		<u>Diagnostic phase:</u> preintervention providing baseline <u>Intervention period:</u> <u>(Multicomponent strategy):</u> - physiotherapy and early mobilization - daily reorientation - prevention of sensory deprivation -drug reviews - pain control, - sleep hygiene, - environmental stimulation, - monitoring of urinary and rectal function, - avoidance of restraints, - family participation in care		**Endpoints:** - delirium rates - overall mortality - duration of MV - total ICU LOS	Delirium was strongly associated with removal of feeding tubes (RR, 12.9; 95% CI, 1.72-96; p < 0.001) **Significant differences between groups in:** -interventional period, delirium developed in 55 pts (24%; 95% CI, 19.0%-30.7%), a significant reduction when compared with the diagnostic phase (RR, 0.64; 95% CI, 0.43-0.95; p = 0.03) -reduction in self-withdrawals of implements in the interventional phase, RR 0.42 (95% CI, 0.19-0.92; p = 0.04) **No significant differences between groups in:** -mortality: p = 0.32, pts with delirium had a no significant increase in risk of death (RR, 1.28; 95% CI, 0.65-2.5; P = 0.54) -duration of MV: median [IQR], 2 [1-5] days vs 1 [0-3] days; p = 0.29 -total ICU LOS: median [IQR], 3 [2-5] days vs 3 [2-6] days; p = 0.066)	4

ICU = intensive care unit, LOS = length of stay, MV = mechanical ventilation, pts = patients

Multicomponent interventions are effective in preventing delirium among the critically ill.
No detailed assessment was carried out further because higher-quality evidence is available on this topic.

#313

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
313 Li-Bassi 2017 (PMID: 29149418 DOI: 10.1007/s00134-017-4858-1) **Specification of study:** multicenter RCT	401 pts **Inclusion criteria:** - pts ≥18 y from 18 hospitals - expected to be on MV ≥ 48 h - within 12 hours from endotracheal intubation		5 pts: 1 excluded by clinician, 3 risk conditions, 1 withdrew consent, 1 randomized twice	**LTP:** - with the head of the bed tilted 5–10° down	**SRP:** - with the head of the bed elevated at least 30°	**Primary endpoint:** - incidence of microbiologically confirmed VAP **Secondary outcomes:** - ICU mortality - duration of mechanical ventilation - ICU LOS	**Primary endpoint:** - microbiologically confirmed VAP 0.5% vs. 4.0%, RR 0.13 (95%CI 0.02-1.03, risk difference -3.5% (95%CI -6.4 to -0.6), p = 0.04 **Secondary outcomes:** - ICU mortality: SRP = 48 (23.9%), LTP = 59 (30.4%), (95%CI, risk difference) 1.27 (0.92-1.76); p = 0.17, no difference in hospital or 28-d mortality (p > 0.05) - duration MV: SRP = 4 (2–9), LTP = 5 (2–-), (95%CI, risk difference) 0.00 (−1.00 to 1.00); p = 0.73 - ICU LOS (days): SRP = 16 (9–30), LTP = 15 (8–28), 95%CI, risk difference −2.00 (−5.00 to 1.00), p = 0.24	2 → 3 (premature study stop due to low VAP incidence)
	Per Branch							
	194	201						

AE = adverse events, CI = confidence interval, ICU = intensive care unit, LOS = length of stay, LTP = lateral Trendelenburg position, MV= mechanical ventilation, pts = patients, SRP = semi recumbent position, VAP = ventilator-associated pneumonia

LTP seems to decrease the incidence of microbiologically confirmed VAP, but implementation seems difficult and safety concerns exist. Study was stopped prematurely due to low VAP incidence.

#315

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop -out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
315 Munshi 2017 (PMID: 29068269 DOI: 10.1513/AnnalsATS.201704-343OT) **Specification of study:** Systematic Review and Meta-Analysis	2129 pts, 8 RCTS[1-8] **Inclusion criteria:** - RCTs that compared MV in prone position to ventilation in the supine position in adults with ARDS and reported mortality - pts with Berlin criteria for ARDS			**Prone position**: -12 hours or longer per day	**Supine or prone position:** - less than 12 h	**Primary outcome:** -28-day mortality **Secondary outcomes:** - 90-day mortality - 6-month Mortality -absolute PaO2/FIO2 ratio on Day 4 - adverse events (unplanned central catheter removal, unplanned extubation, endotracheal tube obstruction, ventilator associated pneumonia, and pressure sores)	**Primary outcome:** - no difference in mortality (RR, 0.84; 95% CI, 0.68–1.04) - subgroup analyses found lower mortality with 12h or greater duration prone (5 trials; RR, 0.74; 95% CI, 0.56–0.99) and for patients with moderate to severe ARDS (5 trials; RR, 0.74; 95%CI, 0.56–0.99) **Secondary outcome** - PaO2 /FIO2 ratio on Day 4: higher for n=1093 (MD, 23.5; 95% CI, 12.4–34.5, I^2, 24%) - prone positioning associated with higher risks of endotracheal tube obstruction (RR, 1.76; 95% CI, 1.24–2.50; I^2 , 26%; three studies [5, 20, 21]) and pressure sores (RR, 1.22; 95% CI, 1.06–1.41; I^2, 0%)	1
	1093	1036						

AE = adverse event, ARDS = acute respiratory distress syndrome, CI = confidence interval, FiO2 = inspiratory oxygen concentration, MV = mechanical ventilation, paO2 = partial oxygen pressure, pts = patients, RR = risk ratio

Prone positioning was associated with a reduction in mortality in patients with moderate to severe ARDS (PaO2/FIO2 < 200) if applied for a longer duration (>12 h), but also with an increase in endotracheal tube obstruction and pressure sores.

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#317

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
317 Bartolo 2017 (PMID: 28980699 DOI: 10.2340/16501977-2269) **Specification of study:** Secondary analysis of prospective observational study	103 pts **Inclusion criteria:** - admitted at ICU/NICU with sABI **Exclusion criteria:** - premorbid CNS-related disability - neurological diseases - neoplastic disease with metastatic involvement of the CNS		6 pts (missing data)	**Early passive-active-assisted mobilization including:** - sitting over the edge of the bed - sitting on a chair - use of a tilt bed/table to ≥40°	**Not well defined, no mobilization**	**Primary outcomes:** - clinical and functional status measured with GCS, DRS, LCF (at each visit), ERBI (at admission and discharge), GOS, FIM (at discharge only), - in-hospital death	**Primary outcomes:** **Significant difference between groups in:** - LOS, MOB group (26.2 (SD) 13.7 days) and NoMOB group (19.5 (SD) 14.2 days), p=0.01. - ERBI, MOB –225 [–250, –125], NoMOB mean (95% CI): –250 [–325, –175], p=0.005 - GOS, MOB (3 (95% CI 3; 3)) vs NoMOB (2 (95% CI 2; 3)), p = 0.009 - FIM cognitive, MOB 7 (95% CI 5; 14) vs NoMOB 5 (95% CI 5; 8.75) (*p* = 0.04) **No significant difference at discharge between groups in:** - GCS, MOB 10.3 (9.2–11.6), NoMOB mean (95% CI): 7.3 (6.1–8.7), p=0.480 - DRS, MOB 20.4 (19.1–21.8), NoMOB mean (95% CI): 24.2 (22.1–26.4), p=0.291 - LCF, MOB 3.5 (3.0–4.1), NoMOB mean (95% CI): 2.3 (1.9–2.9), p=0.707 - FIM total score, MOB 21 (95% CI 18; 27) vs NoMOB 18 (95% CI 18; 21.75) - in-hospital death p=0.375	4
	Per Branch							
	Mobilized (MOB) 68 pts	Not mobilized (NoMOB) 35 pts						

CI = confidence interval, CNS = central nervous system, DRS = disability rating scale, ERBI = early rehabilitation Barthel index, FIM = functional independence measure, GCS = Glasgow Coma Scale, ICU = intensive care unit, LCF = levels of cognitive functioning, LOS = length of stay, NICU = neurological intensive care unit, pts = patient, sABI = severe acquired brain injury

Data from this study show that early mobilization seems to benefit clinical and functional recovery in ICU patients with sABI.

#323

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
323 Wright 2016 (PMID: 28780504 DOI: 10.1136/thoraxjnl-2016-209858) **Specification of study:** multicenter, parallel-group, randomized controlled trial	**Total** 308 pts **Inclusion criteria:** - pts 18 years or older admitted at ICU - received 48+ hours of invasive or non-invasive mechanical ventilation **Exclusion criteria:** - end-of-life care - acute brain or spinal cord injury - multiple burns - rapidly progressive neuromuscular disease - enrolled in another clinical trial without a co-enrolment agreement in place - previously enrolled in this trial **Per Branch** 150 / 158	total 98: - intervention: 43 (29%) died, 11 (7%) withdrawn, 34 (23%) lost to follow-up - control: 56 (35%) died, 5 (3%) withdrawn, 43 (27%) lost to follow-up	**Physical rehabilitation:** - functional training and individually tailored exercise programs + respiratory physiotherapy - goal of 90 minutes per day (Monday to Friday) split in at least 2 sessions	**Physical rehabilitation:** - functional training and individually tailored exercise programs + respiratory physiotherapy - goal of 30 minutes per day (Monday to Friday)	**Primary endpoint:** - PCS at 6 moths follow up to assess quality of life **Secondary outcomes:** - MCS - physical ability at ICU discharge - LOS (hospital and ICU) - exercise capacity (6-minute walk test) - FIM - hand grip strength - survival status and place of residence at 3 and 6 months after randomization **Power analysis** 80% power and a significance level of 0.05 required 77 pts to contribute primary outcome data at 6 months	**Primary endpoints:** - PCS, mean (SD): 37 (12.2) in the intervention group and 37 (11.3) control with an adjusted difference in means −1.1 (95% CI −7.1 to 5.0) **Secondary outcomes:** - ICU LOS, days, median (IQR): 6 (4–9) intervention vs 5 (4–8) control. - only 1 FIM at 3months was significantly different between groups - other outcomes n.s	2 → 4 (downgraded as intervention goal not reached)

FIM = functional independence measure, ICU = intensive care unit, IQR = interquartile range, LOS = length of stay, MCS = mental health component summary, n.s = not significant, PCS = physical component summary, pts = patients, SD = standard deviation

In this context, ICU-based physical rehabilitation did not appear to improve physical outcomes at 6 months compared with standard physical rehabilitation.

#324

Reference, Study Type	Cases and Controls (Participant #, Characteristics) Total	Recommendations	Evidence Grade
324 Hashimoto 2017 (PMID: 28770093 DOI: 10.1186/s40560-017-0222-3) **Specification of study:** Guideline	Systematic review of RCTs regarding PP in adult pts with ARDS. 8 RCTs included	1. PP reduces mortality (RR 0.77; 95% CI 0.62-0.96) 2. Mortality was also reduced in moderate/severe ARDS (RR 0.71; 95% CI 0.52-0.97) 3. No reduction in mortlity in prolonged PP (>8h): RR 0.77; 95% CI 0.58-1.02 4. No increase in adverse events (endotracheal complications): (RR 1.29; 95% CI 0.87-1.91 but sig. increase in incidence of decubitus ulcers (RR 1.36; 95% CI 1.06-1.75)	1

ARDS = acute respiratory distress syndrome, PP = prone positioning, pts = patients, RCT = randomized controlled trial

Prone positioning is suggested in adult patients with ARDS (especially in patients with moderate to severe respiratory dysfunction).

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#331

Reference, Study Type	Cases and Controls (Participant #, characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
331 Sommers 2017 (PMID: 28549273 DOI: 10.1016/j.jcrc.2017.05.010) Specification of study: proof of concept prospective cohort study	From February 2016 to September 2016: 32 included mechanical ventilated pts. at ICU of the AMC **Inclusion criteria:** - ICU patients > 18 years - mechanical ventilation >48h **Exclusion criteria:** - imminent to death - one or more amputated lower extremities - language barrier (dutch language) - S5Q <5 - MRC score 0-1 for M. quadriceps muscle strength - contraindications for physical exercise according to Evidence Statement for ICU PT		- 12 (no consent or ICU discharge	**BWSTT**	**none**	No sample size calculation specified **Outcomes:** - eligibility - recruitment rates - number of staff needed - adverse events - successful number of BWSTT - number of patients that could not have walked without BWSTT - patient satisfaction (1 = very unhappy – 5 =very happy) - patient anxiety (0 = no anxiety – 10 = severe anxiety) - MRC score - FAC	**Results:** - 54 sessions BWSTT with median of 2 (IQR of 1-3) for each participant - median MRC-Score 40 (IQR 32.5-47.5) with 75% having ICU-AW (MRC <48) - median duration 25 minutes (IQR 20-30) - number of staff needed: 2 (IQR 2-3) - no adverse events occurred - walking distance: median 31 (3-95) steps - 40 of 54 sessions: participants would not have been able to walk (FAC 0) -14 of 54 sessions: participants would be able to walk 5m with BWSTT -> with BWSTT participant walked >10m - patient satisfaction: median 5 (IQR 3-5) - patients anxiety median 0 (IQR 0-5)	4
	Per Branch							
	20	none						

Pts. = patients, AMC = Academic Medical Center, ICU = Intensive Care Unit, BWSTT = Body Weight-Supported Treadmill Training, S5Q = Short 5 item Questionnaire, MRC = Medical Research Council, PT = physiotherapy, FAC = functional ambulation Categories, IQR = interquartile range, ICU-AW = intensive care unit acquired weakness

BWTT in critically ill patients is feasible, safe, and potentially effective.

No detailed assessment was carried out because higher-quality evidence is available on this topic.

#332

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
332 Schieren 2017 (PMID: 28538631 DOI: 10.1097/TA.0000000000001572) **Specification of study:** Systematic review and meta-analysis	8 publications from 1988 - 2012 (7 randomized, 1 non-randomized, n = 422 pts)[1-8] **Inclusion criteria:** -prospective controlled trials -comparing CLRT to conventional manual positioning in trauma pts			**CLRT** (prophylactic in 4 studies (n=243), therapeutic in 4 studies (n = 179))	**Standard of care:** - manual turning in regular intervals	**No primary endpoint defined** **Extracted endpoints:** - rates of pneumonia - ICU LOS - hospital mortality	**Significant differences between groups:** - pCLRT decreased HAP (OR: 0.33 [95% CI: 0.17, 0.65], p = 0.001, I2 = 0%; NNT = 4) **No significant differences between groups in:** hospital mortality -pCLRT OR 1.39 [95% CI: 0.69, 2.43], p = 0.42, I^2 = 0% -tCLRT OR 0.54 [95%CI 0.22, 1.33], p = 0.18, I^2 = 0% duration of MV -pCLRT: -1.88 d [95%CI -4.72, 0.97], p = 0.20, I^2 = 0% -tCLRT: -2.97 d [95%CI -7.44, 1.50], p = 0.19, I^2 = 41% ICU LOS -pCLRT: 0.91 d [95%CI -2.79, 4.60], p = 0.63, I^2 = 58% -tCLRT: -1.43 d [95%CI -5.60, 2.74], p = 0.50, I^2 = 0% HAP frequency (tCLRT): OR 1.00 [95%CI 0.15, 6.53], p = 1.00	1 → 2 (downgraded for indirectness)
	Per Branch							

CLRT = continuous lateral rotation therapy, HAP = hospital acquired pneumonia, ICU = intensive care unit, LOS = length of stay, MV = mechanical ventilation, pCLRT = prophylactic CLRT, pts = patients, tCLRT = therapeutic CLRT

Prophylactic CRLT seems to decrease the rate of HAP in trauma patients.

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#333

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
333 Semler 2017 (PMID: 28487139 DOI: 10.1016/j.chest.2017.03.061) **Specification of study**: RCT	260 pts undergoing endotracheal intubation in ICU **Inclusion criteria** - ≥ 18 years **Exclusion criteria:** - intubation was required too emergently to perform randomization - treating clinicians felt a specific patient position was required for the safe performance of the procedure			**Ramped position**	**Sniffing position**	**Primary outcome** - lowest arterial oxygen saturation between induction and 2 minutes after intubation **Secondary outcomes:** - Cormack-Lehane grade of glottic view - difficulty of intubation - number of laryngoscopy attempts	**Primary outcome (ramped vs sniffing)** - p3% [84%-99%] vs 92% [79%-98%] (p=0.27) **Secondary outcomes:** ramped position increased: - incidence of grade III or IV view (25.4% vs 11.5%) (p=0.01) - incidence of difficult intubation (12.3% vs 4.6%) (p=0.04) Ramped position decreased: - rate of intubation on the first attempt (76.2% vs 85.4%) (p=0.02)	2
	Per Branch							
	129	131						

ICU = intensive care unit, LOS = length of stay, MV = mechanical ventilation, pts = patients, RCT = randomized controlled trial

A ramped position in relation to a sniffing position for intubation seems to have no clinical benefit.

#334

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
334 Fan 2017 (PMID: 28459336 DOI: 10.1164/rccm.201703-0548ST) **Specification of study:** Guideline	2.129 pts (8 RCTs) [1-8] **Inclusion criteria:** - patients with ARDS - mechanical ventilation in adult patients **Exclusion criteria:** - cointerventions (e.g., higher PEEP) - did not mandate LTV in the control group			**PP** in pts with ARDS	**SP** in pts with ARDS	**Outcomes:** - mortality - endotracheal tube obstruction - pressure sores - barotrauma	**Significant differences between groups in:** - mortality reduced, in trials with prone duration > 12h/d (5 RCTs; 1002 pts; RR 0.74; [95% CI 0.56-0.99]; high confidence) - PP associated with higher rates of endotracheal tube obstruction (3 studies, 1594 pts; RR 1.76 [95% CI 1.24-2.50]; moderate confidence) - PP associated with higher rates of pressure sores obstruction (3 studies, 1109 pts; RR 1.22 [95% CI 1.06-1.41]; high confidence) **No significant difference between groups in:** - mortality: prone vs. supine groups (8 RCTs; 2129 pts; RR 0.84; [95% CI 0.68–1.04]; moderate confidence) - barotrauma: (4 studies, 988 pts; RR 0.77 [95% CI 0.48-1.24]; moderate confidence)	1
	Per Branch							

ARDS = acute respiratory distress syndrome, CI = confidence interval, RR = risk ratio

Prone positioning with a duration > 12h/d seems to reduce mortality but increases the rate of endotracheal tube obstruction and pressure sores in ARDS patients.

#339

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
339 Hester 2017 (PMID: 28328648 DOI: 10.1097/CCM.0000000000002305) **Specification of study:** retrospective study	**2.645 pts.** **Inclusion criteria:** - Neuro-ICU LOS ≥ 24 h - ≥18 years old			<u>Post period:</u> immediately after implementation of the PUMP Plus program + mobility program <u>Sustained period:</u> 2 years after implementation of the PUMP Plus program + mobility program	before implementation of the PUMP Plus program	**Primary outcome:** - economic impact of the progressive mobility program (total cost per case) **Secondary outcomes:** - Neuro-ICU and hospital LOS - ventilator days - percentage requiring mechanical ventilation - discharge disposition - mortality - 30-day readmissions - falls/falls with injury rates - HAI rates - central line–associated bloodstream infection - catheter-associated urinary tract infection (CAUTI) - protocol utilization compliance	**Significant differences between groups in:** - Mean total cost per case comparison with preintervention: post and sustained period ($p < 0.05$) -Neuro-ICU LOS [days] shorter in the post period (5.2±6.9) vs preintervention period (6.5±9.1) ($p = 0.031$) - hospital LOS shorter in post (8.6±8.8) and sustained periods (8.8±9.3) vs LOS in the preintervention period (11.3±14.1) ($p < 0.001$) - discharge disposition home (p=0.008) and long-term Care (p=0.003) **No significant differences between groups in:** - ventilator days n.s. - percentage requiring mechanical ventilation (p=0.076) -30-day-readmissions (p=0.335) - falls/falls with injury rate (P= 1.0) -HAI (p=0.607) - CAUTI (p=0.583) - protocol utilization compliance not stated	4
	Per Branch							
	731 Post Period 796 Sustained Period	1.118 Pre Period						

CAUTI = catheter-associated urinary tract infection, HAI = hospital acquired infections, ICU = intensive care unit, LOS = length of stay, Neuro-ICU = neuro-ICU, n.s. = not significant, PUMP = Progressive Upright Mobility Protocol

The implementation of the 'Progressive Upright Mobility Protocol' with a mobility program seems to have a benefit in relation to Neuro-ICU and hospital LOS.

No detailed assessment was carried out further because higher-quality evidence is available on this topic.

#340

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
340 Maffei 2017 (PMID: 28279659 DOI: 10.1016/j.apmr.2017.01.028) **Specification of study:** pilot, prospective, randomized, single-center study	40 pts **Inclusion criteria:** - aged >18 - registered on the liver transplant waiting list - consent - absence of motor paralysis and major neuromyopathy (MRC score <36) before LT **Exclusion criteria:** - important hemodynamic instability or severe sepsis			**Intensive and early mobilization protocol:** - started by physiotherapist assessment - applied 2x day for 5 days/week	**Usual care**: - rehabilitation as prescribed by the physician -applied 1x day for 5 days/week	**Primary endpoints:** - tolerance measured by number of adverse effects defined as: HR <35 or >130 bpm, MAP <60mmHg, RR >35 breaths per minute, SpO2 <88%, NPS >5 (out of 10) - feasibility **Secondary outcomes:** - LOS in ICU - LOS in a department of abdominal surgery - duration of ventilation **No power analysis**	**Significant differences between groups in:** - AE: 38/3584 vs 21/1376, p>0.05 - feasibility: first sitting on the edge of bed (3±2 vs. 10±13 d, p=0.018), first transit (4±2 vs. 6±3 d, p= 0.015) **No significant differences between groups in:** - first sitting on chair n.s. - first walking n.s. - MV duration n.s. - ICU LOS n.s. - Hospital LOS	2 →3 (downgraded for lack of blinding and power analysis)
	Per Branch							
	20	20						

bpm = beats per minute, HR = heart rate, ICU = intensive care unit, LOS = length of stay, LT = lung transplantation, MAP = mean arterial pressure, MRC = medical research council, MV= mechanical ventilation, NPS = numerical pain scale, pts = patients, RR = respiratory rate, SPO2 = peripheral oxygen saturation

An ongoing progressive mobility program in the neurological critical care population has clinical and financial benefits associated with its implementation and should be considered.

No detailed assessment was carried out further because higher-quality evidence is available on this topic.

#342

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
342 Gaudry 2017 (PMID: 28236174 DOI: 10.1186/s13613-017-0235-z) **Specification of study:** Retrospective multicenter cohort study	98 pts **Inclusion criteria:** - ARDS (PaO2/FiO2 <300 mmHg with PEEP or CPAP ≥5 cmH2O) in a context of recent (less than 7 days) abdominal surgery **Exclusion criteria:** - laparoscopy - pts who died in the next 48h following surgery			**PP**	**SP**	**Primary endpoint:** - number of pts who had at least one surgical complication induced or worsened by PP **Secondary outcomes:** - number of revision surgeries due to complication induced or worsened by PP - effects of PP on oxygenation - duration of MV - mortality - LOS no sample size calculation	**Primary outcome:** -no significant difference in rate of surgical complications induced or worsened by PP [respectively, 14 (39%) vs 27 (44%); p = 0.65] **Secondary outcomes:** **Significant differences between groups in:** - PaO2/FiO2 ratio, the first PP significantly increased from 95 ± 47 to 189 ± 92 mmHg, p < 0.0001 **No significant differences between groups in:** - revision surgery (p = 0.10) - duration of MV (p = 0.72) - ICU LOS (p= 0.77) - ICU mortality (p= 0.43)	4
	Per Branch							
	36	62						

ICU = intensive care unit, LOS = length of stay, PP = prone position, pts = patients, SP = supine position

Prone position of ARDS patients after abdominal surgery was not associated with an increased rate of surgical complication.

#343

Reference, Study Type	Cases and Controls (Participant #, Characteristics) Total	Drop -out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
343 Nydahl 2017 (PMID: 28231030 DOI: 10.1513/AnnalsATS.201611-843SR) **Specification of study:** Systematic review and meta-analysis	48 publication (6 RCTs, 2 non-RTCs, 5 before/after studies, 22 prospective cohort studies, 2 1-day point prevalence studies, 7546 total pts)[1-48] **Inclusion criteria:** - pts received mobilisation-related interventions in ICU - studies reported on safety events **Exclusion criteria:** - the majority (>50%) of pts were under 18 years old - data on the incidence of potential safety events could not be calculated - interventions did not involve pts mobilisation - sample size was less than 10 pts **Per Branch**		**Mobilisation/ Rehabilitation in the ICU**	No mobilisation while ICU stay	**Primary endpoint:** -safety incidents defined as: 1) hemodynamic changes (high HR > 125–140 beats/min, low MAP < 55–70 mm Hg, low systolic BP < 80–90 mm Hg, high MAP > 100–140 mm Hg, and high systolic BP > 180–200 mm Hg) 2) desaturation (using the categories, <80, <85, <88, and <90%)	**Primary endpoint:** - safety: total 22351 mobilisation/rehabilitation sessions with 583 reported potential safety events, for a cumulative incidence of 2.6%. - most frequently reported types of event: oxygen desaturation and hemodynamic changes, each reported in 33 studies (69% of studies), and removal or dysfunction of intravascular catheter in 31 studies (65% of eligible studies) **Meta-analysis:** - high HR, 6 publications, 319 pts and 1,784 mobilisation/rehabilitation sessions, pooled incidence of 1.9 episodes (95% CI = 0.3–15) per 1,000 mobilisation/ rehabilitation sessions (I2 = 0%). - low BP, 11 publications, 2,793 pts and 8,757 mobilisation/ rehabilitation sessions, pooled incidence of 4.3 episodes (95% CI = 1.6–12.1) per 1,000 mobilisation/rehabilitation sessions (I2 = 67%) - low systolic BP, 9 publications, 329 pts and 2,808 mobilisation/ rehabilitation sessions, pooled incidence of 1.8 episodes (95% CI = 0.8–3.9) per 1,000 mobilisation/ rehabilitation sessions (I2 = 0%). - high BP, 1,931 pts and 6,517 mobilisation/ rehabilitation sessions, pooled incidence of 3.9 episodes (95%CI = 1.0–14.8) per 1,000 mobilisation/ rehabilitation sessions (I2 = 31%) - high systolic BP, 6 studies, 317 pts and 2,896 mobilisation/rehabilitation sessions, pooled incidence of0.3 episodes (95% CI = 0.1–1.2) per 1,000 mobilisation/rehabilitation sessions (I2 = 0%) - Oxygen desaturation, 24 publications, 3,051 pts and 12,798 mobilisation/ rehabilitation sessions, total pooled incidence of 1.9 episodes (95% CI = 0.9– 4.3) per 1,000 mobilisation/rehabilitation sessions (I2 = 60%) - no significant difference in subgroup analysis results comparing prospective and retrospective studies (P = 0.719), nor in comparing intervention and control groups (P = 0.565).	1

BP = blood pressure, CI = confidence interval, HR = heart rate, ICU = intensive care unit, MAP = mean arterial pressure, pts = patients, RCT = randomized controlled trial

Patient mobilisation and physical rehabilitation in the ICU appears safe, with a low incidence of potential safety events, and only rare events having any consequences for patient management.

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#344

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
344 Moyer 2017 (PMID: 28230563 DOI: 10.1097/JNN.0000000000000258) **Specification of study:** prospective cohort study with historical control group	- 26 pts with SAH with EVDs **Exclusion criteria:** - intolerance to 30min of drain clamping - sustained intracranial hypertension (ICP > 20 - fluctuating neurological examination on the day of potential mobilization			**Early mobilization algorithm**	historical control group of patients with SAH	**Primary endpoints:** - time to first mobilization - ICU and hospital LOS **Secondary outcomes:** - ventilator days	**Significant differences between groups in:** - decreased the mean length of time to the first mobilization from 18.7 to 6.5 days (p<0.0001) **No significant differences between groups in:** - ICU and hospital LOS n.s. - ventilator days n.s.	4
	Per Branch							
	26	19						

EVD = external ventricular drain, ICU = intensive care unit, LOS = length of stay, n.s. = not significant, pts = patients, SAH = subarachnoid hemorrhage

Implementation of an early mobilization algorithm for patients with EVD seems to decrease the mean length of time to first mobilization.

No detailed assessment was carried out because higher-quality evidence is available on this topic.

#345

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
345 Yamashita 2017 (PMID: 28210060 DOI: 10.1589/jpts.29.138) **Specification of study:** retrospective study	70 ICU pts **Inclusion criteria:** - >18years - >48h MV before introduction of daily wake-up attempts - usual care PT as well as after introduction with early mobilization		-	**Early mobilization:** - 7d/week in cooperation with PT/nursing -activity according to tolerance	**Deep sedation** and **usual care PT:** - activity level of the pts according to the doctor's instructions and trained only by therapists	**Primary outcome** A-time to first mobilization -duration of sedation - analgesia, -intubation - MV - LOS no sample size calculation (retrospective study)	**Significant differences between groups in:** - duration of sedation (7 (5-8) vs. 5 (4-7)) days, p <0.05 -analgesia (5 (4-6.5) vs. 4 (3-6) days) - duration of ventilation (7 (6-9) vs. 5 (5-7) days), p <0.05 -duration of intubation (7 (6-9) vs. 5 (4-7) days), p <0.05 - time to first mobilization out of bed (10 (8-15) vs. 7 (6-11) days), -time to stand (11 (8.5-18.5) vs. 9 (7-13) days), p <0.05 - walking (13 (9.5-20.5) vs. 11 (7-16) days), p <0.05 -LOS (11 (8.5-18.5) vs. 9 (7-13) days)	4 → 5
	Per Branch							
	35	35						

ICU = intensive care unit, LOS = length of stay, MV = mechanical ventilation, PT = physical therapy, pts = patients

These results suggest that the new sedation and cooperative rehabilitation methods for critically ill patients were effective in the early stage of treatment and shortened the duration of stay in the ward.

No detailed assessment was carried out because higher-quality evidence is available on this topic.

#347

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
347 Dall'Acqua 2017 (PMID: 28101565 DOI: 10.2340/16501977-2168) **Specification of study:** RCT	**Total** 38 pts **Inclusion criteria:** - both sexes - ≥ 18 years - hospitalized for no longer than 15 days - received ≥ 24 h of IMV **Exclusion criteria:** - neuromuscular diseases associated with motor deficits. - extubated within 48 h after inclusion - complications during the protocol - prolonged weaning (failed 3 spontaneous breathing trials) - BMI > 35 kg/m^2 - pacemaker - haemodynamic instability (noradrenaline > 0.5 µg/kg/min for a mean arterial pressure > 60 mmHg) - history of epilepsy - postoperatively with abdominal or chest incision neuromuscular blockers for 2 or more consecutive days **Per Branch** 19 | 19	13 (34,2%) Intervention: n=8 (clinical decompensation (n=3), surgical wound abdominal (n=1), comfort measures (n=1), extubated (n = 2), death (n = 1)) Control: n=5 (clinical decompensation (n=3); EVA (n=1); death (n=1))	**NMES:** - chest and abdominal muscles - for 30 minutes up to day 7 or extubation **Conventional physical therapy:** - twice daily for 30 minutes until day 7 or extubation	**Sham NMES:** - chest and abdominal muscles - for 30 minutes up to day 7 or extubation **Conventional physical therapy:** - twice daily for 30 minutes until day 7 or extubation	**Primary endpoint:** - difference in M. rectus abdominis and chest muscle thickness via ultrasound between day 1 and 7 or extubation **Secondary outcomes:** - diaphragm muscle thickness - diaphragm motion during inhalation and exhalation - ICU LOS - duration of invasive MV - successful extubation - mortality	**Primary endpoint:** - muscle thickness M. rectus abdominis MD (95%CI): -0.07 (-0.10 - -0.04), p > 0.001 - muscle thickness chest, MD (95%CI): -0.06 (-0.10 - -0.02), p > 0.001 **Secondary outcomes:** - diaphragm muscle thickness: MD (95%CI): -0.02 (-0.05 – 0.03), p = 1.000 - inspiratory diaphragmatic motion, MD (95%CI): 0.05 (-0.23 – 0.33), p = 1.000 - expiratory diaphragmatic motion, MD (95%CI): -0.04 (-0.28 – 0.20), p = 1.000 - LOS ICU (days), mean (SD): control 16 (9) vs intervention 10 (4), p = 0.045 - duration of IMV (days), mean (SD): control 8 (3) vs intervention 7 (2), p = 0.607 - reintubation rate, n (%): control 5 (38) vs intervention 3 (25), p = 1.000 - mortality, n (%): control 3 (21) vs intervention: 3 (27), p = 1.000	2 → 4 (bias risk and pilot size)

BMI = body mass index, EVA = encephalic vascular accident, IMV = invasive mechanical ventilation, LOS = length of stay, MD = mean difference, NMES = neuromuscular electrical stimulation, pts = patients

Neuromuscular electrical stimulation reduced loss of chest and abdominal wall muscle thickness.

No detailed assessment was carried out further because higher-quality evidence is available on this topic.

#348

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
348 van Willigen 2016 (PMID: 28090326 DOI: 10.1136/bmjquality.u211734.w4726) **Specification of study:** Quality improvement study	- 112 pts were included in the QI data collection **Inclusion criteria:** - ventilated < 72 hours - expected to remain ventilated for ≥ 24 hours - cognitively intact and functionally independent prior to admission **Exclusion criteria:** - age < 18 - rapidly deteriorating neuromuscular disease, - raised intracranial pressure - post cardiac arrest - BMI > 35			**Quality improvement project to deliver early mobilization:** - twice-daily 30-minute sessions of rehabilitation therapy - addition to standard physiotherapy sessions for ≥ 5days per week - mobility therapy was started within 72 hours of the pts being intubated and ventilated, and was continued until discharge from ICU	**Pre-QI time**	**Derived outcomes** - first out of bed mobilization - ICU and hospital LOS	**Derived outcomes** - pts mobilized out of bed 8.3 days earlier - reduction in mean ICU LOS by 6.6 days after QI implementation - mean number of therapy sessions received by ICU survivors doubled - hospital LOS decreased, by 11.9 days following improvement cycle 1 and by a further 3.9 days following improvement cycle 2	4
	Per Branch							
	2 improvement cycles (2013-2015 and 2016) (65 and 19)	16						

BMI = body-mass index, ICU = intensive care unit, LOS = length of stay, pts = patients, QI = quality improvement

An implementation of a quality improvement (QI) project to deliver early mobilization seems to have a benefit in relation to ICU and hospital LOS and patients are mobilized out of bed earlier.

No detailed assessment was carried out further because higher-quality evidence is available on this topic.

#349

Reference, Study Type	Cases and Controls (Participant #, characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
349 Wollersheim 2017 (PMID: 28065165 DOI: 10.1186/s13054-016-1576-y) Specification of study: Pilot interventional study	**Total** 19 pts. from mixed ICU and a neurosurgical ICU at university hospital **Inclusion criteria:** - critically ill patients with mechanical ventilation >48hours - ICU stay at least 7 days **Exclusion criteria:** - lack of informed consent - age <18 - preexisting neuromuscular disease - implanted pacemaker or defibrillator - pregnancy - acute venous thrombosis - unhealed fractures or recently attached implants in body region to be stimulated - recent eye surgery - acute herniated discs or recently history of herniated disc - participant in another study - terminal cases **Per Branch** 19	none	**Passive PT followed by a single session of WBV in supine position** (Promedi, Vibrosphere/Galileo, 26 Hz, 9 times for 1 minute or home-ICU, 24 Hz, 3 times for 3 minutes)	**none**	**Outcomes:** - safety and tolerability of WBV - heart rate and blood pressure - hemodynamic parameters via $PiCCO_2$ (CO, SV, SV range, CPO) - indirect calorimetry - BGA (pO_2, pCO_2, pH, sodium, potassium, blood glucose)	**Results:** - diastolic BP elevated during PT compared with baseline (p=0.014) - HR, MAP, systolic BP and SpO_2 did not differ from baseline, PT, WBV, and resting periods - CPO: significant decrease (p=0.047) during WBV, no changes in CO or BP - SV range: variability increased during PT in comparison with baseline (p < 0.001) - increased EE (p=0.0007) during WBV compared with baseline: oxygen uptake levels increased (p=0.012), carbon dioxide production enhanced (p<0.001) - PT increased elimination of carbon dioxide (p=0.041) - PT (p<0.01) and WBV (p<0.001) increased respiratory rate - RQ increased during PT (p=0.003) - BGA: WBV was associated with increase of potassium compared with baseline (p=0.048)	3 → 4

Pts. = Patients, ICU = intensive care unit, WBV = whole-body vibration, PT = physiotherapy, PiCCO = Pulse Contour Cardiac Output, BGA = blood gas analyses, ICP = intracranial pressure, CO = cardiac output, SV = stroke volume, CPO = cardiac power output, IGF-1 = insulin-like growth factor 1, pH = potential hydrogen, BP = blood pressure, HR = heart rate, MAP = mean arterial pressure, SpO_2 = peripheral capillary oxygen saturation, EE = energy expenditure, RQ = respiratory quotient

Whole-body vibration is safely applicable even to critically ill patients in severe condition.

#351

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
351 Lai 2016 (PMID: 27979608 DOI: 10.1016/j.apmr.2016.11.007) **Specification of study:** quality improvement study	153 adults pts with MV			**Early mobilization program:** **-** within 72 hours of MV - twice daily, 5d/wk during the 30-minute family visiting time, and, if possible, cooperating with family	preintervention phase	**Clinical outcomes:** - MV duration (d) - ICU and hospital LOS (d)	**Significant differences between groups in:** - MV duration (d) 4.7+-2.3; 7.5+-7.0; p<0.001 - ICU LOS 6.9+-3.5; 9.9+-7.6; p=0.001 **No significant differences between groups in:** - hospital LOS n.s.	4 (downgraded due to historic control)
	Per Branch							
	90 phase 2 (intervention period), Phase 3 (maintenance period)	63 phase 1 (preintervention phase)						

d = days, ICU = intensive care unit, LOS = length of stay, MV = mechanical ventilation, n.s. = not significant, pts = patients, wk = week

An early mobilization program seems to have a benefit in relation to a shorter MV duration and ICU LOS.

352

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
352 Smith 2016 (PMID: 27965224 DOI: 10.4037/ajcc2017374) **Specification of study:** a controlled interventional cohort study	447 pts. January through August 2012 **Inclusion criteria:** - ICU pts. 18 years or older **Exclusion criteria:** - ICU pts who were delirium-positive on admission - ICU stay for 4 months or longer - were transferred to a lower level of care or laterally transferred from the intervention group to the control group			**DPB:** -implemented by nurses - consisting of: 1. Sedation cessation 2. Pain control 3. Sensory stimulation 4. Early mobility 5. Sleep promotion	**Standard ICU care**	**Primary outcome:** - incidence of delirium **Secondary outcomes:** - risk factors associated with delirium	**Primary outcome:** - significant reductions (78%) in the relative risk for delirium in intervention group (odds ratio, 0.22; 95% CI, 0.08-0.56; *P* = .001) **Secondary outcomes:** - increases in age, length of stay in the ICU, and use of mechanical ventilation and restraints were associated with significant increases in the relative risk of delirium (all p <.001) -pts' race, number of comorbid conditions, and sex were not significant risk contributors	4
	Per Branch							
	n = 149 (intervention group)	n = 298 (control group)						

CI = confidence interval, DPB = delirium prevention bundle, ICU = intensive care unit, pts = patients

The delirium prevention bundle was effective in reducing the incidence of delirium in critically ill medical-surgical patients

#355

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
355 Munshi 2017 (PMID: 27898220 DOI: 10.1513/AnnalsATS.201606-484OC) **Specification of study:** retrospective study	107 pts with ECMO within an ICU-ECMO cohort between 2010 - 2015 -> 61 (57%) with ARDS **Inclusion criteria:** - veno-venous ECMO **Exclusion criteria** - ECMO as a bridge to lung transplant - post-transplant ECMO - ECMO for isolated cardiac failure - isolated veno-arterial ECMO			**PT/Mobilisation**	**Bed rest**	No sample size calculation (retrospective study) **Primary outcome** - association between ICU PT and ICU mortality **Secondary outcome**: - factors associated with a higher IMS	**Primary outcome:** - ICU- and in-hospital mortality: 22% who underwent ICU PT compared with 64% who did not (p = 0.006) **Significant differences in ICU-mortality for:** - ICU-physiotherapy (OR, 0.19; 95% CI, 0.04-0.98) - APACHE II score (OR, 1.13; 95% CI, 1.01-1.26) - sex (OR, 9.4;95% CI, 1.71 -41.7) **No significant differences between groups in:** - APACHE II score (p = 0.63) - pre ECMO PF ratio (p = 0.30) - PaO_2 on Day 1 post-ECMO (p = 0.65)	4
	Per Branch							
	50	11						

ARDS = acute respiratory distress syndrome, APACHE II = acute physiology and chronic health evaluation II, ECMO = extracorporal membranous oxygenation, ICU= intensive care unit, IMS = ICU mobility scale, PF = PaO_2/FiO_2 ratio, PT = physical therapy, pts = patients

ICU physiotherapy while on ECMO was significantly associated with reduced ICU mortality.
No detailed assessment was carried out further because higher-quality evidence is available on this topic

#358

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
358 Tipping 2017 (PMID: 27864615 DOI:10.1007/s00134-016-4612-0) **Specificati of study:** systematic review and meta-analysis	14 publications (RCTs, 2 pilot RCT, 2 control observational study) included 1753 pts **Inclusion criteria** - adult patients (>16 years) admitted to the ICU for greater than 24 h			**Active early mobilisation**	**Usual care**	**Primary endpoint**: - hospital mortality **Secondary outcomes**: - 6 and 12-month mortality - days alive and out of hospital at 180 days - functional status - mobility - muscle strength - quality of life and mood state at ICU/hospital discharge and 6- 12 months follow-up - LOS ICU - duration of ventilation - discharge destination	**Significant differences between groups in:** - muscle strength at discharge from ICU (mean 8.62 points in MRC Sum Score, 95% CI 1.39-15.86, p = 0.02) - likelihood of walking unassisted at discharge from hospital (odds ratio 2.13, 95% CI 1.19-3.83, p = 0.01 - more days alive and days out of hospital at day 180 (MD 9.69, 95% CI 1.7-17.66) **No consistent effects regarding**: functionality, quality of life, length of stay in ICU without hospital or mechanical ventilation.	1
	Per Branch							
	N=880	N=873						

CI = confidence interval, ICU = intensive care unit, LOS = length of stay, MD = mean difference, MRC = medical research council scale, pts= patients, RCT = randomized controlled trial

Active early mobilization has no impact on mortality, but may have an impact on muscle strength. A subgroup of early (within 72 hours) mobilized patients spent more days alive and out of hospital at 180 days.

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#359

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
359 Bounds 2016 (PMID: 27802955 DOI: 10.4037/ajcc2016209) **Specification of study:** Retrospective pre and after case control study	159 ICU pts **Inclusion criteria:** - 18 years of age or older - ICU LOS more than 24 hours **Exclusion criteria:** - intracranial pressure increased more than 50% from first ICU measure for hospitalization - quadriplegia - GCS less than 8 without use of sedative - comfort measures only as documented in the medical record by medical orders for life-sustaining treatment and/or palliative care - cardiopulmonary arrest resulting in death		2 pts (incomplete documentation)	**Delirium prevention bundle:** - 6 components - of which one was EM	historical control (usual care)	**Primary outcomes:** - prevalence and duration of delirium - ICU and hospital LOS - days of mechanical ventilation no sample size calculation	**Primary outcome:** **Significant differences between groups in:** -days of delirium decreased (mean, SD): 3.8±2.9 vs. 1.72±0.8 (p<0.001) -number of pts with delirium-free stays increased (from 62% to 77%; p=0.01) - decreases in delirium prevalence (from 69% to 31%; p< .001) and duration (from 2.96 to 0.56 days, p< .001) in ICU pts with mechanical ventilation -pts with mechanical ventilation who had delirium-free stays increased (from 31% to 69%; p < .001) **No significant differences between groups in:** - ICU LOS (p =0.47) or hospital LOS (p=0.15) - total days of mechanical (p=0.78)	4
	Per Branch							
	After bundle implementation 79	Before bundle implementation 80						

EM = early mobilization, GCS = Glasgow coma scale, LOS = length of stay, pts = patients

The implementation of an ABCDE bundle was associated with a decrease in prevalence and duration of delirium.
No detailed assessment was carried out further because higher-quality evidence is available on this topic.

#360

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
360 Girard 2017 (PMID: 27762595 DOI: 10.1164/rccm.201610-2075ST) **Specification of Study:** Guideline with meta-analysis of 3 systematic reviews	3 systematic reviews [1-3] **Inclusion criteria:** - acutely hospitalized adults mechanically ventilated for more than 24 hours			**Early mobilisation**	**SOC without early mobilisation**	**Outcomes:** - mortality - ICU Length of stay - ability to walk at ICU and hospital discharge - 6-minute-walk distance at hospital discharge - duration of mechanical ventilation - ventilator-free days - serious adverse events - arrhythmias	**No Significance stated:** -mortality (mean difference 3; 95% CI, -58 – 103) - ICU Length of stay (mean difference –0.56; 95% CI, -2.76 – 1.63) -more likely to be able to walk at hospital discharge (64.0 vs. 41.4%; RR, 1.56; 95% CI, 1.15–2.10) - 6-minute-walk distance at hospital discharge (Mean difference 53; 95% CI, −16.96 to 122.96) -shorter duration of mechanical ventilation (mean difference 2.7 fewer days; 95% CI, 1.19–4.21) - ventilator-free days (mean difference 2.4; 95% CI, –3.59 to 8.39) - serious adverse events (6.5 events per 1,000 PT treatment sessions) - arrhythmias (1.9 events per 1,000 PT treatment sessions)	1
	Per Branch							

ICU = intensive care unit, PT = physio therapy, SOC = standard of care

For acutely hospitalized adults who have been mechanically ventilated for more than 24 hours, protocolized rehabilitation directed toward early mobilization is suggested.

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#361

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Primary Results	Evidence Grade
	Total		
361 Cho 2016 (PMID: 27790273 DOI: 10.4046/trd.2016.79.4.214) **Specification of study:** Clinical Practice Guideline	Patients with acute respiratory distress syndrome *No data available* **Definition of EM** *No data available*	Recommendations regarding mobilization: - Prone position can be applied to patients with moderate or above ARDS to reduce mortality if it is not contraindicated (grade 1B). ○ Prone position should be applied when there is no improvement of oxygenation at early stage of mechanical ventilation. ○ Prone position is recommended at least for 10 hours. ○ Lung protective strategy should also be applied during prone positioning. *Grading of quality level of evidence following GRADE recommendations (1 = high recommendation, 2 = weak recommendation; A to D = Quality level of evidence)*	1

ARDS = acute respiratory distress syndrome, FiO2 = fraction of inspired oxygen, GRADE = grading of recommendations, assessment, development and evaluations, HFOV = high frequency oscillatory ventilation, ICU = intensive care unit, iNO = inhaled nitric oxide, PaO2 = partial pressure of oxygen, PEEP = positive post-endexpiratory pressure, pts = patients

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#363

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
363 Corcoran 2017 (PMID: 27346093 DOI: 10.1016/j.pmrj.2016.06.015) **Specification of study:** cohort study, historical control	283 ICU pts **Inclusion criteria:** - admitted to the hospital on or after March 10, 2014 - discharged from the hospital on or before June 30, 2014 - admitted to the ICU within 3 days of hospital admission - 18 years or older - received PT or OT orders within 3 days of ICU admission **Exclusion criteria:** - transferred from outside facility - independent at hospital admission in both mobility and activities of daily living - non-ambulatory preadmission - receiving end-of-life care - transferred out of the ICU - refusing rehabilitation therapy for more than 3 days - requiring subsequent surgery within 1 week of initial surgery secondary to complications - progressive neurological, muscular, orthopedic or medical disorders precluding mobility - moderate-to-severe Alzheimer disease - awaiting organ transplant - complications of pregnancy - moderate-to-severe stroke postoperative - post-left ventricular assist device surgery - extracorporeal membrane oxygenation			**Initiation of "Performance Improvement Project":** -including physiotherapy -1-2/day -occupational therapy 1/d	historical control, not specified	**Primary outcomes**: - ICU and hospital LOS - intensity of service - medications - pain - discharge disposition - functional mobility - average cost per day	**Primary outcomes:** - rehabilitation therapy services increased from 2012 to 2014 by approximately 60mins/patient - average ICU LOS decreased by almost 20% from 4.6 days (pre-PIP) to 3.7 days (PIP) (P = 0.05) - increased percentage of PIP patients, (40.5%) discharged home without services compared with (18.2%) the pre-PIP phase (P <0.01) - average cost per day in the ICU and floor bed decreased in the PIP group, resulting in an annualized net cost savings of $1.5 million	4
	Per Branch							
	160	123						

LOS = length of stay, OT = occupational therapy, PIP = performance improvement project, PT = physical therapy, pts = patients

Benefits of this performance improvement program included reduced hospitalization LOS, decreased health care costs, and decreased need for post-acute care services.

No detailed assessment was carried out further because higher-quality evidence is available on this topic.

#364

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
364 McWilliams 2017 (PMID: 27745753 DOI: 10.1016/j.aucc.2016.09.001) **Specification of study:** single center prospective before and after study	80 ICU pts **Inclusion criteria:** - ventilated for ≥ 5 days - > 18 years **Exclusion criteria:** - contraindications to mobilization - severe neurological injury or neuromuscular disease or motor neuron disease - MV >48h - poor preadmission level of mobility - over 6ft 5in tall - weight over 440lbs		control n=9 -7 died -2 transferred to another hospital intervention n=8 -7 died -1 transferred to another hospital	**Training and use of "Sara Combilizer®"**	**Standard care without "Sara Combilizer®"**	**Primary endpoint:** - Time to 1st mobilization (MMS) **Secondary endpoints:** - SOFA score at 1st mobilization - ICU LOS - Duration of ventilation - MRC at ICU discharge - MRC at hospital discharge - Readmission to ICU	**<u>Primary outcome:</u>** **(control vs intervention)** **Significant differences between groups in:** - time to 1st mobilization (MMS of≥2): 13.6 (11.7–15.8) 10.6 (9.1–12.4) days (p=0.028) **<u>Secondary outcomes:</u>** **(control vs intervention)** **Significant differences between groups:** - SOFA 2.9 (0.5) vs 5.1 (2.4) (p=0.005) - ICU LOS **No significant differences between groups in:** - ventilation duration 11 (6, 15) vs 8 (6, 12) (p=0.104) - ICU LOS 17.1 (14.3–20.5) vs 15.3 (13.3–17.5) (p=0.331) - MRC at ICU discharge 51 (41, 54) [n = 16] vs 47 (34, 56) [n = 22] (p=0.579) - MRC at hospital discharge 58 (48, 60) [n = 19] vs 54 (50, 60) [n = 27] (p=0.855) - readmission to ICU 3 (10%) vs 1 (3%) (p=0.355)	4
	Per Branch							
	40	40						

ICU = intensive care unit, LOS = length of stay, MMS = Manchester mobility score, MV = mechanical ventilation

The Sara Combilizer® may be a useful adjunct to an early mobility protocol within the ICU.

No detailed assessment was carried out further because higher-quality evidence is available on this topic.

#365

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
365 Silva 2017 (PMID: 27732921 DOI: 10.1016/j.jcrc.2016.09.012) **Specification of study:** prospective observational study	**Total** 11 pts admitted at ICU (from February to July 2013 in a tertiary public hospital in Teresina, Brazil) **Inclusion criteria:** ≥ 18 years - APACHE II > 13 - MV from 24 to 48h - prediction to stay in MV for ≥ 3 days **Exclusion criteria:** - MAP < 65 or > 110 mmHg - lesions on the skin that prevent the realization of protocol - fractures in lower limbs, vertebral fractures - brain death **Per Branch** N=11		**NMES:** - for 15 min (90 contractions) daily for 3 days - pulse width equal to chronaxie, pulse frequency of 100 Hz, ON time 5 seconds, OFF time of 5 seconds, no rise time, and decay - on tibialis anterior and hamstrings, quadriceps femoris	**No control group**	**Outcome** (not exactly defined) - creatine kinase - lactate - central venous oxygen saturation - burn injuries - chronaxie assessments	**No significant differences:** - creatine Kinase (UI/L): - baseline – mean (SD): 470 (270) - 24 hours – mean (SD): 350 (245) - 48 hours – mean (SD): 430 (245) - 72 hours – mean (SD): 455 (240) - 96 hours – mean (SD): 430 (280), p-value <0.99 - lactate on days 1, 2, and 3 pre to post stimulation - central venous oxygen saturation on days 1, 2, and 3 - central venous oxygen saturation and serum lactate: same pattern with no significant variations (P = .23 and P = .8, respectively) - no burn injuries on the skin - comparisons of intermuscular groups over day 2 and day 3 did not demonstrate any significant difference **Significant difference** - day 1: gluteus maximus=550 (±150) ms vs. quadriceps=300 (±90) ms; quadriceps= 300 (±90) ms vs. tibialis anterior= 540 (±160) ms (P = .005 and P = .005)	4

APACHE II = acute physiology and chronic health evaluation, ICU= intensive care unit, MAP = mean arterial pressure, ms = microseconds, MV = mechanical ventilation, NMES = neuromuscular electrical stimulation, pts = patients, SD = standard deviation

No differences in laboratory parameters as surrogates for muscle damage could be observed after neuromuscular electrical stimulation.
No detailed assessment was carried out further because higher-quality evidence is available on this topic.

#369

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
369 Booth 2016 (PMID: 27618376 DOI: 10.1097/JTN.0000000000000234) **Specification of study:** Observational study, retrospective	343 pts. **Inclusion criteria:** - patients at the NTICU - patients which achieved Protocol level of 2-6 in the MOVE screen criteria - RASS –1 to 1			**Mobilisation**	**Bed rest**	**Outcomes:** - venous thromboembolism (VTE) - ICU and hospital LOS - duration of ventilation - falls - resp. failures - pneumonia No sample size calculation (pre-intervention cohort analyzed retrospectively)	**Significant differences between groups in:** - incidence/VTE pre-intervention group (21%) and post-intervention group (7.5%) (p = 0.0004). **No significant differences between groups in:** - hospital and ICU LOS - average duration of ventilation - mortality - falls, - respiratory failure - pneumonia no adverse events (extubation, hypoxia, falls)	4
	Per Branch							
	184	159						

ICU = intensive care unit, LOS = length of stay, MOVE = myocardial stability/oxygenation adequate/vasopressor(s) minimal/elevated intracranial pressure, NTICU = neurotrauma intensive care unit, RASS = Richmond agitation sedation score, VTE = venous thromboembolism

Progressive mobility protocols reduced the incidence of VTEW in the at-risk intensive care trauma patient population.
No detailed assessment was carried out further because higher-quality evidence is available on this topic.

#370

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
370 Deng 2016 (PMID: 27595451 DOI: 10.1016/j.burns.2016.07.029) **Specification of study:** cohort study, historical control	73 ICU pts (survivors) **Inclusion criteria:** - admitted to the BICU from January 2011 to December 2013 - within 7 days of severe burns - 16–65 years old - TBSA burns equal to or more than 50% - length of BICU stay was not same as the length of hospital stay - received rehabilitation in the BICU - survived			**Active PT**	**Passive PT only**	**Outcomes:** -ICU and hospital LOS - ROM - ADL (assessed with BI and FIM) No sample size calculation	**Significant differences between groups in:** - ICU LOS 65 ± 38 h vs. 39 ± 16 h, p=0.002 - hospital LOS 184 ± 141 vs. 101 ± 42, p=0.010 - ROM: mobility training group better performance in shoulder abduction (p=0.013), wrist extension (p=0.001), hip flexion (p=0.003) hip abduction (p=0.001), knee flexion (p=0.001), ankle dorsiflexion (p<0.001) and plantar flexion (p=0.012) - cognitive subscale of the FIM in the mobility training cohort lower (p<0.001) **Not significant differences between groups in:** - total Score of FIM (p=0.627) - BI total score (p=0.552)	4
	Per Branch							
	24	49						

ADL = activities of daily living, BI = Barthel index, BICU = burn intensive care unit, FIM = functional independence measure, ICU = intensive care unit, LOS = length of stay, PT = physio therapy, pts = patients, ROM = range of motion, TBSA = total body surface area

Mobility training in the BICU was shown to be feasible and effective in achieving better outcomes than passive training for severe burn patients.

No detailed assessment was carried out further because higher-quality evidence is available on this topic.

#372

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
372 Hickman 2016 (PMID: 27553652 DOI: 10.1186/s13613-016-0184-y) **Specification of study:** cohort study	171 ICU pts, 731 patient days **Inclusion criteria:** - pts either already hospitalized in or newly admitted to ICU between December 1, 2014, and January 31, 2015 **Exclusion criteria for EM** (3% of patient days): - active bleeding (n = 7), - increased intracranial pressure with major instability (n = 3) - unstable pelvic fractures (n = 2) - therapy withdrawal (n = 10)	22 patient days (3%) fulfilled their local exclusion criteria for EM	**Protocolized early mobilization**		**Primary outcome:** - feasibility of: -> mobilisation (passive, active-assisted, active, active-resisted) -> passive/active transfer in chair -> cycle ergometer in bed/chair (legs/arms) -> verticalization / standing / leg press / assisted walk **Secondary outcomes:** -safety of early mobilisation - early mobilization rate in MV according to hypoxemia severity - pts' perception No sample size calculated	**Primary outcomes:** - intervention on 86 % of pts days, bed-to-chair transfer 74 %, at least. 1 PT session 59 %. - time to 1st PT 19 h (IQR = 15–23) **Secondary outcomes:** - (mild) adverse events 0.8% (reversible hypotension or arrhythmia) - in MV pts bed-to-chair transfer was achieved on 68 % of patient-days and at least one early mobilisation activity on 80 % - pts were comfortable with intervention	3
	Per Branch						

EM = early mobilisation, ICU= intensive care unit, MV = mechanical ventilation, PT = physical therapy, pts = patient

Early mobilisation was feasible and safe.

#374

Reference, Study Type	Cases and Controls (Participant #, characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
374 Floyd 2016 (DOI: 10.1097/DCC.0000000000000197) Specification of study: Retrospective matched paired study	**Preintervention**: 517 cardiac surgery pts and 65 thoracic surgery pts. From June 2014 – November 2014 **Postintervention**: 392 cardiac surgery pts and 59 thoracic surgery pts. from December 1, 2014 to June 30, 2015 **Inclusion criteria:** - ICU patients age >16 or <99 - mechanical ventilation at ICU admission - thoracic / cardiac surgery **Exclusion criteria:** - postoperative bleeding that required reoperation (first 24hours) - postoperative death within 24 to 72 hours - placement of VAD - postoperative ECMO >96hours		none	**PMP**: Level 1: active/passive ROM in Bed Level2: sitting on edge of bed Level 3: Stand up & lateral side steps along bed Level 4: OOB to chair via stand pivot transfer Level 5: Ambulation <50 ft. Level 6: Ambulation 100 ft Level 7: Ambulation >100ft	Standard care	No sample size calculation **Outcomes:** - ICU readmission within 30 days - ICU LOS - hospital LOS - pressure ulcer prevalence - DVT or PE	**Results:** - mean Hospital LOS: cardiac group: preintervention 8.6 days, postintervention group: 6.5 days (p=0.502) thoracic group: preintervention 12.6 days, postintervention group: 9.8 days (p=0.779) - mean ICU LOS cardiac group: 2.6 days for pre- and postintervention group thoracic group: preintervention: 6.3 days, postintervention: 4.6 days - DVT: 2 preintervention group (cardiac + thoracic), 0 postintervention group (p=0.492) - PE: 0 preintervention group, 1 postintervention group (cardiac+ thoracic) (p=1.0) - ICU readmission: preintervention group: 3, postintervention: 1, (p=0.301) - Pressure ulcers: preintervention group: 1, postintervention group: 0, (p=0.313)	4 → 5
	Per Branch							
	30 PMP (n=15 thoracic surgery, n=15 cardiac surgery)	30 standard of care (n=15 thoracic surgery, n=15 cardiac surgery)						

Pts = Patients; ICU = intensive care Unit; ECMO = extracorporeal membrane oxygenation; VAD = ventricular assist device; PMP = progressive Mobility control; ROM = range of motion; OOB = out of bed; ft = feet; LOS = length of stay; DVT = deep vein thrombosis; PE = pulmonary embolism

Progressive mobility control had no significant influence on patient outcomes.

No detailed assessment was carried out because higher-quality evidence is available on this topic.

#375

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
375 Frazzitta 2016 (PMID: 27447483 DOI: 10.1371/journal.pone.0158030) **Specification of study:** RCT	- 40 pts with DOC admitted to ICU within 24 hours from a severe ABI **Inclusion criteria:** - ≥18 years - GCS ≤8 for ≥24h from the Event - diagnosis of VS or MCS according to the CRSr on the third day after the injury - adequate pulmonary gas exchanging function - stable hemodynamics **Exclusion criteria:** - sedation - unstable ICP - CPP <60mmHg - fractures or skin lesions - deep vein thrombosis - body weight>130 kg - height >210 cm		9 pts died (intervention 5, control 4)	**early stepping verticalization** (Erigo. Hocoma AG, Switzerland) - 30 min sessions - 5x week for 3 consecutive weeks - plus 30 min **conventional physiotherapy**	**conventional physiotherapy** - 60 min sessions	**Primary outcomes:** - GCS - DRS - CRSr - LCF - [all measured at T0 (3d day after injury), T1 (ICU discharge), T2 (neurorehabilitation discharge)] **Secondary outcomes:** - ICU LOS - Hospital LOS -Adverse Events **Power analysis** - none	**Significant differences between groups in:** - ICU LOS (38.8 ± 15.7 vs 25.1 ± 11.2 days, p = 0.01) - Δ DRS (T2-T0) (-20.0 (-22.0,-4.5); -6.0 (-12.7,-2.0); p=0.04) - Δ CRSr (T2-T0) (17.0 (5.1,18.8); 5.0 (2.3,11.0); p=0.033) **No significant differences between groups in:** - Δ GCS (T2-T0) (n.s.) - Δ LCF (T2-T0) (n.s.) - hospital LOS (n.s.) - no adverse events	3 (risk of bias, pilot size)
	Per Branch							
	20	20						

ABI = acquired brain injury, CRSr = coma recovery scale revised, CPP = cerebral perfusion pressure, DOC = disorders of consciousness, DRS = disability rating scale, GCS = Glasgow coma scale, ICP = intracranial pressure, ICU = intensive care unit, LCF = levels of cognitive functioning, LOS = length of stay, MCS = minimally conscious State, n.s. = not significant, pts = patients, VS = vegetative state, Δ = delta

An early stepping verticalization seems to have a benefit on DRS and CRSr but may result in a longer length of stay in the ICU.

#380

Reference, Study Type	Cases and Controls (Participant #, Characteristics) Total	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
380 Fields 2015 (PMID: 27347435 DOI: 10.1097/JAT.0000000000000012) **Specification of study:** Retrospective descriptive study	366 pts in the 10-bed cardiology ICU (CICU) **Inclusion criteria:** - age 18 years or older - with indwelling PAC placed between June 2010 and October 2012 **Exclusion criteria:** not specified **Per Branch**		Data was extracted on all documented mobility activity (nursing, by PT or by OT)		**Primary outcome:** - PAC complications	**Primary outcome:** - physician notes reported 15 occurrences of PAC complications in 15 different pts - PAC complications included: bleeding from PAC site (n = 3), PAC dislodgement or accidental removal (n = 5), or PAC induced arrhythmia (n = 7) - no PAC complications during any physical therapy or occupational therapy session - no PAC complications were associated with nursing reported mobility activities	4

OT = occupational therapist, PAC = pulmonary artery catheter, PT = physical therapist, pts = patients

The data suggest that participation in mobility activities does not place patients with an indwelling PAC at increased risk of PAC-related complications.

No detailed assessment was carried out further because higher-quality evidence is available on this topic.

#383

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
383 Wutzler 2016 DOI: 10.1007/s00068-016-0692-3) **Specification of study:** Prospective cohort study (observational)	264 pts (76 pts with CLRT of 1 trauma center from 2011-2013; 188 pts from the German TraumaRegister®) **Inclusion criteria:** - ISS ≥16 (blunt and penetrating) - AIS Chest ≥3 - age 18–80 years - no secondary transfers from other hospitals - CLRT for chest trauma/lung contusion			**CLRT**	**No CLRT/ Standard of Care**	**Derived endpoints:** - time on MV - ICU/ hospital LOS - rates of pneumonia - rates of sepsis - rates of ARDS - hospital mortality - rates of re-intubation	**Outcomes:** CLRT vs. no CLRT **Significant differences between groups in:** - time on MV: (7.8 vs. 11.1 days) p=0.002 - intensive care unit LOS (11.9 vs. 15.8 days) p<0.001 **No significant differences between groups in:** - ARDS (5.3 vs 9) p=0.438 - Sepsis (18.9 vs 14.3) p=0.524 - hospital mortality (6.6 vs 11.2) p=0.365 **Total patients:** - re-intubation rate 9.2% - rates of pneumonia 25%	4
	Per Branch							
	76	188						

CLRT = continuous lateral rotational therapy, ISS = injury severity score, AIS=abbreviated injury score; ICU=Intensive Care Unit; ARDS=acute respiratory distress syndrome; LOS = length of stay, MV = mechanical ventilation

CLRT remains a therapeutic option to reduce pulmonary complications after severe chest trauma.

No detailed assessment was carried out further because higher-quality evidence is available on this topic.

#384

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
384 McGarrigle 2016 (PMID: 27256069 DOI: 10.2522/ptj.20150644) **Specification of study:** Retrospective Case-Series	10 pts. **Inclusion criteria:** - pts who received VAD support - pts awake and able to consent to rehabilitation - consent for data use - sternum surgically wired closed, cannulae surgically secured with confirmation from the surgeon **Exclusion criteria:** - inability to actively participate - cardiovascular instability: ongoing ECMO support, multi-organ failure unresponsive to medical therapy - ongoing sedation			**Early mobilisation with VAD**		**Primary outcomes:** - feasibility - safety - rehabilitation strategy **Secondary outcome:** - physical function (CPAx)	**Primary outcomes:** - all 10 pts were at least partially mobilized (arm and leg movements) - 330 sessions in total (X=33, SD=18.1, range=16–72) and progressed to ambulation on 71 occasions (X=7.1, SD=7.7, range=1–27) - distance ambulated ranged from 7 to 1,200 m (X=157.7, SD=367.3) - 8 minor adverse events - no major adverse events **Secondary outcome:** - CPAx score for 7 pts improved from a median of 0 (interquartile range=0–1) on day 1 to a median peak score of 39 (interquartile range=37–42)	4
	Per Branch							

CPAx = Chelsea critical care physical assessment tool, ECMO = extracorporeal membrane oxygenation**,** pts = patients, VAD = ventricular assist device

Early rehabilitation and ambulation of recipients of short-term VAD support was safe and feasible.
No detailed assessment was carried out further because higher-quality evidence is available on this topic.

#385

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
385 Sigler 2016 (PMID: 27255089 DOI 10.14423/SMJ.0000000000000472) **Specification of study:** Retrospective Case-Series	**Total** 32 pts **Inclusion criteria:** - ventilated ICU pts in a MICU **Per Branch**		**Early mobilisation according to new protocol**		**Extracted outcomes:** - feasibility - safety - ICU LOS	**Outcomes:** - ambulation of 32 ventilated pts „feasible “, ambulation distance was 102 ± 152 f. and usually required three ICU staff members with 5 to 10 minutes of preparation before ambulation - no adverse events - decrease in ICU LOS (from 4.8 to 4.1 days)	4

ICU= intensive care unit, LOS = length of stay, MICU= medical intensive care unit, pts = patients

Early mobilisation is safe and effective in ventilated ICU patients.

No detailed assessment was carried out further because higher-quality evidence is available on this topic

#386

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
386 Connolly 2016 (PMID: 27220357 DOI: 10.1136/thoraxjnl-2015-208273) **Specification of study:** Systematic Review	SR based on 5 SR from 2013 to 2015 **Inclusion criteria:** - SR reporting on RCTs - any physical rehabilitation (exercise and mobility programs, cycle ergometers or NMS) - critically ill patients		**Early mobilisation** or **mobilisation via PT during ITS stay** or **NMS**	**Usual care** or **Placebo** or **Bed rest**	**Outcomes:** - impairment (peripheral and respiratory muscle strength, CIP/CIM) - activity limitation (physical function, QoL) - Healthcare utilisation (VFD, ICU-LOS, hospital LOS, mortality, duration of MV)	**No meta-analysis** **Outcomes from SR:** a) Early mob/mob. via PT - impairment: peripheral muscle strength[1] (n = 244), Hedge's g=0.27 (0.02 to 0.52), p=0.03 - respiratory muscle strength[1] (n = 105), Hedge's g=0.51 (0.12 to 0.89), p=0.01 - CIP/CIM (Hermans et al, n=104), RR 0.62 (0.39 to 0.96) p=0.03 - activity limitation: physical functionality[1] (n=143), Hedge's g=0.46 (0.13 to 0.78), p=0.01 - participation restriction: quality of life[1] (n = 154), Hedge's g=0.40 (0.08 to 0.71), p=0.01 - health care utilisation: VFD[1] (n = 334), Hedge's g=0.38 (0.16 to 0.59), p<0.001, - ICU LOS[1] (n = 597), Hedge's g=-0.34 (-0.51 to -0.18), p<0.001 - LOS[1,2] (n= 441) Hedge's g=-0.34 (-0.53 to -0.15), p<0.001 - mortality[1,2] (n=274), OR 1.0. (0.54 to 1.85) p=1.0, - duration of MV[2] (n=not reported), median (IQA) 3.4 d (2.3 to 7.3) vs 6.1 d b) NMS - impairment: muscle strength[3] (n= 66), SMD 0.77, (0.13 to 1.40), p=0.02 - CIP/CIM[2] (n= 52), RR 0.32 (0.10 to 1.01), p=0.05	1 → 5 (indirectness)
	Per Branch						

CIM = critical illness myopathy, CIP = critical illness polyneuropathy, LOS = length of stay, MV = mechanical ventilation, NMS = neuromuscular stimulation, RCT = randomized controlled trial, SR = systematic review, VFD = ventilator-free days

Early mobilisation improves muscle strength, physical function and quality of life and reduces time on ventilation, length of stay but not mortality. Neuromuscular stimulation improves muscle strength.

No detailed assessment was carried out because higher-quality evidence is available on this topic.

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#387

Reference, Study Type	Cases and Controls (Participant #, characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
387 Thelandersson 2016 DOI: 10.1007/s12028-016-0278-2 **Specification of study:** Prospective study	20 pts. in the NICU from August 2013 to July 2014 and November 2014 to February 2015 **Inclusion criteria:** -TBI, cerebral infarction, or intracerebral/cerebellar hemorrhage requiring intensive care. -ICP was measured **Exclusion criteria:** -<18 years of age -subarachnoid hemorrhage due to the risk of vasospasm -fractures of the spine or lower extremities -severe infections -severe obesity -non-Swedish-speaking relatives	/	20-min leg exercise using a bedside cycle ergometer (SP, backrest of the bed slightly elevated)	Pts. acted as their own controls	**Sample Size calculation:** Not stated. **Primary Endpoint:** -Safety and feasibility with regards to ICP and CPP after severe brain injuries or stroke **Secondary Endpoints:** -impact on MAP, HR, CO, SV, SVV, SpO2	**Significant differences between groups:** -20-min bedside cycle exercise increased MAP (p = 0.029) and SV (p = 0.003) -After exercise CPP, MAP, CO, and SV decreased significantly versus during exercise (p < 0.01) **No significant differences between groups in:** -20-min bedside cycle exercise increase in CO (p = 0.066) and CPP (p = 0.057) -changes in ICP, HR, SVV, or SpO2 during the procedure (n.s.) -no differences between data obtained before versus after exercise in any of the recorded variables	3
	Per Branch						
	20						

Pts.=patients; NICU=neurointensive care unit; TBI= traumatic brain injury; ICP=intracranial pressure; SP=supine position; CPP=cerebral perfusion pressure; MAP= mean arterial blood pressure; HR= heart rate; CO=cardiac output; SV=stroke volume; SVV=stroke volume variation; SpO2=peripheral oxygen saturation

Early passive exercise with a bedside cycle ergometer for patients with severe brain injuries or stroke is considered a safe procedure as it does not increase ICP and, if anything, increases CPP.

#388

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
388 Lee 2016 (PMID: 27189339 DOI: 10.1159/000446175) **Specification of study:** Review	29 pts **Inclusion criteria:** - pts in medical ICU between February 2014 and August 2014 - CRRT - received PT			Active mobilisation	PROM	**Primary outcomes:** - occurrence of safety events - vital signs changes	**Primary outcomes:** - no safety events during 33 sessions with PROM, 2 events during 48 active mobilisation sessions (4.1%) (both events: ECMO + CRRT delivered) - systolic BP, diastolic BP, mean arterial pressure, heart rate, respiratory rate, or peripheral oxygen saturation before and after both PROM and active mobilisation PT sessions: n.s	5
	Per Branch							
	PROM group (n= 15) (3 pts underwent both PROM and active mobilization)	Active mobilisation (n = 17) (3 pts underwent both PROM and active mobilization)						

BP = blood pressure, CRRT = continuous renal replacement therapy, ECMO = extracorporeal membrane oxygenation, n.s. = not significant, PROM = passive range of motion, PT = physical therapy, pts = patients

Active mobilisation can be performed safely in patients who are being treated with CRRT without significant hemodynamic changes, but patients with ECMO should be monitored carefully.

No detailed assessment was carried out because higher-quality evidence is available on this topic.

#389

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop -out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
389 Hewitt 2016 (PMID: 27169365 DOI: 10.1002/14651858.CD007205.pub2) **Specification of study:** Systematic review (Cochrane Review)	24 publications (24 RCTs)[1-24] **Inclusion criteria:** - lateral positioning - manual/automated turns - duration of body position > 10 minutes - randomized and quasi randomized trials with - at least 1 comparator - single therapy/repetitive therapy			**Single/repeated use of lateral positioning**	**Other body positions**	**Primary endpoints:** - in-hospital mortality - incidence of morbidity - clinical adverse effects during or after repositioning **Secondary endpoints:** - pulmonary physiology or hypoxia score - vital signs - duration of assisted ventilation - LOS in critical care area - LOS in hospital - differences in participant comfort or satisfaction	**Significant differences between groups:** - meta-analysis: favoured good lung down in participants with unilateral lung disease (MD -85.33 points, 95% CI -107.14 to -63.53; P value < 0.00001) - heart rate: 30 minutes after turning for supine position versus allograft lung down (MD -7.64, 95% CI -13.00 to -2.29; P value = 0.005) and five minutes after turning for supine position versus native lung down (MD 3.36, 95% CI 0.29 to 6.42; P value = 0.03) - temperature: 17.60 fewer hours with fever for repetitive lateral positioning versus supine positioning at 72 hours (MD -17.60, 95% CI -26.12 to -9.08; P value < 0.00001) - ICU LOS: repetitive lateral positioning over supine immobilization (MD -18.60, 95% CI -33.07 to -4.13; P value = 0.01) **No significant differences between groups:** - No study reported to reveal adverse events - no study reported mortality as outcome of interest - data were unavailable for Morbidity. - no analyses of pulmonary physiology possible.	1 → 3 (due to lack of sufficiently consistent data for meta-analyses)
	Per Branch							

RCTs = randomized controlled trials

Insufficient data and reporting, therefore no conclusive recommendation is possible. Good lung down seems better for oxygenation than bad lung down.

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#391

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
391 Azuh 2016 (PMID: 27107920 DOI: 10.1016/j.amjmed.2016.03.032) **Specification of study:** cohort before-after study, historical control	3233 MICU pts **Inclusion criteria:** - admission to MICU - Braden Scale score < 19			**(Early) mobilisation protocol:** - time to implementation not defined	Standard care	**Primary endpoint:** - occurence of pressure ulcers **Secondary endpoints:** - rate of VAP - hospital LOS - ICU LOS - hospital readmission rate No sample size calculation	**Primary outcome:** - pressure ulcer incidence of 6.1% (vs. 9.2% before intervention), p = 0.0405 **Secondary outcomes:** - VAP: n.s. - hospital readmission rate 11.50% vs 17.10%, p=0.001 - ICU LOS 11.7 vs. 10.7 days, p=0.17 - hospital LOS: not reported	4
	Per Branch							
	3233	number of historical controls not specified, just effect rate in % is given						

LOS = length of Stay, MICU = medical intensive care unit, VAP = ventilator-associated pneumonia

The implementation of a mobilization protocol reduced the incidence of pressure ulcers and hospital readmissions as well as shortening the length of stay in the ICU.

No detailed assessment was carried out further because higher-quality evidence is available on this topic.

#395

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
395 Dong 2016 (PMID: 26973269 DOI: 10.1536/ihj.15-316) **Specification of study:** Randomized controlled trial	106 adult ICU pts **Inclusion criteria:** - underwent CABG - disease in the left anterior descending artery, circumflex artery or right coronary artery (angiography or NYHA IV) - invasive coronary angiography showed severe luminal stenosis > 75% - prolonged mechanical ventilation (>72h) - stable oxygen saturation, fraction of inspired oxygen ≤ 55%, and positive end expiratory pressure ≤ 8 cm H2O - dopamine at a dose of < 10 μg/kg/ minute and epinephrine at a dose of < 0.4 μg/kg/minute - > 70 mmHg and urine output > 1 mL/kg/hour - good postoperative wound healing was ob - no history of chronic mental illness - had normal cognitive function **Exclusion criteria:** - no ability to do physical actions - had neurological disorders affecting the muscles - irreversible disorders (resulted in 6-month mortality > 50%) - increased intracranial pressure - were admitted to ICU after cardiopulmonary resuscitation - received radiotherapy or chemotherapy within the previous 6 months - acute myocarditis, peripheral vascular thrombosis/embolism, cerebrovascular accident, or new ischemic electrocardiographic changes			**Mobilisation therapy** - Mobilisation before ICU discharge	**Standard care:** -mobilisation after ICU discharge	**Outcomes:** - duration of MV - hospital and ICU LOS - Hospital mortality -Time of death No sample size calculation	**Significant differences between groups in:** - duration of mechanical ventilation (days) 8.1 ± 3.3 vs 13.9 ± 4.1 (p=0.01) - ICU LOS (days) 11.7 ± 3.2 vs 18.3 ± 4.2 (P=0.01) - hospital LOS (days) 22.0 ± 3.8 vs 29.1 ± 4.6 (p=0.01) **Not significant differences between groups in:** - hospital mortality 2 (4%) vs. 3 (6%) (p=0.65) - time of death (p-value not stated)	3 (downgraded for indirectness and lack of power analysis)
	Per Branch							
	53	53						

CABG = coronary artery bypass surgery, ICU = intensive care unit, LOS = length of stay, MV = mechanical ventilated, NYHA = New York heart association, pts = patients

The results provide evidence for supporting the application of early rehabilitation therapy in patients requiring prolonged mechanical ventilation after CABG.

#401

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
401 Wahab 2016 (PMID: 28979452 DOI: 10.1177/17511437156051 18) **Specification of study:** retrospective cohort study with historical control	8145 consecutive pts in 5 ICUs before and after implementation of an early mobilization protocol no inclusion/exclusion criteria (all admitted pts were included)			**Implementation of an early mobilisation protocol**	**Usual care**	**Primary outcomes:** -ICU and hospital LOS **No sample size calculation**	**Primary outcomes:** - ICU LOS: 5.8 ± 7.6 vs 5.4 ± 7.0 days, p < 0.001 - hospital LOS: 14.7 ± 16.7 vs 13.9 ± 15.6 days, p < 0.001 - no PT: 21% vs 69%, p < 0.001	4
	Per Branch							
	4200	3945						

ICU = intensive care unit, LOS = length of stay, PT = physio therapy, pts = patients

A multi-ICU, coordinated implementation of an early rehabilitation program markedly increased rehabilitation treatments in the ICU and was associated with reduced ICU and hospital LOS as well as increased ICU admissions.

#402

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Interven -tion	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
402 Fischer 2016 (PMID: 26825278 DOI: 10.1186/s13054-016-1199-3) **Specification of study:** RCT	63 pts **Inclusion criteria:** - underwent cardiothoracic surgery - anticipated to stay in the ICU ≥ 48h **Exclusion criteria:** - < 18 years BMI >40 kg/m^2 - metal implants - skin lesions in the stimulation area - neuromuscular diseases - implanted ventricular assist device or intra-aortic balloon pump		**Intervention group:** 14 (6 lost to follow-up at ICU discharge, 8 lost to follow-up at hospital discharge) **Control group**: 19 (7 lost to follow-up at ICU discharge, 12 lost to follow-up at hospital discharge)	**NMES:** - 2x daily for 30 min - until ICU discharge or day 14	**Sham NMES**	**Primary endpoints:** - muscle layer thickness M. quadriceps femoris - muscle strength via the MRC **Secondary outcomes:** - hand grip strength - FIM-Score - TUG-Score - SF-12 - average mobility level - satisfaction - ICU LOS - mortality	**Primary endpoints:** muscle layer thickness (cm) - postoperative day - effect in a linear mixed model (95%CI: -0.08 (-0.11 - -0.06); p < 0.001) - NMES - effect in a linear mixed model (95%CI: -0.18 (-0.59 – 0.23); p = 0.38) - postoperative day x NMES - effect in a linear mixed model (95%CI: 0.02 (-0.01 – 0.06); p = 0.21) - MRC postoperative day - effect in a linear mixed model (95%CI): 0.02 (-0.02 – 0.05); p = 0.40 - NMES - effect in a linear mixed model (95%CI: - 0.45 (-0.88 - -0.03); p = 0.04) - postoperative day x NMES - effect in a linear mixed model (95%CI: 0.09 (0.03 – 0.14); p = 0.002) **Secondary outcomes:** patient satisfaction - comfortable Sensation, n (%): intervention 12 (44.4) vs control 5 (18.5), p = 0.03 - discomfort, n (%): intervention 5 (18.5) vs control 0 (0%)), p = 0.048 ICU LOS, median (IQR): intervention (3 – 23) vs control 7 (3 – 213), p-value n.s - Hand Grip Strength/ FIM-Score/ TUG-Score/ SF-12 (PCS-12 + MCS-12)/Average Mobility Level: No difference between groups stated ICU Mortality, n (%): intervention 1 (3.7) vs control 3 (11.1) p-value: n.s	2
	Per Branch							
	34	29						

ICU = intensive care unit, NMES = neuromuscular electric stimulation, n.s. = not significant, pts = patients

No effect of neuromuscular electrical stimulation on muscle thickness could be observed but regaining muscle strength in the ICU stay was quicker.

#403

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
403 Toonstra 2016 PMID: 26788890 DOI: 10.1097/MAT.0000000000000239 **Specification of study:** prospective observational study	1.313 pts from July 1st, 2013, to July 31st, 2014 **Inclusion criteria:** - pts on the MICU		408 pts did not receive physiotherapy 848 pts. Received PT without CRRT	**Physiotherapy during CRRT**	All other MICU pts.	**Primary endpoint**: - feasibility and safety PT	**Primary Results:** - No CRRT-specific safety events occurred (0%; 95% upper confidence interval, 6.3%). - 6 non-CRRT–related potential safety events (2.2% of all physical therapy sessions; 95% confidence interval, 0.6–8.2%), all transient changes in blood pressure	3
	Per Branch							
	57	1256						

CRRT = continuous renal replacement therapy, MICU = medical intensive care unit, pts = patients; PT=physical therapy

Provision of bedside physical therapy while patients underwent CRRT is feasible and appears safe.

#404

Reference, Study Type	Cases and Controls (Participant #, characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
404 Karadas 2016 DOI: 10.1016/j.gerinurse.2015.12.003 RCT	94 ICU pts **Inclusion criteria:** -min. 24h on MV -65y and older - no previous delirium.			Early ROM Exercises (10 repetitions, lying down, 30 min.)	Routine clinical measures	**Primary Outcomes:** - delirium incidence - delirium duration	**Primary Outcomes:** -delirium (incidence 8.5% in intervention vs. 21.3% in control group $p > 0.05$, $X2 = 3.02$) -delirium duration 15 h (3-144 h) in intervention vs 38 h (9-120 h) in control ($p > 0.05$; $Z = 0.997$).	2 → 3 (high risk of bias)
	Per Branch							
	47	47						

ICU = Intensive care unit; pts = patients; ROM = Range of motion

No significant difference in delirium occurrence and duration.

#409

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Interven-tion	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
409 Ayzac 2016 (PMID: 26699917 DOI: 10.1007/s00134-015-4167-5) **Specification of study:** Secondary Analysis of RCT	466 pts **Inclusion criteria:** - adults (18 years or older) - endotracheally intubated for ARDS - ongoing for the previous 36 h - severity criteria (PaO2/fraction of inspired oxygen (FiO2)\150 mmHg under FiO2 C 0.6 positive end-expiratory pressure (PEEP) C5 cmH2O and tidal volume (VT) = 6 ml/kg predicted body weight) fulfilled after a 12–24 h stabilization period - gave consent to participate			**PP**	**SP**	**Primary endpoint:** - incidence of the first episode of VAP - mortality **Secondary endpoints:** - fatality rate during the ICU stay up to 90 days after randomization - number of days free from ventilator support - duration of the ICU stay - duration of organ failure - appropriateness of the antibiotic therapy	**Primary endpoint:** - incidence rate for VAP: 1.18 (0.86–1.60) vs 1.54 (1.15–2.02) per 100 days of invasive mechanical ventilation (p = 0.10), - VAP was associated with an increase in the mortality rate during the ICU stay [HR 1.65 (1.05–2.61), p = 0.03] **Secondary endpoint:** - cumulative probability of VAP at 90 days estimated at 46.5 % (27–66) in PP and at 33.5 % (23–44) in SP - difference between the two cumulative probability curves was not statistically significant (p = 0.11)	3
	Per Branch							
	237	229						

ARDS = acute respiratory distress syndrome, PP = prone position, pts = patients, SP = supine position, VAP = ventilator associated pneumonia, VT = tidal volume

In severe ARDS patients prone positioning did not reduce the incidence of VAP and VAP was associated with higher mortality.

#411

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
411 Fraser 2015 (PMID: 26600359 DOI: 10.1097/01.NAJ.0000475292.27985.fc) **Specification of study:** Retrospective cohort with historical controls	132 ICU pts, retrospectively „randomly“ chosen Inclusion criteria: - at least 18 years of age - admitted directly to an ICU - intensivist as attending or consulting physician Exclusion criteria: - inability to walk without assistance before ICU admission - neuromuscular disease that would prevent weaning from mechanical ventilation - acute stroke, body mass index greater than 45 kg/m2, admission by the trauma service, acute lower extremity fracture, unstable cervical spine or pathologic fracture, hospitalization 30 days prior to admission, hospice care, immediate plans to transfer to an outside hospital, - score greater than 60 on the initial Barthel			**Implementation of an early mobilization protocol**	**Usual care**	**Primary outcomes:** - readmission rate - quality outcomes (falls, ventilator-associated events , pressure ulcers, urinary tract infections) - costs - LOS **No sample size calculation**	**Significant differences between groups in:** - readmission: 10.6 vs 22.7% (p<0.001) - quality outcomes 25.7 vs 1.5% (p<0.001) **No significant differences between groups in:** - LOS: n.s - costs: savings of $111,566 ($1,690 per patient) for the mobility group ($125,309 versus $127,000; t130 = −0.42; P = 0.68)	4
	Per Branch							
	66	66						

ICU = intensive care unit, LOS = length of stay, n.s. = not significant, pts = patients

It is feasible for a community hospital to create and implement a dedicated ICU mobility team. Early mobilisation of ICU patients contributed to fewer delirium days and improved patient outcomes, sedation levels, and functional status.

#412

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#412 **Bloomfield 2015** PMID: 26561745 DOI: 10.1002/14651858.CD008095.pub2 **Specification of study:** Systematic Review and MA	9 RCTs with 2165 pts[1-9] **Inclusion criteria:** - RCTs that examined the effects of PP vs supine/semi recumbent position - during conventional MV - in adult pts with acute hypoxaemia			**PP**	**Supine/ semi recumbent position**	**Endpoints:** - risk ratio for mortality - risk ratio or mean difference for secondary outcomes	**Significant differences between groups in:** - pressure ulcers (4trials; 823 pts) with an RR of 1.25 (95% CI 1.06 to 1.48), p-value = 0.02) - tracheal tube obstruction increased with PP (RR of 1.78 (95% CI 1.22 to 2.60), p-value = 0.003) - reduced arrhythmia with PP (RR of 0.64 (95% CI 0.47 to 0.87), p-value = 0.005) **No significant differences between groups in:** - short- and longer-term mortality (6 trials): RR of 0.84 to 0.86 in favor of the PP Primary analysis: - short term mortality RR of 0.84 (95% confidence interval (CI) 0.69 to 1.02) - longer-term mortality RR of 0.86 (95% CI 0.72 to 1.03)	1
	Per Branch							

MV = mechanical ventilated, PP = prone position, RCT = randomized controlled trials, RR = risk ratio

There is no convincing evidence of benefit nor harm from universal application of PP in adults with hypoxaemia and mechanical ventilation in intensive care units (ICUs).

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#413

Reference, Study Type	Cases and Controls (Participant #, characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
413 Kimmoun 2015 DOI: 10.1186/s13613-015-0078-4 Specification of study: Retrospective study	17 pts with PP and VV-ECMO Between January 2012 and January 2014 **Inclusion criteria:** - PP during VV-ECMO - severe ARDS defined by BERLIN consensus - one unsuccessful ECMO weaning - refractory hypoxemia - persistent high plateau pressure **Exclusion criteria:** - no PP during vasopressor treatment - recent open chest cardiac surgery	none	**PP > 24 hours**	**none**	**Outcomes:** - safety data - oxygenation - respiratory system compliance	**Results:** - total of 27 sessions - PaO_2/FiO_2 ratio increased from 111 (IQR 84-128) to 173 (IQR 120-203) mmHg after 24 hours of PP - RS compliance increased from 18 (IQR 12-36) to 32 (IQR 15-36) ml/cmH_2O - tidal volume: increased from 3.0 (IQR 2.2 – 4.0) to 3.7 (IQR 2.8 – 5.0) ml/kg - PaO_2/FiO_2 increased over 20% in 14/14 sessions for late sessions (>7 days), and in 7/13 sessions for early sessions (<7 days) - 1 oxygenator thrombus, 1 fluid resuscitation	4
	Per Branch						
	n = 17						

VV = venovenous, ECMO = extracorporeal membrane oxygenation, ARDS = acute respiratory distress syndrome, PP = prone positioning, RS = respiratory system, IQR = interquartile range

PP improved oxygenation during VV-ECMO and was not associated with side effects.

No detailed assessment was carried out because higher-quality evidence is available on this topic.

#414

Reference, Study Type	Cases and Controls (Participant #, characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
414 Bartolo 2016 PMID: 26530213 **Specification of study:** Prospective multicenter observational study	**Total** 102 consecutive severe brain injury pts. admitted to ICU/NICU **Inclusion criteria:** - CNS damage due to traumatic or nontraumatic causes - GCS ≤8 **Exclusion criteria:** - previous sABI pts with persistent consciousness disorder - neoplastic disease with metastatic involvement of the CNS **Per Branch** 102	15 (1 missing, 14 died)	**Early rehabilitation**	**Without early rehabilitation**	No sample size was calculated. **Outcomes:** - which early rehabilitation treatment is carried out in Italian ICU/NICUs - which kind of treatment is performed - which care pathways are indicated for sABI pts. at discharge	**Results:** Rehabilitation treatments: - postural changes were performed in 65 (63.7%) pts. - passive/active assited multijoint mobilization was prescribed in 52 (51%) pts. - mobilization was executed in all pts. by phyiotherapists - rehabilitation interventions (respiratory rehabilitation and/or bronchial drainage, speech therapy, multisensory stimulation Discharge destinations: - 38 pts. severe acquired brain injury unit - 18 pts. extensive rehabilitation clinic - 18 pts. neurosurgery - 13 pts. other destination (e.g. other ICU/NICU, other acute ward)	3

DRS = disability rating scale, ERBI = Early rehabilitation Barthel Index, FIM = Functional Independence Measure, GCS = Glasgow coma scale, GOS = Glasgow Outcome Scale, LCF = levels of cognitive functioning, pts = patients; CNS = central nervous system; ICU = intensive care unit; NICU = neurological intensive care unit; sAIB = severe acute brain injury

More than half of all sABI patients received multijoint mobilization and postural changes at ICU/NICU.

#415

Reference, Study Type	Cases and Controls (Participant #, characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
415 Culbreth 2016 https://doi.org/10.4187/respcare.03882 **Specification of study:** Systematic review	7 studies from January 1, 1960 to September 14, 2014 (1 prospective cohort study, 3 retrospective cohort studies, and 3 case series)[1-7] **Inclusion criteria:** -ECMO and PP simultaneously for the treatment of RF -adults and older adolescents within an age range of 15–75 y - primary interventions were required to be PP and ECMO **Exclusion criteria:** - neonates and pediatrics studies - Case studies (consisting of 1 patient) and editorials - Studies that were not translated into English - subject was undergoing treatment for another disease process that did not include RF (e.g., cardiac failure) - multiple interventions and adjuncts for RF	n/a	**PP and ECMO simultaneously**	No control group due to study design	No primary endpoint defined **Extracted endpoints:** - ECMO Cannula Complications - Central Venous and Arterial Catheter Complications - Chest Tube Complications - Airway Dislodgment and Obstruction - Hemodynamic Instability During Positioning - Miscellaneous Non-Life-Threatening Complications - PP Maneuver Type: Mechanical Versus Manual - ECMO Equipment and Cannula Site - Outcomes: Oxygenation and Survival	**Extracted endpoints:** - No occurrence of ECMO cannula dislodgment; CSB was common among these studies, CSB is a frequent occurrence of subjects receiving ECMO due to anticoagulation therapy. - Only 1 study reported catheter complications - None of the adult studies reported chest tube dislodgment in this review. - No episodes of tracheal or endotracheal tube dislodgment was found. - 2 studies reported episodes of hemodynamic instability. (e.g., Bradycardia, decrease in systolic blood pressure). - None of the studies in this review reported cutaneous pressure sores. - Only 1 study reported the use of automated, rotating beds to perform PP of subjects. - The type of ECMO equipment used, all studies reported using either a centrifugal pump system or an occlusive pump system. - 3 studies found a significant difference between the PaO2/FIO2 ratio before and after PP.	1 → 4 (not only RCTs, no metaanalysis)
	Per Branch						

ECMO= Extracorporeal membrane oxygenation; PP=prone position; RF=respiratory failure; CSB= cannula site bleeding;

More studies are needed to assess the clinical efficacy of the addition of PP therapy to ECMO for patients in severe RF.

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#419

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
419 Pandullo 2015 (PMID: 26346813 DOI: 10.1016/j.jcrc.2015.08.007) **Specification of study:** Retrospective cohort study	182 pts **Inclusion criteria:** - admitted to ICU in the second quarter of 2013 - 18 years or older - ICU LOS at least 48 hours - discharge to post-acute inpatient floor **Exclusion criteria:** - discharge from hospital directly after ICU			Retrospective analysis of patient mobility achievements (JH-HLM) 3 groups depending on highest ICU JH-HLM: bed (n = 51), chair (n = 69), ambulation (n = 62)		**Primary outcomes:** - hours between ICU admission and bed - hours between ICU admission and chair, - hours between ICU admission and ambulation - hours to regain/exceed mobility level after transfer - ambulation on day of discharge from hospital - ambulation at any time during hospitalization **Secondary outcomes:** -ICU-LOS -post-ICU LOS -hospital LOS	**Primary outcomes:** - hours between ICU admission and bed, median (IQR): bed:1.8 (0.3, 4.0), chair:1.8 (0.5-4.8), ambulation 1.4 (0.5-4.0); p =0.27 - hours between ICU admission and chair, median (IQR): bed: 118 (75-238), chair: 59 (29-94), ambulation: 39 (19-65); p <0.001 - hours between ICU admission and ambulation, median (IQR): bed: 177 (111-355), chair: 135 (89-200), ambulation: 60 (37-96); p<0.001 - hours to regain/exceed mobility level after transfer, median (IQR): bed: 2.5 (0.5-5.9), chair: 16 (4-26), ambulation: 7 (3-19); p<0.001 - ambulation on day of discharge from hospital, n (%): bed: 9 (17.6), chair: 29 (42.0), ambulation: 37 (59.7); p>0.001 - ambulation at any time during hospitalization, n (%): bed: 25 (49.0), chair: 51 (73.9), ambulation: 62 (100) **Secondary outcomes:** -ICU LOS(h), median (IQR): bed: 80 (57, 161), chair: 97 (71-131) ambulation: 88 (62-138); p=0 .96 - post-ICU LOS (h), median (IQR): bed: 237 (96-436), chair: 186 (108-297), ambulation: 84 (51-131); p<0.001 - hospital LOS (h), median (IQR): bed: 382 (216-724), chair: 355 (230-550), ambulation: 230 (140-358); p<0.001	4
	Per Branch							
	Bed group: n=51 Chair group n=69 Ambulation group n=62							

IQR = interquartile range, JH-HLM = John Hopkins highest level of mobility, LOS = length of stay, pts = patients

Study findings show the need for improvement in maintaining early ICU mobilization achievement during the crucial phase between ICU stay and hospital discharge.

#424

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
424 Yusuke 2016 (PMID: 26311924 DOI: 10.1589/jpts. 27.2053) **Specification of study:** Single Centre Cohort Study Before After	86 pts **Inclusion criteria:** - admitted to ICU **Exclusion criteria:** - <64 years - bedridden before the onset of pneumonia - with serious complications such as severe heart failure - discharged due to death.		15 pts: 11 control (died), 4 Intervention (died)	**Early physical therapy:** - 40 min per day - begin the day after admission	**Standard intervention**	**Primary endpoints:** - ICU LOS - FIM score	**Primary endpoints:** **Significant differences between groups in:** - ICU admission period shorter in early intervention (12.03 ± 4.14 days) vs control (15.45 ± 3.76 days, $p < 0.01$) - rate of change in the FIM smaller in early intervention (14.3 ± 5.7) than in standard intervention (20.3 ± 7.6, $p < 0.01$)	4
	Per Branch							
	38	33						

FIM = functional independence measure, ICU = intensive care unit, LOS = length of stay, pts = patients

Physiotherapy should be recognized as an effective treatment method that prevents complications and improves the prognosis associated with activities of daily living, and not solely as a method to prevent disuse syndrome.

#425

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop -out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
425 Polastri M 2015 (PMID: 26274362 DOI: 10.1002/pri.1644) **Specification of study:** Systematic Review Case series	9 publications[1-9](54 pts, 3 cohort studies, 6 case reports/case studies) **Inclusion criteria:** - pts in ICU - describe the physiotherapeutic activities of subjects on awake VV ECMO - publication date January 2010 to November 2014 - in English, French or Italian **Exclusion criteria:** - editorials, opinion pieces, conference proceedings and citations that did not describe physiotherapeutic interventions in subjects on awake VV ECMO			**Awake ECMO Combination active and passive physiotherapy** (commenced within 2-5 days)		**Primary endpoint:** - assess advantages and safety of physiotherapeutic interventions	**Primary endpoints:** - physiotherapy was commenced as soon as possible (within 2–5days) in almost all patients, and this was clear in all studies - mobilization (passive and active movements and postural changes), in-bed positioning (either sitting or upright) and ambulation were the most commonly used physiotherapeutic interventions	3
	Per Branch							

ECMO = extracorporeal membrane oxygenation, ICU = intensive care unit, pts = patients, VV = veno-venous

Patients on awake ECMO usually received a combination of passive and active physiotherapy, and most achieved an acceptable degree of autonomy after treatment.

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#434

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
434 Castro-Avila 2015 (PMID: 26132803 DOI: 10.1371/journal.pone.0130722) **Specification of study:** Systematic Review Meta Analysis	774 pts, 7 randomised or controlled clinical trials [1-7] **Inclusion criteria:** - randomised or controlled clinical trials - comparing rehabilitation to usual care in ICU/HDU patients - adult pts admitted to ICU/HDU for at least 48 hours - followed for outcomes until ICU discharge **Exclusion criteria:** compared passive to usual care - started rehabilitation after ICU/HDU discharge - evaluated interventions in the same patient - enrolled more than 20% of pts under 18 years - had pts admitted to an ICU/HDU due to neurological conditions or trauma that could limit rehabilitation			**Early rehabilitation / mobilisation**	**Usual Care**	**Primary endpoint:** - functional Status at ICU discharge **Secondary outcomes:** - walking ability - muscle strength - quality of life - duration of MV - hospital and ICU LOS - time in rehabilitation after hospital discharge	**Significant differences between groups in:** - (n=4) improved walking without assistance at discharge (pooled risk ratio 1.42, CI 1.17-1.72), p =0.02 **No significant differences between groups in:** - functional status at ICU discharge (no meta-analysis) - all other outcomes are non-significant: muscle strength, QoL, MV duration, ICU LOS, hospital LOS, time in rehabilitation	2
	Per Branch							
	419 pts intervention group	355 pts control group						

CI = confidence interval, ER = early rehabilitation, HDU = high-dependency unit, ICU = intensive care unit, LOS = length of stay, MV = mechanical ventilation, pts = patients, QoL = quality of life, RCT = randomized controlled trial

Early rehabilitation did not improve functional status at ICU discharge, muscle strength, quality of life, or healthcare utilization. However, early mobilisation improved walking ability without assistance at hospital discharge.

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#437

Reference, Study Type	Cases and Controls (Participant #, characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#437 Daniel 2015 PMID: 25995558 DOI: 10.1589/jpts.27.1067 **Specification of study:** retrospective cross-sectional study	N=105 pts. between January and July 2013 **Inclusion criteria:** - ≥ 18 years of age - admission to the ICU - mechanically ventilated **Exclusion criteria:** - incomplete records - length of ICU stay < 72 hours - > 30 days of hospitalization		not applicable	female	male	**Primary endpoint:** - time interval needed to be able to perform active exercises (e.g., to sit) out of bed (days) **Secondary Outcomes:** - time to sitting out of bed (days) - time to the withdrawal of sedation (days) - duration of MV - duration of weaning from MV - ICU length of stay (days)	**Primary endpoint:** - time interval needed to be able to perform active exercises (e.g., to sit) out of bed (days): Female 3.7 ± 4.0 vs Male 5.7 ± 5.9 (p = significant) **Secondary Outcomes:** - time to sitting out of bed (days): Female 3.1 ± 4.1 vs. 5.0 ± 6.8 (p = n.s.) - time to the withdrawal of sedation (days): Female 2.0 ± 2.1 vs Male 3.6 ± 2.3 (p = significant) - duration of MV (days): Female 4.8 ± 4.4 vs Male 6.7 ± 5.5 (p = significant) - duration of weaning from MV (days): Female 1.6 ± 3.6 vs 2.2 ± 3.9 (p = n.s.) - ICU length of stay (days): Female 6.7 ± 5.0 vs 8.2 ± 5.9 (p = n.s.)	4
	Per Branch							
	Female N = 53	Male N = 52						

ICU = Intensive Care Unit, LOS = length of stay, MV = mechanical ventilation, n.s. = non significant; pts.=patients

Women generally have a better functional response when admitted to the ICU, as they spend less time in the unit and are able to perform active exercises earlier.

No detailed assessment was carried out because higher-quality evidence is available on this topic.

#438

Reference, Study Type	Cases and Controls (Participant #, characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
438 Lee H 2015 PMID: 25957499 https://doi.org/10.1016/j.jcrc.2015.04.012 **Specification of study:** Retrospective Cohort	99 patients, admitted to the medical intensive care unit of a single hospital in Korea between May 1 and December 31, 2013, retrospectively evaluated **Inclusion criteria**: - No deep vein thrombosis or bleeding - RASS -2 to +2 - PEEP <10 cmH2O - FiO2 <0.6 - SpO2 >90% - Respriratory rate <35/min **Exclusion criteria:** - Systolic blood pressure <90 mmHg or >200 mmHg - Mean arterial pressure >110 mmHg or <65 mmHg - Arrhythmia - Increment of dose of vasopressors **Total** **Per Branch** 99		Evaluate risk factors for safety events (adverse events) during mobility physical therapy	Patients acted as their own controls	No sample size calculation (retrospective study) **Endpoints:** - safety events - variables associated with potential safety event	**Incidence of safety events:** 26 SE of 520 mobilization sessions (5,0% CI 3,4-7,3%) in 17 of 99 patients (17,2% CI 10,6-26,4%) **After multivariate logistic regression analysis for safety events revealed:** ECMO was associated with SE during physical mobility therapy (OR 5,8 CI 2,2-15,6%)	4

RASS = Richmond agitation sedation scale; PEEP = positive endexpiratory pressure; FiO2 = oxygen fraction of the air; SpO2 = oxygen saturation of the blood; SE = safety events; CI = confidence interval; ECMO = extracorporeal membrane oxygenation; OR = odds ratio

Early mobility physical therapy performed by a newly established group was feasible, but ECMO was associated with SE during physical mobility therapy.

No detailed assessment was carried out because higher-quality evidence is available on this topic.

#439

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
439 Ota H 2015 (PMID: 25931747 DOI: 10.1589/jpts.27.859) **Specification of study:** Retrospective Cohort Descriptive	111 pts **Inclusion criteria:** - age ≥ 18 years admitted at ICU - performance status score of 0–2 - independent living at their home prior to hospitalization - duration of MV for > 48h - survival after MV **Exclusion criteria:** - cervical spine injury, neuromuscular diseases, or major burns		18(12/15 in EM group and 3/15 in control died, 3/18 missing medical records)	**EM program:** - passive and active limb exercise - relaxation of the muscles - deep breathing exercises - chest physiotherapy - elevation of the head up to 30–90 degrees - changing pts position from supine to up to a 135-degree lateral position	**Bed rest**	**Derived endpoints:** - delirium after weaning from MV - tracheostomy - duration of MV - hospital LOS after initiating MV - discharge disposition	**Significant difference between groups in:** - duration of MV, median 13 (IQR 7–22) in EM and 8 (IQR 6–12) in control, $p < 0.05$ - tracheostomy, 29/48 pts(60%) in EM and 23/60(38%) in control, $p<0.05$ - discharge disposition to home, 28/48 pts EM vs 18/60 pts control, $p<0.05$ **No significant difference between groups in:** - delirium incidents, 13(27%) EM vs 17(28%) control - hospital LOS, median 56days(IQR 38-85) EM vs 58 days(IQR 36-78) control group	4
	Per Branch							
	48	60						

EM = early mobilisation, ICU = intensive care unit, IQR = interquartile range, LOS = length of stay, MV = mechanical ventilation, pts = patients

Early mobilisation program resulted in an improved rate of discharge to home among survivors after mechanical ventilation.

#440

Reference, Study Type	Cases and Controls (Participant #, characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
440 Ko Y 2015 DOI: 10.1097/MAT.0000000000000239 **Specification of study:** Retrospective Case Series Descriptive	**Total** 8 pts. from May 2013 to December 2013 **Inclusion criteria:** - alert and cooperative patient - stable vital signs (MAP > 60mm Hg, respiratory rate less than 30 beats/minute, arterial oxygen saturation higher than 95%) - stable cannulation site **Exclusion criteria:** - coagulopathy - bleeding from cannulation site - use of vasopressor - open surgical wound - unstable ECMO flow **Per Branch** 8	Not specified	**Mobilization during ECMO**: Daily assessment for early mobilization on ECMO by multi-disciplinary team	NA	No sample size calculation through study design **Outcomes:** -safety events during PT -PT interruptions due to unstable vital signs	**Results:** - no clinically significant adverse event in patients - Three sessions (5%) were stopped due to tachycardia (n = 1) and tachypnea (n = 2).	4

Pts.=patients; MAP=mean arterial pressure; ECMO=extracorporeal membrane oxygenation; PT=physiotherapy

It is feasible and safe to perform PT and mobilization for patients on ECMO in an experienced ECMO center.

No detailed assessment was carried out because higher-quality evidence is available on this topic.

#443

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
443 Kayambu 2015 (PMID: 25851383 DOI: 10.1007/s00134-015-3763-8) **Specification of study:** RCT; Single center	50 pts **Inclusion criteria:** - ≥ 18 years admitted to ICU - MV ≥48 h - diagnosed with sepsis, severe sepsis, or septic shock **Exclusion criteria:** - head injuries - burns - spinal injuries - multiple fractured lower limbs, - with septic shock but unresponsive to maximal treatment - moribund or had an expected mortality within 48 h		8 at discharge (4 died, 4 had delirium) for primary endpoint ACIF + 20 (16 death, 3 non-contactable, 1 readmitted) for SF-36	**Early targeted physical rehabilitation:** -**electrical stimulation, active and passive range of motion, sitting, transfer, ambulation** - 30 min, 1 or 2 times daily until discharge - within 48h of diagnosis	**Standard of care:** physical therapy strategies	**Primary endpoint:** - physical function via ACIF - QOL via SF-36 at 6 months post discharge **Secondary outcomes:** - PFIT - muscle strength via MRC muscle score - anxiety on discharge - duration of MV - ventilator-free days - ICU and hospital LOS - ICU readmission - ICU and 90-day mortality and resuscitation status **Power analysis:** A sample size of 35 per group (total 70) was calculated with an effect size of 0.7 and 90 % power with a type 1 error rate of 0.05 and 0.025 with Bonferroni adjustment	**Primary endpoints:** - physical function, ACIF final scores (61.1 ± 33.1 vs. 55.0 ± 24.4, p = 0.45) and mobility scores (39.8 ± 38.2 vs. 34.5 ± 27.1, p = 0.67) - exercise group QOL improvement in the domains of physical function (81.8 ± 22.2 vs. 60.0 ± 29.4 in control, p = 0.04) and physical role (61.4 ± 43.8 vs. 17.1 ± 34.4 in control, p = 0.005) **Secondary outcomes:** - duration of MV (p=0.22), - ventilator-free days (p=0.71), - ICU and hospital LOS (p=0.43 and p = 0.80), - ICU readmission (p=0.13), - ICU and 90-day mortality (p=0.34 and p=0.08 respectively), - resuscitation status (p=0.15), - MRC scores (p=0.24), - PFIT scores (p=0.61)	2 → 3 small pilot RCT
	Per Branch							
	26	24						

ACIF = acute care index of function, h = hours, ICU = intensive care unit, LOS = length of stay, MRC = medical research council, MV = mechanical ventilation, PFIT = physical functional ICU test, pts = patients, QOL = quality of life, RCT = randomized controlled trial

Early ICU exercise can moderate the detrimental effects of sepsis.

#447

Reference, Study Type	Cases and Controls (Participant #, characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
447 Hodgson 2015 PMID: 25715872 DOI: 10.1186/s13054-015-0765-4 **Specification of study:** Prospective Multi-centre Cohort study	**Total** 192 pts. Between August 2012 and March 2013 **Inclusion criteria:** -independently able to mobilize prior to the current hospital admission. -in the ICU <72 hours -receiving invasive ventilation for >24 hour, expected to stay invasively ventilated for at least the next 48 hours. **Exclusion criteria:** -age <18 years -proven or suspected neurological Impairment -inability to communicate in English -cognitive impairment prior to the ICU admission - unstable fractures or any other injury that would require specific medical bed rest orders -ICU admission for palliative care or proven or suspected primary myopathic or neurological process associated with prolonged weakness or ICU readmission **Per Branch** 192		Early mobilization		**Extracted endpoints:** -mobilization during invasive ventilation -Sedation RASS -Duration of MV -Co-interventions -ICU acquired weakness -Mortality 90 days 6 month -functional recovery	**Results:** -Mortality at day 90 was 26.6% (51/192) -no mobilization occurred in 1,079 (84%) -maximum levels of mobilization were exercises in bed (N = 94, 7%), standing at the bed side (N = 11, 0.9%) or walking (N = 26, 2%) -at ICU discharge and 48 (52%) had ICU-acquired weakness -MRC-SS score was higher in those patients who mobilized while mechanically ventilated (50.0 ± 11.2 versus 42.0 ± 10.8, P = 0.003) -survived to ICU discharge but who had died by day 90 had a mean MRC score of 28.9 ± 13.2 compared with 44.9 ± 11.4 for day-90 survivors (P <0.0001)	3

Pts. = patients; ICU=intensive care unit; RASS=Richmond Agitation and Sedation Scale; MV=mechanical ventilation

More than 50% of patients discharged from the ICU had developed ICU-acquired weakness, which was associated with death between ICU discharge and day-90.

No detailed assessment was carried out because higher-quality evidence is available on this topic.

#448

Reference, Study Type	Cases and Controls (Participant #, characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
448 Miyamoto 2014 PMID: 25705410 https://doi.org/10.1186/s40560-014-0052-5 Specification of study: Retrospective monocenter study	ICU patients of a tertiary care hospital with respiratory failure → 15 pts. **Inclusion criteria:** - PP > 40 hours - Pts. With respiratory failure **Exclusion criteria:** - PP < 40 hours		Extended duration PP (> 40 hours)		**Extracted Endpoint:** -PaO2/FiO2 ratio	**Results:** - PP improved the PaO2/FiO2 ratio (mean ± SD): a. baseline vs. 8h: 193.8 ± 70.1 vs. 274.7 ± 70.7 mmHg (p = 0.02) b. baseline vs. 16 h: 193.8 ± 70.1 vs. 294.1 ± 78.0 mmHg (p = 0.23)	4
	Per Branch						
	15						

Pts = patients, ICU = intensive care unit, PP = prone positioning, PaO2 = partial pressure of oxygen, FiO2 = fraction of inspired oxygen

Extended duration-prone positioning resulted in a progressive improvement of oxygenation during the first 8 hours of treatment exclusively.

No detailed assessment was carried out because higher-quality evidence is available on this topic.

#449

Reference, Study Type	Cases and Controls (Participant #, characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
449 Rand 2015 PMID: 25701643 https://doi.org/10.1016/j.apmr.2015.02.008 **Specification of study:** single center before-after cohort study	NICU pts with ICH and SAH → 361 pts **Inclusion criteria:** - ≥ 18 years - pts from a primary stroke center with hemorrhagic stroke according to International Classification of Diseases, Ninth Revision, Clinical Modification diagnosis codes			**Daily mobility intervention** based on patient's LOF	**standard of Care**	**Endpoints:** - LOF before and after introduction of a mobility intervention in NICU - variables associated with higher functional outcomes - similarities among pts achieving a LOF of 5 at discharge No power analysis	**Primary Endpoints:** - LOF before and after introduction of a mobility intervention in NICU: Pts with hemorrhagic stroke had a 2.3-fold increase in LOF > 5 at discharge - variables associated with higher functional outcome (according to a MLRM including NICU LOS as a covariate [OR; 95% CI]): a. the intervention (5.28; 2.52-11.06) b. LOF of 5 at admission (6.02; 1.45 – 24.96) c. SAH stroke type (3.78; 1.83 – 7.80) d. third (vs. lowest) quartile of NICU LOS (2.94; 1.16 – 7.47) e. absence of aphasia and/or hemiplegia (17.77; 6.59 – 47.92)	4
	Per Branch							
	180	181						

Pts = patients, LOF = level of function, NICU = Neurointensive care unit, ICH = intra-cerebral hemorrhage, MLRM = multivariable logistic regression model; CI = confidence interval, SAH = subarachnoid hemorrhage, OR = odds ratio, LOS = length of stay

Evidence-based mobility intervention can improve outcomes for patients with hemorrhagic stroke and is feasible in any intensive care setting.
No detailed assessment was carried out because higher-quality evidence is available on this topic.

#450

Reference, Study Type	Cases and Controls (Participant #, Characteristics) Total	Recommendations	Evidence Grade
450 Sommers 2015 PMID: 25681407 DOI: 10.1177/0269215514567156 **Specification of study**: National Guideline	**Definition of early mobilization**		1 → 5 (outdated)

#456

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
456 Mora-Arteaga 2015 (PMID: 25599942 DOI: 10.1016/j.medin.2014.11.003) **Specification of Study:** Systematic Review	7 RCT (2.119 pts.)[1-7] **Inclusion criteria:** - patients over 16 years - meeting the diagnostic criteria for ARDS - compared results between ventilation in the prone position versus the supine position - evaluated mortality **Exclusion criteria:** - pediatric population (under 16 years of age) - studies in animals - used airway pressure release ventilation (APRV), high-frequency oscillation ventilation (HFOV) or inhaled nitric oxide		**PP**	**SP**	**Outcomes:** - mortality after maximum follow-up - stay in intensive care (days) - days on mechanical ventilation - adverse effects and complications - severity of ARDS (Berlin classification) - daily duration of pronation - start of pronation and duration of ARDS - tidal volume used	**Significant differences between groups in:** - subgroup mortality in pts. ventilated with low tidal volume (OR: 0.58; 95%CI: 0.38-0.87 p = 0.009, I2 33%), - prolonged pronation (OR: 0.6; 95%CI: 0.43-0.83; p = 0.002, I2 27%), - start within the first 48 h of disease evolution (OR 0.49; 95%CI 0.35-0.68; p = 0.0001, I2 0%) - severe hypoxemia (OR: 0.51: 95%CI: 0.36-1.25; p = 0.0001, I2 0%). **No significant differences between groups in:** - overall mortality: (OR: 0.76; 95%CI:0.54-1.06; *p* = 0.11, *I*2 63%)	2
	Per Branch						

ARDS = acute respiratory distress syndrome, APRV = airway pressure release ventilation, HFOV = high-frequency oscillation ventilation, PP = prone position, pts = Patients, SP = supine position

Prone position ventilation is a safe strategy and reduces mortality in patients with severely impaired oxygenation. It should be started early, for prolonged periods, and should be associated with a protective ventilation strategy.

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#458

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
458 Schallom 2015 (PMID: 25554555 DOI: 10.4037/ajcc2015781) **Specification of study:** Cross-over RCT	- 15 ICU pts **Inclusion criteria:** - confirmed gastric location of feeding tube - ventilated per endotracheal tube - at least 18 years old - approval to randomize pts to 45º - anticipated MV and tube feeding duration of 48 hours		4 pts (extubated early and had partial data included in the analysis)	**HOB** -elevated at 30º for 12h on day 1 -at 45º for 12h on day 2	**HOB** - elevated at 45º on day 1 -elevated at 30º on day 2	**Primary outcomes:** - reflux - aspiration - pressure ulcers	**Primary outcomes** - overall mean HOB angle and the % of pepsin-positive oral secretions for each HOB assignment demonstrated a significant negative correlation (t = -0.536, p = 0.008 at 30º and t = -0.433, p = 0.03 at 45º) - no significant difference in aspiration/pepsin positive tracheal secretion (p = 0.37) - no pts developed a pressure ulcer	4 .
	Per Branch							
	15							

HOB = head of bed elevation, ICU = intensive care unit, pts = patients, RCT = randomized controlled trial

HOB angle seems to have a benefit in relation to aspirations.

#459

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
459 Hannemann 2015 (PMID: 25554551 DOI: 10.4037/ajcc2015171) **Specification of study:** Pilot RCT	16 pts randomly selected from 2 hospitals (1 medical, 1 medical-surgical ICU) **Inclusion criteria:** - ≥ 18 y - MV ≤ 8 h **Exclusion criteria:** - pulmonary mass, pneumothorax, hemothorax, pleural effusion, or other potential source of compression atelectasis - systolic bp < 90 mmHg with vasopressor support - injuries requiring immobilization - head injury requiring intracranial pressure monitoring - Intubation within the preceding 2 weeks - weight ≥ 159 kg **Study duration till** - Day 7 or - discontinuation of MV or - death or - transfer from study unit or - consent revoked **Follow up until ICU discharge**		1 (intervention group): death before start of intervention	**CLRT:** Triadyne Proventa bed - rotation angle 45° in the lateral positions Head elevation ≥ 30° (At beginning of protocol) - acclimation mode: gradual increase in the degree of rotation over several hours from 25° to the maximum lateral angle)	**Standard of care:** - manual turning every 2 hours (back to left to back to right) at least 45° head elevation ≥ 30°	**Sample size calculation:** - None for pilot study. **Primary endpoint:** - incidence and progression or resolution of PPCs by serial chest Xrays **Secondary outcomes**: - turning-related AEs - duration of MV - ICU LOS - ICU mortality	**Primary endpoint:** PPCs: no significant difference (p = 0.16, no effect size) **Secondary endpoints:** - AEs (n.s.) - found no statistically significant differences between groups in turning-related adverse events, duration of MV, ICU LOS or ICU mortality - MV duration 6.0 ± 5.0 vs. 5.2 ± 4.3 days - ICU LOS 11.1 [IQR 5.4-23.4] vs. 8.2 [IQR 3.6-14.9] days - ICU mortality 25% vs. 29% **Posthoc power analysis:** a sample size of 54 patients (27 per group) necessary to detect an effect on PPCs with 80% power and an α of 0.05	2 → 3 (pilot RCT)
	Per Branch							
	7	8						

AEs = adverse events, bp = blood pressure, CLRT = continuous lateral rotation therapy, ICU = intensive care unit, IQR = interquartile range, LOS = length of stay, MV = mechanical ventilation, PPCs = preventable pulmonary complications (e.g., atelectasis or pneumonia)

CLRT showed no benefit compared to standard of care. 54 pts would be necessary to detect an effect on PPC with 80% power.

#460

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
460 Klein 2015 (PMID: 25517476 DOI: 10.1097/CCM.0000000000000787) **Specification of study:** prospective cohort study	637 pts **Inclusion criteria:** - admitted to the NICU during the pre- and postintervention 4-month data collection periods **Exclusion criteria:** - admitted diagnosis for something other than a neurologic event or condition - non-English speaking - confusion, combativeness, - chronic psychiatric condition - expiration or discharge from the hospital prior to being approached			**Early progressive mobilisation** - 16 mobility levels - initiated on day of admission	**Standard of Care** - no early mobilization (Pre-EM)	**Primary endpoint:** - daily mobility levels **Secondary outcomes:** - hospital and NICU LOS - 30-day mortality - discharge disposition - VAP - blood stream infection - DVT - HAPUs - anxiety - depression/hostility **Power analysis:** 300 pts (150 per study phase) would provide 80% power to detect a decrease in mean LOS of at least 30% (assuming LOS was distributed log-normally with a coefficient of variation of 1.25 and that a significance level of 0.05)	**Significant differences between groups in:** - higher mobility levels in intervention ($p < 0.001$) - LOS of hospital and NICU stay for pts in the EM group were reduced by 33% and 45% respectively (both $p < 0.001$) - prevalence of blood stream infection was reduced by 3% ($p = 0.015$) -prevalence of HAPU was reduced by 2.7% ($p = 0.026$) - EM pts had lower anxiety scores ($p = 0.029$) **No significant differences between groups in:** - 30-day mortality (p = 0.12) - VAP (p=0.11) - DVT (p=0.12) - depression (p=0.055) - hostility (p=0.18)	3
	Per Branch							
	377	260						

DVT = deep vein thrombosis, EM = early mobilization, HAPU = hospital-acquired pressure ulcer, ICU = intensive care unit, LOS = length of stay, NICU = neurologic ICU, pts = patients, VAP = ventilator-associated pneumonia

An early progressive mobility protocol increased patients' highest level of mobility and decreased hospital and NICU LOS, but did not affect psychological profile.

#461

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Recommendations	Evidence Grade
	Total		
461 Hodgson 2014 PMID: 25475522 DOI: 10.1186/s13054-014-0658-y **Specification of study**: National Guideline	Number of publications not stated **Inclusion criteria:** - adults -mechanically ventilated, intensive care unit patients **Definition of categories** **Safety parameters for mobilization categories:** 1.respiratory 2.cardiovascular 3.neurological 4.other		1 → 5 (outdated)

#465

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
465 Burke 2016 (PMID: 25353646 DOI: 10.1111/crj.12234) **Specification of study:** Systematic Review + Meta-Analysis	12 publications (11 RCT, 1 case control)[1-12] **Inclusion criteria:** - adult ICU pts - ≥ 18 years of age **Exclusion criteria:** - cadaveric studies - cardiac pacing - spinal cord stimulation - phrenic nerve stimulation - stable pts. not requiring ICU admission - incomplete data			**Percutaneous neuromuscular electrical stimulation**	**Usual care**	**Outcomes:** - muscle bulk - muscle strength with MRC - cardiovascular fitness - independence from MV - activity limitations	**Significant differences between groups in:** - MRC, MD: 95%CI): 0.93 (0.51 – 1.35) P-value: < 0.0001 - three RCTs supported NMES to preserve muscle strength using a fixed-effects model [n = 146; standardised mean difference 0.93 (0.51, 1.35) P = 0.0002]	2
	Per Branch							

ICU = intensive care unit, MRC = medical research council, MV = mechanical ventilation, RCT = randomized controlled trial

Neuromuscular electrical stimulation increased muscle strength in a meta-analysis including 3 out of 12 studies.

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#467

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
295 McWilliams, 2015 (PMID: 25316527 DOI: 10.1016/j.jcrc.2014.09.018) **Specification of study:** quality improvement project	582 pts **Inclusion criteria**: - invasively ventilated for at least 5 days **Exclusion criteria:** - significant neurologic injury - orthopedic injury with contraindication to mobilize - significant burn - poor preadmission mobility levels (<10 yards) reported by the pts family on admission			New supportive rehabilitation team was created, with a focus on promoting early and enhanced rehabilitation for patients at high risk for prolonged ICU and hospital LOS	Previous 12 month without new care team	**Primary endpoints:** - mobility level at ICU discharge (MMS) - mean ICU LOS - post-ICU LOS - ventilator days - in-hospital mortality	**Significant differences between groups in:** - significant increase in mobility at ICU discharge - ICU LOS (16.9 vs 14.4 days, P=0.007) - ventilator days (11.7 vs 9.3 days, p <0.05) - total hospital LOS (35.3 vs 30.1 days, p < 0.001) - in-hospital mortality (39% vs 28%, p<0.05)	4
	Per Branch							
	N=292	N=290						

ICU= intensive care unit, LOS = length of stay

The implementation of a new rehabilitation team with focus on early and enhanced rehabilitation was associated with significant reduction of mortality, ICU and hospital LOS and increase of mobility at discharge.

#468

Reference, Study Type	Cases and Controls (Participant #, Characteristics) Total	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
468 Kho 2015 (PMID: 25307979 DOI: 10.1016/j.jcrc.2014.09.014) **Specification of study:** RCT	36 pts **Inclusion criteria:** - ≥ 18 years of age - MV for ≥ 1 day - expected to remain in the ICU ≥ 2 days **Exclusion criteria:** - BMI ≥ 35 kg/m2 - moribund status - ICU LOS > 7 days before enrolment - > 4 days of continuous MV before enrolment - known intracranial process - primary systemic neuromuscular disease - unable to speak English - baseline cognitive impairment before ICU admission - conditions preventing NMES or primary outcome evaluation - unable to transfer independently from bed to chair before ICU admission - implanted cardiac pacemaker or defibrillator - limitation in core other than no cardiopulmonary resuscitation - pregnancy - suspected malignancy in the legs	n = 2 interventional pts (due to new information regarding presence of an exclusion criteria)	**NMES:** 60 minutes per day	**Sham stimulation**	**Primary endpoint:** lower extremity muscle strength via MRC **Secondary outcomes:** - muscle strength via MRC - dynamometry of the M. quadriceps, tibialis anterior und gastrocnemius - HGS - MIP - FSS for ICU - MWD - duration of MV - ICU LOS - hospital LOS - ICU randomisation - hospital mortality - total hospital charges - survivors' hospital discharge disposition - iADLs	**Primary endpoints:** lower extremity MRC, [mean (SD)] at hospital discharge: intervention 28 (2) vs control 27 (3), p = 0.072 **Secondary outcomes:** - lower extremity MRC, [mean (SD)] at o first awakening: intervention 23 (6) vs. control 25 (5), p = 0.271 o ICU discharge, [mean (SD)]: intervention 27 (23) vs. control 25 (4), p = 0.139 - increase in first awakening to ICU discharge [mean (SD)]: iitervention 5.3 (5.9) vs. control 0.8 (3.8); p-value: 0.047 - increase in first awakening to hospital discharge [mean (SD)]: intervention 5.7 (5.1) vs. control 1.8 (2.7), p-value: 0.019 - overall MRC at o first awakening: intervention [mean (SD)]: 42 (10) vs. control 45 (11), p-value: 0.374 o ICU discharge [mean (SD)]: intervention 49 (6) vs. control 48 (8), p-value: 0.982 o hospital discharge [mean (SD)]: intervention 53 (4) vs. control 50 (7), p-value: 0.141 - dynamometry M. tibialis anterior (kg) at o first awakening [mean (SD)]: intervention 18 (11) vs. control 16 (9), p-value: 0.874 o ICU discharge [mean (SD)]: intervention 21 (10) vs. control 19 (9), p-value: 0.627 o hospital discharge [mean (SD)]: intervention 20 (8) vs. control 19 (16), p-value: 0.909 - dynamometry M. gastrocnemius (kg) at o first awakening [mean (SD)]: intervention 25 (16) vs. control 32 (12), p-value: 0.309 o ICU discharge [mean (SD)]: intervention 31 (17) vs. control 39 (10), p-value: 0.272 o hospital discharge [mean (SD)]: intervention 36 (17) vs. control 31 (14), p-value: 0.473 - dynamometry M. quadriceps femoris (kg) at o first awakening [mean (SD)]: intervention 23 (11) vs. control 23 (12), p-value: 0.982 o ICU discharge [mean (SD)] intervention –28 (14) vs. control 33 (14), p-value: 0.458 o hospital discharge [mean (SD)]: intervention 33 (14) vs. control 30 (16), p-value: 0.649 - HGS (% predicted/kg) at: o first awakening [mean (SD)]: intervention 28/7.5 (28/7.5) vs. control 39/10.5 (43/10.0), p-value: 0.472/421 o ICU discharge [mean (SD)]: intervention –34/9.4 (26/7.2) vs. control 41/11.5 (42/9.4), p-value: 0.616/0.522 o hospital discharge [mean (SD)]: intervention 46/12.7 (25/6.4) vs. control 4012.7 (28/9.0), p-value: 0.565/0.998 - MIP (% predicted) at: o first awakening [mean (SD)]: intervention 43 (NA) vs. control 37 (12), p-value: 0.756 o ICU discharge [mean (SD)]: intervention 61 (16) vs. control 51 (37), p-value: 0.688	3

	Per Branch							
	Control n = 18	Intervention n = 16						

BMI = body mass index, FSS = functional status score, HGS = hand grip strength, iADL = independent activities of daily living, ICU = intensive care unit, LOS = length of stay, MIP = maximum inspiratory pressure, MRC = medical research council, MV = mechanical ventilation, MWD = maximum walking distance, NMES = neuromuscular electrical stimulation, pts = patients

Neuromuscular electrical stimulation did not improve leg strength at ICU discharge.

#469

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
469 Dirks 2015 (PMID: 25296344 DOI: 10.1042/CS20140447) **Specification of study:** RCT – intraindividual design	9 pts **Inclusion criteria:** -ICU pts **Exclusion criteria:** - <18 or >80 years of age - not expected to undergo complete sedation - suffering from spinal cord injury - recent arterial surgery on the legs - local wounds that prohibit the application of NMES - chronic use of corticosteroids - intake of certain anti-thrombotic drugs - presence of an implantable cardioverter-defibrillator (ICD) and/or pacemaker - expected sedation time estimated by the responsible physician was <3 days		3 pts (33,3%) because of early awakening (after <3 study days) and death	NMES	Usual care	**Primary endpoint:** - MFCSA difference between first and second measurement)	**Primary endpoint:** MFCSA- Type I (μm^2), mean (SD): - control pre/post: 4560 ± 261 / 3879 ± 484, $p < 0.05$ - intervention pre/post: 4414 ± 441 / 4512 ± 550, p-value: n.s MFCSA- Type II (μm^2), mean (SD): - control pre/post: 3412 ± 530 / 2647 ± 51, $p < 0.05$ - intervention pre/post: 3168 ± 607 / 3246 ± 590, p-value n.s	4
	Per Branch							

ICD = implantable cardioverter-defibrillator, ICU = intensive care unit, MFCSA = muscle fiber cross sectional area, NMES = neuromuscular electrical stimulation, n.s = not significant, pts = patients, SD = standard deviation

Neuromuscular electrical stimulation did not increase MFCSA.

#474

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
474 Dong 2014 (PMID: 25215147 DOI: 10.5847/wjem.j.issn.1920-8642.2014.01.008) **Specification of study:** RCT	60 pts admitted to the ICU **Inclusion criteria:** - ventilated for 48-72h - >18y, expected MV ≥1 week - clear consciousness - cardiovascular stability - respiratory stability - no unstable fracture **Exclusion criteria**: - inability to do activities independently - rapid development of neuromuscular disease, and irreversible disorders, -an estimated 6-month mortality > 50% - increased intracranial pressure - absent limbs - preadmission glucocorticoids >20 days (prednisone >20 mg/d) - ICU admission after cardiopulmonary resuscitation - tumor radiotherapy and chemotherapy within 6 months - acute myocardial infarction or unstable ischemia within 3 weeks.			**Early rehabilitation**: - until hospital discharge - heading up actively, transferring from SP to sitting position at the edge of the bed or sitting in chair, and from sitting to standing, and walking bedside - 2x daily - intensity was adjusted according to the condition of the pts	**Standard of care**	**Primary endpoint:** - not defined (feasibility study) **Derived endpoints**: - duration of MV in days - ICU LOS in days - APACHE II Score - hospital mortality No power analysis (feasibility study)	**Significant difference between groups in:** - duration of MV, 5.6±2.1 intervention vs 7.3±2.8 control, p = 0.005 - ICU LOS, 12.7±4.1 intervention vs 15.2±4.5 control, p = 0.01 **No significant difference between groups in:** - APACHE II Score (10.0±3.1 interventions vs 10.0±3.2 control, p = 0.50) - hospital mortality (2 pts (6.7%) intervention vs 3 pts (10%) control, p = 1.0)	2
	Per Branch							
	30	30						

APACHE II = acute physiology and chronic health evaluation, ICU = intensive care unit, LOS = length of stay, MV = mechanical ventilation, pts = patient

Early rehabilitation therapy reduces the duration of mechanical ventilation and the length of stay in the ICU.

#478

Reference, Study Type	Cases and Controls (Participant #, characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
478 Wang 2014 PMID: 25069952 https://doi.org/10.1186/cc14001 **Specifiation of study:** Prospective cohort study	Pts. requiring CVVH, 35 pts. included (40 planned) **Exclusion control (passive mobilization):** - RASS +3 or +4 - HR >160 or <40 beats/min or new arrhythmia - Limb movement restricted for reasons other than the presence of the vascular catheter **Exclusion low- and high-level mobilization:** - MAD <60 mmHg or >120 mmHg - >10 µg/min noradrenaline (or equivalent) - Fraction of inspired oxygen >0.6 and/or partial pressure of oxygen <65 mmHg - SpO2 <85% or drop >10% from resting level - Respiratory rate >35 breaths/min - Temperature >38.5°C - Drowsy, unable to follow commands - New-onset chest pain with suspected cardiac cause		1 (permanent dialysis access)	**Mobilization group:** 1. Low-level 2. High-level	**Baseline Pts.:** -passive mobilization	No sample size calculation à Convenience sample of 40 Pts. **Primary endpoints:** -AE **Secondary endpoints:** -Filter life (duration, subgroup) -Intervention feasibility (measured by filter alarm rates, pressures (access, return, transmembrane), blood flow recorded each minute from the digital output screen)	**Primary results:** -No AEs occurred **Secondary results:** -Intervention filters lasted longer than nonintervention filters (regression coefficient = 13.8, robust 95% confidence interval (CI) = 5.0 to 22.6, P = 0.003). -femoral filter subgroup (regression coefficient = 15.7, robust 95% CI = 4.6 to 26.7, P = 0.008), but not in the nonfemoral access filter subgroup (regression coefficient = 9.2, robust 95% CI = −6.0 to 24.4, P = 0.20) (Figure 2). -Feasibility: ○ 61% of the time no filter alarm ○ No differences in pressures in the first and final phases of the interventions	3
	Per Branch							
	15 low-level group 8 high-level group	11						

Pts. = patients; CVVH = continuous veno-venous hemofiltration; AE = adverse events; CI = confidence interval; RASS= Richmond Agitation–Sedation Scale; HR=heart rate; MAD= Mean arterial blood pressure

Mobilization during renal replacement therapy via a vascular catheter in patients who are critically ill is safe and may increase filter life.
No detailed assessment was carried out because higher-quality evidence is available on this topic.

#479

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
479 Wageck 2014 (PMID: 25060511 DOI: 10.1016/j.medin.2013.12.003) **Specification of study:** Systematic review with metaanalysis	9 randomized and quasi-randomized controlled trials, 274 pts [1-9], 2 trials included in meta-analysis **Inclusion criteria:** - randomized and quasi-randomized controlled - non-invasive NMES applied to lower and/or upper limbs - critical pts in ICU **Exclusion criteria:** - < 18 years of age - NMES < 48h			NMES	Not specified	**Primary outcomes:** - muscle strength - muscle structure **Secondary outcomes:** - ICU LOS - duration of mechanical ventilation - complications from immobilization and bed rest	**Primary outcomes:** - meta-analysis on the effects of NMES on quadriceps femoris strength showed effect of NMES in MRC Scale (standardized mean difference 0.77 points; p = 0.02; 95% CI: 0.13-1.40) **Mixed results for muscle structure** -3 studies: no difference; - Gerovasili et al: smaller decrease in diameter for the NMES group for all muscles, except left rectus femoris (−0.13 ± 0.10 cm vs −0.19 ± 0.16 cm, respectively; *p* = 0.07) - Bouletreau et al: smaller elimination during NMES application only for creatinine (79.2 ± 25 **µ**mol/kg/day vs 92.4 ± 6.8 **µ**mol/kg/day, respectively; *p* < 0.01) and 3-methyl histidine (3.15 ± 0.32 **µ** mol/kg/day 3.78 ± 0.37 **µ**mol/kg/day, respectively; *p* < 0.01) **Secondary outcomes:** -ICU LOS and ventilation: Rousti et al: no difference between groups for average time in ICU and average time in MV - Rousti et al.: better performance for the weaning period in NMES group when (median 1 day, range 0-10 vs 3 days, range 0-44, respectively; *p* = 0.003) - Rousti et al: shorter period between extubation until ICU discharge (days off MV) for the NMES group (median 4 days, range 0-16 vs 6 days, range 0-41, respectively; *p* = 0.003) **Complications:** Velmhos et al.: higher venous flow velocity for NMES group in superficial femoral left vein (21 ± 6 cm/min vs 16 ± 5 cm/min, respectively; *p* = 0.02) and in the left popliteal vein (22 ± 10 cm/min vs 15 ± 9 cm/min, respectively; *p* = 0.03; - Rousti et al.: development of critical illness polyneuropathy between groups and found an odds ratio = 0.22 (95% CI = 0.05-0.92; *p* = 0.04) in favor of the NMES	1 → 2 (downgraded as n=2 studies included in metaanalysis)
	Per Branch							
	Intervention group (n=135)	Control group (n =139)						

LOS = length of stay, MRC = medical research council, NMES= neuromuscular electrical stimulation, pts = patients

NMES has good results when used for the maintenance of muscle mass and strength.

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#480

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
480 Roth 2014 (PMID: 24985500 DOI: 10.1007/s12028-014-0004-x) **Specification of study:** A retrospective analysis	29 pts **Inclusion:** - severe intracranial pathologies - documented kinetic therapy due to respiratory failure **Exclusion criteria:** - < 18 years - MV in pressure-controlled mode			**PP**	**SP**	**Endpoints:** -ICP -CPP -PEEP -pCO2 -P/F ratio -MAP **No sample size calculation**	**Significant differences between groups:** - mean ICP baseline in SP 9.5 ± 5.9 mmHg (range 0–40 mmHg), increased during PP to 15.4 ± 6.2 (range 0–40 mmHg) ($p < 0.0001$) - MAP decreased from 72.6 ± 17.5 mmHg in SP to 64.7 ± 17.5 mmHg in PP ($p < 0.001$) - pCO2 increased In PP (during and after PP) - PaO2/FiO2 ratio increased In PP (during and after PP) - ICP values >20 mmHg occur more often in PP (17.9 %, n = 145/831) compared to SP (4 %, n = 28/703, $p < 0.0001$) - more often episodes of decreased CPP in PP (24.4 %, n = 203/831) vs SP (17.9 %, n = 126/703, p = 0.0022) **No significant difference between the groups:** - CPP in SP (82 ± 14.5 mmHg, range 37–137 mmHg) or PP (80.1 ± 14.1 mmHg, range 37– 118 mmHg) (p = 0.0591) - PEEP not significant	4
	Per Branch							

CPP = cerebral perfusion pressure, ICP = intracranical pressure, MAP = mean arterial pressure, MV = mechanical ventilated, PEEP = positive end expiratory pressure, PP = prone position, pts = patients, SP = supine position

A significant elevation of ICP during prone positioning is shown and an achieved benefit for oxygenation by far exceeded the changes in ICP.

#485

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
485 Parry 2014 (PMID: 24768534 DOI: 10.1016/j.jcrc.2014.03.017) **Specification of study:** interventional observational study	16 pts **Inclusion criteria:** - 18 years or older - diagnosis of sepsis or severe sepsis - predicted to MV < 48 hours -expected to remain in ICU ≥ 4 days **Exclusion criteria:** - presence of an external fixator, pacemaker or defibrillator - open wound or skin abrasions - obesity, BMI > 40 - physician deemed the pts to be approaching imminent death			**Usual care + FES-cycling** - within 96h of admission - daily until ICU discharge - min 20 min - max 60 min/d - 5x/week	**Usual care** - early mobility activities: sitting on the edge of bed, sitting out of bed, standing, marching in place and walking to a maximum of 15min/d	**Primary endpoints**: Feasibility of FES cycling defined as: - time from ICU admission to 1st training session - total number of sessions - % of total potential sessions completed and reasons not completed - number of sessions with muscle contractions **Safety, defined as:** - recording variability in cardiovascular + respiratory bedside parameters - behavioral pain score / VAS **Secondary outcomes:** - PFIT-s scored on awakening - time to reach functional milestones - incidence and duration of delirium	**Primary endpoints:** - time from recruitment to 1st intervention session: 15.3 (12.0-31.5) h - cycling sessions conducted 8.6 (SD 2.5) - 69 sessions out of 95 (73%) - one minor adverse event - greatest difference between min and max values recorded observed with HR with variation of 20-40 bpm - RR/HR: values at start (5 min prior to exercise) and 30 min post similar - FES-cycling session time 35.8± 10.7 min, quadriceps intensity of 67.0±29.6 mA - visible quadriceps muscle contraction 49/69 sessions (71%); palpable (not visible) contraction 6/69(9%) **Secondary outcome:** - fewer required rehabilitation in intervention group (43%) compared to control group (86%) p=0.5 - duration of delirium significantly shorter in intervention group (p=0.042)	3
	Per Branch							
	8	8						

BMI = body mass index, bpm = beats per minute, FES = functional electrical stimulation, HR = heart rate, ICU = intensive care unit, MV = mechanical ventilated, PFIT = physical function in intensive care test-scored on awakening, pts = patients, SD = standard deviation, VAS = visibal analoge scala

FES-Cycling seems to be safe and feasible, but the sample size is too small regarding functional outcomes and frequency and duration of delirium

#490

Reference, Study Type	Cases and Controls (Participant #, characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
490 Kim 2014 PMID: 24567696 https://doi.org/10.1589/jpts.26.149 **Specification of study:** A prospective multicenter study	NSICU pts of a tertiary hospital with <u>acute stroke</u> → 37 pts **Inclusion criteria:** -below G3 in a muscle strength test -no existing conditions that would disrupt medical treatment -no Amputations -no disfigurements -no external wounds -no other deformations with regard to upper extremities			**Early bilateral passive ROM exercise** - Twice a day - Five days per week - Four weeks	**Standard of care** (participance in bilateral passive ROM exercise two weeks after diagnosis)	No primary endpoint defined **Extracted endpoints:** - Function of upper extremities - ADLs	**Results:** - <u>function of upper extremities:</u> a. edema (baseline, two weeks, four weeks; mean ± SD; mm) 1. affected finger: a. intervention (73.3 ± 6.9, 69.2 ± 6.8, 65.9 ± 6.7) vs. control (73.7 ± 6.3, 77.6 ± 6.6, 77.9 ± 7.0), p = 0.001 b. difference in change between groups at four weeks significant, p = 0.002 2. affected wrist: a. intervention (171.6 ± 12.6, 167.4 ± 12.4, 163.7 ± 11.6) vs. control (173.8 ± 15.2, 180.5 ± 13.4, 180.5 ± 12.7), p = 0.022 b. difference in change between groups at four weeks significant, p = 0.016 3. affected elbow: a. intervention (250.7 ± 23.2, 242.5 ± 22.0, 235.7 ± 19.8) vs. control (256.1 ± 29.4, 262.2 ± 26.5, 263.1 ± 28.0), p = 0.001 b. difference in change between groups at four weeks significant, p = 0.037 4. unaffected finger: intervention (69.8 ± 7.7, 66.5 ± 7.0, 64.0 ± 7.0) vs. control (71.7 ± 5.8, 70.3 ± 4.9, 67.8 ± 5.1), p = 0.001 5. unaffected wrist: intervention (167.2 ± 12.9, 164.2 ± 12.7, 161.2 ± 12.4) vs. control (169.8 ± 12.1, 169.0 ± 10.2, 165.6 ± 9.4), p = 0.001 6. unaffected elbow: intervention (245.3 ± 21.0, 239.1 ± 21.3, 233.8 ± 19.5) vs. control (253.3 ± 27.4, 249.5 ± 25.6, 244.9 ± 24.8), p = 0.001 b. ROM of affected shoulder (baseline, two weeks, four weeks; mean ± SD, °) 1. Flexion: a. intervention (n = 19; 114.1 ± 13.0, 116.7 ± 12.8, 119.0 ± 12.6) vs. control (n = 18; 109.1 ± 20.2, 109.8 ± 20.7, 111.1 ± 21.1); non-significant differences b. difference in change between groups at four weeks significant, p = 0.001 2. Extension: a. intervention (n = 19; 25.2 ± 5.2, 27.1 ± 4.9, 29.5 ± 5.3) vs. control (n = 18; 31.2 ± 4.7, 31.3 ± 4.7, 31.9 ± 4.8), p = 0.007 b. difference in change between groups at four weeks significant, p = 0.001 3. Abduction: a. intervention (n = 19; 94.2 ± 12.0, 96.3 ± 12.1, 98.4 ± 12.5) vs. control (n = 18; 92.7 ± 13.0, 93.0 ± 13.1, 94.2 ± 13.4); non-significant differences b. difference in change between groups at four weeks significant, p = 0.001 4. Internal rotation: a. intervention (n = 19; 51.3 ± 19.8, 53.8 ± 19.5, 55.6 ± 19.6) vs. control (n = 18; 57.7 ± 14.8, 46.7 ± 25.3, 48.6 ± 25.5); non-significant differences b. difference in change between groups at four weeks significant, p = 0.001 5. External rotation: a. intervention (n = 19; 44.8 ± 24.9, 46.7 ± 25.3, 48.6 ± 25.5) vs. control (n = 18; 35.0 ± 18.2, 35.4 ± 18.3, 36.0 ± 18.3); non-significant differences b. difference in change between groups at four weeks significant, p = 0.001 c. ROM of affected elbow (baseline, two weeks, four weeks; mean ± SD, °) 1. Flexion: a. intervention (n = 19; 95.2 ± 35.3, 97.7 ± 35.3, 99.3 ± 35.1) vs. control (n = 18; 103.6 ± 16.7, 104.0 ± 16.9, 105.4 ± 16.8); non-significant differences b. difference in change between groups at four weeks significant, p = 0.001 2. Supination:	3 → 4
	Per Branch							
	25 experimental	26 control						

							a. intervention (n = 19; 46.4 ± 28.2, 48.5 ± 28.7, 50.2 ± 28.5) vs. control (n = 18; 49.0 ± 18.9, 49.5 ± 19.1, 49.8 ± 19.0) b. difference in change between groups at four weeks significant, p = 0.001 3. Pronation: a. intervention (n = 19; 53.7 ± 16.1, 56.0 ± 16.0, 57.3 ± 15.7) vs. control (n = 18; 64.6 ± 11.7, 65.1 ± 11.7, 65.7 ± 11.7) b. difference in change between groups at four weeks significant, p = 0.001 d. ROM of affected wrist (baseline, two weeks, four weeks; mean ± SD, °) 1. Flexion: a. intervention (n = 19; 40.3 ± 7.4, 42.0 ± 7.3, 42.9 ± 7.0) vs. control (n = 18; 46.0 ± 3.6, 46.6 ± 3.6, 47.1 ± 3.7); non-significant differences b. difference in change between groups at four weeks significant, p = 0.016 2. Extension: intervention (n = 19; 36.7 ± 7.3, 38.6 ± 6.6, 40.1 ± 6.6) vs. control (n = 18; 37.0 ± 7.2, 37.5 ± 7.1, 38.0 ± 7.3), p = 0.007 3. Ulnar deviation: a. intervention (n = 19; 20.7 ± 5.0, 22.8 ± 4.5, 24.1 ± 4.2) vs. control (n = 18; 23.1 ± 2.3, 23.5 ± 2.1, 24.0 ± 2.5); non-significant differences b. difference in change between groups at four weeks significant, p = 0.001 4. Radial deviation: a. intervention (n = 19; 15.4 ± 5.8, 17.0 ± 5.3, 17.7 ± 5.2) vs. control (n = 18; 15.5 ± 3.8, 15.8 ± 3.7, 16.1 ± 3.8); non-significant differences b. difference in change between groups at four weeks significant, p = 0.001 - ADLs (two weeks to four weeks; points): Intervention (16.84 to 18.21) vs. control (12.50 to 12.67), p = 0.001	

NSICU= neurosciences intensive care unit, Pts = patients, ICU = intensive care unit, ROM = range of motion, ADLs = activities of daily living

Early passive range of motion exercise improves function of upper extremities and activities of daily living in patients with acute stroke.

#491

Reference, Study Type	Cases and Controls (Participant #, characteristics) Total	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
491 Sricharoenchai 2014 PMID: 24508202 https://doi.org/10.1016/j.jcrc.2013.12.012 **Specification of study:** Monocenter, prospective observational study	ICU patients from a tertiary hospital during July 2009 and December 2011 → 1787 pts **Inclusion criteria:** - ICU admission for at least 24 hours - Receiving physical therapy intervention **Per Branch**		**Physical therapy**		No sample size calculation stated **Endpoints:** - Number of physical therapy sessions - Incidence of abnormal events: a. cardiac arrhythmia, hypertension (mean arterial pressure greater than 140 mm Hg) b. hypotension (mean arterial pressure less than 55 mm Hg) c. desaturation (oxygen saturation less than 85% for more than 3 minutes) d. fall e. removal of medical device f. cardiorespiratory arrest - Number of events with consequences for the prevalence of additional treatments, cost, length of stay	- **Number of physical therapy sessions (n [%]):** 1110 pts (62%) participated in 5267 physical therapy sessions - **Incidence of abnormal events (n [%]):** 34 (0.6%) a. arrythmia: 10 (0.2%) b. hypertension: 8 (0.2%) c. hypotension: 5 (0.1%) d. no data for other abnormal events - **Number of events with consequences (n [%]):** 4 (0.1%)	3

Pts = patients, ICU = Intensive Care Unit

Physical therapy in critically ill patients seems safe.

No detailed assessment was carried out because higher-quality evidence is available on this topic.

#494

Reference, Study Type	Cases and Controls (Participant #, characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
494 Balas 2014 PMID: 24394627 https://doi.org/10.1097/ccm.0000000000000129 **Specification of study:** before-after cohort study	300 pts. from five adult ICUs, one step-down unit, and one oncology/hematology special care unit **Inclusion criteria:** ->19 years old with indication internal or surgical ICU **Exclusion criteria:** -no legal representative available within 48 hours post admission		4 (control/ ‚pre' group) withdrew from study	**Fixed protocol for early complex treatment:** ABCDE-bundle	**Standard of care**	No sample size calculation **Primary Endpoint:** -days without MV within 28 days **Secondary Endpoints:** -prevalence, duration and % of ICU pts with delirium or coma -mobilization rate -Mortality -number of discharges not home -adverse events	**Significant differences between groups in:** -days without MV, control median 21d [IQA 0 - 25] vs intervention median 24 d [IQA 7 - 26]; p = 0.04 -delirious pts: control 62.3% vs intervention 48.7%; p = 0.02 -delirium duration/d: - 17% (control 50% [IQA 30 - 64.3] vs intervention 33.3% [IQA 18.8 to 50]; p = 0.003), significance retained when adjusting for sex, co-morbidity APACHE II, age and MV -mobilization rate out of bed: control 48% vs intervention 66% within IICU time, p = 0.002 -pts mobilized according to fixed ABCDE-bundle protocol with significantly higher probability of mobilization for at least 1 unit out of bed 95% CI, 1.30-3.45, p = 0.003 -unadjusted mortality/illness in intervention (p = 0.04) **No significant differences between groups in:** -unadjusted mortality/ICU, p = 0.07 -mortality rate control 19.9% vs intervention 11.3% (OR 0.56, 95% CI 0.28-1.10; p = 0.09) -discharge rates -no adverse events	4
	Per Branch							
	150 'pre' group	150 'post' group						

Pts. = patients; ICU = Intensive Care Unit, MV = Mechanical Ventilation, APACHE II = Acute Physiology and Chronic Health Evaluation II

The ABCDE Bundle seems to reduce the duration of mechanical ventilation, delirium and mortality while also increasing the rate of mobilization out of bed.

#496

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
496 Lee 2014 (PMID: 24368348 DOI: 10.1097/CCM.0000000000000122) **Specification of study:** Meta-Analysis	**Total** 11 RCTs (2.246 pts)[1-11] **Inclusion criteria:** - adult patients - acute hypoxemic respiratory failure (PaO2/FIO2 ≤ 300 mm Hg), including acute lung injury (ALI) and ARDS - mechanical ventilatory support - randomly assigned patients to two or more groups, including prone or supine positioning, during ventilation - all-cause mortality was reported regardless of the timing of data collection **Exclusion criteria:** - pediatric patients - randomized crossover trials that assigned patients to both prone and supine groups **Per Branch** 1142 PP / 1104 SP		**PP**	**SP**	**Primary outcome:** - overall mortality at the longest available follow-up **Secondary outcome:** - mortality stratified to: 1. the duration of prone position 2. lung protective ventilation - adverse events	**Primary outcome:** - overall mortality: Prone position group (OR, 0.77; 95% CI, 0.59–0.99; p = 0.039, I = 33.7%) **Secondary outcome:** - duration of prone position: effect on mortality was not significant (p=0,130) - duration of prone ventilation more than 10 hr/session showed a significant reduction in overall mortality (p < 0.001) - prone positioning increased the risk of pressure ulcers (p=0.001)	1

ARDS = acute respiratory distress syndrome, pts = patients, PP = prone position, SP = supine position

Ventilation in the prone position significantly reduced overall mortality in patients with severe acute respiratory distress syndrome.

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#499

Reference, Study Type	Cases and Controls (Participant #, characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
499 Yosef-Brauner 2015 PMID: 24345055 DOI: 10.1111/crj.12091 **Specification of study:** a prospective, single-blinded study	1 center from June 2011 to February 2012 → 18 pts. **Inclusion criteria:** - over the age of 18 -independent before the current hospitalization -fully conscious and able to perform simple commands - MRC physical strength examination score lower than 48 points **Exclusion criteria:** -unconsciousness -central or peripheral neurological damage -hemodynamic instability (i.e., blood pressure >200 or <80 mmHg, heart rate <40 or >130 per minute) -arrhythmias -acute myocardial infarction -respiratory instability (i.e., O2 saturation <88%)		n/a	**Group I/ Routine Care group:** PT according to daily custom protocol	**Group II/ Intensive treatment group:** same protocol, twice a day	No sample size calculation stated No primary endpoint defined **Extracted Endpoints:** -MRC physical strength examination -MIP -hg dynamometer -SB -ICU LOS -ventilation time Performed at: T1(at baseline), T2(48-72h after), T3(ICU discharge)	**Significant differences between groups:** -improvement for MIP and MRC in the intensive treatment group II in Mean diff(SE) T2 – T1 (MIP: (−)6.5 (0.613) p=0.018; MRC: 8.333 (3.454) p=0.029) -decrease in the number of intensive care hospitalization days in favor of the intensive treatment group: LOS was 18.11 ± 3.1 days in group I vs 13 ± 4.6 days in group II (P = 0.043) -strong positive relationship between the MRC index and the SB (r = 0.673); between the MRC index and the right hg dynamometer test (r = 0.619) at T1 -strong negative correlation between the average changes in MRC in relation to average changes in MIP (r = −0.623) between T1 and T2 **No significant differences between groups in:** -no difference at baseline between groups in any endpoint -ventilation time in group II (9 ± 5 days) compared with group I (16.22 ± 2 days; P = 0.076) -no difference in percentage of pts who were able to walk during hospitalization in the ICU (P = 0.343)	2 → 3 (pilot RCT)
	Per Branch							
	9	9						

pts. = patients; MRC=Medical Research Council; PT=physical therapy; MIP= maximal inspiratory pressure; SB= sitting balance; LOS=Length of stay; hg=hand grip

It is possible that an intensive therapy protocol may facilitate the initial recovery process in patients who suffer from ICUAW.

#505

Reference, Study Type	Cases and Controls (Participant #, characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
505 Winkelman 2018 PMID: 29902939 https://doi.org/10.1177/1099800418780492 **Specification of study**: RCT	**Total** 55 pts. From December 2009 to December 2012 in two academic medical centers **Inclusion criteria:** - Pts. not enrolled in another study - received MV for 36 hr and expected to require 24 hr more of MV **Exclusion criteria:** - ICU LOS of 14 or more days prior to eligibility to enroll, - weight >350 lb - a history or acute diagnosis of neurological or orthopedic injury that precluded the ability to participate in volitional and progressive EM - new myocardial infarction - open fascia from abdominal or lower extremity surgery - end-stage or end-of-life or intensivist opinion that the individual was moribund - patients without a surrogate or with a surrogate who could not be contacted over a 2-day period. **Per Branch** 29 | 26	1 from the twice daily branch	**EM Group:** 1. Protocol based EM **twice** daily 2. Protocol based EM **once** daily	Pts. acted as their own control in a before after design	**Sample Size calculation**: it was estimated that a sample size of 50 would have .80 power to detect a .30 effect size with an alpha of .10 **Primary Endpoint:** - Change scores of Interleukins 6, 10, 8, 15, and TNF-α collected from serum before and after EM **Secondary outcomes**: - Manual muscle and handgrip strength - delirium onset - duration of MV - ICU LOS	**Primary Endpoint:** TNF-α level was significantly and negatively associated with frequency, however the CI includes 0 (-0.35 to 0.01) **Secondary endpoints:** -Only ICU LOS was "significantly" different between the groups (Once daily:18.76 + 14.47; Twice daily:13.40 + 7.97; P=0.06 (they choose 0.10 as significance level) -no difference in the other secondary endpoints	2

Pts = patients; MV = mechanical ventilation; hr = hour; ICU = intensive care unit; LOS = Length of stay; EM = early mobilization; CI = confidence interval; TNF= Tumor necrosis factor

Twice daily mobility interventions did not alter serum inflammatory markers.

#506

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
#506 **Hodgson 2016** PMID: 26968024 DOI: 10.1097/CCM.0000000000001643 **Specification of study:** multi-center, pilot-RCT	**Total** 50 pts **Inclusion criteria:** - invasively ventilated the day after tomorrow, - >18 years old **Exclusion criteria:** - second or subsequent ICU admission during a single hospital admission - unable to follow simple verbal commands in English - inevitable/imminent death - unable to walk without assistance prior to the ICU admission - diagnosed with dementia prior to current acute illness - had written rest in bed orders due to documented injury or process that precluded mobilization such as suspected or proven instability of spine or pelvis - severe acute brain injury - unsafe to commence mobility therapy - cardiovascular or respiratory instability **Per Branch** 29 | 21	13 pts: 8/29 (2 died in ICU, 4 lost to follow up, 2 declined at 6 months) and 5/21 (1 died in ICU, 2 lost to follow up, 2 declined)	**EGDM (IMS concept):** - active functional activities - start at the highest level of activity pts can sustain and works down to maximize activity	**Usual care**	**Primary endpoint:** - feasibility of intervention delivery (higher maximal level of activity measured via IMS, increased duration of activity measured with min/day) **Secondary outcomes:** - time from admission to randomization and from admission to mobilisation - duration of MV, ICU and hospital LOS, and total inpatient stay - serious AEs - ventilator-free days and ICU-free days on day 28 - physical function - ICU-acquired weakness at <48h after ICU discharge - follow up at 6 months: independent activities, return to work, health-related quality of life, healthcare utilization, hospital anxiety and depression **No power analysis** (pilot feasibility study)	**Primary endpoint:** - higher IMS in intervention vs control (mean IMS (95% CI) 7.3 (6.3–8.3) vs 5.9 (4.9–6.9), unadjusted p = 0.05 at ICU discharge, and after adjustment mean IMS (95% CI) for intervention 7.5 (6.5–8.5) vs control 5.6 (4.6–6.6), p = 0.01 - duration of activity was > in intervention, median 20min/d [IQR, 0–40] for EGDM vs 7min/d [IQR, 0–15] for control; p = 0.002 **Secondary outcomes:** - time from admission to randomization (3[2-6] intervention vs 3[2-4] control, p=0.5) - time from admission to mobilisation (time to stand: median [IQR], intervention 3.0 d [2.0–6.0 d] vs control group 3.0 d [2.4–4.5 d]; p = 0.88; time to walk: median [IQR], intervention 6.0 d [3.0–12.0 d] vs control group 6.0 d [3.0–8.0 d]; p = 0.97) - duration of MV: p=0.18 - ICU LOS: p=0.28 - hospital LOS: p=0.33 - total LOS: p=0.37 - ventilator-free days: p=0.4 - no differences in all outcomes at 6 months follow up	2 →3 Pilot RCT

AE = adverse effects, CI = confidence interval, EGDM = early goal-directed mobilization, ICU = intensive care unit, IMS = ICU mobility scale, IQR = interquartile range, LOS = length of stay, min = minute, MV = mechanical ventilation, pts = patients, RCT = randomized controlled trial

EGDM was feasible, safe and resulted in increased duration of active exercises and an increase in the mobility milestones achieved during ICU stay.

#507

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#507 **Machado 2017** PMID: 28538781 DOI: 10.1590/S1806-37562016000000170 **Specification of study:** RCT	49 pts from a single ICU **Inclusion criteria**: - ≥18 years - on MV - light level of sedation - hemodynamically stable **Exclusion criteria:** - palliative care - amputees - leg fractures - neuromuscular/neurological disease - ICU-AW - joint/musculoskeletal disorder		11 pts died: (4 Intervention, 7 control	**Passive cycling + conventional PT** 5 days a week (20 minutes, fixed 20 cycles/minute)	**Conventional PT:** - 2x a day for 30 minutes - 7 days a week	**Outcomes:** - peripheral muscle strength (MRC Score) - cardiovascular parameters (SpO2, HR, mean arterial pressure) - duration of sedation - time to first treatment - time to first muscle strength assessment	**Outcomes:** - peripheral muscle strength: intervention 38.73 ± 11.11 vs. 47.18 ± 8.75; control: 40.81 ± 7.68 vs. 45.00 ± 6.89, $p < 0.001$) - MRC score pre- and post-implementation periods: IG 8.45 ± 5.20 vs. GG 4.18 ± 2.63; $p = 0.005$) - MV, Hospital LOS, ICU LOS n.s.	2
	Per Branch							
	26	23						

CG = control group, ICU = intensive care unit, IG = intervention group, LOS = length of stay, MRC = medical research council, MV = mechanical ventilation, n.s = not significant, PT =physio therapy, pts = patients

The results suggest that the performance of continuous passive mobilization on a cyclical basis helps to recover peripheral muscle strength in ICU patients.

#508

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
#508 **Schaller 2016** PMID: 27707496 DOI: 10.1016/S0140-6736(16)31637-3 **Specification of study:** multicenter RCT	**Total** 200 pts **Inclusion criteria:** - SICU pts 18 years or older - MV<48h - expected to require MV>24 h - functionally independent 2 weeks before admission to SICU - Barthel Index score ≥ 70. **Exclusion criteria:** - hospital LOS >5 days before screening - motor component of GCS < 5 - irreversible disorder with a 6-month mortality >50% - raised ICP - cardiopulmonary arrest - unstable fractures contributing to probable immobility - acute MI - lower part of their legs missing - rapidly developing neuromuscluar disease - pregnant, or ruptured or leaking aortic aneurysm. **Per Branch** 104 / 96	7 / 104: (3 ineligible, 4 withdrew consent) Loss of follow up at 3 months: 57/104 and 52/96	**Early goal directed mobilization (SOMS concept)**	**Standard of care**	**Primary endpoints:** hierarchically tested - mean mobilization score (SOMS level) - SICU LOS - function: mmFIM at hospital discharge **Secondary outcomes:** - global muscle strength via MRC sum score - QoL at 3 months after hospital discharge **Tertiary outcomes**: daily high serum glucose concentrations, functional status at discharge, hospital LOS, in-hospital mortality, 3-month mortality, discharge disposition, ICU delirium-free days, ventilator-free days, ICU sedation-free days, neuromuscular blocking agent-free days, vasopressor- free days, mean daily morphine equivalent dose (mg), number of days receiving corticosteroids, and daily high serum sodium concentration (mmol/L) **Power analysis:** With the assumption of an 11% mortality rate, and an 11% attrition rate, it is estimated that enrolling 100 pts in each treatment group would result in a > 80% power to identify an inter-group difference with a two-sided α error of 0·05	**Primary endpoints:** - SOMS higher in intervention vs control (2.2 (1.0), 1.5 (0.8), p<0.0001) - ICU LOS shorter in intervention (7 (5-12) vs 10 (5-15), p=0.0054) - functionally independent at hospital discharge: 44 (51) intervention vs 25 (28) control, p = 0.0030. **Secondary outcomes:** - no significant difference between groups in QoL (p=0.69) and muscle weakness (0.95) **Tertiary outcomes:** Significant difference between groups in: - functional status at ICU discharge (p=0.009) - hospital LOS (p=0.011) - discharge disposition (p=0.0007) - ICU delirium-free days (p=0.016) **No significant difference between groups in:** - in-hospital mortality (p=0.09) - 3-months mortality (p=0.35) - daily high serum glucose (p=0.83) - ICU sedation-free days (p=0.38) - neuromuscular blocking drug-free days (p=0.38) - vasopressor-free days (p=0.12) - ventilator-free days (p=0.31) - mean daily morphine equivalent dose (p=0.62) - corticosteroid days (p=0.42) - daily high serum sodium (p=0.32)	2

GCS = Glasgow coma scale, ICP = intracranial pressure, LOS = length of stay, MI = myocardial infarction, MRC = medical research council, MV = mechanical ventilation, RCT = randomized controlled trial, SICU = surgical intensive care unit, SOMS = SICU optimal mobilization score

Early, goal-directed mobilization improved patient mobilization throughout SICU admission, shortened patient length of stay in the SICU, and improved patients' functional mobility at hospital discharge.

#509

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#509 **Amundadottir 2019** **PMID:** not available https://doi.org/10.1080/21679169.2019.1645880 **Specification of study:** RCT	50 pts **Inclusion criteria:** - 18-80 years - MV > 48h - ambulate independently before acute illness **Exclusion criteria:** - poor survival prognosis - admitted to the hospital >2 weeks prior to admission to the ICU - progressive upright mobilization contraindicated (prolonged hemodynamic instability, severe head injuries or substantial unstable fractures)			**Daily Intensive upright mobilization**: - IMS ≥ 3 - twice a day - initiated after 48h after start of MV	**Daily mobilization:** - 1x daily - commenced after 96h of MV	**Primary endpoints:** - MV duration - Hospital/ICU LOS **Secondary outcomes:** - health-related QoL via SF-36v2, at baseline, 3/6/12 months after ICU discharge. - physical function via 6MW, MRC-SS, and MBI (at baseline, ICU discharge, hospital discharge, 3/6/12 months after ICU discharge **Additional endpoints:** - hospital mortality - employment 12 months after ICU discharge **Sample size calculation:** based on Burtin et al. 36 pts necessary for 50 m in 6MWT with 80% power and α 0.05. Planned to include 120 pts.	**Primary endpoints:** - MV duration (median [IQR]), 8.8 days (6.4–19.3) in intervention vs 7.8 days (5.4–17.7) in control, p =0.89 - ICU LOS (median [IQR]), 12.4 days (8.4–19.6) in intervention vs 11.0 days (7.3–22.8) in control, p=0.86 - hospital LOS (median [IQR]), 36.9 days (21.5–55.7) in intervention vs 24.6 days (15.5–56.6) in control, p = 0.29 **Secondary outcomes:** - health-related QoL across time points n.s. (12 months SF36 PCS: p =1.0, 12 months SF36 MCS: p = 0.99) - functionality across time points n.s (6MWT 3 monts, 6months and 12 months: p = 1.0, MRC hospital discharge p = 0.9, MRC 12 months p = 1.0) - hospital mortality n.s.(6,6% vs. 4,8%) - employment n.s., p = 0.65	2 → 3 (downgrade; under-powered)
	Per Branch							
	29	21						

ICU = intensive care unit, LOS = length of stay, MBI = modified Barthel Index, MRC-SS = the medical research council sum-score, MSC = mental component score, MV = mechanical ventilation, PSC = physical component score, pts = patients, QoL = quality of life, RCT = randomized controlled trial, SF-36v2 = short-form 36 health survey version 2; 6MWT = six-minute walking test

There was no difference in short-term or long-term outcomes in the intensive twice-daily mobilization group.

#515

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
#515 **Higgins 2019** PMID: 31526602 DOI: 10.1016/j.injury.2019.09.007 **Specification of Study:** Systematic review and meta-analyses	9 publications (3 retrospective cohort, 2 prospective cohort, 2 prospective observational, 1 bidirectional case-control, 1retrospective control, 15 to 1132 pts)[1-9] **Inclusion criteria:** - adult trauma ICU pts - compared EM vs no/SOC - ≥ 1 relevant outcome (mortality, hospital LOS, ICU LOS, duration of MV) **Exclusion criteria:** - case series or reports - <18 years - EM delivered as part of a bundle intervention **Per Branch**		**EM:** - any mobilization in the ICU delivered earlier than intervention in standard care	**No mobilization or SOC**	**Derived endpoints:** - in-hospital mortality - hospital LOS - ICU LOS - MV duration	**Significant differences between groups in:** - MV duration, shorter in intervention: mean difference -1.18 days, 95% CI, -2.17 – -0.19, p =0.02, I^2 = 0% **No significant differences between groups in:** - hospital mortality - ICU LOS - hospital LOS Quality of studies and risk of bias: Only 1 study was judged as good quality with low risk of bias across the 3 domains of selection, comparability, and outcome.	1 → 3 (downgrade, heterogenity and small effect)

CI = confidence interval, EM = early mobilization, ICU = intensive care unit, LOS = length of stay, MV = mechanical ventilation, pts = patients, SOC = standard of care

The results of the meta-analysis showed a reduction in the duration of mechanical ventilation among patients who received EM, but no difference in mortality or LOS.

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#516

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop -out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
#516 **Akar 2017** PMID: 26597394 DOI: 10.1111/crj.12411 **Specification of study:** RCT	**Total** 30 pts **Inclusion criteria:** - intubated COPD pts (COPD stage C or D) - monitored ≥ 24 h on MV - no DVT - no comorbidities e.g. renal failure, congestive heart failure, cerebrovascular diseases, neuromuscular diseases, diabetes mellitus, malignancy **Exclusion criteria:** - monitored on MV < 24 h - discharged ≤ 48 h from the ICU - infection during the study - unconscious pts - DVT or pulmonary embolism - hemodynamically unstable pts **Per Branch** NMES + exercise: 10 pts NMES: 10 pts Exercise: 10 pts		3 Groups **NMES + exercise:** - NMES 5 days a week for a total of 20 sessions -active exercise training **NMES:** - NMES 5 days a week for a total of 20 sessions **Exercise:** - active exercise training		**Outcomes:** - MRC score - ICU LOS - MV duration - time to sit up assisted in bed - time to sit up unassisted in bed - time to sit up assisted at bedside - time to sit up unassisted at bedside - time to stand assisted - time to stand unassisted - time to move from bed to chair - ICU discharge	**Outcomes:** MRC score: - NMES + exercise (lower extremities, median [min -max]): before 3 [3-5], after 5 [4 -5], p = 0.014 - NMES + exercise (upper extremities, median [min-max]): before 4 [3- 5], after 5 [4-5], p = 0.038 - NMES (lower extremities, median [min-max]): before 4 [3-5], after 5 [4- 5], p = 0.046 - NMES (upper extremities, median [min-max]): before 4 [3-5], after 5 [3-5], p = 0.046 - exercise (lower extremities, median [min-max]): before 4 [3-5], after 5 [3-5], p = 0.084 - exercise (upper extremities, median [min-max]): before 4 [4-5], after 5 [4-5], p = 0.034 - ICU length of stay (days, median [min-max]): NMES + exercise 20 [5-31], NMES 4 [3-17], exercise 5 [5-15], p = 0.949 - duration of MV (days, median [min-max]): NMES + exercise 2 [1-3], NMES 2 [2-9], exercise 4 [2-17], p = 0.781 - time to sit up assisted in bed (mean ±SD): NMES + exercise 1.25 ± 0.5, NMES 3.33 ± 4.04, exercise 4.40 ± 3.91, p = 0.712 - time to sit up unassisted in bed (mean ± SD): NMES + exercise 1.5 ± 1.0, NMES 3.66 ± 4.61, exercise 6.80 ± 3.96, p = 0.500 - time to sit up assisted at bedside (mean ± SD): NMES + exercise 3.25 ± 2.21, NMES 4.00 ± 5.19, exercise 7.20 ± 4.94 , p = 0.402 - time to sit up unassisted at bedside (mean ± SD), NMES + exercise 3.75 ± 2.50, NMES 6.00 ± 4.35, exercise 7.60 ± 4.50, p = 0.304 - time to stand assisted (mean ± SD): NMES + exercise 4.25 ± 2.98, NMES 7.00 ± 4.35, exercise 11.00 ± 5.24, p = 0.671 - time to stand unassisted (mean ± SD): NMES + exercise 5.25 ± 2.62, NMES 8.00 ± 4.35, exercise 12.00 ± 5.61, p = 0.123 - time to move from bed to chair (mean ± SD): NMES + exercise 5.25 ± 2.62, NMES 8.33 ± 4.04, exercise 12.60 ± 6.30, p = 0.102 - ICU discharge (n (%): NMES + exercise 8 (80), NMES 8 (80), exercise 5 (50), p = 0.240	2 → 3 (methodological flaws)

COPD = chronic obstructive pulmonary disease, DVT = deep venous thrombosis, ICU = intensive care unit, LOS = length of stay, MRC = medical research council, MV= mechanical ventilation, NMES = neuromuscular electrical stimulation, pts = patients

Neuromuscular electrical stimulation could not show an effect on muscle strength or functional milestones.

#522

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#522 **Silva 2019** PMID: 31890221 DOI: 10.1186/s40560-019-0417-x **Specification of study:** RCT	60 pts **Inclusion criteria:** - 18-60y of age - MV ≤ 24h - traumatic brain injury **Exclusion criteria:** - history of alcoholism - HIV - chronic kidney failure - spinal cord injury - pregnancy - skin lesions in the region to be treated - unstable fractures in the vertebral column and lower limbs		20 pts: 10 interventions (death, extubation) 10 controls (death, extubation, IHT)	**NMES + Usual care:** - for 14 days	**Usual care:** - with PT 2x week	**Primary endpoints:** -muscle architecture -neuromuscular electrophysiological disorders -evoked peak force **Secondary outcomes:** -ICU LOS -hospital LOS -duration of MV -mortality	**Primary endpoints:** muscle thickness difference day 1 until day 14 M. tibialis anterior (mm) -interaction time x group: effective size = 0.35, p < 0.0001; control-mean (95%CI): -0.33 (-0.39 - -0.26), p < 0.0001 vs intervention – mean (95%CI): 0.01 (-0.069 – 0.08), p = 0.78 M. rectus femoris (mm): interaction time x group: effective size = 0.34; control – mean (95%CI): -0.49 (-0.58 - -0.4), p < 0.0001; intervention – mean (95%CI): -0.04 (-0.11 – 0.02), p = 0.15 Echogenicity difference day 7 until day 14 M. tibialis anterior: interaction time x group: effective size = 0.23, p < 0.0001 M. rectus femoris: interaction time x group: effective size = 0.24, p < 0.0001 chronaxie difference day 1 until day 14 M. tibialis anterior: interaction time x group: effective size = 0.22, p < 0.0001 M. rectus femoris: interaction time x group: effective size = 0.13, p < 0.0001 Incidence of neuromuscular electrophysiological disorders M. tibialis anterior: control: day 1 – n (%): 3 (10%), Day 14 – n(%): 14 (47%), p = 0.003; intervention: day 1 – n (%): 5 (17%), Day 14 – n(%): 0 (0%), p = 0.06; between group comparison day 14: RR (95%CI): 16 (2.9 – 88.9), p = 0.0001 M. rectus femoris: between group comparison day 14: control – n (%): 4 (13), intervention – n (%): 0 (0), RR (95%CI): 16 (2.9 – 88.9), p = 0.0001; evoked peak force (kg/F) difference day 1 until day 14; -interaction time x group: ηp2 = 0.55, p < 0.0001; control – mean difference (95%CI): -1.55 (-2.05 - -1.05), p < 0.0001 vs intervention – mean difference (95%CI): 2.34 (1.89 – 2.79), p < 0.0001; between group difference day 7: p < 0.0001 **Secondary Outcomes:** - duration of MV (days): control – median [IQR]: 15.5 [8.8 – 19.9] vs intervention – median [IQR]: 14.0 [8.0 – 18.0], p = 0.65 - ICU LOS: control – median [IQR]: 19.5 [12.0 – 27.3] vs. intervention – median [IQR]: 19.0 [10.0 – 26.0], p = 0.58 - Hospital LOS: control – median [IQR]: 42.0 [20.0 – 56.0] vs -intervention – median [IQR]: 34.0 [15.0 – 41.2], p = 0.06 - Mortality ICU: control – n (%): 3 (10%) vs. intervention – n (%): 5 (17), p = 0.71	2 → 3 (risk of bias)
	Per Branch							
	30	30						

ICU = intensive care unit, IHT = inter-hospital transfers, LOS = length of stay, MV = mechanical ventilation, NMES = neuromuscular electrical stimulation, PT = physiotherapy

#523

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#523 **Moss 2016** PMID: 26651376 DOI: 10.1164/rccm.201505-1039OC **Specification of study:** RCT	120 ICU pts **Inclusion criteria:** - at least 4d on MV - older than 18y **Exclusion criteria:** - physical impairment - cognitive impairment - cardiopulmonary risk - lived >45 miles from hospital - unlikely to survive after 6 months - patient/doctor declined			**Mobilisation:** - intensified PT until d28 **Inpatient:** - 7d/week - 30 min in ICU - up to 60 min. on normal ward Outpatient/ home: - 3d/week **5 components of intensive PT:** - techniques for proper breathing during exercise - progressive ROM - therapeutic exercises focusing on muscle strengthening - exercises to improve core mobility and strength - functional mobility retraining, including bed mobility, transfers, gait, balance.	**SOC:** -until d28 **Inpatients:** -3d/week **Outpatients:** -information only ROM exercises, positioning and functional movement training. As soon as possible, assistance with ADL (transfers to bed or chair and walking)	**Primary endpoint:** - CS-PFP-10 after 1 month **Secondary Outcomes:** - CU- and hospital-free days on d28 - discharge home - morbidity on d28 - days without institutionalization on d90 and 180 (def. as living, not in hospital, AHB, long-term care or similar) **Power analysis**: enrollment of 120 pts could detect a difference of 12.3 points between the group mean CS-PFP-10 score at 1 month with a significance level (α) of 0.05 and a power of 80% using a two-sided	**Primary endpoint:** - CS-PFP-10 scores at 1, 3 and 6 months: p = 0.73, p = 0.29, p = 0.43 - total CS-PFP-10 score trajectory: p = 0.71 **Secondary outcome:** - mortality: 17%, 10/ 59 intensive PT vs. 10%, 6/61 SOC, p = 0.25 - d without ITS on day 28: p = 0.69 - d without hospital on d28: p = 0.97 - discharge home: p = 0.84	2 → 3 (high risk of bias)
	Per Branch							
	59	61						

CS-PFP-10 = continuous scale physical, functional performance test short form, d = day, ICU = intensive care unit, MV = mechanical ventilation, pts = patients, RCT = randomized controlled trial, ROM = range of motion, SOC = standard of care

Intensified physical therapy does not improve the functional outcome measured by the CS-PFP-10.

#524

Reference, Study Type	Cases and Controls (Participant #, characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
524 Gillespie 2020 PMID: 32484259 https://doi.org/10.1002/14651858.CD009958.pub3 Specification of study: Systematic review and meta-analysis	8 publications until February 2019 (8 RCTs, n = 3941 pts) [1-8] **Inclusion criteria:** - RCTs or cluster RCTs - Adults without existing PI in any healthcare or long-term care setting - Assessment of effects of repositioning regimes - Measurement of PI incidence **Per Branch**		Repositioning regimes	Standard of care	**Primary outcome:** - Cumulative incidence of PI **Secondary outcome:** - health-related quality of life - procedural pain - patient satisfaction - costs	**Significant differences between groups:** - Cumulative incidence of PI: a. 3-hourly vs. 4-hourly repositioning frequency: reduction of incidence might be associated with 3-hourly repositioning (RR 0.20, 95% CI 0.04 – 0.92), low certainty of evidence; (n = 1 RCT with 407 pts[1]) b. 4-hourly vs. 6-hourly repositioning frequency: 27% reduction of incidence associated with 4-hourly repositioning (RR 0.73, 95% CI 0.53 – 1.02 %), very low certainty of evidence; (n = 1 RCT with 129 pts[2]) c. 2-hourly repositioning frequency using a 20° tilt vs. standard of care: reduction of incidence associated with 2-hourly repositioning (RR 0.28, 95% CI 0.10 – 0.75), very low certainty of evidence; (n = 1 RCT with 1312 pts[6]) **Non-significant differences between groups:** - Cumulative incidence of PI: d. 2-hourly vs. 3-hourly repositioning frequency: due to high heterogeneity (I^2 = 77%) *data was not pooled*; no clear differences were found (n = 2 RCTs with 1229 pts)[1,2] e. 2-hourly vs. 4-hourly repositioning frequency: fixed-effect-model; I^2 = 45%, pooled RR 1.06, 95% CI 0.80 – 1.41, no clear difference in incidence of PI, very low certainty of evidence (n = 3 RCTs with 1074 pts)[1,2,4] f. 30° vs. 90° tilt: random-effect-model; I^2 = 69%, pooled RR 0.62, 95% CI 0.10 – 3.97, very low certainty of evidence, no clear difference in the incidence of stage 1 or 2 PI; (n = 2 RCTs with 259 pts)[5,7] g. 30° HOB elevation vs. 45° HOB elevation vs. standard of care: no PI occurred, low certainty of evidence; (n = 1 RCT with 120 pts[3]) h. prone positioning vs. supine positioning: increase of incidence of PI stage 1 associated with prone positioning, low certainty of evidence; (n = 1 RCT with 116 pts[8]) - health-related quality of life, procedural pain, patient satisfaction not reported in the publications - costs: a. Comparing 2-hourly repositioning regimen with 3-/4-hourly regimens a cost reduction of 11.05, 16.74 CAD per resident per day resulted, respectively (n = 1 RCT[1]) b. Comparing 30° tilt 3-hourly repositioning regimen with 90° tilt 6-hourly repositioning regimen for 588 individuals, who were completely immobile or had very limited mobility an annual cost difference of 512800€, equivalent to 21462 hours of nursing time resulted; mean nurse time cost per patient 206.6 € vs. "53.1 €, incremental difference -46.5€, 95% CI -1.25 to -74.6€; (n = 1 RCT[5])	1 → 3 (high uncertainty)

Pts = patients, RCTs = randomized controlled trials, PI = pressure injury, RR = risk ratio, CI = confidence interval, CAD = Canadian Dollar, HOB = head of bed

The effectiveness of repositioning frequency and positioning for PI prevention remains unclear due to low certainty levels of evidence.

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#526

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#526 **Hermans 2014** PMID: 24477672 DOI: 10.1002/14651858.CD006832.pub3 **Specification of study:** Systematic Review and Meta-analysis	1 publication[1] **Inclusion criteria:** - RCTs in humans - ≥ 18 years of age - any treatment used to prevent or reduce the incidence of CIP or CIM as a primary or secondary outcome **Exclusion criteria:** - not stated			**NMES**	**Usual care**	**Primary endpoint:** incidence of CIP or CIM **Secondary outcomes:** duration of MV ICU LOS death on 30- and 180-days	**Primary endpoint:** incidence of CIP/CIM - 0.81 RR (95%CI) 0.94 (0.78 – 1.15), p = 0.56 **Secondary outcomes:** no significant differences between groups in: - duration of MV - ICU LOS - death on 30- and 180-days	1 → 2 (only 1 study included)
	Per Branch							

CIM = critical illness myopathy, CIP = critical illness polyneuropathy, ICU = intensive care unit, LOS = length of stay, MV = mechanical ventilation, NMES = neuromuscular electrical stimulation, RCT = randomized controlled trial

NMES does not significantly reduce the incidence of CIP/CIM compared to usual care.

#527

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
#527 **Herling 2018** PMID: 30484283 DOI: 10.1002/14651858.CD009783.pub2 **Specification of study:** Systematic review with meta analysis	12 RCTs, 3.885 pts only 1 study with physical therapy as intervention (n=65)[1] **Inclusion criteria:** - RCTs - adult patients in internal medicine or surgical ICU - any intervention to prevent delirium/ICU - control via standard of care, placebo or both - search period: 1980-2018 **No exclusion criteria defined**		**Prevention of immobilization**	Not defined	**Primary outcomes:** - event rate of delirium in ICU (CAM-ICU positive) - in-hospital mortality **Secondary outcomes:** - number of delirium- and coma-free days - ventilator-free days - ICU-LOS - MMSE - AEs of interventions	**Primary outcome:** - event rate of delirium: not reported - In-hospital mortality: RR 0.94, 95% CI 0.40 to 2.20; p = 0.88, n = 65 **Secondary outcomes:** - number of delirium- and coma-free days: MD -2.77, 95% CI -10.09 to 4.55; p = 0.46, n = 65 - ventilator-free days: median days 25.3 versus 27.4; p = 0.81, n = 65 - ICU-LOS: MD 1.23, 95% CI -0.68 to 3.14; p = 0.21, n = 65 - MMSE: MD 0.97, 95% CI-0.19 to 2.13; p = 0.10, n = 30 - AEs: no calculations	1 → 4 (only 1 study with PT)
	Per Branch						

AE = adverse event, ICU = intensive care unit, LOS = length of stay, MMSE = mini mental state examination, PT = physical therapy, RCT = randomized controlled trial

PT does not seem to reduce in-hospital mortality

References

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#1001

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
1001 Abroug 2008 (PMID: 18350271 DOI: 10.1007/s00134-008-1062-3) **Specification of study:** Meta-Analysis	6 RCTs to November 2007 **Inclusion criteria:** - adults with ARDS or ALI **Exclusion criteria**: - non-controlled studies - studies that only examined the physiological effects of prone positioning		**Ventilation in prone position** whatever its duration, on a 24-h basis, and during the ICU stay	**Conventional ventilation in supine position**	**Primary endpoint**: - mortality in the ICU or at 28 days **Secondary outcomes:** - effect on $PaPO_2/FiO_2$ ratio - rate of VAP - procedure-related major airway complication - ICU LOS	**Significant differences between groups in:** - $PaPO_2/FiO_2$ by 25mmHg; 95% CI 15–35, p for effect <0.00001, p for heterogeneity = 0.06, I2= 56% **No significant differences between groups in:** - mortality [249 of 713 pts (34.9%) in the prone ventilation group versus 234 of 659 pts (35.5%) in the supine position]: OR 0.97, 95% CI 0.77–1.22, p for effect = 0.79, p for heterogeneity = 0.35; I2= 9.3% - rate of VAP: n.s. - complications: n.s. - ICU LOS: n.s.	1 → 2 (downgrade)
	Per Branch						

ALI = acute lung injury, ARDS = acute respiratory distress syndrome, ICU LOS = intensive care unit length of stay, pts = patients, RCT = randomized controlled trial, VAP = ventilator-associated pneumonia

Prone positioning has no significant effect on the mortality of critical ill patients but seems to improve the $PaPO_2/FiO_2$ ratio.

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#1002

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
1002 Abroug 2011 (PMID: 21211010 DOI: 10.1186/cc9403) **Specification of study:** Meta-Analysis	7 RCTs to March 2010 [1-7] (n = 1675 pts) Inclusion criteria: - RCTs - mechanical ventilation in prone versus supine positioning - adults with acute respiratory failure, ALI, or ARDS		**Prone positioning** (7-24h/day) while on mechanical ventilation	Mechanical ventilation in **supine position**	**Primary endpoints:** - ICU-mortality - adverse effects	**Significant differences between groups in:** - ICU- mortality in pts. with ARDS (n=540): (OR = 0.71; 95% CI = 0.5 to 0.99; P= 0.048; NNT= 11; I_2= 0%) **Non-significant differences between groups in**: - ICU-mortality overall: non-significant 9% reduction (OR = 0.91, 95% CI= 0.75 to 1.1; P= 0.39; I_2= 0%) - adverse effects: n.s. OR = 1.16; 95%CI = 0.75 to 1.78; P= 0.5	1
	Per Branch						

ALI = acute lung injury, ARDS = acute respiratory distress syndrome, ARI = acute respiratory failure, ICU = intensive care unit, NNT = number needed to treat, RCT = randomized controlled trial

Prone positioning has no significant effect on the mortality of respiratory patients overall but significantly reduces mortality in ARDS patients.

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#1004

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
1004 Alsaghir 2008 (PMID: 18216609 DOI: 10.1097/01.CCM.0000299739.98236.05) **Specification of study:** Meta-analysis	**Total** 5 RCTs including 1316 pts[1-5] **Inclusion criteria:** - adults - MV - ICU pts - comparison of PP vs. SP - report of at least one of the following outcomes: mortality, improvement in oxygenation, number of days receiving MV, incidence of VAP **Exclusion criteria:** - not stated **Per Branch**		**Prone positioning:** sessions of ≥ 6h (n=4) or single sessions of PP (n=1)	**Supine positioning** (n=4) or SP in combination with high-frequency ventilation (n=1)	- mortality - changes in PaO2/FiO2 - total ventilator days - incidence of VAP	**Significant differences between groups in:** - post-hoc analysis: mortality for patients with SAPS II of > 50 o mortality at 10 days: PP vs. SP 19.4% vs. 28.5% (RR, 0.4; 95% CI, 0.19-0.85) - changes in PaO2/FiO2: o early stage (12 hours to 2 days) (n=4): WMD of 51.5 (95% CI, 6.95–96.05) o intermediate stage (day 4) (n=3): WMD of 43.87 (95%CI, 13.86 –73.88) o late stage (day 7-10) (n=4): WMD of 24.89 (95% CI, 15.3–34.48) **Non-significant differences between groups in:** - ICU-mortality (n=3): PP vs. SP (pooled OR, 0.79; 95% CI, 0.45–1.39) - 28d - 30d-mortality (n=3): pooled OR, 0.95; 95% CI, 0.71–1.28 - 90d-mortality (n=4): pooled OR, 0.99; 95%CI, 0.77–1.27 - total ventilator days (n=2) - incidence of VAP (n=3)	1

MV = mechanical ventilation, PP = prone positioning, pts = patients, RCT = randomized controlled trial, SP = supine positioning, VAP = ventilator-associated pneumonia, WMD = weighted mean difference

PP has a significant positive effect on mortality and early as well as late-stage oxygenation but does not reduce the number of ventilator days or the rate of VAP.

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#1006

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
1006 Niël-Weise 2011 PMID: 21481251 https://doi.org/10.1186/cc10135 **Specification of study:** Systematic Review with meta-analysis	3 RCTs (337 pts)[1-3] **Inclusion criteria:** - RCTs and quasi randomized trials - published as full papers - stated outcomes - sufficient data to calculate the risks in both the treatment and the control group		**Semi-upright positioning** 45° bed head elevation	25°, 10°, or 0° elevations	**Primary endpoints:** - clinically suspected and microbiologically confirmed VAP **Secondary outcomes:** - mortality - venous thromboembolism - hemodynamic instability - duration of mechanical ventilation - ICU LOS - decubitus - ulcers - patient comfort and safety	**Primary outcomes:** - it was uncertain whether a 45° bed head elevation was effective or harmful with regard to the occurrence of clinically suspected or microbiologically confirmed VAP (test of overall effect clinical: Z=1.62; p=0.10; microbiology: Z=0.71,p=0.48) **Secondary outcomes:** - it was unknown whether 45° elevation for 24h a day increased the risk for thromboembolism or hemodynamic instability - uncertain whether a 45° bed head elevation was effective or harmful with regard to the occurrence of decubitus and mortality (test for overall effect: Z=0.58,p=0.56) -not indicated: ICU LOS, duration of mechanical ventilation, ulcers, patient comfort, and safety	1 → 3 (not only RCTs, heterogenity, indirectness)
	Per Branch						

ICU = intensive care unit, LOS = length of stay, pts = patients, RCT = randomized controlled trial, VAP = ventilator associated pneumonia

Experts prefer elevated position in ventilated patients, even though this study could not show clinical benefits.

References

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#1013

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
1013 Beitler 2014 (PMID: 24435203 DOI: 10.1007/s00134-013-3194-3) **Specification of study:** Meta-Analysis	7 RCTs including 2.119 adults **Inclusion criteria:** - adults meeting the Berlin definition of ARDS **Exclusion criteria:** - review for non-conventional ventilation in the control arm - non-randomized design			**Prone positioning:** -daily dose of prone positioning ranged from 6 to >20 h/day	**Supine positioning**	**Endpoints:** - risk ratio of death at 60 days - ICU mortality + other duration of MV	**Significant differences between groups in:** - decrease in mean baseline tidal volume of 1 ml/kg PBW was associated with a decrease in risk ratio of death at 60 days by 16.7 % (95 % CI 6.1–28.3; p = 0.001) - prone positioning: decrease in risk ratio of death using low tidal volumes (RR = 0.66; 95 % CI 0.50–0.86; p = 0.002)	1
	Per Branch							
	1088	1031						

ARDS = acute respiratory distress syndrome, ICU = intensive care unit, MV = mechanical ventilation, PBW = predicted body weight, PP = prone positioning, RCT = randomized controlled trial, SP = supine positioning, TV = tidal volume

Prone positioning reduces 60-day mortality in patients receiving low tidal volume but not in those receiving high tidal volumes.

References

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7. Guérin C, Reignier J, Richard J-C, et al. Prone positioning in severe acute respiratory distress syndrome. N Engl J Med. 2013; 368:2159–2168. [PubMed: 23688302]

#1016

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
1016 Gócze 2013 (PMID: 23622019 DOI: 10.1186/cc12694) **Specification of study:** prospective randomized multivariable analysis	**Total** 202 pts **Inclusion criteria:** - hemodynamically stable - MV - 18 years or older - central venous catheter situated in the superior vena cava **Exclusion criteria:** - acute cardiovascular instability - pump-driven circulatory or respiratory support - supine position contraindicated (e.g. pts with traumatic brain injury) - immobilized due to spinal injuries or unstable pelvic fractures **Per Branch** 200	2 pts from 202 (severe hypotension requiring volume and inotropic resuscitation)	sequence of HBE positions (0°, 30°, and 45°) was adopted in random order	pts acted as their own controls	**Primary endpoints:** - effect of head of bed elevation (HBE) on hemodynamic status - factors that influence MAP and central venous oxygen saturation (ScvO2) when pts were positioned at 0°, 30°, and 45°	**Primary endpoints:** - changing HBE from supine to 45° caused significant reductions in MAP (from 83.8 mmHg to 71.1 mmHg, P < 0.001) and ScvO2 (76.1% to 74.3%, P < 0.001) - mode and duration of mechanical ventilation (p= <0.001), the norepinephrine dose (p=0.005), and HBE (p= <0.001) had statistically significant influences - PCV was the most influential risk factor for hypotension when HBE was 45° (odds ratio (OR) 2.33, 95% confidence interval (CI), 1.23 to 4.76, P = 0.017)	3

HBE = head of bed elevation, MAP = mean arterial pressure, MV = mechanical ventilation, PCV = pressure-controlled ventilation, pts = patients

HBE is associated with decrease in MAP and ScvO2 in mechanically ventilated patients.

#1021

Reference, Study Type	Cases and Controls (Participant #, characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
1021 Chiumello 2012 PMID: 22187085 DOI: 10.1007/s00134-011-2445-4 **Specification of study:** Observational prospective study	5 centers → 26 pts. **Inclusion criteria:** -pts with ARDS enrolled in a randomized multicenter trial (PSII study) **Exclusion criteria:** -not stated		n/a	**PP**	**SP**	No sample size calculation No primary endpoint defined **Extracted Endpoints:** -long-term pulmonary function -quality of life (HRQL; SF-36)	**Results:** -Pulmonary function in the normal range without any differences between the two groups - Quantitative lung CT scan analysis (PP vs. SP): similar amounts for not aerated (8.1 ± 3.2% versus 7.3 ± 3.4%), poorly aerated (15.3 ± 3.6% versus 17.1 ± 4.9%), and well-aerated (64.0% ± 8.4 versus 70.2 ± 8.4%) lung regions overaerated lung region was slightly higher in the PP (12.5 ± 6.5% versus 5.3 ± 5.5%) -no difference in quality of life stated	4 (downgraded from 3)
	Per Branch							
	13	13						

pts. = patients; ARDS = acute respiratory distress syndrome; PP = prone position; SP = supine position; HRQL = health-related quality of life; SF-36 = short-form-36; CT = computer tomography

No differences in pulmonary function or quality of life were observed in this small group of ARDS survivor patients treated in PP vs. SP.

No detailed assessment was carried out because higher-quality evidence is available on this topic.

#1025

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
1025 Keeley, 2007 (PMID: 17983363 DOI: 10.1111/j.1478-5153.2007.00247.x) **Specification of study:** RCT	**Total** 30 patients **Inclusion criteria:** - intubated within 12 h **Exclusion criteria**: - previous intubation within the last 30d - recent abdominal surgery with vacuum dressing that requires changes of pts position to gain a seal or renew the dressing - severely obese pts unable to tolerate head elevation of 45° - haemodynamic instability (i.e. mean arterial pressure below 60 mmHg for more than 30 min) refractory to colloid therapy or inotropic support - pts receiving renal replacement therapy whose body position results in insufficient flow to continue therapy - pregnancy - spinal surgery or trauma that necessitates nursing the patient flat - intubated for more than 12 h prior to admission **Per Branch** 17 | 13	treatment group: 12 (developed VAP, Died) control group: 14 (developed VAP, Died)	**45° raised head of bed**	**25° raised head of bed**	**Primary endpoint:** -incidence of VAP **Secondary outcomes:** - ventilator hours - tracheostomy - mortality	**Primary endpoints:** - 29% (5) in the treatment group and 54% (7) in the control group contracted VAP ($p < 0.176$) **Secondary outcomes:** - ventilator hours: 63.1 h in treatment group, 61.5h in control group - tracheostomy: 11 of 12 pts with VAP had tracheostomies - mortality: ICU mortality rate of those pts who developed VAP was 50%, with a hospital mortality rate of 58% - no p-values stated for ventilator hours, tracheostomy, mortality	2 → 3

pts = patients, RCT = randomized controlled trial, VAP = ventilator acquired pneumonia

There was no significant reduction of VAP in patients with 45° raised head of bed.

#1027

Reference, Study Type	Cases and Controls (Participant #, characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							

1027
Davis, 2007
 	
PMID: 17495725
 	
DOI: 10.1097/TA.0b013e31804d490b
 	
Specification of study: Retrospective study
	61 pts
	
	Inclusion criteria:
	- ALI or ARDS
	
	Exclusion criteria:
	- placed on a kinetic therapy bed for prophylaxis against atelectasis or pneumonia
	- did not tolerate the bed surface
				Supine positioning in oscillating bed	**Prone positioning in oscillating bed**	**Outcomes:**
						- Mortality
						- Pulmonary associated mortality
						- PaO2/FiO2 ratio
						- FiO2 requirement
						- Ventilator days
						- Hospital LOS
						- GCS
						- Use of pressors
						- Use of Intracranial pressure monitors
						- Presence of pneumonia
						- Days on the kinetic bed
						- Dynamic compliance
						- Age
						- CVP
						- ISS
						- RTS
						- Base deficit
						- Head AIS
						- Chest AIS
						- Abdominal AIS
						- Probability of survival
							Significant differences between groups (SP vs. PP):
							- Mortality (pts): 18 vs. 1, $p < 0.01$
							- PaO2/FiO2 ratio day 5 in cross-over patients (n=4): 146 ± 16 vs. 238 ± 6, $p < 0.001$
							
							Significant results (Between groups analysis not stated)**:**
							- FiO2 requirement decreased in both groups:
							  o Supine group: 0.63 to 0.45 ($p < 0.001$)
							  o Prone group: 0.58 to 0.4 ($p < 0.001$)
							
							Non-significant differences between groups (SP vs. PP):
							- Pulmonary-related mortality (pts): 7 vs. 0, $p = 0.051$
							- PaO2/FiO2 ratios:
							  o Baseline: 149 vs. 153, $p > 0.05$
							  o Day 5: 200 ± 14 vs. 243 ± 13, $p = 0.06$
							- PaO2/FiO2 ratios by day 5: 200 vs. 243, $p = 0.066$)
							- Ventilator days: 24.2 vs. 13.6, $p = 0.12$)
							- Hospital LOS (40 vs. 22 days, $p = 0.08$)
							- GCS : 9.8 vs. 13, $p = 0.063$
							- Use of pressors: 54% vs. 46%, $p > 0.05$
							- Intracranial pressure monitors: 12 vs. 2 ($p = 0.2$)
							- Presence of pneumonia: 22 pts vs. 6 pts, $p = 0.8$
							- Bed days: 6.2 ± 0.7 vs. 5.3 ± 0.5, $p > 0.05$
							- Dynamic compliance: 29.8 vs. 32.8, p = n.s.)
							- No difference between the groups in age, CVP, ISS, RTS, base deficit, head AIS score, chest AIS score, abdominal AIS score, or probability of survival
								4 → 5

	Per Branch							
	44 pts supine position	17 pts prone position (including 4 cross-over patients)						

ISS = injury severity score; AIS = Abbreviated Injury Scale score; RTS = revised trauma score; GCS = Glasgow coma scale; CVP = central venous pressure; LOS = length of stay, ALI = acute lung injury, ARDS = adult respiratory distress syndrome, n.s. = not stated

Prone kinetic therapy was associated with a reduction in mortality, but not length of stay and decreased duration of ventilation. Due to methodological deficits, the results should be interpreted with caution.

No detailed assessment was carried out because higher-quality evidence is available on this topic.

#1034

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
1034 Fernandez 2008 (PMID: 18427774 DOI: 10.1007/s00134-008-1119-3) **Specification of study:** RCT	40 pts **Inclusion criteria:** - intubation and MV - 18 years or older - ARDS > 48 hours - protective ventilation **Exclusion criteria:** - Severe hypotension needing vasopressors (Cardiovascular SOFA 3 or 4) - traumatic brain injury - unstable pelvic or spinal column fractures - moribund condition - enrollment in another trial		n = 2 (n = 1 in supine group, n = 1 prone group)	**Prone position** for about 20h/d	**Supine position**	**Primary endpoint:** - mortality **Secondary outcomes:** - ICU LOS (days) - hospital LOS (days) - MV duration (days) - prevalence of pneumothorax - prevalence of unplanned extubation - prevalence of VAP Sample size calculation: - based on an expected 60% mortality in severe ARDS, the estimated sample size required to confirm a 15% absolute reduction with an alpha error of 0.05 and a power of 80% was 250.	This study was stopped prematurely because of slow inclusion process and therefore was underpowered. **Primary endpoint** (SP vs. PP): - mortality: SP vs. PP 10 (53%) vs. 8 (38%), p = 0.3 **Secondary outcomes** (SP vs. PP): - ICU LOS: 17.5 ± 16.1 vs. 14.7 ± 9.7, p = 0.5 - hospital LOS: 25.5 ± 17.4 vs. 31.3 ± 26.4, p = 0.4 - MV duration: 15.7 ± 16.9 vs. 11.9 ± 9.2, p = 0.5 - prevalence of pneumothorax: 1 (5%) vs. 0 (0%), p = 0.5 - prevalence of unplanned extubation: 1 (5%) vs. 1 (5%), p = 1.0 - prevalence of VAP: 1 (5%) vs 3 (14%), p = 0.6	2 --> 3 (down-graded)
	Per Branch							
	n = 21	n = 19						

ARDS = acute respiratory distress syndrome, ICU = intensive care unit, LOS = length of stay, MV = mechanical ventilation, pts = patients, SOFA = sequential organ failure Assessment, VAP = ventilator associated pneumonia

Prone position compared to supine position did not improve mortality, ICU LOS, hospital LOS or MV duration.

#1037

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#1037 Galiatsou 2006 (PMID: 16645177 DOI: 10.1164/rccm.200506-899OC) **Specification of study:** Non-randomized, non-controlled interventional study	**n = 22** pts **Inclusion criteria:** - ALI/ARDS - ability to be safely transported to the radiology department **Exclusion criteria:** - contraindications to the prone position - cardiogenic pulmonary edema - chronic lung disease - hemodynamic instability		n = 1 (because of accidental extubation)	recruitment maneuver with subsequent prone position		**Outcomes:** - respiratory system compliance - pCO_2 - pO_2/FiO_2	- **Respiratory system compliance** (Mean ± SD): o lobar ARDS: ▪ baseline vs. post-RM: 32.75 ± 4.23 vs. 37.12 ± 6.31, p = 0.061; 95% CI of the difference: -9.01 - 0.27 ▪ post-RM vs. prone position: 37.12 ± 6.31 vs. 43.12 ± 6.56, p = 0.019; 95% CI of the difference: -10.69 - 1.31 o diffuse ARDS: no significant differences - **pCO_2**(Mean ± SD): o lobar ARDS: ▪ baseline vs. post-RM: 44 ± 6.18 vs. 42.7 ± 5.03, p = 0.095; 95% CI of the difference: -0.28 – 2.78 ▪ post-RM vs. prone position: 42.7 ± 5.03 vs. 35.25 ± 3.41, p = 0.01; 95% CI of the difference: 3.56 – 9.4 o diffuse ARDS: no significant differences - **pO_2/FiO_2**(Mean ± SD): o lobar ARDS: ▪ baseline vs. post-RM: 106.25 ± 15.88 vs. 143 ± 12.27, p = 0.000 *(p-value not further described);* 95% CI of the difference: -43.42 - -30.08 ▪ post-RM vs. prone position: 143 ± 12.27 vs. 225.00 ± 37.82, p = 0.000 *(p-value not further described);* 95% CI of the difference: -112.86 - -1.14 o diffuse ARDS: ▪ baseline vs. post-RM: 117.8 ± 25.99 vs. 149.6 ± 20.38, p = 0.04; 95% CI of the difference: -60.32 - -3.28 ▪ post-RM vs. prone position: 149.6 ± 20.38 vs. 180.4 ± 17.87, p = 0.0003; 95% CI of the difference: -38.11 - -23.49	3
	Per Branch							

ALI = acute lung injury, ARDS = acute respiratory distress syndrome, CI = confidence interval, pCO_2 = partial pressure of carbon dioxide, pO_2/FiO_2 = ratio of partial pressure of oxygen and fraction of inspired oxygen, pts = patients, RM = recruitment maneuver, SD = standard deviation

Prone positioning seems to be superior to a recruitment maneuver in recruiting lung volume

#1038

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#1038 **Gattinoni 2010** PMID: 20473258 DOI: not available **Specification of study**: Review with meta-analysis	4 publications from 2001-2009 (n = 4 RCTs, n = 1.573 pts) **Inclusion criteria:** - investigation of the effects of PP on patient outcome - adults - ARDS pts			PP	SP	Mortality	**No significant differences between groups.** **No significant differences between groups in:** - mortality (PP vs. SP): absolute reduction at the last follow-up approximately 10% (ranging between 6-21%). - Kaplan-Meier estimates of survival rates at the latest follow-up in severly-hypoxaemic pooled showed higher survival in PP vs. SP at each time-point, Log-rank = 0.03, p not stated.	1
	Per Branch							
	809	764						

PP = prone positioning, pts = patients, RCTs = randomized controlled trials, SP = supine positioning

Prone positioning may reduce the absolute mortality of severely hypoxemic ARDS patients.

1. Gattinoni L, Tognoni G, Pesenti A, Taccone P, Mascheroni D, Labarta V et al. Effect of prone positioning on the sur- vival of patients with acute respiratory failure. N Engl J Med 2001;345:568-73.
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3. Mancebo J, Fernández R, Blanch L, Rialp G, Gordo F, Ferrer M,et al. A multicenter trial of prolonged prone ventilation in severe acute respiratory distress syndrome. Am J Respir Crit Care Med 2006;173:1233-9.
4. Taccone P, Pesenti A, Latini R, Polli F, Vagginelli F, Mietto C et al. Prone positioning in patients with moderate and severe acute respiratory distress syndrome: a randomized controlled trial. JAMA 2009;302:1977-84.

#1042

Reference, Study Type	Cases and Controls (Participant #, characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
1042 Girard 2013 PMID: 24352484 https://doi.org/10.1007/s00134-013-3188-1 **Specification of study:** Ancillary study of a RCT (PROSEVA Trial)	**Total** 466 pts. **Inclusion criteria:** Severe ARDS was defined by: - PaO2/FIO2 (partial pressure oxygen in arterial blood/fraction of inspired oxygen) ratio of <150 mmHg with a FIO2 of ≧0.6 - PEEP of ≧5 cm H2O - tidal volume of 6 ml/kg predicted body weight **Per Branch** PP group = 237 / SP group = 229		**PP** fully horizontal prone position (180°) within 1 h after the randomization for sessions of ≥16 h until predetermined stopping criteria were met	**SP**	Sample size calculation was done in the parent trial. **Primary endpoints:** - Incidence of new pts with pressure ulcers at stage 2 or higher from randomization to ICU discharge **Secondary endpoints:** - incidence of new patients with pressure ulcers from day 1 to day 7 - incidence of new pressure ulcers from day 1 to day 7 and to ICU discharge - proportion of patients with pressure ulcers both overall and according to site at day 7 and ICU discharge and mean pressure ulcer score overall and by site	**Primary outcome:** - incidence: 20.80 and 14.26 / 1,000 days of invasive mechanical ventilation (P = 0.061) and 13.92 and 7.72/1,000 of ICU days (P = 0.002) in both groups **Secondary outcomes:** - incidence of new patients with pressure ulcers per 1,000 days of invasive ventilation from day 1 to ICU discharge was not significantly different between groups - incidence of new patients with pressure ulcers at stages >1 per 100 days of ICU stay was significantly higher in the PP - incidence of new patients with pressure ulcers from day 1 to day 7 was significantly higher in the PP group for both stage analyses and both denominators - in both groups, the incidence of pressure ulcers was higher from day 1 to day 7 than during the stay as a whole - at day 7, the rate of patients with pressure ulcers was significantly higher in the PP group (116/204 (57.1)) than in the SP group (79/186 (42.5)); P= 0.005; also significantly more often PU in the face (SP: 8/184 (4.3); PP: 58/197 (29.4); P= 0.0001) and anterior thorax (SP: 1/184 (0.5); PP: 35/195 (17.9); P = 0.0001) - At the time of ICU discharge, the rate of patients with PUs was not different between groups SP group (85/225 (37.8)); PP group (103/232 (44.4)); P= 0.151¸ number of PUs involving the face (SP: 3/216 (1.4);PP: 41/223 (18.4) P = 0.0001) and the anterior part of the thorax (SP: 2/216 (0.9); PP: 14/219 (6.4): P= 0.0025) was still significantly higher in patients in the PP group	3

PP = prone position; SP = supine position; pts = patients; ARDS = acute respiratory distress syndrom; ICU = intensive care unit; PEEP = positive endexpiratory pressure; pts = patients

In patients with severe ARDS, prone positioning was associated with a higher frequency of pressure ulcers than the supine position, however, prone positioning was not a determining risk factor.

#1045

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop -out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
1045 Guerin, 2013 (PMID: 23688302 DOI: 10.1056/NEJMoa1214103) **Specification of study:** RCT	466 pts with severe ARDS to undergo PP sessions of at least 16 hours or to be left in the SP **Inclusion criteria:** - ARDS (Pao2:Fio2 ratio of <150mmHG, FiO2 ≥ 0.6., PEEP ≥ 5cm H2O, Vt > 6ml/kgKG - endotracheal intubation and ventilation for <36h **Exclusion criteria:** - contraindication for prone positioning (e.g. Intracranial pressure > 30 mmHG, massive hemoptysis) - respiratory reason (e.g. NOi, ECMO) - clinical context (e.g. lung transplantation, severe burns) - others (e.g. end-of-life decision) **Total** **Per Branch** 237 / 229		**Prone positioning** (at least 16h), average number of sessions: 4±4 p. patient, mean duration per session: 17±3 h	**Supine positioning** (semi-recumbent position)	**Primary endpoint:** - mortality at day 28 **Secondary outcomes:** - mortality at day 90 - rate of successful extubation - time to successful extubation - ICU LOS - use of non-invasive ventilation - tracheotomy rate -ventilator settings - arterial blood gases - respiratory-system mechanics	**Primary endpoint:** - 28-day mortality n=237: 16%, n= 229: 32.8% (p<0.001) - hazard ratio for death with PP: 0.39 (95% confidence interval [CI], 0.25 to 0.63) **Secondary outcomes:** - 90-day mortality n=237: 23.6% , n=229: 41.0% (P<0.001), hazard ratio of 0.44 (95% CI, 0.29 to 0.67) - successful extubation was significantly higher in the prone group n=237: 80.5% [95% confidence interval [CI], 75.4–85.6], n=229: 65.0% [95% confidence interval [CI], 58.7–71.3] - ICU LOS n=229: 26±27, n=237: 24±22 (p=0.05) - non-invasive ventilation (at day 28) n=237: 1.8% [0.1–3.5], n=229: 4.7% [1.9–7.5] (p=0,11) - tracheotomy rate (at day 28) n= 237: 3.8% [1.4–6.0], n=229: 5.2% [2.3–8.1] (p= 0.37) - duration of invasive mechanical ventilation, length of stay in the ICU, incidence of pneumothorax, rate of use of noninvasive ventilation after extubation, and tracheotomy rate: n.s.	2

ARDS = acute respiratory distress syndrome, ECMO = extracorporeal membranous oxygenation, FiO2 = inspiratory oxygen concentration, LOS = length of stay, NOi = inhaled nitric oxide, n.s. = not significant, PEEP = positive end expiratory pressure, Vt = tidal volume

Prolonged prone-positioning sessions significantly decreased 28-day and 90-day mortality.

#1051

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#1051 Jozwiak 2013 (PMID: 24102072 DOI: 10.1164/rccm.201303-0593OC) **Specification of study:** non-controlled interventional study	**n = 18** pts **Inclusion criteria:** - ARDS with pulmonary artery catheter **Exclusion criteria:** - contraindication to transesophageal echocardiography - contraindication to PP - known chronic RV failure			PLR test (to assess cardiac index) with following prone positioning		**Outcomes:** - respiratory variables - hemo-dynamic variables - tissue oxygenation variables - Echocardio-graphic variables - ICU mortality *Outcomes not divided into primary or secondary*	**Outcomes:** - pre-PP vs. post-PP (in n = 9 pts with significant change in cardiac index after PLR test previous to PP; median [IQR]): o PaO2/FiO2 (mmHG): 137 (79-154) vs. 160 (134-202), p < 0.05 o cardiac index (L/min/m2): 3.0 (2.3-3.5) vs. 3.6 (3.2-4.4), p < 0.05 o stroke volume (ml/m2): 34 (29-47) vs. 42 (38-58) o right atrial pressure (mmHg): 15 (13-18) vs. 17 (16-23) o pulmonary artery occlusion pressure (mmHg): 19 (17-20) vs. 22 (19-26), p < 0.05 o pulmonary artery mean-occlusion pressure gradient (mmHg): 16 (14-23) vs. 11 (9-21), p < 0.05 o pulmonary vascular resistance (dyn*s/cm5/m2): 514 (333-885) vs. 234 (155-549), p < 0.05 o intra-abdominal pressure (mmHg): 16 (12-17) vs. 18 (17-20), p < 0.05 o oxygen delivery (ml/min/m2): 355 (273-438) vs. 514 (424-590), p < 0.05 o oxygen consumption (ml/min/m2): 65 (42-84) vs. 113 (101-126), p < 0.05 o P(v-a)CO2/C(a-v)O2 (mmHg/ml): 1.4 (1.2-2.2) vs. 1.0 (0.8-1.3), p < 0.05 o right/left ventricular end-diastolic area ratio *(no unit described)*: 0.65 (0.55-0.80) vs. 0.60 (0.50-0.65), p < 0.05 o left ventricular eccentricity index 1.13 (1.02-1.16) vs. 1.00 (0.99-1.06), p < 0.05 o left ventricular end-systolic area * systolic arterial pressure (cm2*mmHg): 603 (420-895) vs. 946 (765-1146), p < 0.05 - pts with significant change in cardiac index after PLR test previous to PP (n=9) vs. pts without significant change in cardiac index after PLR test previous to PP (n=9); n [%]): o left ventricular ejection fraction: Pre-PP 40 (35-56) and Post-PP 40 (36-49) vs. Pre-PP 57 (50-62) and Post-PP 60 (53-65), p < 0.05 - pts with significant change in cardiac index after PLR test previous to PP (n=9) vs. pts without significant change in cardiac index after PLR test previous to PP (n=9); n [%]): o ICU mortality: 5 (56%) vs. 4 (44%), non-significant	3
	Per Branch							

ARDS = acute respiratory distress syndrome, PLR = passive leg raising, PP = prone positioning, pts = patients, RV = right ventricular

Prone Positioning seems to increase cardiac index in ARDS patients.

#1053

Reference, Study Type	Cases and Controls (Participant #, Characteristics) Total	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
#1053 Kopterides 2018 (PMID: 19272544 DOI: 10.1016/j.jcrc.2007.12.014) **Specification of study:** Systematic Review and Meta-Analysis	4 publications (n = 4 RCTs, n = 1271 pts)[1-4] **Inclusion criteria:** - RCTs on prone positioning - providing data on mortality - population: adult patients with hypoxemic respiratory failure **Exclusion criteria:** - inappropriate study design - control group not standard of care **Per Branch**		Prone positioning	Standard of care	**Primary outcomes:** - ICU mortality **Secondary outcomes:** - duration of prone positioning - incidence of VAP - ICU LOS - duration of MV - incidence of pneumothorax - complications ○ new or worsening pressure sores ○ complications related to ETT (accidental extubation, selective intubation, obstruction of ETT)	**Significant differences between groups in (PP vs. SP):** - ICU mortality [in a subset of the most severely ill pts (n = 195 pts)]: ○ Pts with PP showed lower mortality. *(No further data available)* ○ OR 0.34 (95% CI: 0.18-0.66), p = 0.001; heterogeneity: p = 0.69, I^2=0% **Non-significant differences between groups in (PP vs. SP):** - ICU mortality (across all pts): ○ 37% (265/662 pts) vs. 37.8% (230/609 pts) ○ OR 0.97 (95% CI: 0.77-1.22); heterogeneity: p = 0.22, I^2 = 32.0% - duration of prone positioning: mean > 10 h/day in the 2 most recent published articles. *(No further data available)* - incidence of VAP: ○ 21.9% (112/510 pts) vs. 25.6% (117/457) pts ○ OR 0.81 (95% CI: 0.60-1.10); heterogeneity: p = 0.16, I^2 = 45.9% - ICU LOS: 20.5 ± 18.2 vs. 19.1 ± 23.1 days, p = 0.7 - duration of MV: ○ weighted mean difference: -1.14 days (95% CI: -2.86-0.59) ○ heterogeneity: p = 0.77, I^2 =% - incidence of pneumothorax ○ OR 0.8 (95% CI: 0.47-1.34); heterogeneity: p = 0.33, I^2 = 0% - complications ○ new or worsening pressure sores: ▪ 1135 pts, FEM OR 1.49 (95% CI: 1.17-1.89) REM OR 1.50 (95% CI: 1.12-2.00); heterogeneity: p = 0.32, I^2 = 13.1% ○ complications related to ETT ▪ 1271 pts, OR 1.30 (95% CI: 0.94-1.80); heterogeneity: p = 0.35, I^2 = 8.4%	1 → 2

CI = confidence interval, ETT = endotracheal tube, FEM = fixed effect model, ICU = intensive care unit, LOS = length of stay, MV = mechanical ventilation, OR = odds ratio, PP = prone positioning, pts = patients, RCTs = randomized controlled trials, REM = random effect model, SP = supine positioning, VAP = ventilator-associated pneumonia

Except for most severely ill patients, PP seems not to influence mortality in patients with hypoxemic respiratory failure, although the incidence of VAP might decrease at the expense of more pressure sores and complications related to the endotracheal tube.

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#1054

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
1054 Lee, 2010 PMID: 20195404 DOI: 10.3904/kjim.2010.25.1.58 **Specification of study:** retrospective search	96 patients **Inclusion criteria:** - ARDS (PaO2/ FiO2 ≤ 150 mmHg with a positive end-expiratory pressure (PEEP) of at least 8 cm H2O - bilateral chest radiography showing lung infiltrate without evidence of cardiac failure **Exclusion criteria**: - not stated **Per Branch** 96 divided in: PaO_2 responders (n=60) and PaO_2 non-responders (n=36)		PP for ≥ 12 hours and change from prone to supine due to improvement (then PaO_2 responder)	patients were divided in the intervention group by itself	**Primary endpoint:** - 28-day mortality **Secondary outcomes:** - gas exchange values after prone positioning - ventilatory parameters after prone positioning	**Primary endpoint:** - 28-day mortality: PaO_2 responders 28 (46.7) and PaO_2 non-responders 26 (72.2) (p=0.019) **Secondary outcomes:** - gas exchange values after prone positioning: ○ PaO2 responders mean PaO2/FiO2 increase at 8 to 12 hours of PP 75.4 ± 47.2 mmHg (median, 64.3; range, 20 to 215) and for ○ PaCO2 responders, mean PaCO2 change was - 10.6 ± 10.3 mmHg (median, - 7.4; range, - 42 to 1) - ventilatory parameters after PP: no significant differences (p>0.05)	4

ARDS = acute respiratory distress syndrome, PP = prone position; PEEP = positive endexspiratory pressure

The early oxygenation improvement after prone positioning might be associated with an improved 28-day outcome and may be an indicator to maintain prolonged prone positioning in patients with severe ARDS

No detailed assessment was carried out because higher-quality evidence is available on this topic.

#1056

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
1056 Mancebo 2006 (PMID: 16556697 DOI: 10.1164/rccm.200503-353OC) **Specification of study:** Randomized Controlled Trial	136 pts **Inclusion criteria:** - intubation and MV - 18 years or older - ARDS - diffuse bilateral infiltrates on X-ray **Exclusion criteria:** - > 48 hours had elapsed since inclusion criteria were met - participation in other trials - pregnancy - systolic blood pressure < 80 mmHg despite vasopressors - pelvic/spine fractures - cranial trauma and/or suspicion of high intracranial pressure - moribund pts	Supine: n=2 (Case reports lost) Prone: n = 4 (1 lost, 2 Data lacking, 1 High PCWP)	**Prone position** for about 7h/d	**Supine position**	**Primary outcome:** - ICU mortality **Secondary outcomes:** - hospital mortality - complications - LOS	**Primary outcome:** - ICU mortality was 58% (35/60) in supine group and 43% (33/76) in prone group (p = 0.12) **Secondary outcomes:** - hospital mortality was higher in supine group (62% vs. 50%; p = 0.22) - ICU LOS did not differ between groups - total of 28 complications were reported, most were rapidly reversible	2
	Per Branch						
	76 | 60						

ICU = intensive care unit, LOS = length of stay, MV = mechanical ventilation, PCWP = pulmonary capillary wedge pressure, pts = patients

Prone positioning may reduce ICU and hospital mortality in patients with ARDS.

#1062

Reference, Study Type	Cases and Controls (Participant #, characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
1062 Mounier 2009 PMID: 19741030 DOI: 10.1183/09031936.00057509 **Specification of study:** prospective observational study	2409 pts. From 2000 to 2008 to 12 French ICUs **Inclusion criteria:** - MV duration ≥ 2 days - MV started < 48h after ICU admission - PaO2/FiO2 ≤ 300 in the first 2 MV days - Bilateral lung infiltrates - Absence of left atrial hypertension **Exclusion criteria:** -not stated			**PP:** during the MV period, one PP session involving the pts remaining prone for > 6h/day	**SRP**	**Sample Size calculation:** Assuming a 50% VAP rate, at least 200 PP pts and 200 matched controls for a HR of 2 for VAP with > 90% power and 0,05 type I error risk **Primary Endpoint:** -Incidence of VAP **Secondary outcome**: -Mortality	**Primary Endpoint:** no significant difference in VAP incidence (p=0,14) **Secondary endpoints:** -No significant difference in mortality overall or with a single day of PP -Significant delay of mortality in the PP group (p=0,001) -Significantly lower mortality with ≥ 2 PP days (p=0.009) **Posthoc power analysis:** power of the study decreased by the lower than expected prevalence of VAP	3
	Per Branch							
	199	199						

MV = mechanical ventilation, VAP = ventilator associated pneumonia, ALI =acute lung injury, ARDS = acute respiratory distress syndrome, pts = patients; SRP: = Semi-recumbency position; HR=Hazard ratio; ICU=intensive care unit; PP=prone position

PP is not superior to SP to prevent VAP, but longer PP use may improve survival.

No detailed assessment was carried out because higher-quality evidence is available on this topic.

#1064

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
1064 Nekludov, 2006 (PMID: 16923086 DOI: 10.1111/j.1399-6576.2006.01099.x) https://pubmed.ncbi.nlm.nih.gov/16923086/ **Specification of study:** prospective cohort study	8 pts **Inclusion criteria:** - adults treated for TBI or SAH - GCS </= 8 - association with pulmonary pathology **Exclusion criteria:** - high or unstable ICP - circulatory unstable - high doses of inotropes - hemodialysis			change between supine to prone positioning (same in all pts)		**Primary endpoints:** - hemodynamics - arterial oxygenation - respiratory mechanics - ICP and CPP	**Significant differences between groups in:** - significant improvement in PaO2 in the prone position, from 12.6 ± 1.4 kPa to 15.7 ± 3.2 kPa (p = 0.02) - intracranial pressure and mean arterial pressure increased in prone position, from 12 ± 6 to 15 ± 4 mmHg (p = 0.03) and from 78 ± 8 to 88 ± 8 mmHg (P = 0.005) - arterial pressure increased to a greater extent than ICP, resulting in improved CPP, from 66± 7 to 73 ± 8 mmHg (P 0.03) in the prone position	3 --> 4 (downgraded for small sample size)
	Per Branch							

CPP = cerebral perfusion pressure, GCS = Glasgow coma scale, ICP = intracranial pressure, pts = patients, SAH = subarachnoidal hemorrhage, TBI = traumatic brain injury

Oxygenation was improved during prone positioning as well as CPP, but it also may result in increased ICP.

#1066

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
1066 Papazian, 2005 (PMID: 16215365 DOI: 10.1097/01.ccm.0000181298.05474.2b) **Specification of study:** Prospective, comparative randomized study	**Total** 39 pts with ARDS **Inclusion criteria:** - PaO2/FIO2 ratio ≤ 150 mm Hg while on PEEP ≥ 5 cm H2O - bilateral radiographic pulmonary infiltrates - pulmonary artery occlusion pressure of ≤ 18 mm Hg **Exclusion criteria:** - younger than 18 years old - lack of informed consent - moribund status - severe chronic respiratory insufficiency requiring long-term oxygen therapy or long-term mechanical ventilation - head injury - unstable pelvic or vertebral fracture, extra-alveolar air in the chest radiograph - a chest tube in place with persistent air leak - patients who had participated in other investigational trials within 30 days **Per Branch** Prone CV: 13 Supine-HFOV: 13 Prone-HFOV: 13		12h period of: <u>Prone-CV:</u> conventional lung-protective mechanical ventilation in PP <u>Supine-HFOV:</u> HFOV in SP <u>Prone-HFOV:</u> HFOV in PP	only intervention groups	**Endpoints:** - oxygenation variables - respiratory variables - venous admixture, the other hemodynamic variables, and gas exchange - cytokines and cell differential counts	**Endpoint:** - oxygenation variables: prone-CV and prone-HFOV: improvement in PaO2/FIO2 (from 138 ± 58 mm Hg to 217 ± 110 mm Hg, p = .0001; and from 126 ± 40 mm Hg to 227 ± 64 mm Hg, p = .0001) - respiratory variables: mean airway pressure under HFOV was not different from the plateau pressure used during the periods that patients with CV (baseline supine-CV: 19 ± 4; supine-HFOV 25 ± 5; prone-CV 19 ± 5; prone-HFOV 25 ± 6; p = < .01) - venous admixture, the other hemodynamic variables, and gas exchange prone position (p < .0001) and HFOV (p < .001) reduced the venous admixture other hemodynamic variables (including cardiac index) remained unchanged (data not shown) modification of PaCO2 n.s. (no p-value) - cytokines and cell differential counts neutrophils counts were higher in the supine-HFOV group (median 475,000·mL^{-1} , IQR 290,000– 875,000·mL^{-1}) than after prone-CV (median 110,000·mL^{-1} , IQR 72,000– 310,000·mL^{-1} ; p < 0.05) neutrophil count correlated with BAL IL-8 level at baseline and after all 12-hr periods (p < .001)	3

ARDS = acute respiratory distress syndrome, CV = conventional mechanical ventilation, HFOV = high-frequency oscillatory ventilation, PEEP = positive end-expiratory pressure, PP = prone position, pts = patients, SP = supine position

HFOV in the supine position does not improve oxygenation or lung inflammation, while the prone position improves both parameters in ARDS patients.

#1075

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop -out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
1075 Sud 2008 (PMID: 18427090 DOI: 10.1503/cmaj.071802) **Specification of study:** Systematic review and meta-analysis	13 publications (randomized and quasi-randomized trials)[1-13] **Inclusion criteria:** - adult or pediatric MV pts with AHRF (defined as $PaO_2/FiO_2 \leq 300$ mmHg) - randomized controlled setting, comparing MV in prone and supine position - report of all-cause mortality, PaO_2/FiO_2, ventilator associated pneumonia, the duration of ventilation, the number of ventilator-free days from randomization to day 28 or 30, or adverse events		mechanical ventilation in prone position		**Primary endpoint:** - all-cause mortality **Secondary outcomes:** - oxygenation on days 1-3 - VAP - number of days on MV - VFD - AEs	**Significant differences between groups in:** - VAP: PP reduces the risk of VAP (RR 0.81, 95% CI 0.66 to 0.99, p = 0.04) - AE: PP increased the risk of pressure ulcers (RR 1.36, 95% CI 1.07 to 1.71; p = 0.01, I^2 = 0%). - oxygenation on days 1-3: PP increases PaO_2/FiO_2 ratio by 23%-34% on days 1-3 after randomization, PaO_2/FiO_2 ratio remained 6-9% higher in pts in the PP group after they were returned to the SP after a prone maneuver - number of MV days (6 trials (n = 992)): shorter duration of MV in the prone group (weighted mean difference -0.9 days, 95% CI -1.9 to 0.1; p = 0.06, I^2 = 3% **No significant differences between groups in:** - mortality: (RR 0.96, 95% CI 0.84 to 1.09; p = 0.52), subgroup analysis: mortality between trials of short-term PP and prolonged PP does not differ. [RR 0.77, 95% CI 0.46 to 1.28 vs. RR 0.97, 95% CI 0.85 to 1.11; (p = 0.39 for comparison of RRs using z-score)] - VFD (4 trials (n = 148)): weighted mean difference 3.7 days, 95% CI -1.8 to 9.3; p = 0.19, I^2 = 67%	1 → 2 (downgraded for indirectness / applicability)
	Per Branch						

AE = adverse effects, AHRF = acute hypoxemic respiratory failure, CI = confidence interval, MV = mechanical ventilation, PP = prone position, Pts = patients, VAP = ventilator associated pneumonia, VFD = ventilator-free days

Mechanical ventilation in the prone position does not reduce mortality or increase ventilator-free days despite improved oxygenation and a decreased risk of pneumonia.

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#1076

Reference, Study Type	Cases and Controls (Participant #, Characteristics) Total	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
1076 Sud 2010 (PMID: 20130832 DOI: 10.1007/s00134-009-1748-1) **Specification of study:** Systematic Review and Meta-Analysis	1.867 pts in 10 publications (RCT)[1-10] **Inclusion criteria:** - prone positioning used early (within 72 h after initiation of mechanical ventilation) and as late or rescue therapy (72 h after initiation of mechanical ventilation) - prone ventilation was applied intermittently or continuously **Exclusion criteria:** - patients received both treatment and control interventions in random order - short-term trials in which the intervention was applied for ≤48 h **Per Branch**		**Prone positioning** for ≥48H	**Supine positioning**	**Primary endpoint:** - hospital mortality (pts with PaO_2/FiO_2 <100 mmHg vs. pts PaO_2/FiO_2 >100 mmHg) **Secondary outcomes:** - hospital mortality (limited to pts. with ALI/ARDS) - rate of VAP - duration of MV - ventilator-free days on day 28 - adverse events	**Significant differences between groups in:** adverse events, PP increased risk of - pressure ulcers: RR1.29, 95% CI 1.16–1.44, p <0.00001 - endotracheal tube obstruction: RR 1.58, 95% CI 1.24–2.01, p=0.0002 - accidental chest tube removal: RR 3.14, 95% CI 1.02–9.69, p=0.05 - PP reduced mortality in pts. with PaO_2/FiO_2 <100 mmHg (RR 0.84, 95% CI 0.74–0.96; p=0.01; N=555) NNT= 11 (95% CI 6–50) - mortality in pts. with ALI/ARDS: PaO_2/FiO_2 <100 mmHg (RR 0.85,95% CI 0.74–0.98, p=0.02) -VAP: RR 0.81, 95% CI 0.67–1.00, p=0.05; n=1,066) **No significant differences between groups in:** - MV duration - ventilator-free days - mortality in pts with PaO_2/FiO_2 >100 mmHg (RR 1.07, 95% CI 0.93–1.22; p=0.36; N=1,169)	1 --> 2

AHRF = acute hypoxemic respiratory failure, ALI = acute lung injury, ARDS = acute respiratory distress syndrome, CI = confidence interval, MV = mechanical ventilation, PP = prone positioning, pts = patients, RCT= randomized controlled trial, VAP= ventilator-associated pneumonia

Prone positioning reduces mortality in patients with a PaO_2/FiO_2 ration <100 mmHg but not in those with a higher ratio. It increases the risk of adverse events.

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#1077

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
1077 Taccone 2009 (PMID: 19903918 DOI: 10.1001/jama.2009.1614) **Specification of study:** Randomized Controlled Trial	344 pts randomized and stratified to moderate hypoxia or severe hypoxia. **Inclusion criteria:** -invasive MV and ARDS diagnosis **Exclusion criteria:** - < 16 years, - > 72h since ARDS diagnosis - history of organ transplantation - contraindications for PP		2 drop-outs (1 in each group, both inclusion mistake)	**PP** - for ≥ 20h/day until resolution of ARDS or until day 28	**SP**	**Primary endpoint:** - death by any cause at day 28 **Secondary outcomes:** - death by any cause at ICU discharge and 6 months - SOFA-Score at day 28 - Ventilator-free days	**Primary endpoint:** - overall death by any cause at day 28, PP 52 vs SP 57 (RR=0.97 95% CI 0.84-1.13 p=0.72) - moderate hypoxia death: PP 24 vs SP 22 (RR=1.04 95% CI 0.89-1.22 p=0.62) - severe hypoxia death: PP 28 vs SP 35 (RR=0.87 95% CI 0.66-1.14 p=0.31) **Secondary outcomes:** - mortality at ICU discharge: n.s. (p=0.47) - mortality at 6 months: n.s. (p=0.33) - SOFA-Score at day 28: n.s (p=0.87) - ventilator-free days n.s. (p=0.31)	2
	Per Branch							
	169	175						

ARDS = acute respiratory distress syndrome, ICU = intensive care unit, MV = mechanical ventilation, PP = prone positioning, pts = patients, RCT =randomized controlled trial, SOFA = sequential organ failure assessment, SP = supine positioning

Prone positioning does not have a significant effect on mortality in ARDS patients regardless of the severity of the disease.

#1078

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
1078 Theleandersson 2006 (PMID: 16923087 DOI: 10.1111/j.1399-6576.2006.01037.x)(https://pubmed.ncbi.nlm.nih.gov/16923087/) **Specification of study:** A prospective pilot study	**Total** 12 pts all pts received PP; analysis focused of differences in SP to PP for each patient **Inclusion criteria:** - MV NICU pts with FiO2 of 0.4 - intraventricular catheter for ICP measurements **Exclusion criteria:** - unable PP (fracture) - MV in pressure-controlled mode **Per Branch**	n = 1 (ICP increase)	**PP**		**Outcomes:** - ICP - CPP - HR - PaCO2 - PaO2 - SaO2 - MABP - Respiratory system compliance (ml/cm H2O)	**Significant differences after turning prone in:** - PaO2 Baseline vs. 3h PP: 13.2 ± 2.1 vs. 19.1 ± 6.1; p < 0.05 - SaO2 Baseline vs. 3h PP: 97.6 ± 0.8 vs. 98.6 ± 0.8, p < 0.05 - HR Baseline vs. 10min/1h/3h PP: 67 ± 15 vs. 72 ± 15/ 73 ± 15 / 76 ± 18, p < 0.05 respectively - respiratory system compliance ○ baseline vs. supine post-prone position at 1 hour: 66 ± 23 vs. 56 ± 18, p < 0.05 ○ supine post-prone position at 10 min vs. prone position at 10 min: 62 ± 19 vs. 53 ± 14, p < 0.05 ○ supine post-prone position at 1 hour vs. prone position at 1 hour: 66 ± 23 vs. 52 ± 15; p < 0.05 **No statistically significant differences after turning prone in:** - ICP, CPP and MABP, PACO2	3 → 4 Pilot / small sample size

CPP = cerebral perfusion pressure, HR = heart rate, ICP = intracranial pressure, MABP = mean arterial blood pressure, min = minutes, MV = mechanical ventilation, NICU = neuro intensive care unit, PaCO2 = partial pressure of arterial carbon dioxide, PaO2 = partial pressure of arterial oxygen, PP = prone position, pts = patients, SaO2 = saturation of arterial oxygen, SP = supine position

Prone positioning leads to improvement of oxygenation in NICU patients and did not influence CPP, ICP or MABP.

#1079

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
1079 Tiruvoipati 2008 (PMID: 18359427 DOI: 10.1016/j.jcrc.2007.09.003) **Specification of study:** Meta-analysis	1.287 pts, 5 RCTs on PV[1-5] **Inclusion criteria:** - adults with ARDS or ALI requiring intubation and MV **Exclusion criteria:** - chronic respiratory failure - non-ARF			PV	SV	**Primary endpoint:** - mortality **Secondary outcomes:** - changes in oxygenation - incidence of VAP - duration of MV - ICU LOS - hospital LOS - complications related to ET tube, intravascular catheters and pressure sores	**Primary endpoint:** - mortality: n.s. (OR: 0.98, 95% CI 0.7-1.3 p=0.91) **Secondary endpoints:** **Significant differences between groups in:** - changes in oxygenation: MD 21.2 mmHg (95% CI 12.4-30.0 p<0.001) - pressure sores: OR: 1.95, 95% CI 0.09-4.15, p=0.08 **No significant differences between groups in:** - incidence of VAP: n.s. - ICU LOS: n.s. - ET tube complications: n.s. - duration of MV: no meta-analysis - hospital LOS: no meta-analysis	1 → 2 (downgraded for indirectness / applicability)
	Per Branch							

ALI = acute lung injury, ARDS = acute respiratory distress syndrome, ARF = acute respiratory failure, ET = endotracheal, ICU = intensive care unit, LOS = length of stay, MV = mechanical ventilation, n.s. = not significant, pts = patients, PV = prone ventilation, RCT = randomized controlled trial, SV = supine ventilation, VAP = ventilator-associated pneumonia

Prone ventilation reduces the mortality compared to supine ventilation in ARDS and ALI patients.

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#1080

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
1080 Vieillard-Baron 2007 (PMID: 17925425 DOI: 10.1378/chest.07-1013) **Specification of study:** Retrospective study	42 patients with ARDS treated by PP were included between January 1998 and December 2006 **Inclusion criteria** patients with: "severe" ARDS, leading to a Pao2/fraction of inspired oxygen (Fio2) ratio of 100 mm Hg after 48 h of respiratory support with our "low-stretch" respiratory strategy - treatment by PP during the first week of respiratory support			**Patients with acute cor pulmonale** (defined by RV enlargement associated with septal dyskinesia) (transesophageal echocardiography before PP and 18 h after PP)	**Patients with normal RV** (transesophageal echocardiography before PP and 18 h after PP)	**Outcome** (not defined) - RV enlargement - septal dyskinesia - Respiratory compliance	**Outcome** - intervention group: significant decrease in mean (± SD) RV enlargement (from 0.91 ± 0.22 to 0.61 ± 0.21) after 18 h of PP (p =0.000) - intervention: significant reduction in mean septal dyskinesia (from 1.5 ± 0.2 to 1.1 ± 0.1) after 18 h of PP (p = 0.000) - significantly lower respiratory system compliance : intervention= 22 ± 7 vs control= 28 ±7 mL/cm H2O, respectively; p= 0.008	4
	Per Branch							
	N=21	N=21						

ARDS = acute respiratory distress syndrome, PP = prone position, RV = right ventricle

In the most severe forms of ARDS, PP was an efficient means of controlling RV dysfunction.
No detailed assessment was carried out because higher-quality evidence is available on this topic.

#1082

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
1082 Voggenreiter 2005 (PMID: 16294072 DOI: 10.1097/01.ta.0000179952.95921.49) **Specification of study:** PRT	40 multiple trauma pts of the ICUs of 2 university hospitals with ALI or ARDS **Inclusion criteria:** - multiple trauma pts in an ICU, 18–80 years - ISS ≥16 - MV (PEEP ≥5cm H2O, PaO2:FiO2 ≤ 200 mmHg for 8h or PaO2:FiO2 ≤ 300 mmHg for 24h) **Exclusion criteria:** - evidence of cardiogenic pulmonary edema, cerebral edema - intracranial hypertension - contraindicated the use of the PP (unstable spine fractures, hemodynamic instability)			**PP:** 30 ± 17 days; first and third quartile, 18 to 39 days; kept prone for at least 8h and a max. of 23h/day	**SP**: 33 ± 23 days; first and third quartile, 17 to 45 days; were positioned according to standard care guidelines	**Primary endpoint:** - duration of mechanical ventilation **Secondary endpoints:** - days with ARDS/ ALI - days with lung injury score - course of PaO2:FiO2 ratio - Qs/Qt - total static lung compliance - PIP - PEEP - LIS - TISS-28 - SOFA - sepsis - prevalence of pneumonia - mortality -complications/adverse events - ARDS following ALI	**Primary outcome:** - duration of mechanical ventilation did not significantly differ (p=0.48) **Secondary outcome:** -number of days with ARDS: 2 ± 2 days in the prone group and 3 ± 1 days in the supine group (p = 0.07) -number of days with ALI: prone group 8 ± 4 days; supine group: 11 ±5 days (p = 0.03) -PaO2:FiO2 ratio increased after 4 days: p = 0.03 in prone group -reduction of PEEP after 4 days of prone ventilation (p = 0.009) -ICU- mortality (p = 0,27): prone = 5%, supine = 16% -end of study period: spontaneous breathing by 19 patients (prone) and 15 pts(supine) -prone positioning: reduced the prevalence of pneumonia (p =0.048) adverse effects: -pressure sores and skin lesions (p = 0.48) -persisting swelling and edema of the head and neck region (p = 0.26) -brady- or tachyarrhythmias (p = 0.31)	2 → 3
	Per Branch							
	21	9						

ALI = acute lung injury, ARDS = acute respiratory distress syndrome, ICU = intensive care unit, ISS = injury severity score, LIS = lung injury score, TISS-28, PEEP = positive end expiratory pressure, PIP = peak inspiratory pressure, PRT = prospective randomized trial, pts = patients

Prone positioning improves oxygenation and the duration of ARDS.

#1087

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
1087 Weig 2014 (PMID: 24666961 DOI: 10.1016/j.jcrc.2014.02.010) **Specification of study:** retrospective cohort study	82 consecutive ARDS pts receiving PP		12 pts died or were discharged within 7 days (unknown group)	PP was decided by staff (based on clinical and radiologic findings) 1 PP session = 12h		**Endpoints:** - death - ICU discharge - renal failure - hepatic failure	- survival: 65.9% (in both groups) - median ICU-LOS: 26d **Significant differences between the groups:** - renal failure: obese pts. Showed higher rates of renal failure (p<0.0001) - mortality: obesity led to higher risk of mortality (p = 0.0004) **No significant difference between the groups:** - hepatic failure	4
	Per Branch							
	SAD>26cm : 41	SAD<26cm : 41						

ARDS = acute respiratory distress syndrome, ICU = intensive care unit, PP = prone positioning, pts = patients, SAD = sagittal abdominal diameter

Prone positioning is associated with a higher risk for mortality and renal failure in obese patients.
No detailed assessment was carried out further because higher-quality evidence is available on this topic

#1088

Reference, Study Type	Cases and Controls (Participant #, Characteristics) Total	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
1088 Sud 2014 (PMID: 24863923 DOI: 10.1503/cmaj.140081) **Specification of study:** systematic review and meta-analysis	11 Studies included in meta-analysis (11 RCTs, n = 2341 pts)[1-11] **Inclusion criteria:** - adults or post-neonatal children with ARDS supported by MV - RCTs or quasi-randomized trials - comparison of PP and SP - primary outcome mortality analysis - only trials with lung protective ventilation (< 8 mL/kg) **Exclusion criteria:** - unoriginal studies - crossover-trials - studies lasting 48h or less **Per Branch**		**PP**	**SP**	**Primary endpoint:** - all-cause mortality, at hospital discharge or the longest duration of follow-up **Secondary outcomes:** - change in oxygenation and AEs - mortality with lung protective ventilation - oxygenation	**Significant differences between groups in:** - mortality: o mortality (n = 6) was reduced with MLPV (RR 0.74, 95% CI 0.59–0.95; I^2 = 29%) o prone positioning (>16h daily) reduced all-cause mortality (RR 0.77, 95% CI 0.64–0.92: I^2 = 21%) o prone positioning reduced all-cause mortality among patients with severe hypoxemia at baseline (RR 0.76, 95% CI 0.61–0.94: I^2 = 0%). - oxygenation: PaO2/FiO2 ratios improvements were greater in PP group than SP group: 25%–36% during the first 3 days after randomization. (Day 1 I^2 = 49%, day 2 I^2 = 27%, day 3 I^2 = 0%). - AEs occurred: pressure Ulcers: RR 1.27 (1.16–1.40); obstruction of endotracheal tube: RR 1.60 (1.27–2.02); dislodgement of thoracostomy tube: RR 3.14 (1.02–9.69) **Non-significant differences between groups in:** - mortality with lung protective ventilation: no effect on mortality (n = 4) if higher tidal volumes were permitted than currently recommended (RR 0.98, 95% CI 0.86–1.12; I^2 = 0%), which differed when compared with trials using protective lung ventilation (interaction p = 0.05) - subgroup-analysis of patients with mild and moderate hypoxemia: No mortality reduction - AEs: There was no difference in other adverse events between the two groups.	1 → 2 (due to indirectness)

AEs = adverse events, ARDS = acute respiratory distress syndrome, CI = confidence interval, MV = mechanical ventilation, PP = prone position, pts = patients, RCTs = randomized controlled trials, RR = risk ratio, SP = supine position, MLPV= mandated lung protective ventilation

Prone positioning may reduce mortality and improve oxygenation in critically ill ventilated patients on ICU.

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#1104

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
1104 Zeppos 2007 (PMID: 18047463 DOI: 10.1016/s0004-9514(07)70009-0)https://doi.org/10.1016/s0004-9514(07)70009-0 **Specification of study:** multi-centre prospective observational study	12.281 PT interventions all patients in 5 ICUs over 3 months		PT intervention (including: directed positioning, mobilisation, transfer, active or passive exercise, manual hyperinflation, ventilator hyperinflation, recruitment maneuvers, application of oxygen, suction, insertion of airway, manual interventions)		**Outcome:** AEs	**Outcomes:** - 27 AEs in 12.281 sessions (0.2%) - 55% AEs related to blood pressure - 30% recovery after stop of intervention, 59% recovery after specific intervention, 11% unknown - pre-existing cardiac comorbidities in 96% - use of vasopressors in 86%	3
	Per Branch						

AEs = adverse events, ICU = intensive care unit, PT = physio therapy

AEs during PT interventions are rare and are self-limiting or treatable.

#1109

Reference, Study Type	Cases and Controls (Participant #, Characteristics) Total		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
# 1109 **Adler 2012** PMID: 22807649 DOI: not available **Specification of study:** Systematic review	15 studies (11 prospective studies, 4 retrospective), exact number of pts unclear [1-15] **Inclusion criteria:** - prospective randomized trials, prospective cohort studies, retrospective analyses, and case series - adults - between January 1, 2000 and June 1, 2011 **Exclusion criteria:** - review articles - only studied non-mobility interventions - described programs or protocols designed to promote early mobilization **Per Branch**			**(Early) mobilisation**	**Usual care/other form of mobili-sation/no control**	**Primary outcomes:** - safety - functional outcomes	**Primary outcomes:** **-** 10 studies pertained to patient safety/ feasibility and 10 studies pertained to functional outcomes with 5 fitting both categories **- safety:** - most cited AE was oxygen desaturation (less than 3 minutes) - accidental removal of patient support equipment rare (<1%) - Burtin et al:1 Achilles tendon rupture in intervention group (bed cycling) **- Functional outcomes:** **- muscle strength:** **-** MRC scores, handgrip, and extremity strength did not differ at time of discharge from the ICU - Burtin et a:increased quadriceps muscle force at hospital discharge - one study: MV for median duration of 46 to 52 days (22.8 80.8 days), pts demonstrated upper extremity/ lower extremity (UE/ LE) strength gains measured by dynamometry - another study: pts mechanically ventilated for 18.1 7 days and also demonstrated UE/LE strength gains by manual muscle testing (MMT) **- Functional mobility:** - mobility milestones accomplished earlier in the intervention groups than the comparison groups in 4 studies - compared to controls, ambulation frequency was greater in the study by Thomsen et al and ambulation distance was greater at hospital discharge in studies by Schweickert et al and Burtin et al. - in postacute care setting, bed mobility and transfers improved in 3 studies, but ambulation/locomotion only improved in studies by Chiang et al and Montagnani et al. **- Quality of life** - Burtin et al noted improvements in PF subscore of the SF-36 at time of hospital discharge	1 → 3 (downgraded for indirectness / applicability and not only RCTs)

AE = adverse event, MRC = medical research council, MV = mechanical ventilation, PF = physical function, pts = patients, SF-36 = short-form 36

Early physical therapy and ICU mobilization is feasible and safe, but effects on muscle strength and quality of life need to be studied further.

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#1119

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#1119 **Bein 2011** PMID: 21939972 DOI: 10.1016/j.injury.2011.08.034 **Specification of study:** prospective randomized study	27 pts **Inclusion criteria:** **-** posttraumatic ALI (PaO2/FIO2 = 200–300 mmHg after stabilization and optimization of ventilation - absence of contraindications for positioning therapy (acute shock syndrome, instable fractures of the spine, severe acute brain injury [Glasgow Coma Scale < 9] - age <18 years or >80 years - absence of preexisting severe chronic lung disease (chronic obstructive lung disease) - absence of multiple organ failure			**CLRT**	**Positioned conventionally**	**Primary endpoints:** - levels of cytokines (Tumour Necrosis Factor, Interleukin 6, Interleukin 8 or Intercellular Adhesion Molecule-1) in BAL and blood **Secondary outcomes:** - haemodynamic, pulmonary, and laboratory values - ventilator-free days - organ-failure free days - ICU LOS - hospital LOS - mortality	**Primary endpoints:** - d5: no significant differences were found in cytokine levels between groups, but a significant decrease in IL-8 ($p < 0.01$) and TNF-a ($p < 0.05$) serum levels and an increase in IL-8 BAL levels in the CLRT-group - in general, cytokine BAL levels tended to be increased in both groups, but more pronounced during CLRT **Secondary outcomes** **Significant differences:** - daily assessment of the severity of disease (SAPS-II, SOFA) significantly reduced in the study group on days 2–4 ($p < 0.05$) - d5: significant difference of pulmonary gas exchange between groups ($p = 0.001$); FIO2 at d5 was significantly different between groups ($p = 0.035$) **No significant differences:** **-** haemodynamic values - ventilator free days - organ-failure free days - ICU + hospital LOS - mortality	2 → 3
	Per Branch							
	14	13						

BAL = broncho-alveolar lavage fluid, CLRT = continuous lateral rotational therapy, ICU = intensive care unit, LOS = length of stay, pts = patients

CLRT might reduce the inflammatory response to acute lung injury.

#1123

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
#1123 **Amidei 2012** PMID: 22390919 DOI: 10.1016/j.iccn.2011.09.002 **Specification of study:** concept analysis	17 publication unknown study type, 12 analyzed[1-12] **Inclusion criteria:** - published in English language - incorporated mobilization as an intervention in a critically ill (acute or chronic) sample - utilized at least one type of physiologic measure in data collection **Exclusion criteria:** - reviews only - addressed functional or other outcomes alone - without discussion of physiologic measures - addressed mobilization after resolution of the critical illness - written in a language other than English		**Mobilization**	**No Mobilization in critically ill**	**Outcomes:** - physiologic outcome (Cardiopulmonary measures) - functional outcome (Borg Rating of Perceived Exertion, Medical Research Council Muscle Strength Grading Scale)	**Outcomes:** - physiologic outcomes: primarily used as indicators of safety; - cardiopulmonary measures comprised the majority of variables; - only the Borg rating of perceived exertion could be suitable for safety measurement; - medical research council muscle strength grading scale could be a physiologic outcome measure no statistically analysis stated and big variance in between the cited studies	1 → 2
	Per Branch						

Multiple physiologic variables should be measured when considering response to mobilization in critically ill patients.

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#1126

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
#1126 **Andersen 2014** PMID: 24335413 DOI: 10.1097/EJA.0000000000000028 **Specification of study:** prospective, controlled, single cohort study	52 pts in single group trial **Inclusion criteria**: - spinal surgery > 2h - 18 – 80y - ASA physical status 1-3 - free and painless movement of the neck **Exclusion criteria**: - history of cervical spine disease - central nervous system disorders - carotid vessel disease - BMI > 35	4 (1: no steady-state, 1: short surgey, 2: missing data)	**head rotated left and right** in prone position during surgery	**head in neutral position** in prone position during surgery	**Outcome:** - $rScO_2$ (measured by NIRS)	$rScO_2$ was significantly different when the head was lifted vs when rested on a surface this is due to compression of sensors. Therefore, only lifted positions were compared. - $rScO_2$ in lifted position: rotated left vs. neutral: n.s. (MD 1 [IQR -1 to 4.5]; p =0.37) - $rScO_2$ in lifted position: rotated right vs. neutral: n.s. (MD - 0.5 [IQR -3.5 to 1]; p = 0.26)	3
	Per Branch						

ASA = American Society of Anestesiologists, BMI = body mass index, NIRS = near-infrared spectroscopy, pts = patients, $rScO_2$ = regional cerebral oxygen saturation

Rotating the head in prone position during spinal surgery does not change the cerebral oxygen saturation compared to a neutral position.

#1128

Reference, Study Type	Cases and Controls (Participant #, Characteristics) Total	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
#1128 **Bird 2010** PMID: 20479345 DOI: 10.1001/archsurg.2010.69 **Specification of study:** Secondary analysis of prospective observational study	45 pts **Inclusion criteria:** - ICU pts - MV *Exclusion criteria not further described* **Per Branch**		**VAP-prevention bundle:** - HOB elevation > 30° - Daily sedation break - Daily assessment for extubation - Peptic ulcer prophylaxis - Deep vein thrombosis prophylaxis		**Primary Outcome:** - Relationship between VAP bundle compliance and VAP incidence **Secondary Outcome:** - Cost savings resulting from the VAP bundle program	**Primary Outcome:** - VAP compliance: Compliance increased in both participating ICUs in the course of the study. o ICU A (Mean; (95% CI)): Baseline 63 (57-69); Post-interventional 81 (72-90) o ICU B (Mean; (95% CI)): Baseline 53 (46-60); Post-interventional 91 (85-97) *Combined data concerning compliance not described* - VAP incidence: o baseline 10.2 VAP cases/1000 ventilator days o during the study period of three years, the combined VAP rates significantly during the last two years. (No values states; p = 0.01 and p = 0.004, respectively) *Data concerning correlation between compliance/incidence not further described* **Secondary Outcome:** - estimated costs of $30.000(±20.000) per VAP case in combination with reduced VAP incidence resulted in $1.080.000 ($360.000-$1.800.000) cost savings as a result of VAP prevention	4

HOB = head of bed, ICU = intensive care unit, MV = mechanical ventilation, pts = patients, VAP = ventilator-associated pneumonia

The VAP-prevention bundle seems to decrease VAP incidence and thereby save treatment costs by prevention.

#1130

Reference, Study Type	Cases and Controls (Participant #, characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
1130 Fleegler 2009 PMID: 19855209 DOI: 10.1097/DCC.0b013e3181b3fff7 **Specification of study:** Observational study with historic control	46 patients **Inclusion criteria:** - the presence of mechanical ventilation - delivered percentage of inspired oxygen (FIO2) greater than 0.50 - PaO2/FIO2 (P/F) ratio less than 300 **Exclusion criteria:** -not defined			Use of continuous lateral rotational therapy protocol	Retrospective identified control subjects	**Primary Endpoints:** - mortality - morbidity - mean ventilator days - ICU LOS - Hospital LOS **Secondary Endpoints:** - lag time to initiating therapy - effects of lag time on ventilator days, ICU LOS, Hospital LOS	**Primary Outcomes:** No significant differences between the groups in: (control vs CLRT) - observed mortality rate (0.39 vs 0.44) - mean acute physiology score (58.2 vs 65.8) p=0.203 - mean MV days (13.4 vs 11.6) p=0.403 - mean ICU LOS (15.4 vs 15.4) p=1 - mean hospital LOS (26.6 vs 23) p=0.425 **Secondary Outcomes:** **(CLRT<5d n=20 vs CLRT≥5d n=14)** Early initiation of continuous lateral rotational therapy resulted in significant decreases in: - ventilator days (11.5 vs 23.4) p=0.001 - ICU LOS (14.7 vs 27.9) p=0.002 No significant changes in: - Hospital LOS (22.5 vs 31.5) p=0.064	4 → 5 (downgraded for indirectness / applicability)
	Per Branch							
	23 intervention	23 control						

LOS = length of stay, ICU = intensive care unit, CLRT = continuous lateral rotational therapy, MV = mechanical ventilation

No benefit of CLRT.

No detailed assessment was carried out because higher-quality evidence is available on this topic.

#1134

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
#1134 **Bailey 2006** PMID: 17133183 DOI: 10.1097/01.CCM.0000251130.69568.87 **Specification of study:** prospective cohort study	103 pts **Inclusion criteria:** - respiratory failure pts - >4 days of mechanical ventilation - pts admitted to respiratory ICU **Exclusion criteria:** - mechanical ventilation for ≤ 4 days		**Assessment of early activity as part of routine respiratory ICU care**		**Primary outcomes:** - safety - feasibility	**Primary outcomes:** - activity events included 233 (16%) sit on bed, 454 (31%) sit in chair, and 762 (53%) ambulate - for pts with endotracheal tube, there were a total of 593 activity events (249 (42%) were ambulation) - <1% activity-related AEs (fall to the knees without injury, feeding tube removal, systolic blood pressure >200 mm Hg, systolic blood pressure <90 mm Hg, and desaturation <80%) - no patient was extubated during activity	3
	Per Branch						

AE = adverse event, pts = patients

Early activity is safe and feasible in patients with respiratory failure.

#1136

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
#1136 **Bouadma 2010** PMID: 20068461 DOI: 10.1097/CCM.0b013e3181ce21af **Specification of study:** Pre- and post-intervention observational study	1.649 ventilator-days **Inclusion criteria:** - mechanically ventilated pts **Per Branch**		**Educational session** about hand-hygiene, glove-and-gown use, backrest elevation, cuff-pressure maintenance, orogastric tube use, gastric overdistension avoidance, good oral hygiene and elimination of non-essential tracheal suction)	**Before education**	**Outcomes:** - compliance to each indicator - VAP	**Outcomes:** - compliance to each indicator (baseline vs 24-months after implementation): - hand-hygiene: n.s. - glove-and-gown use: n.s. - backrest elevation: 5% vs 58%; p < 0.001 - cuff-pressure maintenance: 40% vs 89%; p < 0.001 - orogastric tube use: 52% vs 96%; p < 0.001 - gastric overdistension avoidance: 20% vs 68%; p < 0.001 - good oral hygiene: 47% vs 90%; p < 0.001 - elimination of non-essential tracheal suction: 41% vs 92%; p < 0.001 - VAP: 26.7% vs 11.1%; p < 0.0001	3

VAP = ventilator associated pneumonia

Additional education improves the usage of preventive factors for VAP and reduces the rate of VAP.

#1138

Reference, Study Type	Cases and Controls (Participant #, Characteristics) Total	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
# 1138 **Goldhill 2007** PMID: 17192526 DOI: not available **Specification of study:** Review and Meta-Analysis	35 studies (20 RCTs, 15 nonrandomized, uncontrolled or retrospective studies) between 1987 and 2004 only 15 RCTs were included in meta-analysis[1-15] **Inclusion criteria:** - rotational therapy to prevent or treat respiratory complications **Per Branch**		**Rotational therapy** using a programmable bed that turns on its longitudinal axes	**Manual turning** of patients by nurses every 2 hours	**Outcomes:** - days of MV - days in ICU - mortality - incidence of pneumonia	**Outcomes:** - days of MV[2, 7-9, 15]: n.s. - days in ICU[2, 6,7,9,13,15]: n.s. - mortality[1,2, 4-7, 10-15]: n.s. - incidence of pneumonia when used as prophylaxis[1-4, 7-11]: OR: 0.40 (95% CI 0.27, 0.58); I^2 = 0% - incidence of pneumonia when used as treatment[15]: OR 0.34 (95% CI 0.18, 0.67); I^2 = 0%	1 → 3 (downgraded for indirectness / applicability and not only RCTs)

ICU = intensive care unit, MV = mechanical ventilation, OR = odds ratio, RCT = randomized controlled trial

Rotational therapy reduces the rate of pneumonia when used as phrophylaxis. It has no effect on duration of mechanical ventilation, length of stay or mortality.

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#1139

Reference, Study Type	Cases and Controls (Participant #, Characteristics) Total	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
# 1139 **Bukhari 2012** PMID: 22426908 DOI: not available **Specification of study:** Prospective longitudinal study	**n = 2747** pts **Inclusion criteria:** mechanically ventilated ICU pts **Exclusion criteria:** non-ventilated pts **Per Branch**		**VAP prevention bundle:** - elevation of the head of the bed (30-45°) - daily sedation weaning - daily readiness-to-wean from ventilator assessment - PUD prophylaxis - DVT prophylaxis		**Primary outcome:** - adherence to intervention **Secondary outcomes:** - rate of pneumonia - days on mechanical ventilation - ICU LOS	**Primary outcome:** - adherence to intervention: o 78.9% compliance rate of VAP bundle overall o correlation between the VAP rate and its bundle compliance (*r-value not reported*; p = 0.001) **Secondary outcomes:** - rate of pneumonia (Pre-interventional vs. post-interventional): o 2.5 infections per 1000 patient days vs. 1.98 infections per 1.000 patient's days (*no p-value reported*) o reduction of VAP rate 1.41 per 1000 ventilator days (*no p-value reported*) - days on mechanical ventilation: *not reported* - ICU LOS: *not reported*	4

DVT = deep venous thrombosis, ICU = intensive care unit, MV = mechanical ventilation, pts = patients, PUD = peptic ulcer disease, VAP = ventilator-associated pneumonia

The VAP-prevention bundle is feasible and well tolerated by patients, relatives and staff.

#1141

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#1141 **Hamlin 2013** PMID: 18510182 DOI: 10.1097/01.dcc.0000311593.87097.6a **Specification of study:** article	number of pts not stated **Inclusion criteria:** mechanical ventilated patients on the ICU **Exclusion criteria:** not stated			**Turning (Lateral Rotation)**	**Patients acted as their own control**	**Endpoints:** hemodynamic effects of turning	**Endpoint:** - negative hemodynamic effects of PPV + lateral rotation: Increased pericardial pressure with constrained left ventricular filling/ reduced venous return/ reduced mean arterial pressure, stroke volume, cardiac output /change in the determinants of the venous pressure gradient / reduced SvO2 / inferior vena cava compression that creates a vascular waterfall condition no statistics or p-values mentioned	4
	Per Branch							

ICU = intensive care unit, PPV = positive pressure ventilation, pts= patients

There are several negative effects of PPV and Lateral Rotation. No detailed assessment was carried out because higher-quality evidence is available on this topic.

#1142

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
# 1142 **Balas 2013** PMID: 23758115 DOI: 10.3928/0098 9134-20130530-06 **Specification of study:** Case study	no systematic inclusion of studies			**ABCDE-Bundle**			- immobilization needs to be reduced - ambulation protocols should be implemented - contraindications need to be defined - early mobilization improves DVT, LOS, functional status	4
	Per Branch							

DVT = deep vein thrombosis; LOS = length of stay

No detailed assessment was carried out because there is higher-quality evidence available.

#1155

Reference, Study Type	Cases and Controls (Participant #, characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
1155 Mauri 2010 PMID: 20196878 No DOI **Specification of study:** prospective pilot trial	20 pts. **Inclusion criteria:** - MV < 24h before inclusion - no pneumonia or ALI **Exclusion criteria:** - intubated < 72h - hemodynamic instability - recent esophageal, gastric or pulmonary resection - head or spinal cord injury		1 withdrew consent (LHG)	**Semi-recumbent group** 30° for 64h	**Lateral-Horizontal group** Supine position with turning from side to side every 2-4h 12-24h	**Outcomes:** - aspiration (measured as pepsin assay) - VFD - VAP	**Results:** - aspiration: n.s. - VFD: SRG 8 (0–21) vs LHG 24 (12–25); p = 0.04 - VAP: n.s.	3
	Per Branch							
	SRG: 10	LHG: 11						

MV = Mechanical Ventilation, ALI = Acute Lung Injury, SRG = Semi-recumbent Group, LHG = Lateral-Horizontal Group, VAP = Ventilator-associated pneumonia, VFD = Ventilator-free Days, pts.= patients

Lateral-horizontal positioning does not reduce the risk for aspiration or ventilator associated pneumonia but increases the number of ventilator-free days.

No detailed assessment was carried out because higher-quality evidence is available on this topic.

#1156

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#1156 **Deye 2012** PMID: 23093247 DOI: 10.1007/s00134-012-2727-5 **Specification of study:** prospective, crossover study	24 pts. **Inclusion criteria:** - at least 1 failure of SBT before the end of a 2h trial - and/or 1 unexplained extubation failure (need for reintubation within the 72 h after extubation not related to an untreated cardiac failure or an intercurrent infectious disease or to laryngeal dyspnea) **Exclusion criteria:** - hemodynamic instability - uncontrolled sepsis - patient refusal - age less than 18 years - current esophageal pathology			three postures: seated position in bed (90°LD), the semi-seated (45°), and the supine (0°) positions (applied in random order)	patient acted as their own controls	**Primary outcomes:** - breathing pattern - occlusion pressure (P0.1) - PEEPi - inspiratory muscle effort	**Primary outcome:** - 45° position with lowest levels of effort ($p \leq 0.01$) and occlusion pressure ($p < 0.05$) - Respiratory effort: lowest at 45° in 18/24 patients - PEEPi and PEEPi-related work higher in 0° ($p \leq 0.01$), - respiratory effort, heart rate, and $P_{0.1}$ values increased in 45° ($p < 0.05$) - median Ccw highest in 0° ($p = 0.03$), CcW lower in 45° ($p < 0.05$) - correlation between PEEPi values and the PTP ($p < 0.001$) - correlation PEEPi values and the WOB ($p < 0.001$) - correlation PEEPi values and the $P_{0.1}$ ($p < 0.001$)	3
	Per Branch							

Ccw = chest wall compliance, iPEEP = intristic positive end expiratory pressure, LD = legs down, pts = patients, SBT = spontaneous breathing trial, WOB = work of breathing

A 45° position helps to unload the respiratory muscles, moderately reduces $PEEP_i$, and is often considered comfortable and the semi-seated position may help the weaning process in ventilator-dependent patients.

#1158

Reference, Study Type	Cases and Controls (Participant #, Characteristics) Total	Drop-out Rate	Intervention	Control	Outcome	Primary Results	Evidence Grade
# 1158 **Delaney 2006** PMID: 16684365 DOI: 10.1186/cc4912 **Specification of study:** systematic review and meta-analysis	15 RCTs , 1169 pts[1-15] no trial met all the validity criteria. **Inclusion criteria:** - critically ill adults receiving MV - kinetic or rotating bed as intervention applied for > 24 hours - intermittent manual turns for the control group - prospective randomized or pseudo-randomized design - outcome measures included any of the incidence of nosocomial pneumonia, mortality, duration of mechanical ventilation, or ICU or hospital LOS		**Kinetic or rotating bed** applied for at least 24 hours in critically ill mechanically ventilated adult patients	**Intermittent manual turns**	**Outcomes:** - incidence of nosocomial pneumonia - the effect of the intervention on mortality, duration of mechanical ventilation, ICU length of stay and hospital length of stay - complications associated with the use of these beds	**Significant differences between groups in:** - reduction in the incidence of nosocomial pneumonia (pooled odds ratio (OR) 0.38, 95% confidence interval (CI) 0.28 to 0.53) **No significant differences between groups in:** - reduction in mortality (pooled OR 0.96, 95%CI 0.66 to1.14) - duration of MV (pooled standardized mean difference (SMD) -0.14 days, 95%CI, -0.29 to 0.02) - duration of ICU stay (pooled SMD -0.064 days, 95% CI, -0.21 to 0.086) - duration of hospital stay (pooled SMD 0.05 days, 95% CI -0.18 to 0.27).	1 → 2

CI = confidence interval, ICU = intensive care unit, LOS = length of stay, OR = odds ratio, pts = patients, RCT = randomized controlled trial, SMD = standardized mean differences, VAP = ventilator associated pneumonia

Kinetic bed therapy is associated with a significant reduction in the odds of developing nosocomial pneumonia in mechanically ventilated patients. However, it is not associated with a significant reduction in the mortality, duration of mechanical ventilation, or ICU or hospital length of stay.

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#1162

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
#1162 **Burtin 2009** PMID: 19623052 DOI: 10.1097/CCM.0b013e3181a38937 **Specification of study:** RCT	90 critically ill pts **Inclusion criteria** - expected to have a prolonged ICU stay of at least 7 more days **Exclusion criteria** - conditions impairing the cycling movement - anticipated fatal outcome - body length <1.5 m - preexisting diagnosis causing neuromuscular weakness, acute stroke, status epilepticus - coagulation disorders - intracranial pressure >20 mmHg - psychiatric disorders or severe agitation - cardiorespiratory instability	23 for ICU discharge assessment (14 intervention, 9 control)	**Cycling exercise** - session 5 days a week, using a bedside cycle ergometer starting at D5 the earliest - standard of care	**Standard of care**: Respiratory + Physiotherapy and a standardized mobilization session of the upper and lower extremities on 5 days per week	**Primary endpoint:** - 6MWD at hospital discharge **Secondary outcomes:** - isometric quadriceps force and functional status - weaning time - ICU and hospital LOS - 1 year mortality **Sample size** - sample size of 36 pts was required in each group to demonstrate a difference of 50 m in 6MWD with a statistical power of 80% and an alpha level of 0.05	**Primary outcome** - 6MWD (196 m [126–329 m] vs. 143 m [37–226 m]; 29 [19–43] vs. 25 [8–36] %pred., $p < 0.05$) **Secondary outcomes** - SF-36 PF (21 points [18–23 points] vs. 15 points [14–23 points], $p < 0.01$) - handgrip force n.s. - Berg Balance Scale n.s. - ability to walk independently n.s. - weaning time n.s. - ICU and hospital LOS n.s. - no severe adverse events were identified	2
	Per Branch						
	45	45					

ICU = intensive care unit, LOS = length of stay, m = meter, n.s. = not significant, pts = patients, RCT = randomized controlled trial, 6MWD = 6 minute walking distance

Early exercise in critically ill patients led to improved functional exercise capacity and self-perceived functional status.

#1164

Reference, Study Type	Cases and Controls (Participant #, characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
#1164 **Schellongowski 2007** PMID: 17252227 DOI: 10.1007/s00134-006-0513-y **Specification of study:** prospective observational study	**Total** 12 pts **Inclusion criteria:** - acute respiratory failure requiring MV - diagnosis of ALI or ARDS made within 96h prior to inclusion - decision to treat patients with CLRT taken within 48h prior to inclusion - hemodynamically stable during rotation over the max. angle for at least 12h prior to inclusion - 18 – 85 years **Per Branch**		**CLRT**		**Primary endpoints:** - pulmonary gas exchange (blood gas analysis) - respiratory mechanics (static lung compliance) - hemodynamics (blood pressure, cardiac index, pulmonary shunt fraction)	**Significant differences between groups in:** - lower static compliance was observed in lateral steep position than in supine position ($p < 0.001$) - $PaCO_2$, lower in supine position than in left and right lateral steep position ($p < 0.01$) **No significant differences between groups in:** - no significant changes in PaO_2/FiO_2 ratio, mean arterial blood pressure, pulmonary shunt fraction, or cardiac index	3

ALI = acute lung injury, ARDS = acute respiratory distress syndrome, CLRT = continuous lateral rotation therapy, MV = mechanical ventilation, pts = patients

Lateral steep position does not lead to benefits with respect to oxygenation or hemodynamics.

#1167

Reference, Study Type	Cases and Controls (Participant #, Characteristics) Total	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
#1167 **Goldhill 2008** PMID: 18412649 DOI: 10.1111/j.1365-2044.2007.05431.x **Specification of study:** Prospective observational study	**n = 393** pts **Inclusion criteria:** - ICU pts **Exclusion criteria:** - incomplete data sheets **Per Branch**		**Positioning of the patient**		**Outcomes:** - time between turns - number of turns - type of positioning *(Outcomes not divided into primary or secondary outcomes)*	**Outcomes:** - time between turns: o in total (h; mean [SD]; median [IQR]): 4.85 [3.3]; 4.0 [3.0-5.5] o per RASS (n [%] and hours between turns as median [IQR]): ▪ RASS = 1; 19 (5.0%); 3.6 [2.8-4.9] ▪ RASS = 2; 159 (41.5%); 4.0 [3.0-6.0] ▪ RASS = 3; 31 (8.1%); 4.5 [3.1-5.7] ▪ RASS = 4; 86 (22.5%); 3.7 [3.0-4.8] ▪ RASS = 5; 42 (11.0%); 4.0 [3.0-4.6] ▪ RASS = 6; 34 (8.9%); 4.2 [3.4-5.0] o no significant association between average time between turns and age, weight, height, gender, respiratory diagnosis, intubated and ventilated, sedation score, day of week or nurse to patient ratio. - positions (% of time; mean [SD]): o on back: 46.1 [24.1] ▪ turned to left: 28.4 [17.0] ▪ turned to right: 25.5 [16.1] ▪ turn to side < 30°: 46.3 [39.2] ▪ turn to side > 30°: 53.7 [39.2] ▪ head down: 0.2 [3.1] ▪ flat: 2.3 [9.7] ▪ head up < 45°: 50.7 [35.4] ▪ head down ≥ 45°: 46.7 [35.8] *(Difference between flat and head down not further described)* - number of turns per patient (median [IQR): 5 [3-7]	3

ICU = intensive care unit, IQR = interquartile range, pts = patients, RASS = Ramsay agitation sedation score, SD = standard deviation

Time between turns seems not to be associated with age, weight, height, gender, respiratory diagnosis, intubated- or ventilated-status, sedation score, day of week or nurse to patient ratio.

#1168

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
#1168 **Zhiqiang 2013** PMID: 23127305 DOI: 10.1016/j.apmr.2012.10.023 **Specification of study:** Systematic review	17 studies (7 RCT, 1 quasi-RCT, 7 case-series, 1 prospective cohort study, 1 historical controlled study), 1.614 pts [1-17] **Inclusion criteria:** - population consisted of adults, at least 60% with MV for 24 h or more - study design: RCT, quasi-RCT, or other comparative study with or without controls or case series with 10 or more cases - active mobilization in ICU or HDU setting - primary outcome: physical function - Secondary outcomes: hospital outcomes **Exclusion criteria:** - intervention started at home or was conducted both during hospital stay and hospital-discharge - studies which only assessed effects of passive mobilization		**Active mobilisation**	**Standard of care / other form of mobilisation / no control**	**Primary outcomes:** - physical function (muscle strength, physical activity, mobility and functional ability, and health-related QoL) **Secondary outcomes:** - hospital outcomes (weaning rate, duration of MV, ventilator-free days, LOS in the ICU/HDU and hospital, mortality, discharge destination, costs, adverse events)	**no meta analysis was conducted**	1 → 4 (different study types, no meta analysis, indirectness / applicability)
	Per Branch						

ADL = activities of daily living, AE = adverse event, BI = Barthel index, FIM = functional independence measure, HDU = high dependency unit, LOS = length of stay, MV = mechanical ventilation, pts = patients, QoL = quality of life, 6MWD = six-minute walk distance

Active mobilisation therapy for patients who have undergone mechanical ventilation in ICU settings appears to have no severe adverse effects.

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#1169

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#1169 **Simonis 2011** PMID: 22729756 DOI: 10.1007/s00392-012-0484-7 **Specification of study:** RCT	89 patients **Inclusion criteria:** - cardiogenic shock (defined by a systolic blood pressure of<90 mmHg, or a cardiac index of <2.2 l/m2 and a pulmonary wedge pressure > 15 mmHg, or the need for inotropic or vasopressor support) - prolonged ventilator support, defined as modified oxygenation index (PaO2/ FiO2) <300 torr (40 kPa) after 24–30 h of ventilator therapy **Exclusion criteria:** - rhythmogenic instability requiring repeated resuscitation procedures - active bleeding precluding rotation - body weight above the upper weight limit for the KT device (i.e., more than 140 kg)		n/a	**Kinetic therapy = continuous lateral rotation** - continuously turned through an arc of about 80° every 7 min - percussion was administered by the automated percussion mode of the beds at nine beats/s for 10 min every 2 h	**Standard care**	**Primary outcomes:** **-** occurrence of nosocomial pneumonia (defined as combined occurrence of fever, new radiological infiltrate occurring more than 48 h after admission, and growth of typical microorganism in tracheal aspirates) **Secondary outcomes:** - occurrence of pressure ulcer - all-cause mortality during the first year after hospital admission	**Primary outcomes**: - hospital-acquired pneumonia occurred in 10 patients in KT and 28 patients in SC (p<0.001) **Secondary outcomes:** - pressure ulcers were seen in 10 versus 2 patients (p<0.001) - hospital mortality tended to be lower in KT, and 1-year all-cause mortality was 41 % in KT and 66 % in SC (p = 0.028)	2 → 3
	Per Branch							
	45 KT	44 SC						

KT = kinetic therapy, SC = standard care

In this study the use of kinetic therapy reduced the rate of pneumonia and pressure ulcers and decreased mortality in patients with cardiogenic shock.

#1173

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#1173 **Staudinger 2010** PMID: 19789440 DOI: 10.1097/CCM.0b013e3181bc8218 **Specification of study:** RCT	150 pts **Inclusion criteria:** - < 48h MV - free from pneumonia, ALI, ARDS - age: 18-89 years - expected ICUS LOS > 48h **Exclusion criteria:** - contradictions for rotation therapy (e.g. fractured rib cage/spine, weight > 150kg, height > 185cm) - pregnancy - GCS > 8 - post-operative MV			**CLRT** - rotation started with 60° angle and escalated to max. angle over 2-6 h - performed continuously, aiming for a rotation time of >18hrs/day	**Standard of care**	**Primary endpoint:** - 28-day prevalence of VAP **Secondary outcomes:** - hospital LOS - duration of MV - ventilator-free days during the first 28 days after intubation - ICU and Hospital Mortality - number and duration of atelectasis - prevalence of ALI/ARDS - changes in oxygenation and Lung injury score - complications (Pressure sores or Intolerance)	**Primary endpoint:** - prevalence of VAP was 11% in the rotation group and 23% in the control group (p = 0 .048) **Secondary outcomes:** - hospital LOS shorter in CLRT group (p=0.01) - duration of ventilation (8 ± 5 vs. 14 ± 23 days, p = 0 .02) - ventilator free days more in rotation group (p=0.04) - ICU und hospital Mortality (n.s.) - number and duration of atelectasis lower in rotation group (p=0.001) - prevalence of ALI/ARDS not stated - changes in oxygenation and lung injury score not stated - complications (pressure sores or intolerance) not stated	2
	Per Branch							
	75	75						

ALI = acute lung injury, ARDS = acute respiratory distress syndrome, LOS = length of stay, MV = mechanical ventilation, n.s. = not significant, pts = patients, VAP = ventilator associated pneumonia

Application of CLRT led to a reduction of the prevalence of VAP, a shorter ventilation time and length of stay. The results were not statistically significant after adjusting for disease severity.

#1177

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
#1177 **Swadener-Culpepper 2008** PMID: 18574374 DOI: 10.1097/01.CNQ.0000325051.91473.42 **Specification of study:** retrospective case control study	96 pts from January 2003 to May2004 and 75 pts. of a retrospective comparison group **Inclusion criteria:** - FiO2 >50% more than 1h - ratio of partial pressure of arterial oxygen (PaO2/FiO2) <300mmhg - PEEP 8cmHg - predicus score of 5 **Exclusion criteria:** - unstable spinal injury - long bone fractures requiring traction - certain head/neck injuries - neurologic patients placed on high level oxygen for short time **Total** **Per Branch** 1.Early: 50 2.Late: 46 — 75		**CRLT** 1. Early: begin within 48h 2.Late: begin more than 48h	**Without CLRT** (comparison group)	**Primary endpoints:** - hospital LOS - number of ventilation days - overall treatment costs **Secondary outcomes:** - pts rates of readmission into ICU - rate of reintubation	**Primary endpoints:** - mean LOS in the ICU, early intervention group: 13.1 days, compared to late intervention group: 18.9 days (p=0.02) compared to comparison group: 18.4 days (p<0.05) - cost to treat for early intervention group was less than for late intervention group (p=0.01), compared with comparison group (p=0.056) - hospital LOS, ventilation days (n.s.) **Secondary outcomes:** - reintubation rate, readmission to ICU (n.s.)	4

CCU = critical care unit, CLRT = continuous lateral rotation therapy, LOS = length of stay, PEEP = positive end expiratory pressure, pts = patients; n.s.= not significant

CLRT reduced critical care LOS as well as treatment costs.

No detailed assessment was carried out because higher-quality evidence is available on this topic.

#1178

Reference, Study Type	Cases and Controls (Participant #, characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
1178 Thomas 2007 PMID: 17444315 https://doi.org/10.1177/0310057X0703500214 **Specification of study:** systematic review	12 publications between 1951 and 2007 (1 review and 11 empiric articles)[1-12] **Inclusion criteria:** - age > 16 years - RCTs - ICU MV pts - lateral positioning **Exclusion criteria:** - positioning during surgery or anaesthesia - pts with one-lung ventilation - pts with lung transplant or lung resection - several interventions - exclusively investigation of validity/repeatability of measurements from clinical monitoring after intervention		**Lateral positioning in MV ICU patients**	**Standard of Care**	**Endpoints:** - oxygenation - compliance - haemondynamics - incidence of pneumonia - mortality - long-term outcomes		1 → 4 (downgraded due to quality of evidence of included articles and indirectness/ applicability)
	Per Branch						

Pts = patients, ICU = intensive care unit, MV = mechanically ventilated

The effectiveness of lateral positioning on clinical outcomes in critically ill patients is unclear due to limited evidence.
No detailed assessment was carried out because higher-quality evidence is available on this topic.

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#1182

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
#1182 **Thomas 2006** PMID: 17628197 DOI: 10.1016/j.hrtlng.2006.10.008 **Specification of study:** A prospective, within-subjects, randomized cross-over study	**Total** N=34 patients **Inclusion criteria:** presence on chest radiograph of: a) bilateral lung pathology consistent with ALI or ARDS criteria b) or unilateral lung pathology c) or no lung pathology intubated and mechanically ventilated hemodynamically stable with: a) heart rate 60–130 beats/min b) mean arterial blood pressure 70–120 mm Hg c) no compromising arrhythmias d) ICP<20 mm Hg (if measured) e) mean pulmonary arterial pressure<30 mm Hg, pulmonary capillary wedge pressure 8-17 mm Hg (if measured via pulmonary arterial (PA) catheter. - no, unilateral, or bilateral pulmonary infiltrates on chest radiograph **Exclusion criteria:** - age < 18 years - preexisting severe chronic respiratory disease (FEV1less than 40%) - burn injuries - chest wall abnormalities - pulmonary barotrauma (eg, pneumothorax) - paralysing medications - nitric oxide - contraindications to lateral positioning (eg, unstable spinal fractures). **Per Branch** 34 | 34		90 degree lateral position at the supine starting position (T0)	Same population but data at different time stamps - 30 min in lateral turn (T30) - 2 hours into lateral turn (T120) - 30 min post return to supine position (T150)	**Primary endpoints:** - arterial blood gas - respiratory mechanic - hemodynamic data **Secondary endpoints:** - AE	**Primary outcomes:** No significant differences between the groups in: - PaO2/FiO2 p=0.15 - RR p>0.05 - heart rate p>0.05 Significant differences between the groups in: - dynamic compliance (T0=56±18.6>(T30=49.9±18 ; T120=49.2±17) L/cmH20,P=0.01) - cardiac index increased at T30 (T0=3.7±1.2, T30=4.8±1.3 L/min/m2, P<0.01) **Secondary outcomes:** - 21% AEs but primarily minor and transient	2 → 3

AE = adverse event, ALI = acute lung injury, ARDS = acute respiratory distress syndrome, ICP = intracranial pressure

In this heterogeneous population, lateral positioning had no beneficial effect on gas exchange. However, in ventilated patients who were hemodynamically stable, it was well tolerated and not associated with significant serious adverse events.

#1184

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#1184 **Clark 2012** PMID: 22879442 DOI: 10.2522/ptj.20110417 **Specification of study:** Retrospective Cohort Study	2.176 pts **Inclusion criteria:** - patients admitted to TBICU **Exclusion criteria:** - cardiovascular, pulmonary and musculoskeletal instability - vascular access requiring femoral or dorsal pedis arterial line - nasotracheal intubation due to high extubation risk - use of pressor or inotropic medications to maintain hemodynamic stability - conditions requiring continuous sedation or paralytic medications, such as open abdominal wounds (fascia visible)			**Early mobilisation** - group 1: Prior to implementation of EMP - group 2: After implementation of EMP *EMP:* *- Level 1:* ○ *nursing standard of care* ○ *daily physiotherapist screening* *- Level 2: (Assistance of physiotherapy, nursing and respiratory team)* ○ *previous level continued* ○ *active-assisted to active exercises* ○ *mobility training* ○ *sitting up in bed (back supported)* *- Level 3: (Assistance of physiotherapy, nursing and respiratory team)* ○ *previous level continued* ○ *sitting on edge of bed initiated* *- Level 4: (Assistance of physiotherapy, nursing and respiratory team)* ○ *previous level continued* ○ *standing and active transfer to chair with assistance initiated* ○ *mobility progressed to walking*		**Primary outcome:** - safety (related to nosocomial complications and adverse events) **Secondary outcome:** - TBICU LOS - hospital LOS	**Group differences (group 1 vs. group 2):** - age [mean (SD)]: 44.1 (18.5) vs. 46.6 (19.6), p ≤ 0.01 - gender male (%): 75.1% vs. 70.5%, p ≤ 0.02 - ISS score [median (SD)]: 23.6 (12.8) vs. 22.2 (12.8), p = 0.01 - prevalence of arthritis (%): 5.5 vs. 9.7, p ≤ 0.001 - prevalence of cardiovascular disorder (%): 31.8 vs. 37, p = 0.01 - prevalence of diabetes (%): 3.5 vs. 10.2, p ≤ 0.001 - prevalence of neurologic disorder (%): 8.2 vs. 10.9, p = 0.03 - prevalence of obstructive sleep apnea (%): 1.6 vs. 3.0, p = 0.04 - prevalence of pulmonary disorder (%): 7.7 vs. 10.5, p = 0.03 **Primary outcome (group 1 vs. group 2):** - safety: *(RRs adjusted for age and injury severity)* ○ **Nosocomial complications (%):** ▪ airway: 7.1 vs. 3.5, p < 0.001; Crude RR: 0.5 (95% CI: 0.34-0.73), p < 0.05; Adjusted RR: 0.52 (95% CI: 0.35-0.76), p < 0.05 ▪ cardiovascular: 12.2 vs. 15.2, p = 0.04; Crude RR: 1.33 (95% CI: 1.06-1.68), p < 0.05; Adjusted RR: 1.26 (95% CI: 0.99-1.59), p > 0.05 ▪ psychiatric: 3.4 vs. 1.7, p = 0.02; Crude RR: 0.60 (95% CI: 0.35-1.04), p > 0.05; Adjusted RR: 0.60 (95% CI: 0.35-1.03), p > 0.05 ▪ pulmonary (excluding pneumonia): 49.2 vs. 42.2, p ≤ 0.001; Crude RR: 0.81 (95% CI: 0.72-0.92), p < 0.05; Adjusted RR: 0.84 (95% CI: 0.74-0.95), p < 0.05 ▪ renal/genitourinary: 18.3 vs. 15.0, p = 0.04; crude RR: 0.86 (95% CI: 0.0.70-1.06), p > 0.05; adjusted RR: 0.83 (95% CI:0.67-1.02), p > 0.05 ▪ vascular: 15.3 vs. 8.5, p ≤ 0.001; crude RR: 0.57 (95% CI: 0.44-0.73), p < 0.05; adjusted RR: 0.58 (95% CI: 0.45-0.75), p < 0.05 ▪ deep vein thrombosis: 10.9 vs. 6.7, p ≤ 0.001; crude RR: 0.64 (95% CI: 0.48-0.85), p < 0.05; adjusted RR: 0.67 (95% CI: 0.50-0.90), p < 0.05 ▪ pneumonia: 27.9 vs. 22.4, p ≤ 0.01; crude RR: 0.78 (95% CI: 0.66-0.92), p < 0.05; adjusted RR: 0.79 (95% CI:0.66-0.93), p < 0.05 ○ **Adverse events:** none reported **Secondary outcomes (group 1 vs. group 2):** - TBICU LOS [mean (SD)]: 11.0 (16.2) vs. 10.4 (14.0), p = 0.33 - hospital LOS [mean (SD)]: 19.2 (28.2) vs. 16.8 (18.4), p = 0.02	4
	Per Branch							
	Group 1 n = 1044	Group 2 n = 1132						

EMP = early mobilisation protocol, LOS = length of stay, pts = patients, TBICU = trauma and burn intensive care unit

Implementation of an early mobilization program with daily screening and assistance in mobilization seems safe and feasible, as it reduces nosocomial complications (with exception of cardiovascular complications) and decreases hospital length of stay in critically ill patients admitted to trauma and burn ICU.

#1186

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
# 1186 **Tongyoo 2006** PMID: 17718246 DOI: not available **Specification of study:** A pilot study	**Total** 18 patients (intervention and control group) **Inclusion criteria:** - ratio of partial pressure of arterial oxygen (PaO2) to the fraction of inspired oxygen (FiO2) of or less than 200 while receiving positive end expiratory pressure (PEEP)of at least 5 cm of water - radiographic evidence of bilateral pulmonary infiltrates - absence of clinical evidence of left atrial hypertension or a pulmonary capillary wedge pressure of less than 18 mmHg **Exclusion criteria:** - aged < 14 years - evidence of cerebral edema - chest X-ray showed pleural effusion, pneumothorax or atelectasis - contraindication to using the lateral position, such as fracture of the spine (within 2 weeks), thoracoabdominal surgery or severe hemodynamic instability **Per Branch** 18 | 18		**Lateral position**	**Supine position**	**Endpoints:** comparing supine, right, left lateral positions (>60 degree) in: - PaO2 - arterial blood gas parameters - respiratory mechanics - hemodynamic parameters	**Outcomes:** no significant differences between the groups in: (supine vs decubitus) - mean PaO2 (84.6 vs 90.3) p=0.23 - arterial blood gas parameters p>0.05 - respiratory mechanics p>0.05 - hemodynamic parameters p>0.05	3 → 4

The PaO2 increased while in the right lateral position in patients with predominant left pulmonary infiltration or bilateral infiltration. This effect may be due to the small sample size. A larger randomized controlled study is needed.

#1198

Reference, Study Type	Cases and Controls (Participant #, Characteristics) Total	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
#1198, **Muscedere 2008** PMID: 18359430 DOI: 10.1016/j.jcrc.2007.11.014 **Specification of study:** Practice guidelines	109 trials **Inclusion criteria:** database search from 1980 to October 1, 2006 for: - randomized controlled trials - systematic reviews - meta-analysis -> topic prevention of VAP **Exclusion criteria:** - RCTs of stress ulcer prophylaxis **Per Branch**		**Depending on trial**	**Depending on trial**	**Endpoints:** - physical strategies - positional strategies - pharmacologic strategy	**Physical outcomes:** recommendation to reduced VAP risk: - orotracheal intubation (1 level 2 trial, 4 level 2 trials) - new circuits for each patient (2 level 2 trials) - change airway humidifier every 5-7 days (2 level 2 trials) - closed endotracheal suctioning system (6 level 2 trials) - change of suctioning system for every patient (1 level 2 trial) - use of subglottic secretion drainage for patients MV > 72h no recommendation to reduce VAP risk: - Systematic search for maxillary sinusitis (1 level 2 trail) - Use of airway humidifier (12 level 2 trials - Use of bacterial filters (1 level 2 trial) **Positional outcomes:** positional strategies: recommendation to reduced VAP risk: - kinetic bed therapy (7 level 2 trials) - semi recumbent positioning (1 level 1 trial, 1 level 2 trial) no recommendation to reduce VAP risk: - prone positioning (2 level 2 trials)	1 → 3 (outdated)

MV = mechanical ventilation, VAP = ventilator-associated pneumonia

There are a growing number of evidence-based strategies for VAP prevention, which, if applied in practice, may reduce the incidence of this serious nosocomial infection.

#1214

Reference, Study Type	Cases and Controls (Participant #, Characteristics) Total	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
1214 Wang 2016 PMID: 26743945 DOI: 10.1002/14651858.CD009946.pub2 **Specification of study:** Systematic Review and Meta-Analysis	10 publications from 1999-2012 (10 RCTs, n = 878 pts)[1-10] **Inclusion criteria:** - RCTs - population: endotracheal intubated and mechanically ventilated adult pts - Studies comparing SRP vs. SP or different degrees of body positioning **Exclusion criteria:** - cluster randomisation (due to "herd effect") - cross-over design due to ("carry-over effect") - quasi-RCTs (due to potential problems with imbalanced prognosis and failure to conceal the treatment allocation) - >15% of pts. Ineligible for SRP **Per Branch**	24 pts (due to lost to follow-up in one trial)	SRP (30°-60°) or 45°	SP (0°-10°) or (25°-30°)	**Primary outcomes:** - clinically suspected VAP (according to the definition of CDC 1997) - microbiologically confirmed VAP, - composite of clinically suspected and clinically confirmed VAP - ICU mortality - hospital mortality **Secondary outcomes:** - ICU LOS - hospital LOS - duration of ventilation - use of antibiotics - adverse events (device-related, dysphagia, laryngospasm, aspiration, venous thromboembolism, pressure ulcers, haemodynamic instability)	**Significant differences between groups in:** - clinically suspected VAP [8 trials comparing SRP (30°-60°) vs. SP (0°-10°); n = 759 pts] o 14.3% vs. 40.2%, *no p-value reported* o RR 0.36 (95% CI 0.25-0.5) o heterogeneity: p= 0.2, I^2 = 29% o RD 25.7% (95% CI 20.1%-30.1%) o GRADE: moderate confidence in the estimate **Non-significant differences between groups in:** - clinically suspected VAP [2 trials comparing SRP 45° vs. SRP 25° or 30°; n = 91 pts] o 22.2% vs. 26.1%, *no p-value reported* o RR 0.74 (95% CI 0.35-1.56) o GRADE: very low confidence in estimates - microbiologically confirmed VAP o 3 trials comparing SRP (30°-60°) vs. SP (0°-10°); n = 419 pts ▪ 12.6% vs. 31.6%, *no p-value reported* ▪ RR 0.44 (95% CI 0.11-1.77), ▪ heterogeneity: p = 0.0006, I^2 = 87% ▪ GRADE: very low confidence in the estimate o 1 trial comparing SRP 45° vs. SP 25°; n = 30 pts ▪ 23.5% vs. 38.5%, *no p-value reported* ▪ RR 0.61 (95% CI 0.2-1.84) ▪ GRADE: very low confidence in estimates - composite of clinically suspected and clinically confirmed VAP: none of the included studies reported this outcome - ICU mortality o 2 trials comparing SRP (30°-60°) vs. SP (0°-10°); n = 307 pts ▪ 29.8% vs. 34.3%, *no p-value reported* ▪ RR 0.87 (95% CI 0.59-1.27) ▪ heterogeneity: p = 0.43, I^2 = 0% ▪ GRADE: low confidence in the estimate o 1 trial comparing SRP 45° vs. SRP 25°; n = 30 pts ▪ 17.6% vs. 30.8% ▪ RR 0.57 (95% CI 0.15 vs. 2.13) ▪ GRADE: very low confidence in estimates - hospital mortality o 3 trials comparing SRP (30°-60°) vs. SP (0°-10°); n = 346 pts ▪ 23.8% vs. 27.6%, *no p-value reported* ▪ RR 0.84 (95% CI 0.59-1.20) ▪ heterogeneity: p = 0.32, I^2 = 12% ▪ GRADE: low confidence in the estimate o 2 trials comparing SRP (30°-60°) vs. SP (25° or 30°); n = 91 pts ▪ 15.6% vs. 13%, *no p-value reported*	1

							▪ RR 1.00 (95% CI 0.38 vs. 2.65) ▪ GRADE: very low confidence in estimates - ICU LOS o 3 trials comparing SRP (30°-60°) vs. SP (0°-10°); n = 346 pts ▪ MD = -1.64 days (95% CI -4.41 to 1.14), *no p-value reported* ▪ heterogeneity: p = 0.21, I^2 = 35% ▪ GRADE: moderate confidence in the estimate o 1 trial comparing SRP 45° vs. SP 30°; n = 30 pts ▪ MD = -1.6 days (95% CI -0.88 to 4.08), p = 0.21 ▪ GRADE: very low confidence in the estimate - hospital LOS [2 trials comparing SRP (30°-60°) vs. SP (0°-10°); n = 458 pts]: o MD = -3.35 days (95% CI -7.8 to 1.09), *no p-value reported* o heterogeneity: p < 0.00001, I^2 = 93% o GRADE: very low confidence in the estimate - duration of ventilation o 4 trials comparing SRP (30°-60°) vs. SP (0°-10°); n = 458 pts o MD -3.35 days (95% CI -7.80 to 1.09), *no p-value reported* o heterogeneity: p = < 0.00001, I^2 = 93% o 1 trial comparing SRP 45° vs. SP 25°; n = *not reported* ▪ Pts without VAP: mean ventilated hours 61.5 vs. 63.1 (45° and 25° respectively); SD not reported ▪ Pts with VAP: mean ventilated hours 160 vs. 172.5 hours (45° and 25° respectively); SD not reported - use of antibiotics [3 trials comparing SRP (30°-60°) vs. SP (0°-10°); n = 284 pts]: o 84.8% vs. 84.2%*, no p-value reported* o RR 1.00 (95% CI 0.97-1.03) - adverse events [1 trial comparing SRP (30°-60°) vs. SP (0°-10°); n = 221 pts]: o pressure ulcers ▪ 28% vs. 30%*, no p-value reported* ▪ RR 0.91, 95% CI 0.6-1.38 ▪ GRADE: low confidence in the estimate o *No other events across all studies reported*	

CDC = Center for Disease Control and Prevention, CI = confidence interval, GRADE = quality of evidence according to study limitations, consistency of effect, imprecision, indirectness and publication bias, ICU = intensive care unit, I^2 = I^2-statistic testing for heterogeneity across studies, MD = mean difference, pts = patients, RCTs = randomized controlled trials, RD = risk difference, RR = risk ratio, SRP = semi-recumbent position, SP = supine position; VAP= ventilator associated pneumonia; LOS=Length of stay;

Semi-recumbent positioning (30°-60°) might reduce clinically suspected VAP compared to supine position (0°-10°), but there is high risk of bias and under-reporting of adverse events.

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#1226

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#1226 **McBeth, 2007** PMID: 17434374 DOI: 10.1016/j.amjsurg.2007.01.013 **Specification of study:** prospective cohort study	37 non-consecutive patients with 300 observations **Inclusion criteria:** - a 3-way bladder catheter had been placed because of concerns regarding IAH or ACS **Exclusion criteria:** - could not be flexed at the waist because of concerns about spinal or hemodynamic stability			HOB positions: 0° (supine) and at HOB increases of 10°, 20°, 30°, and 45°	patients acted as their own control	**Endpoints:** - IAP at each HOB angle -BMI, PEEP, temperature, diagnosis, Riker sedation score in correlation with IAP difference	**Endpoint:** - HOB increase associated with IAP, with stronger correlations at 30° and 45° (10° : p=0.04; 20°: p = 0.001, 30°: p < 0.001, 40°: p< 0.001) -BMI significant (p=0.01); PEEP (p=0.001), Temperature (p=0.02), Neurologic (non-trauma) diagnostic category (p <0.001) - Riker sedation score n.s. (no p-value)	3
	Per Branch							
	37							

ACS = abdominal compartment syndrome, BMI = body mass index, HOB = head-of-bed, IAP = intra-abdominal pressure, IAH = intra-abdominal hypertension, n.s. = not significant, PEEP = positive end-expiratory pressure, pts = patients

There is a significant, positive association between IAP and HOB positioning in critically ill patients.

#1242

Reference, Study Type	Cases and Controls (Participant #, characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
1242 Gosselink 2008 PMID: 18283429 https://doi.org/10.1007/s00134-008-1026-7 **Specification of study:** ERS / ESICM guideline	**Per Branch**						1 → 5 (out of date)

ERS = European Respiratory Society, ESICM = European Society of Intensive Care Medicine

Appropiately prescribed physiotherapy may improve clinical outcomes of critically ill patients and reduce risks and arising costs associated with intensive care.

No detailed assessment was carried out because higher-quality evidence is available on this topic.

#1251

Reference, Study Type	Cases and Controls (Participant #, characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
1251 Hanekom 2012 PMID: 23232109 DOI: 10.1186/cc11894 **Specification of study:** Prospective study	Level three surgical ICU in a tertiary hospital in South Africa → 193 patients **Inclusion criteria:** - not stated **Exclusion criteria:** - age <16 years			**Protocol Care:** allocated Physiotherapist providing evidence-based/protocol care based on the ICU admission date	**standard of care**	**Endpoints:** - Ventilation - Mortality - LOS/ time to discharge - TISS-28 - BI	**Results:** - pts admitted to ICU during protocol care were less likely to be intubated after admission (p = 0.005) or to fail an extubation (p = 0.04) - protocol care pts were discharged from the hospital 4 days earlier than usual-care patients (p = 0.05), which did not reach statistical significance - tendency noted for more pts to reach independence in transfers (p = 0.07) and mobility (p = 0.09) categories of the BI - no difference in mortality (p = 0.52) - mean difference in the cumulative daily unit TISS-28 score during the two intervention periods was 1.99 TISS-28 units (P = 0.04).	3
	Per Branch							
	96	97						

ICU = intensive care unit, LOS = length of stay, pts = patients, BI = Barthel Index, TISS = Therapeutic Intervention Scoring System

A physiotherapy service approach that includes an exclusively allocated physiotherapist providing evidence-based/protocol care that addresses pulmonary dysfunction and promotes early mobility improves patient outcome.
No detailed assessment was carried out because higher-quality evidence is available on this topic.

#1254

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
#1254, **Vasquez, 2007** PMID: 17161433 DOI: 10.1016/j.jss.2006.10.023 **Specification of study:** Prospective observational cohort study	n = 45 pts **Inclusion criteria:** - trauma patients aged 18 or older - admitted to the ICU with indwelling bladder catheter **Exclusion criteria:** - pregnancy - unstable pelvis fracture with pelvic hematoma - previous cystectomy - traumatic bladder ruptures - contraindications to supine - semi-recumbent, or tilt positioning - hemodynamic instability - massive infusion protocol - supra-pubic catheter		<u>bladder pressures measures in:</u> (1) supine position, or 0° from horizontal; (2) 15° above horizontal; (3) 30° above horizontal; (4) semi-recumbent defined as 45° above horizontal; (5) 30° above horizontal with a 15° above-horizontal bed tilt	patients served as his/her own control	**Primary outcome:** - effect of HOB elevation on bladder pressure measurements - effect of BMI Status on bladder pressure measurements - BMI status as a covariate	- **Primary outcome:** - effect of HOB elevation on bladder pressure measurements: HOB elevation (within-subjects effect) demonstrated statistically significant differences, F(4) = 114.478, P = 0.001; significant differences at the P = 0.001 level between all body positions - effect of BMI status on bladder pressure measurements supine position, F(2) = 11.404, P = 0.001; between “normal” and “overweight” as well as and “obese,” 15° HOB elevation, F (2) = 10.873, P = 0.001 between “normal” and “obese,” 30° HOB elevation, F(2) = 6.473, P = 0.004 between “normal” and “obese” 45° HOB position, F(2) = 7.112, P = 0.002 between “normal” and “obese” 30° with 15° tilt HOB position, F(2) = 7.112, P = 0.001 between “normal” and “obese” - BMI status as a covariate significant differences, F(1.82) = 4.846, P = 0.013	3
	Per Branch						

BMI = body mass index, HOB = head-of-bed, ICU = intensive care unit, pts = patients

Elevating HOB significantly increases bladder pressure measurement and bladder pressure measurements in non-supine positions may not provide valid interpretation for IAP, and more so in cases of increased body mass index.

#1260

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
#1260, **Yi,** **2012** PMID: 22033056 DOI: 10.1016/j.jcrc.2011.08.010 **Specification of study:** prospective cohort study	88 pts. **Inclusion criteria:** - 18 years or older - sedated - mechanical ventilation - demonstrated at least 1 risk factor for IAH or ACS **Exclusion criteria:** - unable to tolerate changes in body position (because of spinal precautions, intracranial hypertension, hemodynamic instability, etc) - IAP measurements were contraindicated (such as recent bladder surgery, injury, or pregnancy) **Total** **Per Branch** 88		HOB elevation: supine, 10°, 20°, 30°, 45°	patients acted as their own control	**Endpoints:** - comparison of IAP, APP, and FG among body position (HOB angle elevated) - APACHE II - SOFA - IAH and ACS	**Endpoints:** - head of bed increase was found to be significantly associated with IAP, with stronger correlations at HOB increases of 30° and 45° ($p < 0.05$) - head of bed elevation was associated with clinically significant decreases in APP and FG ($p< 0.05$) - APACHE II: IAH group 17.36 ± 11.99, non-IAH: 13.12 ± 7.26 $p = 0.05$ - SOFA n.s. -prevalence of IAH and ACS were 28.4% and 2.3%	3

ACS = abdominal compartment syndrome, APACHE = acute physiology and chronic health evaluation, APP = abdominal perfusion pressure, FG = filtration gradient, HOB = head-of-bed, IAH = intraabdominal hypertension, IAP = intra-abdominal pressure, pts = patients, SOFA = sequential organ failure assessment

There is a significant and independent relationship between IAP and HOB positioning in critically ill patients, with the HOB of 30° and 45° showing significant difference.

#1262

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#1262, **Kasotakis, 2012** PMID: 22067629 DOI: 10.1097/CCM.0b013e3182376e6d **Specification of study:** Prospective single-center cohort study.	113 pts **Inclusion criteria:** - older than 18 years - expected to stay in the SICU for at least 24 hours - met criteria for baseline functional independence (defined as a Barthel Index score > 70 obtained from a proxy describing patient function 2 weeks before admission) **Exclusion criteria:** - enrolled in another clinical trial		N=11 (Death)			**Primary endpoint:** - SOMS taken on the morning after SICU admission explains variance of SICU LOS. **Secondary endpoint:** - SOMS explains variance of hospital LOS and in-hospital mortality	**Primary endpoint:** - SOMS taken on the morning after SICU admission explains variance of SICU LOS. - SOMS values of 0, 1, 2, 3, and 4 were associated with 8 (4–12), 7 (5–9), 6 (2.5–9), 3 (2–4), and 2 (1.5–3) days (means and confidence intervals [CI] in parentheses) of SICU LOS - SOMS (coefficient, –.2651817; 95% CI –0.3508765 to –0.1794869; p = .0001) predicted SICU LOS **Secondary endpoint:** - SOMS explains variance of hospital LOS and in-hospital mortality: - SOMS was the only variable that correlated with in-hospital mortality (p = .001). - SOMS (coefficient, –.1359776; CI –0.1747335 to –0.0972217]; p = .0001) as independent predictor of overall hospital LOS	3
	Per Branch							

LOS = length of stay, pts = patients, SICU = surgical intensive care unit, SOMS= SICU optimal mobility score

In surgical critically ill patients presenting without preexisting impairment of functional mobility, the surgical intensive care unit optimal mobility score is a reliable and valid tool to predict mortality and intensive care unit and hospital length of stay.

#1263

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						

#1263, **Kayambu, 2013**
 	
PMID: 23528802
 	
DOI: 10.1097/CCM.0b013e31827ca637
 	
Specification of study: A systematic review and meta-analysis
	10 studies included in meta-analysis
	(10 RCTs, n=790 pts)[1-10]
	
	Inclusion criteria:
	- RCTs, systematic reviews or meta-analyses from 1992 to 2012
	- published in English, French, Chinese, and Tamil.
	- investigating physical intervention in ICU patients (defined as activities such as positioning, stretching, EMS, ROM exercise, resistive exercise, ergometry, walking, splinting, mobilization activities and aerobic train)
	
	Exclusion criteria:
	- unoriginal studies, such as case reports, reviews
	- pre-post-designs, observational, retrospective designs
	- only chest physical therapy
	- non-randomized controlled trials
			Physical intervention
			- passive or active limb mobilization
			- ambulation
			- electrical muscle stimulation
			- ergometry
				standard of Care (no or minimal physical therapy)	- peripheral muscle strength
					  o MRC score
					  o handgrip strength
					- respiratory muscle strength
					- physical function
					- QoL
					- ventilator-free days
					- hospital LOS
					- ICU LOS
					- incidence of mortality
						Significant effect in pooled analysis:
						- peripheral muscle strength (MRC): positive effect following physical intervention (pooled hedges g = 0.27; 95% CI: 0.02-0.52; n = 244 [127,117], p = 0.03)
						- respiratory muscle strength: moderate effect following physical intervention (pooled hedges g = 0.51; 95% CI 0.12-0.89; n = 105 [53, 52], p = 0.01)
						- physical function: small effect following physical intervention (pooled hedges g = 0.46; 95% CI 0.13, 0.78; n = 143 [74, 69], p = 0.01)
						- QoL: Small effect following physical intervention (pooled hedges g = 0.40; 95% CI 0.08-0.71; n = 154 [78, 76], p = 0.01)
						- ventilator-free days: small effect following physical intervention (pooled hedges g = 0.38; 95% CI 0.16-0.59; n = 334 [172, 162] , p < 0.01
						- hospital LOS: small reduction following physical intervention (pooled hedges g = –0.34; 95% CI –0.53 - –0.15; n = 441), p < 0.01)
						- ICU LOS: small reduction following physical intervention (pooled hedges g = –0.34; 95% CI –0.51 - –0.18; n = 597 [285, 312], p < 0.01)
						
						Non-significant effect in pooled analysis:
						- peripheral muscle strength (handgrip strength): no effect following physical intervention: pooled hedges g = 0.07;
						95% CI: -0.23-0.38; n = 194 [100,94], p = 0.03
						- mortality: no effect following physical intervention (Odds ratio, 1.0; 95% CI 0.54, 1.85; n = 274 [120, 154], p = 1.0)
							1 → 3 (downgraded as not only RCTs included and for indirectness / applicability)

	Per Branch						

EMS = electric muscle stimulation, ICU = intensive care unit, LOS = length of stay, pts = patients, QoL = quality of life, ROM = range of motion

Physical intervention in critically ill ICU patients improves peripheral and respiratory muscle strength, physical function, quality of life, increases ventilator-free days and shortens ICU as well as hospital length of stay.

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#1272

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#1272, **Malkoc, 2009** PMID: 19011583 DOI: 10.1097/MRR.0b013e3282fc0fce **Specification of study:** Retrospective and prospective study	568 patients who were treated as inpatients in the ICU at Dokuz Eylu¨l University Hospital **Inclusion criteria** - MV - admitted to a six-bed, multidisciplinary internal medicine ICU **Exclusion criteria** **-** ARDS - acute pulmonary edema - acute head injury, MAP less than 60 mmHg, peak inspiratory airway pressure over 40 cm H2O (as recorded from the ventilator) -acute bronchospasm, or whether the patients had sustained any injury or developed any complication			**Chest physiotherapy program** (consisted of modifying postural drainage, percussion, vibration, coughing, and stimulation techniques, deep breathing exercises, suctioning, bed exercises, and mobilization)	**Standard nursing care**	**outcome measurements** - blood gas analysis - number of days when mechanical ventilation was provided - ventilation dependence - LOS ICU	**Outcome** (not subdivided in primary / secondary) - ventilation dependence (days) mean SD: intervention= 14.0 ± 5.9, control= 20.0 ± 6.1; p<0.05 - LOS ICU (days) mean SD: intervention= 15.8 ± 8.5, control= 25.5 ± 4.5; p<0.05 **No statistical differences:** - between the groups in the analysis of blood gas values - the length of time when mechanical ventilation was provided (mean 6.1 days physiotherapy group 5.2 days control group),	4
	Per Branch							
	N=277	N=233						

ARDS = acute respiratory distress syndrome, ICU = intensive care unit, LOS = length of stay, MAP = mean arterial pressure, MV = mechanical ventilation, SD = standard deviation

In conclusion, this study shows that the use of physiotherapy can result in reducing the period of treatment required in the ICU.

#1274

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
#1274, **Morris, 2008** PMID: 18596631 DOI: 10.1097/CCM.0b013e318180b90e **Specification of study:** Prospective cohort study	**Total** 330 ICU patients with acute respiratory failure requiring mechanical ventilation **inclusion criteria** - age >18 years - mechanically ventilated via an endotracheal tube **Exclusion criteria** - inability to walk without assistance before acute ICU illness - cognitive impairment before acute ICU illness (nonverbal) - preadmission immunocompromised status (prednisone 20 mg/d for 2 weeks) - neuromuscular disease that could impair weaning (myasthenia gravis, amyotrophic lateral sclerosis, Guillian-Barre), acute stroke - body mass index (BMI)> 45 - hip fracture, unstable cervical spine/ pathologic fracture - mechanical ventilation 48 hrs before transfer from an outside facility, current hospitalization or transferring hospital stay 72 hrs - CPR at admission, DNR at admission, hospitalization within 30 days before admission - cancer therapy within last 6 months - readmission to ICU within current hospitalization **Per Branch** N= 165 | N=165		**Mobility protocol (daily mobility therapy)**	**Usual care**	**Primary outcome** - proportion of patients receiving physical therapy in patients surviving to hospital discharge **Secondary outcome** - days until first out of bed - ventilator days - ICU LOS - hospital LOS	**Primary outcome** - in-hospital mortality control= 18.2%(: 30 of 165) vs. intervention=12.1%(20 of 165); (p = 0.125); received physical therapy(with in-hospital death) : n=5 of (control, n=2; intervention, n=3) **Secondary outcome** - days to first out of bed: control= 13.7 (11.7–15.7) vs. intervention = 8.5 (6.6–10.5); p<0.0001 - ventilation days: control= 9.0 (7.5–10.4)vs. Intervention=7.9 (6.4–9.3); p=0.298 - ICU LOS: control= 8.1 (7.0–9.3) vs. Intervention=7.6 (6.3–8.8); p=0.084 - hospital LOS: control= 17.2 (14.2–20.2) vs. intervention= 14.9 (12.6–17.1); p=0.048	3

CPR = cardiopulmonary resuscitation, DNR = do not resuscitate, hrs = hours, ICU= intensive care unit

A mobility team using a mobility protocol initiated earlier physical therapy that was feasible, safe, did not increase costs, and was associated with decreased intensive care unit and hospital length of stay in survivors who received physical therapy during intensive care unit treatment compared with patients who received usual care.

#1280

Reference, Study Type	Cases and Controls (Participant #, characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
1280 Olkwoski 2012 PMID: 22652987 https://doi.org/10.2522/ptj.20110334 **Specification of study:** Retrospective study	25 pts. In 1 American ICU from 01.2011 to 05.2011 **Inclusion criteria:** -ICU admission -Age > 18y -SAH-diagnosis through lumbar puncture or brain CT -Ability to open eyes to voice and move one extremity on command -Lindegaard ratio ≤ 3,0 or MCA MFV ≤ 120cm/s -110 ≥ MAP ≥ 80 mmHg -ICP ≤ 15 mmHg -No AEs criterion present at inclusion **Exclusion criteria:** -Age < 18y -ICU-admission > 14 days -Withdraw of care -Trauma or AV-malformation as SAH cause -Seizure **Total** **Per Branch** 25	n/a	**Early mobilization 30-60 min/day:** positioning, education, functional training and exercise in supine, sitting, standing and walking position as long as the pt remained stable / no AEs happened		No sample size calculation due to study design **Primary Endpoint:** -Feasibility: number of sessions attempted, or failed due to unmet participation criteria, reasons why criteria were not met -Safety: 30-day mortality rate, quantity and types of AEs **Secondary outcome**: -Type of mobilization -Number of out-of-bed sessions and with walking ≥ 15,24m, -Time to out-of-bed and walking ≥ 15,24 m -Barthel at discharge -Post-discharge destination	**Primary Endpoint:** -Attempted sessions = 332 -failed sessions = 46 (Lindegaard ratio ≥ 3.0 or MCA MFV ≤ 120 cm/s = 27, MAP ≤ 80 mm Hg = 6, ICP ≥ 15 = 6, unable to open eyes in response to voice = 3, respiratory rate ≥ 40 = 2, MAP ≥ 110 mm Hg = 1 and heart rate ≥ 40 = 1) -30-day mortality rate = 0% -AEs in 17/ 286 sessions (MAP < 70 mm Hg = 9, MAP > 120 mm Hg = 7, HR > 130 bpm = 1) **Secondary endpoints:** -Type of mobilization: bed mobility training = 175, transfer training = 157, therapeutic exercise = 112, gait training = 104, balance training = 103, ADL training = 51 -number of out-of-bed mobilization = 167, walking at least 15,24 m = 51 -Means time: admission – out-of-bed = 5,4 d -Mean time admission – walking at least ≥15,24 m = 10,7 d -Mean BI at discharge = 59,8 -Pts discharged at home = 15 -Pts discharged at rehabilitation facility = 10	4

Pts = patients, SAH = subarachnoid hemorrhage, ICU=intensive care unit; MAP = mean arterial pressure, ICP = intracranial pressure, HR = heart rate, RR = respiratory rate, MCA MFV = mean flow velocity in the middle cerebral artery, AEs = adverse events; BI = Barthel index; AV = arterio-venous; m=meters

An early mobilization program for patients with SAF is safe and feasible.

#1288

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#1288, Bezbaruah, 2022 PMID: not available DOI: http://dx.doi.org/10.4103/2278-344X.105081 **Specification of study:** RCT	15 patients who were on MV between May 25, 2011 and October 30, 2011 at the medical ICU, Father Muller Medical College Hospital **inclusion criteria** patients : - on MV with respiratory pathology - in age group 30-60 years - out of sedation with Glasgow Coma Scale (GCS) of 14/15 - with stable vitals **Exclusion criteria** patients with: - any neurological impairment - unstable fractures, spinal fractures, and fractures of the lower limb			**EM**	**Usual care**	**Outcome (not more defined)** - days first out of bed - days of weaning - LOS ICU	**Outcome** - first out of bed (mean days): intervention= 2.88 (min 2-max 4) (SD: 0.641) vs. control= 7.71 (min 7-max 9) (SD: 0.756), p=0.001 - mean days of weaning: intervention=5.38(min 5-max 6) (SD: 0.518) vs. control= 7.43 (min 7-max 9) (SD:0.787); p=0.001 - mean LOS ICU (days): intervention= 5.63(min 5 - max 6) (SD:0.518) vs. control= 8 (min 7 - max 9) (SD: 0.577); p=0.001	2 → 4 (downgraded for high risk of bias and pilot trial only)
	Per Branch							
	N=8	N=7						

EM = early mobilization, ICU = intensive care unit, LOS = length of stay, max = maximum, min = minimum, MV = mechanical ventilation, SD = standard deviation

Early mobilisation showed better outcome compared to routine physiotherapy in reducing the length of ICU stay in mechanically ventilated patients.

#1290

Reference, Study Type	Cases and Controls (Participant #, characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
1290 Abrams 2014 PMID: 24571627 https://doi.org/10.1186/cc13746 **Specification of the study:** Retrospective cohort study	ICU patients of a tertiary hospital treated for refractory respiratory or cardiac failure → 100 pts **Inclusion criteria:** - ECMO therapy (with the intention of BTR and BTT)			**Active PT during ECMO**	**Without PT**	**No sample size calculation due to study design** No primary endpoint defined **Extracted Endpoints:** - Intention for ECMO therapy - survival to transplant or discharge - discharge disposition among survivors - safety No power calculation.	**Results:** - intention for ECMO therapy (n [%]): a. BTT: 26 pts (26%) b. BTR: 74 (74%) - survival to transplant or discharge: a. survival to transplant of BTT pts (n [%]): 10 (53%) b. survival to discharge of BTR pts (n [%]): 14 (88%) - discharge disposition (n [%]): a. home 13 (57%) b. acute rehabilitation 8 (35%) c. subacute rehabilitation 2 (9%) - safety: no patient-related or circuit-related complications as a result of physical therapy treatment sessions.	4
	Per Branch							
	35 with PT	65 without PT						

Pts = patients, ICU = intensive care unit, ECMO = extracorporeal membrane oxygenation, BTR = bridge to recovery, BTT = bridge to transplant; PT=physical therapy

Active physiotherapy in patients treated with ECMO due to respiratory or cardiac failure seems safe.
No detailed assessment was carried out because higher-quality evidence is available on this topic.

#1292

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#1292, **Schweickert, 2009** PMID: 19446324 DOI: 10.1016/S0140-6736(09)60658-9 **Spezification of study:** RCT	- 104 pts **Inclusion criteria** - ≥18 years - MV for less than 72 h - expected to continue for at least 24 h - baseline functional independence **Exclusion criteria** - rapidly developing neuromuscular disease, cardiopulmonary arrest, irreversible disorders with 6-month mortality estimated at > 50%, raised intracranial pressure, absent limbs, or enrolment in another trial		0	**daily sedation interruption + exercise and mobilisation** (physical and occupational therapy)	**standard care with physical and occupational therapy**	**Primary Outcome** - number of patients returning to independent functional status at hospital discharge **Secondary Outcomes** - number of hospital days with delirium - MV free days within 28 days - ICU and hospital LOS - Barthel Index -number of functionally independent ADLs -distance walked without assistance -ICU-acquired paresis - hand-grip strength	**Primary Outcome** - return to independent functional status at hospital discharge 29 (59%) 19 (35%) p=0.02 **Secondary Outcomes** - ICU delirium (days) 2.0 (0.0–6.0) 4.0 (2.0–7.0) p=0.03 - time in ICU with delirium (%) 33% (0–58) 57% (33–69) p=0.02 - hospital delirium (days) 2.0 (0.0–6.0) 4.0 (2.0–8.0) p=0.02 - hospital days with delirium (%) 28% (26) 41% (27) p=0.01 - Barthel Index score at hospital discharge 75 (7,5–95) 55 (0–85) p=0.05 - ICU-acquired paresis at hospital discharge 15 (31%) 27 (49%) p=0.09 - ventilator-free days 23,5 (7,4–25,6) 21,1 (0,0–23,8) p=0.05 - duration of mechanical ventilation (days) 3.4 (2.3–7.3) 6.1 (4.0–9.6) p=0.02 - LOS in ICU (days) 5.9 (4.5–13.2) 7.9 (6.1–12.9) p=0.08 - greatest walking distance at hospital discharge (m) 33.4 (0–91.4) 0 (0–30.4) p = 0.004 - independent ADLs total at ICU and hospital discharge n.s. - MRC score n.s. - hand-grip strength n.s. - hospital LOS n.s. - mortality n.s.	2
	Per Branch							
	49	55						

ADL = activity of daily living, ICU = intensive care unit, LOS = length of stay, MRC = medical research council, MV = mechanical ventilation, n.s. = not significant, pts = patients

The combination of daily interruption of sedation with physical and occupational therapy was safe and resulted in better functional outcomes at hospital discharge, a shorter duration of delirium and more ventilator-free days.

#1301

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#1301, **Titsworth 2012** PMID: 22462507 DOI: 10.3171/2012.2.JNS111881 **Specification of study:** pre-post-study	all consecutive patients admitted to NICU from April 1, 2010, through July 31, 2011 (n = 3291) **Exclusion criteria:** - < 18 years old - hemodynamicly instable - end of life care		10.6% ± 4.7% of patients had to discontinue the PUMP plus program for clinical contraindications. Additionally, 2.2% ± 0.2% of patients per day refused to participate and only 1.4% ± 0.2% of patients had the protocol discontinued for inappropriate or indiscernible reasons	comprehensive mobility initiative utilizing the **Progressive Upright Mobility Protocol (PUMP) Plus**	**Patients in the pre-intervention period**	no sample size calculation **Endpoints:** - NCU LOS - hospital LOS - mobility level assessed with the I-MOVE tool - occurrence of pressure ulcers - AEs - hospital acquired infections - occurrence of VAP	93.8% ± 4% of patients who had no contraindication to the protocol were participating **Significant results:** - overall mobility among neurointensive care patients increased by 300% (p<0.0001) - reduction in NCU LOS (p<0.004), Hospital LOS (p<0.001), hospital-acquired infections (p < 0.05), and ventilator-associated pneumonias (p < 0.001), and decreased the number of patient days in restraints (p < 0.05) no increase in AEs was observed	3
	Per Branch							
	10 month preintervention (8025 patient days)	6 month post-intervention (4455 patient days)						

AE = adverse events, LOS = length of stay, NCU = neurointensive care unit, VAP = ventilator associated pneumonia

Among neurointensive care unit patients, increased mobility can be achieved quickly and safely with associated reductions in LOS and hospital-acquired infections using a structured mobilization program.

#1303

Reference, Study Type	Cases and Controls (Participant #, characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
1303 Alexiou 2009 PMID: 19327314 https://doi.org/10.1016/j.jcrc.2008.09.003 **Specification of study:** systematic review with meta-analysis	7 publications until December 2007 (7 randomized with 1355 pts)[1-7] **Inclusion criteria:** - MV - treatment in ICU **Exclusion criteria:** - age < 18 years - examination of the effect of the position on oxygenation - intervention during surgical or radiographic procedure		**Prone- and semi-recumbent 45° positional strategies**	**Standard of Care**	**Endpoints:** -incidence of VAP -all-cause mortality until ICU discharge -ICU LOS -duration of MV until death or extubation	**Significant differences between groups:** - incidence of VAP: Comparison of 45° semirecumbent position vs. supine position on the development of *clinically* diagnosed VAP resulted in an effect favouring intervention (OR 0.47, 95% CI 0.27-0.82; n = 3 articles with 337 pts[1-3]) **Non-significant differences between groups:** - incidence of VAP: a. comparison of prone position vs. supine position on the development of *clinically* diagnosed VAP resulted in a trend favouring intervention (OR 0.80, 95% CI 0.60-1.08; n = 4 articles with 1018 pts[4-7]) b. comparison of 45° semirecumbent position vs. supine position on the development of *microbiologically* diagnosed VAP resulted in a trend favouring intervention (OR 0.59, 95% CI 0.15-2.35; n = 3 articles with 337 pts[1-3]) - all-cause mortality: inconsistent data a. comparison of 45° semirecumbent position vs. supine position on the incidence of death resulted in a trend favouring intervention (OR 0.86, 95% CI 0.54-1.37; n = 3 articles[1-3]) b. comparison of prone position vs. supine position on the incidence of death resulted in a trend favouring intervention (8% reduction; OR 0.92, 95% CI 0.72-1.18; n = 4 articles[4-7]) - ICU LOS: No difference between prone and supine groups (WMDs: 1.54 days of ICU stay; 95% CI -1.54 to 4.62; n = 2 RCTs with 978 pts[4,7]) - duration of MV: No difference between prone and supine groups (WMDs: -0.45 days of MV; 95% CI -1.58 to 0.68; n = 3 RCTs with 882 pts[4,6,7])	1 → 2 (indirectness)
	Per Branch						

Pts = patients, ICU = intensive care unit, MV = mechanical ventilation, VAP = ventilator-associated pneumonia, LOS = length of stay, OR = odd's ratio, WMDs = weighted mean differences

45° semirecumbent positioning reduces the development of clinically diagnosed VAP in critically ill mechanically ventilated patients.

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#1305

Reference, Study Type	Cases and Controls (Participant #, characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
1305 van Delft 2021 PMID: 23801900 DOI:10.1097/01823246-201324020-00003 **Specification of study:** Prospective Observational Study	77 pts., from 2009 to 2010 in 1 center **Inclusion criteria:** - 18 years of age or older who had at least one femoral catheter (femoral central venous catheters, dialysis catheters, and arterial catheters for hemodynamic monitoring) -met criteria for a PT intervention (awake, able to follow most directions and hemodynamically stable) **Exclusion criteria:** - pts. femoral sheath catheter		**PT with femoral catheters**		No sample size calculation due to study design No primary Endpoints defined **Extracted Endpoint:** -safety and feasibility of PT in patients with femoral catheters (AEs)	**Results:** - no catheter related mechanical or thrombotic complications either during or immediately following a mobility session, which was usually 15 to 20 minutes after the activities	3
	Per Branch						
	77						

Pts. = patients; PT = Physical therapy; AE = Adverse events

Physical therapy sessions, including standing and walking were feasible and safe in cardiovascular ICU patients with femoral catheters.

No detailed assessment was carried out because higher-quality evidence is available on this topic.

#2002

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#2002 **Alhazzani 2022** PMID: 35569448 DOI: 10.1001/jama.2022.7993 **Specification of study:** Multicenter, non-blinded, randomized clinical trial	400 pts with COVID-19 **Inclusion criteria:** - adults - not intubated - requiring oxygen (≥ 40%) or non-invasive ventilation **Exclusion criteria:** - invasive MV - contraindications to prone positioning - risk of complications from prone positioning - self-Prone Positioning prior to enrollment			**Awake prone positioning** (until relative improvement in FiO_2 requirement by 40% from the baseline value that was sustained for 24 hours; endotracheal intubation; discharge from ICU)	**Usual care** without prone positioning	**Primary endpoint:** endotracheal intubation within 30 days of randomization **Secondary outcomes:** - mortality at 60 days - days free from invasive MV or noninvasive ventilation at 30 days - days free from the ICU or hospital at 60 days - adverse events - serious adverse events	Awake prone positioning group: median duration of prone positioning 4 days after randomization 4.8 hours/day (IQR 1.8-8.0 hours/days) **Primary endpoint:** by day 30, 70 of 205 pts(34.1%) in the prone positioning group were intubated vs. 79 of 195 patients (40.5%) in the control group [hazard ratio: 0.81 (95% CI, 0.59 to 1.12), p = 0.2; absolute difference: -6,37% (95% CI, -15.83% to 3.1%)] **Secondary outcomes:** - mortality: Prone positioning did not significantly reduce mortality at 60 days [hazard ratio: 0.93 (95% CI, 0.62 to 1.40), p = 0.54; absolute difference: -1.15% (95% CI, -9.40% to 7.10%)] - days free from invasive MV or noninvasive ventilation at 30 days: n.s - days free from the ICU or hospital at 60 days: n.s - adverse events: 21 pts (10%) , most frequently reported musculoskeletal pain or discomfort from prone positioning [13 of 205 pts(6.34%)] and desaturation [2 of 205 pts(0.98%)] - serious adverse events: n>>one in either group	2
	Per Branch							
	205	195						

FiO_2 = inspired fraction of oxygen, ICU = intensive care unit, IQR = interquartile range, MV = mechanical ventilation, pts = patients

Awake prone positioning in patients with acute hypoxemic respiratory failure from COVID-19 does not significantly reduce endotracheal intubation within 30 days compared with usual care.

#2003

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Inter-vention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
#2003 **Protti 2022** PMID: 35526009 DOI: 10.1186/s13054-022-03996-0 **Specification of study:** institutional review	15 patients **Inclusion criteria:** - a diagnosis of ARDS - ongoing invasive mechanical ventilation with deep sedation and neuromuscular blockade - prone positioning prescribed by the attending physician within 3 days of endotracheal intubation **Exclusion criteria:** - already undergone a lung CT after endotracheal intubation - too unstable for transfer to the radiology unit - body weight exceeded 100 kg - none of the authors was available for collecting data, due to the exceptional clinical workload at that time		**PP**	**Patients acted as their own control**	**Endpoints:** - lung morphological response - global inflation - regional inflation - lung functional response - association between morphological and functional responses		4
	Per Branch						

ARDS = acute respiratory distress syndrome, CT = computer tomography, PP = prone position

In fifteen patients with COVID-19, prone positioning decreased alveolar collapse, hyperinflation, and homogenized lung aeration. A similar response has been observed in other ARDS, where prone positioning improves outcome.

No detailed assessment was carried out because higher-quality evidence is available on this topic.

#2008

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop -out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#2008 **Liu 2022** PMID: 35400079 DOI: 10.1155/2022/4579030 **Specification of the study:** single center retrospective study	**238 pts** study duration: 3 consecutive days **Inclusion criteria:** - ARDS pts with PaO2/FiO2 (P/F) < 150 mmHg - age 16-75 years **Exclusion criteria:** - non-invasive ventilation before orotracheal intubation - previous lung diseases - pelvic, cervical, or spinal fracture or requiring a fixed position - uncontrolled increase in ICP - multiple traumas with unstable fractures - pregnancy - severe hemodynamic instability (mean arterial blood pressure - < 60 mmHg or systolic blood pressure >200 mmHg)			**PP**	**No PP**	**Primary outcomes:** - P/F - compliance of respiratory system	**Significant differences between groups in:** - improvement of P/F and Crs in the PP group over 3 consecutive days (p < 0.05) - shorter total mechanical ventilation time (5.1 ± 1.4 vs. 9.3 ± 3.1 days, P < 0.05) - shorter invasive ventilation time (4.9 ± 1.2 vs. 8.7 ± 2.7 days, P < 0.05) - shorter ICU stay (7.4 ± 1.8 vs. 11.5 ± 3.6days, P < 0.05) - higher extubation rate (95.6% vs. 84.4%, P < 0.05) - less atelectasis (15 vs. 74, P < 0.05) and pneumothorax (17 vs. 24, P > 0.05) - more 28-day ventilator-free days (21.6 ± 5.2 vs. 16.2 ± 7.2 days, P < 0.05) - lower mortality (4.4% vs. 13.3%, P < 0.05).	4
	Per Branch							
	121	117						

ICP = intracranial pressure, PP = prone position, pts = patients

Among PC cases with moderate to severe ARDS, PP can correct hypoxemia more quickly, improve Crs, reduce atelectasis, increase the extubation rate, shorten mechanical ventilation time and length of ICU stay, and reduce mortality.

#2010

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#2010 **Fralick 2022** PMID: 35321918 DOI: 10.1136/bmj-2021-068585 **Specification of study:** Multicenter pragmatic randomized clinical trial	257 pts **Inclusion criteria:** - clinically highly suspected diagnosis of covid-19 - needed supplemental oxygen (up to 50% fraction of inspired oxygen) - able to independently lie prone with verbal instruction **Exclusion criteria:** - ineligible or declined - FiO2 >50% - unable to obtain consent - could not prone - > 48 hours after admission - discharged before consent - transferred to ICU before consent - tracheostoma		13 (n = 4 withdrawal of consent, n = 7 no consent, n = 2 determined as ineligible)	**Prone positioning:** median time spent in prone position up to the first 72 hours: 6h (1.5-12.8)	**Standard care** median time spent in prone position up to the first 72 hours: 0h (0-2)	**Primary endpoint:** - composite outcome of in-hospital death, mechanical ventilation, or worsening respiratory failure defined as needing at least 60% fraction of inspired oxygen for at least 24 hours **Secondary endpoints:** - time spent in prone position - change in the ratio of oxygen saturation to fraction of inspired oxygen - time to discharge from hospital - rate of serious events	**Primary endpoint:** - no differences between both groups (FiO_2 > 60%: Prone (18(14)) Control (17(14)) OR 0.92 (0.44 – 1.92)) **Secondary outcome:** - median (IQR) time spent in prone: 6 (1.5 -12.8) vs. 0 (0-2) - median (IQR) S/F ratio after 72 hours: 336 (216-438) vs. 336 (232-443) - median (IQR) change in S/F ratio in first 72 hours 14 (–52-94) vs. 49 (–32-102) - median (IQR) days to discharge 5 (3-9) vs. 4 (3 -8) - discharged 115 (91) vs. 118 (97) - serious adverse events 5 pts (4%) vs. 3 pts (2%)	2
	Per Branch							
	126	122						

ICU = intensive care unit, IQR = interquartile range, pts = patients, S/F = saturation of inspired oxygen/fraction of inspired oxygen

Awake prone positioning in patients with hypoxemia and laboratory confirmed or highly suspected of COVID-19 did not lead to significant differences in mortality, rate of mechanical ventilation or respiratory failure, compared with standard of care.

#2011

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
#2011 **Li** **2022** PMID: 35305308 DOI: 10.1016/S2213-2600(22)00043-1 **Specification of study:** Systematic review with meta analysis	29 publications concerning prone positioning in non-intubated adults with COVID-19 (10 RCTs (n= 1985) inclusive NCT04853979, 19 observational studies (n= 2669), 4654 pts in total)[1-28] 2 RCTs exclusively in ICU pts, 2 RCTs with mixed population, the other 6 in general ward setting **Inclusion criteria:** - RCTs comparing awake prone positioning with the supine position for non-intubated adult pts with COVID-19 - observational studies of awake prone positioning that included supine position for sensitivity analysis **Exclusion criteria**: - studies with intubated pts		**Awake prone positioning** for 1h to 16h	**Supine positioning**	**Primary endpoint**: - requirement of intubation **Secondary outcomes**: - all-cause mortality - escalated respiratory support - ICU-LOS - hospital-LOS - safety	**Primary endpoint (**for ICU pts only): - intubation: RR 0.83 (0.71- 0.97) **Secondary outcomes** (for ICU pts only): - mortality: n.s. - escalation of respiratory support: n.s - ICU-LOS: n.s. - hospital LOS: n.s. - safety: no calculations	1 → 2 (not only RCTs included)
	Per Branch						

COVID-19 = corona virus disease 2019, ICU = intensive care unit, LOS = length of stay, n.s. = not significant, pts = patients, RCT = randomised controlled trial, RR = risk ratio

Awake prone positioning reduces the risk of intubation in non-intubated ICU patients with COVID-19.

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#2015

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
2015 PozueloCarrascosa 2022 (PMID: 35193688 DOI: 10.1186/s40560-022-00600-z) **Specification of study:** systematic review and network meta-analysis	- 20 publications (RCTs) **Inclusion criteria:** - RCTs comparing different body positions or alternative degrees of positioning of MV pts - reported data on VAP incidence - mechanical ventilation for at least 48 hours			**Different body positions:** supine, semi-recumbent, lateral, prone	Standard of care	**Primary endpoint:** - incidence of VAP **Secondary outcomes:** - ICU LOS - hospital LOS - duration of MV - mortality	**Primary endpoint:** - protective effect of the semi-recumbent versus supine position (RR: 0.38, 95% CI: 0.25–0.52) **Secondary outcomes:** mortality: - prone position had a positive effect compared to the supine position (RR: 0.71, 95% CI: 0.50–0.91) ICU LOS: - pts positioned in the lateral Trendelenburg position spent less time (1.25 days) in the ICU than pts positioned in the semi-recumbent position (MD: − 1.25, 95% CI: − 1.60 to − 0.90) hospital LOS: - lateral–Trendelenburg position achieved a reduction in the hospital LOS compared to the semi-recumbent position (MD: − 1.25, 95% CI: − 1.92 to − 0.58) duration of MV: - higher in pts positioned in the lateral Trendelenburg position than in those positioned in the semi-recumbent position (MD: 0.50, 95% CI: 0.27 to 0.73) - lower duration of MV in pts positioning in the semi-recumbent position than in those in the supine position (raw MD: − 3.26, 95% CI: − 6.31 to − 0.20)	1
	Per Branch							

CI = confidence interval, ICU = intensive care unit, LOS = length of stay, MV = mechanical ventilation, RCT = randomized controlled trials, RR = risk ratio, VAP = ventilator acquired pneumonia

The semi-recumbent positioning seems to have a protective effect in comparison to supine position in relation to the incidence of VAP (RR: 0.38).

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#2018

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#2018 **Laghlam 2021** PMID: 35111786 DOI: 10.3389/fmed.2021.810393 **Specification of study:** Prospective single cohort study	24 patients Included were all consecutive patients fulfilling the **Inclusion criteria:** - ARDS according to Berlin criteria - Vv-ECMO implantation - COV-19 positive by PCR **Exclusion criteria:** - <18 years old - pregnancy - patients under legal protection			**PP under vv-ECMO therapy in patients with severe ARDS**	**vv-ECMO patients**	**Endpoints:** - number of PP sessions - ICU LOS - duration of ventilation - 28- and 60-day mortality - respiratory and hemodynamic parameters	- a total of 38 PP sessions was performed in 10 patients (42%) with a mean duration of 17.4 ± 2.1 h - duration of VV-ECMO was significantly longer (20 (13–31) vs. 9 (4–17) days, p = 0.01) in patients on whom PP was performed - duration of mechanical ventilation, ICU length of stay, and Day-28 and Day-60 mortality rates were not different between the two groups of patients **Respiratory mechanics:** - under VV-ECMO, PP significantly increased the PaO_2/FiO_2 ratio by 14 ± 21% and compliance by 8 ± 15% and compliance by 8 ± 15%, and significantly decreased the oxygenation index by 13 ± 18% and driving pressure by 8 ± 12%	3
	Per Branch							
	14	10						

ARDS = acute respiratory distress syndrome, COV-19 = Corona virus disease 2019, ICU = intensive care unit, LOS = length of stay, PCR = polymerase chain reaction, PP = prone positioning, vv-ECMO = venovenous extracorporeal membrane oxygenation

In patients with COVID-19 and severe ARDS, PP under vv-ECMO improved the respiratory mechanical and oxygenation parameters, and the effects of PP on respiratory mechanics persisted after supine repositioning.

#2021

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
2021 Schmid 2022 (PMID: 35054084 DOI: 10.3390/jcm11020391) **Specification of study:** Systematic review and meta-analysis	5 RCTs, 2 RCTs with APP as intervention (n= 1196) [1,2,] 3 RCTs comparing NIV and HFNC **Inclusion criteria**: adult pts with severe respiratory failure due to COVID-19 receiving HFNC, NIV or invasive MV **Exclusion criteria**: - studies comparing HFNC or NIV to oxygen insufflation or invasive MV - studies comparing ventilator settings		**Full APP** or 135° APP	**Standard of care**: 90° or supine positioning	**Primary endpoints:** - all-cause mortality (D28 and D60) - clinical status at D28, D60 an FU (deterioration/ death, discharged alive, QoL) - SAE - AE **Secondary outcomes:** - clinical status at D28, D60 and FU (intubation, weaning, liberation from supplemental oxygen, ventilator-free days, duration of MV and oxygen therapy) - admission to ICU at D28 - hospital LOS - skin lesions from prone positioning	**Primary endpoints (only APP):** - mortality D28 (n= 1196): RR 1.08, 95% CI 0.51- 2.31 - clinical deterioration/ death (n=1121): RR 0.86, 95% CI 0.75- 0.98 - SAE and AE not reported on **Secondary outcomes (only APP):** - weaning n.s. - hospital LOS: n.s. - ventilator-free days: n.s. - skin lesions: n.s.	1 → 2 (not only RCTs included)
	Per Branch						

AE = adverse event; APP = awake prone positioning, COVID-19 = corona virus disease 2019, D = day, FU = follow up, HFNC = high flow nasal cannula, ICU = intensive care unit, LOS = length of stay, MV = mechanical ventilation, NIV = non-invasive ventilation, n.s.= not significant, QoL = quality of life, RCT = randomised controlled trial, pts= patients, SAE = serious adverse event

Prone positioning did not reduce the mortality on day 28 but reduced the combined risk of intubation or death within 28 days.

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#2022

Reference, Study Type	Cases and Controls (Participant #, Characteristics) Total	Drop -out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
#2022 **Papazian 2022** PMID: 35037993 DOI: 10.1007/s00134-021-06604-x **Specification of study:** systematic review and meta analysis	13 publications from 2018-2021(12x observational, 1x RCT, 1836 pts)[1-13] **Inclusion criteria:** - cohort studies and rRCTs - adult ARDS pts receiving vvECMO - comparisons of pts under ECMO submitted to PP and ECMO pts not turned prone during ECMO **Exclusion criteria:** - vaECMO - extracorporeal O_2-removal		**PP**	**Standard care**	**Primary endpoint:** -28 days survival **Secondary outcomes:** - survival: 60-days/90-days/6-months - ICU/hospital mortality - duration of MV	**Significant differences between groups in:** - 28-day survival (503 survivors among 681 pts in the PP group [74%; 95% CI 71–77] vs. 450 survivors among 770 pts in the control group [58%, 95% CI 55–62]; RR 1.31 [95% CI 1.21–1.41]; *I*2 22% [95% CI 0–62%]; p < 0.0001) - survival was also improved in terms of 60-day survival, 90-day survival, ICU survival, and hospital survival - duration of MV increased in vvECMO pts with PP (mean difference 11.4 days [95% CI 9.2–13.5]; 0.64 [95% CI 0.50–0.78]; *I*2 8%; p < 0.0001)	1 → 2 (not only RCTs included)

ICU = intensive care unit, MV = mechanical ventilation, PP = prone position, pts = patients, RCT = randomised controlled trial

According to this meta-analysis, survival was improved when prone positioning was used in ARDS patients receiving vvECMO. The impact of this combination on survival should be investigated in prospective randomized controlled trials.

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#2024

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#2024 **Giani 2022** PMID: 34986895 DOI: 10.1186/s13054-021-03879-w **Specification of study:** A pooled individual patient data analysis	Five publications (monocentric prospective cohort studies); 889 pts[1-5] **Inclusion criteria:** - patients femoro-jugular approach (66%), followed by femoro-femoral (18%) and jugular dual-lumen (16%) ECMO-cannulation		missing	**Prone position** during ECMO	**Standard of care** (supine position during ECMO)	**Primary endpoint:** ICU mortality **Secondary outcomes:** - hospital mortality - successful ECMO weaning - ICU length of stay	median ECMO duration before prone position was 5 days **Significant differences between groups in:** - ECMO duration was significantly lower in the supine group (p<0.001) - higher successful ECMO weaning in prone group (p= 0.003) **No significant differences between groups in:** - association with reduced mortality between supine or prone position. - propensity score matching identified 227 patients in each group. ICU mortality of the matched samples was 48.0% and 39.6% for patients in the supine and prone group, respectively (p=0.072) - ICU and hospital survival rates were 8.4% higher in the prone group (p=0.072 and 0.073)	1 → 2 (data not only from RCTs)
	Per Branch							
	315	575						

ECMO = extracorporeal membrane oxygenation, ICU = intensive care unit, pts = patients

In a large population of ARDS patients receiving veno-venous extracorporeal support, the use of prone positioning during ECMO was not significantly associated with reduced ICU mortality. The impact of this procedure will have to be definitively assessed by prospective randomized controlled trials.

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#2025

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#2025 **Patton 2021** PMID: 34916149 DOI: 10.1016/j.aucc.2021.10.003 **Specification of study:** Meta-Review	10 systematic reviews published from 2008 to 2017 including 15.979 pts[1-10] **Inclusion criteria:** - systematic reviews, published in English since 2005 - patients > 16 years - inpatient in an ICU, with no restrictions on the length of stay, diagnosis, comorbidities, or concurrent treatments **Exclusion criteria:** - published systematic reviews focused on only pediatric ICU patients - coronary care units, step-down or high-dependency units			**Prone positioning**	**All other positions**	**Primary endpoints**: - incidence of PI (cumulative and/or rate/ density) - prevalence (point and/or period) **Secondary outcome:** - PI stage - PI location - time to PI	**Primary outcome:** the cumulative incidence of PIs in PP ranged from 25.7% to 48.5% **Secondary outcomes:** PI stage (using AMSTAR-2): - three reviews high quality - six as moderate quality - one low quality PI location (only one review): PIs were identified in 13 locations	1 → 2
	Per Branch							
	prone position n=2.320 (included 5 reviews)	Supine position n=2.140 (included 5 reviews)						

ICU = intensive care unit, PI = pressure injuries, pts = patients

This meta-analysis found 25% to almost 50% of adult ICU patients placed in the prone position developed a PI. The high incidence of PI in the prone position highlights the need for targeted preventative strategies.

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#2026

Reference, Study Type	Cases and Controls (Participant #, characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
2026 Lucchini 2022 PMID: 34895799 10.1016/j.iccn.2021.103158 **Specification of study:** a Retrospective cohort study	1 center between February 2020 and January 2021 → 96 pts. **Inclusion criteria:** -diagnosis of COVID-19 pneumonia -under invasive MV and PP **Exclusion criteria:** -not stated			**standard (≤24 hours) PP**	**extended (>24 hours) PP**	No sample size calculation (retrospective study) No primary endpoint defined **Extracted Endpoints:** - duration of PP, number of proning cycles -prevalence with pressure sore -MRC grade distribution and handgrip strength at 3 months follow up	**Results:** - extended PP had a median of 34 (30–41) hours vs. 16 (15–18) ($p < 0.0001$) of patient receiving standard PP, a higher total time spent in PP [85 (43–136) vs. 33 (18–64) hours – $p < 0.0001$] during ICU stay, a higher number of proning cycles [3 (2–4) versus 2 (1–4) – $p = 0.017$] -prevalence of patients with pressure sore was 51% (n = 19) for patient with extended pronation and 32% (n = 19) in patient with standard pronation ($p = 0.032$). -MRC grade distribution, between patients with and without extended pronation only for the right Elbow flexors test ($p = 0.028$) at 3 months follow up -not observe any difference between standard and extended pronation groups in handgrip dynamometry results [33 (25.0–37) vs. 29 (20–39) kg-force - $p = 0.679$]	4
	Per Branch							
	59	37						

pts. = patients; COVID= coronavirus disease; MV=mechanical ventilation; PP= prone position; MRC= Medical Research Council; ICU=Intensive Care unit

Extended PP is feasible and might reduce the workload on healthcare workers without significant increase of major PP related complications.

No detailed assessment was carried out because higher-quality evidence is available on this topic.

#2028

Reference, Study Type	Cases and Controls (Participant #, characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
2028 Nakano 2021 PMID: 34863251 https://doi.org/10.1186/s13054-021-03827-8 **Specification of study:** Single center historical control study	111 pts of which 61 Intervention pts admitted to Hitachi General Hospital ICU between 09.2020 and 12.202 and 50 control pts admitted to the same ICU between 11.2019 and 02.2020 **Exclusion criteria:** -Age < 20y -Possible pregnancy -Anuria -Lower extremity perturbation -ECMO -Expected ICU stay < 2 days -New ICU admission in the same hospital stay -Do not resuscitate		-5 control and 4 intervention pts due to inappropriate CT measurements -1 more in the intervention group, but the reason not stated	**IGREEN Protocol:** -20 min daily rehabilitation with intensity based on the IMS on the previous day, aiming at a higher IMS than the previous day, plus 20 min EMS when pts could not reach the standing position or if IMS on previous day < 3 -nutrition protocol: if EN not contraindicated, EN initial target at 20 kcal/kg/day if MUST < 4 and at 30 kcal/kg/day at day 4 if MUST ≥ 4. For all pts target at 30 kcal/kg/day after day 7. Protein target at 1,8 or 1 g/kg/day if protein restriction indicated. Correction of any shortage through PN.	SC	**Primary Endpoint:** **-**FVM loss on femoral CT in the first 10 days **Secondary outcome**: -achievement of IMS 3 or 4 -MRC scores, Grip strength, FSS-ICU at ICU discharge -BI at hospital discharge -mean calorie and protein delivery -Nitrogen balance -Number of EN failure -Mean values and change of N-tinin/Cre from days 1 to 7 -BUN, creatinine, Albumin, TLC and CRP at day 10 -Proportion of survival discharge -ICU length of stay -Hospital length of stay -Use of adjunctive therapy	**Primary Endpoint:** -FMV loss significantly lower in the IG (11,5 vs 14,5%, p=0,03) **Secondary endpoints:** **-**IG reached IMS 3 significantly earlier than SG (p = 0,03). -No significant difference for time to IMS 4, MRC, FSS-ICU, BI, survival discharge, length of hospital and ICU stay, adjunctive therapy -Mean calorie and protein delivery in the first 10 days higher in IG (20,1 vs 16,8 kcal/kg/day, p = 0,01 and 1,4 vs 0,8 g/kg/day, p < 0,01) -N-tinin/cre higher in the IG both as mean value and for decrease from days 1 to 7 (96,3 vs 46,2 pmol/mgCre and – 27,2 vs 4,5 pmol/mgCre, p < 0,01) -BUN on day 10 higher in the IG (36,6 vs 27,6 mg/dl, p = 0,02), -No significant difference for the other lab markers	4
	Per Branch							
	56	45						

IMS = ICU mobility score, EMS = Electrical Muscle Stimulation, EN = Enteral Nutrition, MUST = Malnutrition Universal Screening Tool, PN = parenteral nutrition, FVM = Femoral Muscle Volume, MRC = Medical Research Council, FSS-ICU = Functional Status Scores for the ICU, BI = Barthel Index, CRP = C reactive protein, TLC = Total Lymphocyte Count, IG = Intervention group, SC = standard of care, BUN = Bloor Urea Nitrogen

The IGREEN protocol reduced FMV loss in the first 10 days after ICU admission.

#2033

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#2033 **Zhuo 2021** PMID: 34763512 DOI: 10.21037/apm-21-2359 **Specification of study:** Systematic review and meta-analysis	7 RCTs including 740 adult critically ill mechanically ventilated pts. [1-7] **Inclusion criteria:** - aged > 18 years and treated in the ICU with MV to support respiration - intervention group of patients given MV in the 45° bed head elevation angle, with adjustments not greater than 5°, and a control group treated at the 30° bed head elevation angle - the duration of bed head elevation must be identical for both the intervention group and the control group - the outcome indicators included VAP incidence rate, gastric reflux incidence rate, pressure sores incidence rate, ventilation indicators, ventilation time, mortality, length of hospital stay, and other indicators. **Exclusion criteria:** - non-randomized studies, studies or observational studies, investigations, case analysis, reviews, guidelines, systematic review, etd - literatures with repeated study contents with others; and (III) literatures with missing data, or data that could not be transformed and/or used			**Mechanical ventilation in 45° bed head elevation**	**Mechanical ventilation in 30° bed head elevation**	**Derived outcomes:** - incidence of VAP - incidence of gastric reflux - incidence of pressure sores - ventilation indicators - ventilation time - mortality - hospital- LOS	**Significant differences between groups in:** - incidence of VAP: (OR =0.48; 95% CI: 0.28 to 0.84; Z=2.59; P=0.009 - incidence of gastric reflux: OR =0.50; 95% CI: 0.27 to 0.96; Z=2.09; P=0.04 - incidence of pressure sores (OR =1.88; 95% CI: 1.05 to 3.36; Z=2.11; P=0.03) no meta-analysis for ventilation indicators, ventilation time, mortality, and hospital LOS.	1
	Per Branch							
	Intervention: 372	Control: 368						

CI = confidence interval, LOS = length of stay, pts = patients, RCT = randomised controlled trial, VAP = ventilator-associated pneumonia

The 45° semi-recumbent position reduces the incidence of ventilator-associated pneumonia, gastric reflux and pressure sores.

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#2034

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop -out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#2034 **Beran 2022** PMID: 34753813 DOI: 10.4187/respcare.09362 **Specification of study:** Systematic review and meta-analysis	14 publications (5 RCTs, 9 (6 retrospective cohort, 3 prospective) cohort; n = 3.324 pts)[1-14] **Inclusion criteria:** - published studies - RCTs and observational studies -compared APP vs control group - in non-intubated COVID-19 pts - reported one of the following outcomes: endotracheal intubation, mortality, or hospital LOS **Exclusion criteria:** - did not report endotracheal intubation or mortality rates - single-arm studies, case reports, reviews, commentaries, preprints (not peer reviewed), and abstracts.			**APP**	**Standard of care**	**Primary endpoint:** - need for endotracheal intubation - mortality **Secondary Outcomes**: - hospital LOS	**No significant differences between groups in:** - need for endotracheal intubation (27% vs. 29.8%; RR 0.85 [95% CI: 0.66-1.08]; p = 0.17) - mortality (17.9 % vs 25.7%; RR 0.68 [95% CI 0.51-0.90]; p = 0.08; I^2 = 52%) - hospital LOS (MD -3.09d [95% CI: -10.14-3.96]; p = 0.39, I^2 = 97%) **Significant differences between groups in:** - subgroup analysis of RCTs: need for endotracheal intubation: (RR 0.83 [95% CI: 0.72-0.97; p = 0.02; I^2 = 0%)	1 → 2 (downgrade since not all RCTs)
	Per Branch							
	1495	1929						

APP = awake prone positioning, CI = confidence interval, LOS = length of stay, RCT = randomized controlled trial, RR = risk ratio

APP reduced mortality in non-intubated COVID-19 subjects without a significant difference in the need for endotracheal intubation and length of hospital stay.

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#2040

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
#2040 **Zaaqoq 2019** PMID: 34582415 DOI: 10.1097/CCM.0000000000005296 **Specification of study:** Observational study	**Total** 232 pts with COVID-19 who were supported by venovenous extracorporeal membrane oxygenation **Inclusion criteria:** - ≥ 18 years - confirmed COVID-19 - need for invasive mechanical ventilation and venovenous ECMO support **Per Branch** Prone position: n= 67 / Standard care : n= 165		**Prone positioning:** - pts were allowed to move between the prone and supine positions during their ECMO run	**Standard care**	**Primary endpoints:** - survival to hospital discharge - mortality through 90 days from ECMO initiation	**Significant differences between groups:** - PP associated with lower mortality in the cumulative outcome model: HR 0.31 (95% CI 0.14-0.68; p < 0.05) - PP associated with reduced discharge: HR 0.03 (95% CI 0.00 – 0.21; p < 0.05) **Non-significant differences between groups:** - discharged from hospital alive a) all pts (n=232): 59 (25%) b) PP (n=67): 22 (33%) c) control (n=165): 37 (22%) - discharged to other facilities a) all pts (n=232):: 40 (17%) b) PP (n=67): 12 (18%) c) control (n=165): 28 (17%) - remain in the hospital a) all pts (n=232): 9 (4%) b) PP (n=67): 4 (6%) c) control (n=165): 5 (3%) - in-hospital death a) all pts (n=232): 90 (39%) b) PP (n=67): 23 (34%) c) control (n=165): 67 (41%) - PP not associated with reduced mortality in Weibull survival model (HR 0,85; 95% credible interval 0.34-1.95) - after inclusion of the interaction between cumulative prone and the day of ECMO run: a) gradual decrease in the probability of death associated with the duration of PP (No data) b) PP continued to be associated with lower mortality: HR 0.95 (95% CI 0.92-0.98)	3

CI = confidence interval, ECMO = extracorporeal membrane oxygenation, HR = hazard ratio, ICU = intensive care unit, pts = patients

No detailed assessment was carried out because higher-quality evidence is available on this topic.

#2043

Reference, Study Type	Cases and Controls (Participant #, characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
2043 Altinay 2022 PMID: 34411633 https://doi.or/10.1016/j.bjane.2021.07.029 **Specification of study:** a retrospective observational study	**Total** 1 center, 5 COVID cohort ICUs from March 15 to June 15, 2020 → 72 pts. **Inclusion criteria:** - >18 years of age - monitored and treated in the ICU for acute respiratory failure due to COVID-19 pneumonia - received conventional oxygen therapy with nonrebreather mask oxygen upon admission **Exclusion criteria:** - supported with noninvasive or invasive MV due to respiratory acidosis (pH <7.30 and PaCO2 >50 mmHg), PaO2/FiO2 ratio <150, GCS score <12 points, or hemodynamic instability from the moment of admission - with primary pulmonary pathologies (lung cancer, cardiopulmonary edema, and Kartagener's syndrome) other than pneumonia - nasal high-flow therapy - applied APP < 12 hours in 1 day **Per Branch** 25 / 23	N=24 in the APP group: PP less than 12 h a day due to noncompliance	**APP group**	**Non APP group**	No sample size calculation (retrospective study) No primary endpoint defined **Extracted Endpoints:** - PaCO2, PaO2, pH, SpO2 values and PaO2/FiO2 ratios at the beginning and 24th hour - intubation requirements - ventilator-free days - ICU LOS - short-term mortality	**Results:** - At the 24th hour, the median SpO2 value of the APP group was 95%, the median PaO2 value was 82 mmHg, SpO2 value of the non-APP group 90% and the PaO2 value 66 mmHg. (p = 0.001, p = 0.002) - no difference between the groups in ICU LOS and ventilator-free days (n.s.) - short-term mortality and intubation requirements was lower in the APP group (p = 0.020, p = 0.001)	4

pts. = patients; COVID= coronavirus disease; ICU=intensive care unit; APP=awake prone position; MV=mechanical ventilation; GCS= Glasgow Coma Scale; PP=prone position; LOS= Length of stay

APP application in patients receiving non-rebreather mask oxygen therapy for respiratory failure due to COVID-19 pneumonia improves oxygenation and decreases the intubation requirements and mortality.

No detailed assessment was carried out because higher-quality evidence is available on this topic.

#2045

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
#2045 **Poon 2021** PMID: 34384475 DOI: 10.1186/s13054-021-03723-1 **Specification of study:** systematic review and meta-analysis	12 studies, pts 640 (n = 6 single arm observational studies, n = 6 two-armed comparative studies)[1-12] **Inclusion criteria:** - keywords: "Extracorporeal Membrane Oxygenation" from 1 March 2021 - written in English - pts aged >18 years - undergoing ECMO for ARDS in which PP was explicitly described, - outcomes of PP therapy such as pts survival **Exclusion criteria:** - population < 10 pts - non-human studies - review articles and case reports - reviews of Extracorporeal Life Support Organization (ELSO) registry data - in studies taking place at the same institution across overlapping time periods the study with the larger number of pts was included, and all others were excluded		PP during ECMO	No PP during ECMO	**Primary endpoint:** - cumulative survival **Secondary outcomes:** - ICU length of stay - ECMO duration - changes in ABG values - ventilator mechanics - complication rates	**Significant differences between groups:** patients undergoing PP had longer ICU LOS (+ 14.5 days, 95% CI 3.4–25.7, p = 0.01; 3 studies) patients undergoing PP had longer ECMO duration (+ 9.6 days, 95% CI 5.5–13.7, p < 0.0001; 6 studies). pre-PP-PaCO2 vs. Post-PP-PaCO2 44.7 [42.2-47.2] vs. 43.7 [41.2-46.2]; MD = -1.5 [-2.9 to -0.2]; p = 0.03) Pre-PP-PaO2/FiO2 vs. Post-PP- PaO2/FiO2 112.2 [92.2-132.3] vs. 147.7 [131.4-164.0]; MD = +24.9 [+6.5 to + 43.2]; p = 0.01) pre-PP-driving pressure vs. Post-PP-driving pressure 11.5 [9.9-13.1] vs. 10.7 [9.2-12.1]; MD = -0.8 [-1.5 to -0.2]; p = 0.01) **Non-significant differences between groups:** cumulative survival in patients that underwent PP was 57% (95% CI 41.9–71.4, high certainty; 11 studies) cumulative survival PP vs. No PP: RR = 1.1.9 (95% CI 0.92-1.55, p = 0.19) pooled proportion of survival to hospital discharge in patients that underwent PP was 58% (95% CI 37.6-77.9; 7 studies) chance of survival to discharge (4 studies, RR = 1.18, 95% CI 0.96-1.46, p = 0.11) pooled survival to 30-days post-discharge was 50% (95% CI 21.4 – 79.1; 3 studies) pooled survival to 60-days post-discharge was 72% (95% CI 63.6-80.5; 2 studies) survival to 90-days post-discharge was 64% vs. 42% (1 study) after sensitivity analysis (exclusion of studies with JBI score < 8) pooled cumulative survival for patients undergoing PP was 56% (95% CI 36.9-73.9; 8 studies) and chance for cumulative survival was 1.23 (95% CI 0.9-1.68, p = 0.19; 6 studies) pooled ICU LOS 42.5 days (95% CI 28.4-56.7; 7 studies) survival to ECMO weaning between groups: RR = 0.92 (95% CI 0.49-1.71, p = 0.78; 3 studies) no major complications were reported.	1 → 3 (inclusion of mainly retrospective studies)
	Per Branch						

ABG = arterial blood gas, ECMO = extracorporeal membrane oxygenation, FiO2 = Fraction of inspired oxygen, ICU = intensive care unit, JBI = Johanna Briggs institute, MD = Mean Difference, PaCO2 = Partial pressure of carbon-dioxide, PaO2 = Partial pressure of oxygen, PP = prone positioning, pts = patients, RCT = randomized controlled trial, VV ECMO = veno-venous extracorporeal membrane oxygenation

PP during VV ECMO appears safe with a cumulative survival of 57% and may result in longer ECMO runs and ICU LOS. However, evidence from appropriately designed randomized trials is needed prior to widespread adoption of PP on VV ECMO.

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#2047

Reference, Study Type	Cases and Controls (Participant #, characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
2047 Bahloul 2021 PMID: 34380290 https://doi.org/10.4266/acc.2021.00500 **Specification of study:** prospective observational study	1 university hospital between September 1 and December 4, 2020→ 21 pts. included in PP group **Inclusion criteria:** -severe, critically ill adult COVID-19 patients, a confirmed SARS-CoV-2 infection, admitted into the ICU -spontaneous breathing, whose hypoxemia (oxygen saturation measured by pulse oximetry [SPO2] < 92%) did not resolve despite supplemental oxygen delivered via facial mask or HFNO cannula -accepted the PP **Exclusion criteria:** -admitted in cardiac arrest -required non-invasive and/or invasive MV on ICU admission -hemodynamic instability (shock) -neurological disorders (agitation and/or coma) ➔ patients who refused the PP were used as a control group		n/a	**PP group** (2-4h, followed by 2 h of SP during the day, to sleep in a PP at night)	**PP-free group**	No sample size calculation stated **Primary Endpoint:** -change in SpO2, RR, and the evolution of signs of respiratory distress (such as retractions, accessory muscle use) prior to and 60 minutes after the application of the PP, without change in inspired oxygen concentration **Secondary Endpoints:** -need for MV -prognostic impact (i.e., wether the patient survived or died) of the PP	**Primary Result:** -PP was associated with a significant increase in oxygen saturation measured by pulse oximetry (SpO2) from 82%±12% to 96%±3% (P<0.001) 1 hour later. -PP associated with reduction in respiratory rate from 31±10 to 21±4 breaths/min (P<0.001) - Number of patients who exhibited signs of respiratory distress after PP was reduced from 10 (47%) to 3 (14%) (P=0.04) **Secondary Results:** -not associated with a reduction in mortality rate or in the use of invasive mechanical ventilation (P>0.05 for both)	3
	Per Branch							
	21	17						

pts. = patients; COVID-19= coronavirus disease 2019; SARS-CoV-2= severe acute respiratory syndrome coronavirus 2; ICU=intensive care unit; HFNO= high-flow nasal oxygen; PP=prone position; MV=mechanical ventilation; RR=Riva Rocci

Early application of PP can improve hypoxemia and tachypnea in COVID-19 patients with spontaneous breathing.
No detailed assessment was carried out because higher-quality evidence is available on this topic.

#2052

Reference, Study Type	Cases and Controls (Participant #, characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
2052 Burnol 2021 PMID: 34312789 10.1007/s12028-021-01240-1 **Specification of study:** A Prospective Cohort Study	**Total** 2 University hospitals from February 2012 to September 2015 → 23 pts. **Inclusion criteria:** - adults admitted to the ICU for acute brain injury, i.e., traumatic, vascular, or other injury - ICP was monitored with an intraparenchymal ICP device **Exclusion criteria:** - persistence of hemodynamic or respiratory instability despite Treatments - severe brain hypoxia (defined as PbtO2 less than 15 mm Hg) - refractory intracranial hypertension (defined as ICP more than 30 mm Hg) at baseline - development of cerebral vasospasm - no cerebral monitoring of ICP and PbtO2 **Per Branch** 23	n/a	**HUP Intervention** 30° HUP 10 Min stabilization Subsequently lowered to 15° and 0° positions In 3 experiments: <u>Exp1</u> during first 24h after ICU admission <u>Exp2</u> repeated 24 h later <u>Exp3</u> 96 h later	Pts. acted as their own controls	**sample size calculation:** 20 pts. needed to detect a 25% posture-induced change from baseline in PbtO2 values with a two-sided α risk of 0.05 and a power of 90% no primary endpoints defined **Extracted Endpoints:** - brain parameters (mean ICP, CPP, and PbtO2) - systemic variables (FVm, arterial blood gases, hemoglobin content, and body temperature)	**Significant differences between groups:** -exp1, lowering the head from 30° to 15° and 0° was associated with a gradual elevation in ICP, with a mean increase of 2.6 mm Hg (1.4–3.7; P<0.001) from 30° to 15° and of 7.4 mm Hg (6.3–8.6 mm Hg; P<0.001) from 30° to 0° - PbtO2 and FVm improved from 30° to 0° by 1.2 mm Hg (0.2–2.3 mm Hg) and 4.1 cm/s (0.0– 8.2 cm/s), respectively (both P<0.05) -PbtO2 and FVm were significantly higher during exp2 than exp1 (no p-value stated) **No significant differences between groups in:** -CPP, arterial blood gases, hemoglobin content, and body temperature remained unchanged during the three experiments. - decompressive craniotomy nor the order in which the head position was changed affected brain parameters	3

pts. = patients; ICU=Intensive Care Unit; ICP= intracranial pressure; PbtO2= brain tissue oxygenation pressure; HUP= head-up posture; CPP= cerebral perfusion pressure; FVm= mean blood fow velocity;

Changing the positioning of stable patients with acute brain injury resulted in opposite changes of ICP versus brain oxygenation and circulation.

#2054

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#2054 **Liu** **2021** PMID: 34308257 DOI: 10.1007/s42399-021-01008-w **Specification of study:** Systematic review with meta-analysis	465 pts (n = 6 retrospective studies)[1-6] **Inclusion criteria:** - PP applied during VV-ECMO for respiratory failure in critical adult pts **Exclusion criteria**: - pts less than 18 years old - received VA-ECMO or VAV-ECMO - reviews or case reports			**VV-ECMO therapy and PP:** between 8 and 24 hours (6 studies): 1: 8 hours, 1: 12 hours, 1: 15 hours, 1 24 hours and 2: time was not mentioned)	**VV-ECMO and no PP**	**Derived outcomes:** - Survival - ECMO duration - ICU LOS - complications	**Significant differences between groups in:** - ECMO duration (longer in intervention group): MD 5.37, 95% CI 4.19–6.54, I2= 67%, p < .00001 - ICU LOS (longer in intervention group): MD 7.29, 95% CI 4.06–10.52, I2= 64%, p < .00001) - survival *(Rillinger et al.[2])*: Earlier PP (< 17h) vs. Later or no PP: 82% vs. 33%, p < 0.05 **Non-significant differences between groups in:** - improvement in PaO2/FiO2 ratio: higher in intervention group (higher with longer duration of PP) - comparison of survival at discharge *(Giani et al.[3] and Rilinger et al.[2])*: OR 1.42, 95% CI 0.92-2.18; p = 0.11 - overall survival rate of all six studies: Intervention group= 61.8% vs. control group= 45.8% - complications: a) no dislodgement of ECMO cannules when applying PP b) no displacement of vascular lines, ECMO cannula, endotracheal tube, or chest tubes c) reversible complications *(Giani et al.[3])*: desaturation (2.5%), bleeding (1.2%), decrease of blood flow (1.2%), hemodynamic instability (0.6%), increased PaCO2 (0.3%), thigh swelling (0.3%), face swelling (0.3%) and vomiting (0.3%). d) n = 1 membrane thrombosis, n = 1 drop in ECMO blood flow *(Kimmoun et al.[1])* *e)* n = Pneumothorax during PP *(Guervilly et al.[6])*	1 → 3 (retrospective studies and high risk of bias)
	Per Branch							
	212	253						

CI = confidence interval, FiO2 = fraction of inspired oxygen, ICU = intensive care unit, LOS = length of stay, MD = mean difference, OR = odds risk, PaCO2 = partial pressure of carbon-dioxide, PaO2 = partial pressure of oxygen, PP = prone positioning, pts = patients, VA-ECMO = veno-arterial extracorporeal membrane oxygenation, VAV-ECMO = veno-arterial-venous ECMO, VV-ECMO = veno-venous ECMO

Performance of PP during ECMO for refractory respiratory failure is safe, reduces ECMO duration, ICU LOS, might increase survival and improve PaO2/FiO2 ratio.

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#2055

Reference, Study Type	Cases and Controls (Participant #, Characteristics) Total	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
#2055 **Gonzalez-Seguel 2021** PMID: 34301802 DOI: 10.4187/respcare.09194 **Specification of study:** Scoping review	41 publications -n = 15 retrospective observational study - n = 8 case report - n = 4 prospective observational study, - n = 1 RCT - n = 5 clinical practice guideline - n = 3 national guideline - n = 2 clinical commentary - n = 2 care protocol - n = 1 checklist **Inclusion criteria:** - mechanically ventilated pts in prone position due to ARDS **Exclusion criteria:** - reporting on awake prone positioning - pediatric population - animal or experimental studies.	**Prone positioning**	No control required Supine position in 3 studies	**Primary Endpoint:** AEs related to: - pressure sores/ skin injuries - invasive devices - respiratory system - cardiovascular system - musculoskeletal system - visual system - gastrointestinal system - nervous system	Outcomes (number of studies reporting on the AE): pressure sores/ skin injuries (n=7): 29.7% 95% CI 26.2-33.2 invasive devices: - removal of lines (n=7): 0.9% 95% CI 0 – 1.7 - unscheduled extubation (n=5): 7.7% 95% CI 5.2 – 10.3 - displacement of endotracheal tubes (n= 4): 1.9% 95% CI 0.7 – 3.2 - airway obstruction (n=2): 4% 1.7 – 6.4 respiratory system: - severe desaturation (n=3): 37.9% 95% CI 33.3 – 42.4 - VAP (n=2): 28.2 95% CI 23.5 – 33.0 - pneumothorax (n=2): 2.9% 95% CI 0 – 6.1 - barotrauma (n=1): 30.6% 95% CI 15.5 – 45.6 cardiovascular system: - cardiac arrest (n=5): 3.4% 95% CI 1.9 – 4.9 - hypotension (n=3): 10.2% 95% CI 7.2 – 13.2 - arrhythmia (n=2): 15.4% 95% CI 11.1 – 19.7 peripheral nerve injuries (n=4): 8.1% 95% CI 4.2 – 12.0 visual system: eye hemorrhage or edema (n=3): 3.5% 95% CI 1.1 – 5.9 gastrointestinal system: - vomit (n=1): 1.5% 95% CI 0 – 4.5 - hemoptysis (n=1): 2.5% 95% CI 0.5 – 4.5 nervous system: - transient intracranial pressure (n=2): 2% 95% CI 0 – 4.7	5

AE = adverse event, ARDS = acute respiratory distress syndrome, CI = confidence interval, pts = patients, RCT = randomized controlled trial, VAP = ventilator-associated pneumonia

The most common adverse events associated with prone positioning are in the domain of the respiratory system and pressure sores.

#2056

Reference, Study Type	Cases and Controls (Participant #, characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
2056 Petit 2022 PMID: 34259655 10.1097/CCM.0000000000005145 **Specification of study:** Retrospective, single-center study	1 center from January 2012–2020 → 298 pts. **Inclusion criteria:** -severe ARDS patients given VV-ECMO support **Exclusion criteria:** -venoarterial-ECMO		n/a	**PP - ECMO**	**No-PP-ECMO**	No sample size calculation due to study design (retrospective) **Primary Endpoint:** -time to successful ECMO-weaning within the 90-day post-randomization **Secondary Endpoints:** -90-day survival status -ECMO and PP-related complications -respiratory system static compliance gain post-PP -quantitative lung CT profile	**Primary Results:** -PP-ECMO patients' 90-day probability of being weaned-off ECMO and alive higher (0.75 vs 0.54; sHR [95% CI], 1.54 [1.05–2.58]) **Secondary Results:** -PP-ECMO patients' lower 90-day mortality (20% vs 42%) ($p<0.01$) -PP- and no-PP-ECMO groups' complication rates were comparable (n.s.) -Respiratory system static compliance increased greater than or equal to 3mL/cm H2O after 16 hours of PP for 34 patients (53%), whose static compliance rose by 6mL/cm H2O (3.5–10.3mL/cm H2O) post-PP, whereas static compliance changed by 0mL/cm H2O (–0.85 to 0.82mL/cm H2O) for the 30 other PP patients, already observed after 4 hours of PP ($p < 0.01$) -PP nonresponders had higher percentages of nonaerated or poorly aerated lung than PP responders (57% [15–76%] vs 29% [10–46%], respectively, $p = 0.047$), in ventral and medial-ventral regions.	4
	Per Branch							
	64	234						

pts. = patients; ARDS= acute respiratory distress syndrome; ECMO= extracorporeal membrane oxygenation; VV-ECMO= venovenous-ECMO; PP=prone positioning; CT=computer tomography; CI=confidence interval; sHR= Subdistribution hazard ratio; n.s.= not significant;

PP during VV-ECMO was safe and effective and was associated with a higher probability of surviving and being weaned-off ECMO at 90 days.

No detailed assessment was carried out because higher-quality evidence is available on this topic.

#2057

Reference, Study Type	Cases and Controls (Participant #, characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
2057 Binda 2021 PMID: 34244027 https://doi.org/10.1016/j.iccn.2021.103088 **Specification of study:** A cross-sectional study	63 pts., 219 proning cycles, from March to June 2020 **Inclusion criteria:** -laboratory-confirmed SARS-CoV-2 infection -admitted to ICU -on invasive MV -treated with PP **Exclusion criteria:** -noninvasive ventilation -intubated but not treated with PP		n/a	**PP**	**n/a**	No sample size calculation No primary endpoint defined **Extracted Endpoints:** -prevalence of complications - development of pressure ulcers	**Results:** -32 pts. had at least one complication -15 PP cycles were interrupted (6.8%,15/219) -Episodes of bleeding 25.4% (16/63) -Rate of displacement of medical devices during PP 12.7% (8/63) -no unplanned extubation nor chest drainage tube accidental removal -prevalence of pts. with PU: 42.9% (95% CI: 30.6–55.1) whereas 30.2% (95%CI: 18.8–41.5) were prone related ○ With PU higher level of correlation (q = 0.47, P = 0.042) between days of MV and PP-time, compared to pts. without PU (q = 0.29, P = 0.052) ○ PP-time, predictor for prone related PU (P = 0.039) ○ effect of increasing mean PP-time from 24 to 48 hours was to increase the odds by a factor of 1.4 (95%CI: 1.02 to 1.91) ○ increasing weight from 22 to 28 kg/m2 increased the odds by a factor of 1.3 (95%CI 0.6–2.8, P = 0.498)	3 → 4
	Per Branch							
	63							

pts. = patients; SARS-CoV-2= severe acute respiratory syndrome coronavirus 2; ICU=intensive care unit; MV=mechanical ventilation; PP=prone position; PU=pressure ulcers; CI=confidence intervall

The use of PP in patients with COVID-19 was a safe and feasible treatment.
No detailed assessment was carried out because higher-quality evidence is available on this topic.

#2059

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
#2059 **Rosén 2021** PMID: 34127046 DOI: 10.1186/s13054-021-03602-9 **Specification of study:** multicenter randomized clinical trial	**Total** 75 pts in 2 tertiary and 1 county hospital in Sweden **Inclusion criteria:** - adults ≥ 18 years of age - COVID-19 infection with SARS-CoV-2 and hypoxemic respiratory failure - HFNO or NIV respiratory support and a PaO2/FiO2-ratio ≤ 20 kPa or corresponding values of SpO2 and FiO2 for > 1 hour **Exclusion criteria:** - oxygen supplementation with a device other than HFNO or NIV - inability to assume prone or semi-prone position - immediate need for endotracheal intubation - severe hemodynamic instability - previous intubation for COVID-19 pneumonia - pregnancy - terminal illness with less than one year life expectancy - do-not-intubate order - inability to understand oral or written study information **Per Branch** 36 / 39		**APP:** - at least 16 h APP per day - prone and semi-prone positioning was allowed - flat supine positioning was discouraged and patients were instructed to place themselves in the semi-recumbent or lateral position in between proning sessions.	**Standard of care**	**Primary endpoint**: - intubation within 30 days **Secondary outcomes:** - duration of APP - 30-day mortality - NIV - ventilator-free days - ICU and hospital LOS - organ support **Sample size calculation:** estimated based on previous studies with 240 pts to detect a decrease in intubation rate of 20%	**Primary outcome:** - intubation within 30 days: 13 pts (33%) in the control group and 12 pts (33%) in the prone group were intubated [HR 1.01 (95% CI 0.46–2.21), P = 0.99] **Secondary outcomes:** - duration of early APP and total APP was longer in the prone group compared with the control group (P = 0.0001; P = 0.014, respectively). - 3 pts (8%) died in the control group compared with 6 pts (17%) in the prone group [HR 2.29 (95% CI 0.57–9.14), P = 0.30] - no significant differences between groups in ventilator-free days for intubated pts , days free of NIV/HFNO for not intubated pts, hospital or ICU LOS , use of organ support between groups - 9 pts in control and 2 pts in intervention group had pressure sores - 3 cardiac arrests not related to APP (n = 1 control, n = 2 intervention)	2

APP = awake prone positioning, FiO2 = fraction of inspired oxygen, HFNO = high-flow nasal oxygenation, HR = hazard ratio, ICU = intensive care unit, LOS = length of stay, NIV = non-Invasive ventilation, PaO2 = partial pressure of oxygen, pts = patients, SpO2 = oxygen saturation

Awake prone positioning did not reduce rate of intubation in patients with hypoxemic respiratory failure but seemed to increase mortality, whilst not increasing prevalence of pressure sores.

#2088

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#2088 **Longobardo 2021** PMID: 33594874 DOI: 10.23736/S0375-9393.21.15254-X **Specification of study:** Systematic review and meta-analysis	8 RCTs including 2235 adult ARDS pts[1-8] **Inclusion criteria:** - RCTs - studies with prone positioning as intervention **Exclusion criteria:** - studies involving ARDS therapies requiring transfer to a tertiary level referral center - patients outside the ICU - pediatric patients			**Prone positioning**	**Standard care**	**Primary endpoint:** - mortality (28-day or 30-day) **Secondary outcome:** - improvement in oxygenation measured by the P:F ratio at 24h	**Significant differences between groups in:** - prone positioning duration >12h improves mortality: (33.1% vs. 44.4%; RR 0.75 [0.59-0.95]; P=0.02; I^2=49%) **No significant differences between groups in:** -improvement in mortality: (39.3% vs. 44.5%; RR 0.83 [0.68-1.01]; P=0.06; I^2=67%) - improvement in P:F ratio(n=3): MD 26.81 [-5.93-59.54]; P=0.11; I^2=86%	1
	Per Branch							
	1144	1091						

ARDS = acute respiratory distress syndrome, P:F = PaO_2/FiO_2, pts = patients

Prone positioning only improves mortality when it is performed for 12 hours or more.

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#2094

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
#2094 **Wright 2021** PMID: 33481406 DOI: 10.1097/CCM.0000000000004820 **Specification of study:** Systematic review and Proposed Protocol	**Total** 10 publications (1 RCT, 4 cohort studies, 1 case series, 4 case reports) **Inclusion criteria:** - neurologically ill patients with ARDS **Exclusion criteria:** - nonhuman studies - basic science research - pediatric patients **Per Branch**		**Prone Position**	**Supine Position**	**No primary endpoint defined** **Extracted endpoints:** - protocols for prone positioning - safety - ICP - CPP - MAP - PbtO2 - PaO2	no meta-analysis **Significant differences between groups in:** - ICP increase: 3 studies p<0.05 - CPP increase: 1 study p<0.05, - CPP decrease: 1 study p<0.05 - MAP increase: 1 study p<0.05 - MAP decrease: 1 study p<0.05 - PbtO2 increase: 1 study p<0.05 - PaO2 increase: 1 study p<0.05	1 → 3 (not only RCTs, no MA)

ARD = acute respiratory distress syndrome, CPP = cerebral perfusion pressure, ICP = intracranial pressure, MA = meta-analysis; MAP = mean arterial pressure, PbtO2 = brain tissue oxygen tension, RCT = randomised controlled trial

Prone position is safe and feasible in neurologically ill patients with acute respiratory distress syndrome.
Increased intracranial pressure and compromised cerebral perfusion pressure may occur with prone positioning.

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#2105

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#2105 **Akbiyik 2021** PMID: 33230628 DOI: 10.1007/s10096-019-03789-4 **Specification of study**: RCT	40 pts hospitalized between July 2015 and April 2019 **Inclusion criteria:** - over 18 years of age - supported MV by endotracheal tube - ≥ 24 h remaining connected to mechanical ventilator - position could be changed every 4 h in a day - relatives approved to participate in the study **Exclusion criteria:** - pneumonia developed prior to MV support within the first 48 h following MV support - positive sputum culture - MV support or within the first 48 h following MV support - diabetes mellitus - contraindications for routine change of position			**Oropharyngeal aspiration** - using a pressure of 100–120mmHg for 10s - prior to each position changes	**Routine nursing care in the ICU** - endotracheal aspiration and oropharyngeal aspiration - oral care - routine (every 4 h in a day) and non-routine position changes	**Primary endpoints:** - ICU LOS - mechanical ventilation support - VAP mortality	**Primary endpoints:** - median ICU LOS 27.28 ± 30.69 and 18.00 (min 4 days; max 168 days) days - median of mechanical ventilation support 26.72 ± 30.65 and 18.00 (min 4 days; max 168 days) days - VAP development significantly different with respect to OA before the change of position ($\chi 2 = 11.905$; $p = 0.001$) - mean age of the pts who developed VAP 66.2 ± 17.71 (min 22; max 89) - no significant difference in the development of VAP according to the mean of age ($t = 0.843$; $p = 0.405$) - VAP development increased the death rate ($\chi 2 = 13.112$; $p = 0.002$)	2 → 3
	Per Branch							
	20	20						

ICU = intensive care unit, LOS = length of stay, MV = mechanical ventilation, OA = oropharyngeal aspiration, pts = patients, RCT = randomized controlled trial, VAP = ventilated associated pneumonia

Oropharyngeal aspiration prior to each position change reduced the incidence of VAP significantly.

#2112

Reference, Study Type	Cases and Controls (Participant #, Characteristics) Total	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
#2112 **Monsees 2022** PMID: 35649531 DOI: 10.1111/nicc.12785 **Specification of study:** Systematic review + MA	10 RCTs including 1291 adult ICU pts[1-10] **Inclusion criteria:** - RCT - language English - critically ill adult patients - inclusion within 4 days of admission or intubation - utilization of EM - report of ICU LOS **Exclusion criteria:** - utilization of Passive exercise only - utilization of cycle ergometry as only intervention **Per Branch**		**EM that promotes active exercise**	**Usual care or no EM intervention**	**Primary endpoint:** - ICU LOS **Secondary outcomes:** - duration of MV - mortality - hospital LOS - FI	**Significant differences between groups in:** - reduction in duration of MV: p= 0.0002, I^2= 82% **No significant difference between groups in:** - ICU LOS (n=4 studies): Study MD -0.18 (95% CI -0.53 – 0.18) - mortality: No significance. Risk Ratio of 1.01 (95% CI 0.2-1.26), I^2 = 0%. - hospital LOS: Results favored intervention treatment, except for one study. Results were not significant, except for one study reporting a reduction of 6.5 median days (p = 0.011). - FI: no meta-analysis possible	1

EM = early mobilization, FI = functional independence, ICU = intensive care unit, LOS = length of stay, MD = mean difference, MV = mechanical ventilation, pts = patients, RCT = randomised controlled trial

Early mobilisation shortens the duration of mechanical ventilation and shows a trend towards reduced ICU LOS and hospital LOS.

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#2114

Reference, Study Type	Cases and Controls (Participant #, Characteristics) Total	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
#2114 **Cartotto 2022** PMID: 35639543 DOI: 10.1093/jbcr/irac008 **Specification of study**: Comprehensive Literature Search and Review	3 case-control studies[1-3] **Inclusion criteria:** - burn pts in ICU - EMR intervention - with a control group - at least one outcome of predefined PICO outcomes - MV - publications in English - from the inception of the database to April 29, 2021 **Exclusion criteria:** - abstracts - surveys - case reports - unrelated articles		**EMR**	**Non-standardized or late mobilization and rehabilitation**	**Primary endpoints:** **1.** Does EMR (a) shorten the duration of MV and (b) reduce the development of ICUAW? **2.** Does EMR result in fewer hospital-acquired pressure injuries? **3.** Does EMR result in loss of skin grafts or skin substitutes? **4.** Does EMR reduce the prevalence of delirium?	**1. Does EMR (a) shorten the duration of MV and (b) reduce the development of ICUAW?** - recommendation: (a): none. insufficient evidence. (b): conditional recommendation (based on low- to very low quality evidence) for implementation of EMR to reduce ICUAW with open dialogue between medical, nursing, and rehabilitation staff to identify any specific safety concerns or medical/surgical limitations. **2. Does EMR result in fewer hospital-acquired pressure injuries?** - recommendation: none. no evidence identified. **3. Does EMR result in loss of skin grafts or skin substitutes?** - recommendation: none. no evidence identified. suggestion that surgeons and rehabilitation therapists consider whether EM is feasible and warranted in a critically ill burn pts with recent grafting. **4. Does EMR reduce the prevalence of delirium?** - recommendation: no evidence identified - conditional recommendation for implementation of EMR to reduce delirium recommended, based on literature that was not included in the search results of this database search.	1

BI = Barthel index, EMR = early mobilization and rehabilitation, FIM = functional independence measure, ICU = intensive care unit, LOS = length of stay, MV = mechanical ventilation, pts = patients

Underlying evidence is not sufficient to recommend EMR to reduce the duration of MV in the burn ICU or development of hospital-acquired pressure injuries. Conditional recommendation for the use of EMR to reduce development of ICUAW and delirium in critically ill burn patients in the ICU.

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#2115

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#2115 **Matsuura 2022** PMID: 35624556 DOI: 10.1111/nicc.12780 **Specification of study:** A systematic review and meta-analysis	11 publications included in meta-analysis (3 randomized, 8 controlled before and after studies, n = 2.549 pts)[1-11] **Inclusion criteria:** - ICU pts aged 18 year or older - occurrence of delirium via reliable and valid tools - RCTs, CCTs, CBAs - evaluated the effects of non-pharmacological interventions to prevent delirium - multicomponent non-pharmacological interventions - delirium occurrence as primary outcome - published in English. **Exclusion criteria:** - unoriginal studies - not an ICU setting - pediatric participants - pharmacological interventions			**Non-pharmacological multicomponent intervention (i.e. Assessment of SP, CS, EM, PC)**	**Usual Care**	**Primary endpoints:** - the efficacy of non-pharmacological interventions, - combination of care - effectiveness of combinations of non-pharmacological interventions in preventing delirium	**Significant differences between groups:** - rate of delirium occurrence in non-pharmacological multicomponent interventions performed to prevent delirium (OR 0.58, 95% CI 0.44-0.76, p <0.001) - two effective bundles compared to control for the incidence of delirium: a) the combination of SP, CS, EM, PC , and AS (OR 0.47, 95% CI 0.35–0.64, p < 0.002) b) the combination of SP and CS (OR 0.46, 95% CI 0.28–0.75, p < 0.001) - SUCRA analysis suggests with 76.8% that SP-CS was the highest among multicomponent interventions for reducing the delirium incidence.	1→ 2 (not only RCTs included)
	Per Branch							
	1353	1196						

AS = assessment, CBA = controlled before and after trial, CCT = controlled clinical trial, CS = cognitive stimulation, EM = early mobilization, PC = pain control, pts = patients, RCT= randomized controlled trial, SP = sleep promotion, SUCRA = surface under the cumulative ranking

This study revealed that non-pharmacological interventions, particularly multicomponent interventions, helped to prevent delirium in critically ill patients. In the network meta-analysis, the most effective care combination for reducing incidence of delirium was found to be multicomponent intervention, which comprises SP-CS-EM-PC-AS, and SP-CS.

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#2116

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
#2116 **Rahiminezhad 2022** PMID: 35619171 DOI: 10.1186/s13102-022-00489-z **Specification of study:** a single-blinded randomized controlled clinical trial	**Total** 90 pts **Inclusion criteria:** - above 18 years - 1st day of ICU admission (pts under invasive MV, non-invasive MV, and not MV pts) - FOUR score ≥ 14 - no amputation - no fractures in the lower or upper extremities - no neuromuscular diseases (myasthenia gravis, Guillain–Barre syndrome, botulism and pesticide poisoning - no deep vein thrombosis - no skin diseases - no metabolic disorders (including hypokalemia, hypophosphatemia, hypomagnesemia) - no allergy to olive oil in the massage group **Exclusion criteria:** - transferred to the ward during the intervention **Per Branch** n = 38 massage / n = 36 ROM / n = 35 control	- Control n=5 a. ICU LOS < 7 days n = 3, b. inadequate loc n = 2 - Massage n=8 a. decline to participate n = 5 b. ICU LOS < 7 days n = 2 c. inadequate loc n = 1 - ROM n=6 a. decline to participate n = 3 b. ICU LOS < 7 days n = 2 c. inadequate loc n = 1	Group 1: ROM exercises (on pts extremities once a day for 7 consecutive days) Group 2: Massage	Routine care as usual	**Primary endpoint:** - muscle strength measured with a hand-held dynamometer before, before the intervention (T1), on the 4th (T2) and 7th (T3) day of intervention at 8 p.m.	**Primary endpoints:** - muscle strength of the right arm - before intervention lower strength in massage group than that of the control ($p < 0.001$, mean difference = -2.4) - mean difference of increase of muscle strength T3-T1 (mean+SD): a) ROM: 0.63 ± 0.17 b) massage: 0.29 ± 0.23 c) control: -0.55 ± 0.28 - significant difference between the three groups (ANOVA, $p < 0.001$, $F = 205.54$) - Bonferroni post hoc test for mean difference between: a) massage and Rom (-0.34): $p < 0.001$) b) massage and control (0.84): $p < 0.001$) c) ROM and control (1.18): $p < 0.001$) - muscle strength of the left arm - before intervention lower strength in massage group than that of the control ($p < 0.001$, mean difference = -2.45) - mean difference of increase of muscle strength (mean+SD): a) ROM: 0.61 ± 0.17 b) massage: 0.28 ± 0.29 c) control: -0.56 ± 0.28 - significant difference between the three groups (ANOVA, $p < 0.001$, $F = 173.47$) - Bonferroni post hoc test for mean difference between: a) massage and ROM (-0.33): $p < 0.001$) b) massage and control (0.84): $p < 0.001$) c) ROM and control (1.18): $p < 0.001$) - muscle strength of the right leg - mean difference of increase of muscle strength (mean+SD): a) ROM: 0.53 ± 0.21 b) massage: 0.27 ± 0.18 c) control: -0.70 ± 0.33 - significant difference between the three groups (ANOVA, $p < 0.001$, $F = 204.04$) - Bonferroni post hoc test for mean difference between: a) massage and ROM (-0.25): $p < 0.001$) b) massage and control (0.97): $p < 0.001$) c) ROM and control (1.22): $p < 0.001$) - muscle strength of the left leg - mean difference of increase of muscle strength (mean+SD): a) ROM: 0.54 ± 0.19 b) massage: 0.26 ± 0.2 c) control: -0.71 ± 0.29 - significant difference between the three groups (ANOVA, $p < 0.001$, $F = 241.12$) - Bonferroni post hoc test for mean difference between: a) massage and ROM (-0.28): $p < 0.001$) b) massage and control (0.97): $p < 0.001$) c) ROM and control (1.25): $p < 0.001$)	2

ICU = intensive care unit, loc = level of consciousness, LOS = length of stay, pts = patients, ROM = range of motion, T = timepoint

The results of the present study showed that ROM exercises and massage were effective interventions in increasing muscle strength of the critically ill patients admitted to intensive care units.

#2118

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#2118 **Zhou 2022** PMID: 35617287 DOI: 10.1371/journal.pone.0268599 **Specification of study:** a prospective dual-center randomized controlled trial	150 pts **Inclusion criteria:** - >18 years of age - admitted to the ICU for the 1st time - expected ICU stay >72 h - conscious within the subsequent 24 h to respond to at least three of the following orders: "open and/or close your eyes," "look at me," "put out your tongue," "nod your head," and "raise your eyebrows" - BI >70 at 2 weeks before ICU admission **Exclusion criteria:** - pregnancy - deformity, paralysis, fracture, or surgery of limbs - pre-existing primary systemic neuromuscular disease that affects muscle strength - intracranial or spinal processes affecting motor function; - gastrointestinal surgery within 1 month - no expectation of any nutritional intake within the subsequent 48 h - terminal cancer, expected death, or extremely poor prognosis.			EM Group: **early, individualized, progressive mobilization** within 24 h of ICU admission EMN Group: **early mobilization + guideline-based early nutritio**n (within 48 h of ICU admission)	**Routine care**	**Primary endpoint:** - occurrence of ICU-AW at discharge from the ICU **Secondary outcomes:** - muscle strength - functional independence - organ failure (SOFA) - nutritional status - duration of MV - ICU LOS - ICU mortality at ICU discharge.	**Primary endpoint:** - control had more incidents of ICU-AW at discharge than EM or EMN groups (16% vs. 2%; p = 0.014 for both) -ICU-AW (EM vs. control: p = 0.027, OR [95% CI] = 0.066 [0.006–0.739], EMN vs. control: p = 0.016, OR [95% CI] = 0.065 [0.007–0.607]). **Secondary outcomes:** -Barthel Index (control vs. EM/EMN: 57.5 vs 70.0; p = 0.022) - muscle strength, EMN vs control (p = 0.028) - nutritional status EMN vs control (p = 0.031) - organ failure EMN vs control 0 vs 0 (p = 0.614) - duration of MV control vs EM/EMN 0 vs 0 vs 0 (p = 0.753) - ICU LOS control vs EM/EMN 4.1 vs 4.5 vs 3.4 (p = 0.040) - ICU mortality control vs EM/EMN 2 vs 3 vs 2 (p = 1)	2→3 (high risk of bias)
	Per Branch							
	EM Group = 50 EMN Group = 50	50						

EM = early mobilisation, EMN = early mobilisation with early nutrition, ICU-AW = ICU-acquired weakness, ICU = intensive care unit, LOS = length of stay, MV = mechanical ventilation, pts = patients

EM and EMN had positive effects. There was little difference between the effects of EM and EMN, except for muscle strength improvement. Both EM and EMN may lead to a lower occurrence of ICU-AW and better functional independence than standard care. EMN might benefit nutritional status more than usual care and promote improvement in muscle strength.

#2119

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
#2119 **Balke 2022** PMID: 35615672 DOI: 10.3389/fphys.2022.865437 **Specification of study:** systematic review	26 RCTs [1-26] **Inclusion criteria:** - full text articles - RCTs - pts aged >18 years **Exclusion criteria:** - focused on histological and morphological changes only - investigated the acute effects of EMS - not written in English - grey literature or website articles - did not clearly report on included subjects, type of intervention or applied treatment, outcome measures, and statistical analysis - included healthy subjects - focused on other conditions - did not include humans - not original research		**EMS**	**Conventional care**	**Endpoints:** - stimulated muscles/muscle area (quadriceps muscle only; two to four leg muscle groups; legs and arms; chest and abdomen) - treatment duration (≤10 days, >10 days). -stimulation parameters (impulse frequency, pulse width, intensity, duty cycle) - the net EMS treatment time	**No meta-analysis or comparative statistical analysis was performed** - isolated stimulation of quadriceps muscles(n=10), 60% reported significantly larger improvement in the EMS group - combined stimulation of two to four leg muscle groups(n=8) All eight studies reported on muscle parameters and three (37.5%) detected significant positive EMS effects compared to control. - combined stimulation of legs and arms(n=3), Three studies of this group reported on muscle parameters, of which two reported significantly greater improvements compared to control, with one study applying EMS for ≤10 days, and two studies applying EMS for >10 days. - 2–4 Leg muscle groups and abdomen (n= 1) Improved muscle volume and functional independence without any significant differences in ICU LOS - abdomen and chest (n=2) significant reduction of ICU LOS.	1 → 3 (qualitative approach, no meta-analysis)
	Per Branch						

EMS = electrical muscle stimulation, LOS = length of stay, pts = patients

The overall efficacy of EMS was inconclusive and neither treatment duration, stimulation site nor net EMS treatment time had clear effects on study outcomes.

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#2120

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#2120 **Cordeiro 2022** PMID: 35600284 DOI: not avilable **Specification of study:** Prospective cohort study	103 pts **Inclusion criteria**: - > 18y - submitted to myocardial revascularization via median sternotomy with cardiopulmonary bypass **Exclusion criteria**: - previous cardiac surgery - physical limitations (amputation, auxiliary devices) - pre-existing pulmonary disease (COPD, restrictive lung disease) - neurological or neuromuscular disease (ALS, myestenia gravis)			**MG** (pts that achieved bed to chair transfer on first day post-op and ambulation on second day post-op)	**NMG** (passive kinesiotherapy in bed)	**Outcomes:** - duration of MV - ICU LOS - mortality - MRC (admission vs. discharge) - FIM (admission vs. discharge) - 6-MWT	**Significant differences between the groups:** - duration of MV (hours): MG: 6 ± 2 vs. NMG 10 ± 3; p= 0.02 - ICU-LOS (days): MG: 2 ± 2 vs. NMG: 4 ± 3; p < 0.001 - 6-MWT (admission vs. discharge) (Δ): MG: -37 ± 10 vs. NMG: -78 ± 11; p < 0.001 **No significant differences between the groups:** - mortality: n.s. - MRC (admission vs. discharge): n.s. - FIM (admission vs. discharge): n.s.	3
	Per Branch							
	MG = 55	NMG = 48						

ALS = amylotrophe lateral sclerosis, COPD = chronic obstructive pulmonary disease, FIM = functional independence measurement, LOS = length of stay, MG = mobilisation group, MRC = medical research council, MV = mechanical ventilation, NMG = non-mobilization group; pts = patients; 6MWT = 6-minute walking test

Cardiac surgery patients in the early mobilization group had a reduced duration of MV and length of stay, better physical function, and had a lower decrease in distance walked during 6-MWT.

#2123

Reference, Study Type	Cases and Controls (Participant #, characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
2123 Wanabe 2022 PMID: 35566716 DOI: 10.3390/jcm11092587 **Specification of study:** A Multi-Center Prospective Cohort Study	N = 192 **Inclusion criteria:** - ICU stay for more than 48 h **Exclusion criteria:** - less than 18 years of age - unable to walk independently before admission - neurological complications - lacking communication skills due to pre-existing mental diseases - terminal state - history of psychiatric disorders - died or did not complete the assessment at 3 months follow-up after hospital discharge		N=47 in Non EM (death, lost to follow-up after ICU discharge) N=47 in Non-EM (death, lost to follow-up after ICU discharge)	**EM**	**Non-EM**	**Primary Endpoint:** - incidence of psychiatric symptoms at 3 months after hospital discharge (using HADS, IES-R) **Secondary Endpoints:** - HADS subsets (depression, anxiety) and IES-R score (PTSD) at hospital discharge and 3 months after and changes between 3 months and hospital discharge - EQ-5D-5L at 3 months follow-up and at hospital discharge - walking independence at discharge - duration of MV - LOS ICU and hospital - incidence of delirium during ICU stay - incidence of ICU-AW at ICU discharge	**Primary Endpoint:** - incidence of psychiatric symptoms: significantly lower in the EM group (odds ratio (OR): 0.27, adjusted p = 0.032] - significantly lower incidence of PTSD (OR: 0.06, adjusted p = 0.026) and significantly lower HADS subset score for anxiety (adjusted p = 0.004) and IES-R (adjusted p = 0.009) in EM-group - risk for developing psychiatric symptoms [RR: 0.49, confidence interval (CI): 0.29–0.83, p = 0.010], depression (RR: 0.52, CI: 0.27–0.99, p = 0.006), anxiety (RR: 0.27, CI: 0.10–0.71, p < 0.001), and PTSD (RR: 0.07, CI: 0.01–0.54, p < 0.001) at 3 months follow-up **Secondary Endpoints:** - 3 months follow-up, EM group lower incidence of PTSD (OR: 0.06, adjusted p = 0.026) and lower HADS subset score for anxiety (adjusted p = 0.004) and IES-R (adjusted p = 0.009) -incidence of depression, anxiety, and PTSD, the HADS subset scores for depression and anxiety, and the IES-R score at the time of hospital discharge (n.s) -comparing hospital discharge and at 3 months follow-up, changes in the HADS subset scores for anxiety in the EM group were significantly higher (adjusted p = 0.032) - EQ-5D-5L 3 months follow-up (p=0.235) hospital discharge (p=0.384) - walking independence at discharge higher in EM (p=0.032) - duration of MV shorter in EM (p <0.001) - LOS ICU and hospital shorter in EM (ICU: p <0.001 and hospital: p= 0.004) - incidence of delirium during ICU stay lower in EM (p=0.013) - incidence of ICU-acquired weakness (ICU-AW) at ICU discharge lower in EM (p= 0.006)	3
	Per Branch							
	107	85						

ICU = Intensive Care Unit, EM = Early Mobilization, HADS = Hospital anxiety and depression scale, IES-R = Impact of event scale-revised, PTSD = post-traumatic stress disorder, MV = Mechanical ventilation, LOS = Length of stay, ICUAW = Intensive Care Unit acquired weakness; OR= Odds ratio

EM in the ICU is significantly associated with lower rates of psychiatric symptoms, including depression, anxiety, and PTSD, at 3 months follow-up after hospital discharge.

#2124

Reference, Study Type	Cases and Controls (Participant #, characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
2124 Vollenweider 2022 PMID: 35552550 DOI: 10.1371/journal.pone.0267255 **Specification of study:** a systematic review	5 publications (1x within-patient randomized trial, 1x controlled randomized open clinical trial, 1x within-patient randomized trial, 1x randomized controlled cross-over trial, 1x controlled randomized pilot study) **Inclusion criteria:** -RCTs -in English or German language - mechanically and invasively ventilated and sedated critically ill pts > 18 years - evaluated the effect of passive motion of the lower extremities carried out in bed, either manually or through a therapy device, on musculature, inflammation, the immune system -development of ICUAW -included a comparison		**Passive early motion interventions**	**Standard therapy** -respiratory therapy -nursing measures and positioning	**Outcomes:** Effects of early passive motion -on musculature -on inflammation and immune system -on development of ICUAW	No p-values stated **No significant difference between groups in:** -muscle degradation -development of ICUAW **Significant difference between groups in:** - effect on musculature by passive bed cycling o preservation of muscle thickness o increase of microcirculation - application of a cuff with additional passive exercise and the high-dose passive exercise on a CPM splint led to significantly lesser muscle loss - Significant reduction of TNF-α **Unclear effects on inflammation and immune system:** - unclear effects on cytokines - Increase of pro-inflammatory IFN- γ	1 → 3 (no meta-analysis)
	Per Branch						

Pts = patients, ICU-AW = intensive care unit acquired weakness

Multicomponent strategy was the most effective non-pharmacological intervention in reducing the incidence of ICU delirium. Early mobilization and family participation involvement in non-pharmacological interventions seemed to be more effective in reducing the incidence of ICU delirium.

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#2126

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#2126 **Bordas-Martinez 2022** PMID: 35479948 DOI: 10.3389/fmed.2022.866055 **Specification of study:** retrospective cohort study	159 patients admitted to the ICU and/or the intermediate respiratory care unit (IMCU) from March 13th until May 15th of 2020 **Inclusion criteria** - survival of severe COVID-19 pneumonia - requirement of high oxygen support required [inspired oxygen fraction (FiO2) >0.5] with HFNC , and/or either invasive (IOT-MV) or NIV-MV **no exclusion criteria mentioned**			**Physiotherapy group** With : n=32 early PT, n=76 non-early PT	**Non-physiotherapy group**	**Primary outcome** - hospital LOS - subject and therapist safety **Secondary outcome** - multivariate analysis of MV obesity	**Primary outcome** - hospital LOS: 19 [IQR 36.25] and 34 days (IQR 27.25) (p = 0.001) for early and non-early PT groups - no physiotherapist was infected, no subject adverse effect was identified - early-PT group: identified obesity [OR 3.21; p-value 0.028], invasive mechanical ventilation (OR 6.25; p-value<0.001) - non-early-PT-group:(OR 3.54; p-value 0.017) as independent factors associated with a higher risk of prolonged hospital stay	4
	Per Branch							
	N=108	N=51						

HFNC = high-flow nasal cannula, IQR = interquartile range, MV = mechanical ventilation, NIV = non-invasive, OR = odds ratio, PT = physio therapy

Rehabilitation in acute severe COVID-19 pneumonia is safe for subjects and healthcare workers and could reduce the length of hospitalization stay, especially in those that start early.

#2127

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#2127 **Liu** **2022** PMID: 35468868 DOI: 10.1186/s40560-022-00613-8 **Specification of study:** retrospective cohort study	296 septic patients **Inclusion criteria** - aged ≥18 years who were admitted to the ICU with sepsis based on the Sepsis-3 criteria **Exclusion criteria** patients with: - acute cerebrovascular disease - progressive neuromuscular disease - post-cardiac arrest syndrome - unstable pelvic fracture - spinal injury with fracture of the spine, or multiple absent limbs			**EM group** (rehabilitation at the level of sitting on the edge of the bed or more within the frst 3 days of the patients' ICU stay	**Non-EM group**	**Primary outcome** - in-hospital mortality - ambulatory dependence at the hospital discharge **Secondary outcome** - ICU-LOS - hospital stay - total hospital costs	**Primary outcome** - mortality : 7 (n=96) vs. 48 (n=200), OR= 0.22 [95% CI 0.06–0.88]; p<0.01 - dependence at discharge: 26 (n=96) vs. 113 (n=200), OR=0.24 [95% CI 0.09–0.61]; p<0.01 **Secondary outcome** - ICU-LOS (days) : Intervention= 5.3 [4.2–6.8] vs. control= 6.5 [5.0–10.7];p<0.01 - LOS hospital (days): intervention= 28.3 [16.8–46.1] vs. control= 34.0 [19.5–61.1]; p=0.10 - total costs: intervention= 24,823 [14,778– 39,703], control= 32,515 [20,060– 51,854]; p<0.01	4
	Per Branch							
	N=96	N=200						

CI = confidence interval, ICU = intensive care unit, LOS = length of stay, OR = odds ratio

Achieving mobilisation within the first 3 days of ICU stay was significantly associated with better outcomes. Patients with sepsis might benefit most from achieving mobilization within 2–4 days.

#2128

Reference, Study Type	Cases and Controls (Participant #, characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
2128 Chen 2022 PMID: 35468538 DOI: 10.1016/j.ijnurstu.2022.104239 **Specification of study:** a systematic review and network meta-analysis	29 RCTs, 7005 pts[1-29] **Inclusion criteria:** -pts (age >18 years) in ICU -non-pharmacological interventions as the intervention group - non-pharmacological interventions or routine care as the control group - reporting delirium incidence assessed by valid assessment tools -delirium duration -adopting RCT design **Exclusion criteria:** -subacute critical care unit **Total** **Per Branch**		**non-pharmacological interventions**	**routine care**	**Outcomes:** - incidence of delirium - duration of delirium	**Results:** -multicomponent strategy was the most effective non-pharmacological intervention compared to usual care in reducing incidence of ICU delirium (OR=0.43, 95% CI= 0.22–0.84) but not ICU delirium duration - specific multi-treatment interventions reduced the ICU delirium incidence and duration, particularly involvement of EM and family participation (OR = 0.12 with 95% CI = 0.02 to 0.83; mean difference = - 1.34 with 95% CI = -2.52 to -0.16)	1

Pts = patients, RCT = randomized controlled trial, ICU = intensive care unit, OR = Odds Ratio, CI = Confidence interval, EM = early mobilization

The study suggests that the multicomponent strategy was the most effective nonpharmacological intervention in reducing the incidence of ICU delirium. Early mobilization and family participation involvement in non-pharmacological interventions seemed to be more effective in reducing the incidence of ICU delirium.

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#2129

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#2129 **Kagan 2022** PMID: 35458151 DOI: 10.3390/nu14081589 **Specification of study:** RCT	- 62 pts **Inclusion criteria:** - age 18–90 years - MV for at least 48 h - expected period of ventilation ≥ 7d **Exclusion criteria:** - conditions that impaired the cycling movement - trauma, arthritis, or surgery of the leg, pelvis, or lumbar spine - open abdominal wounds or abdominal compartment syndrome - anticipated fatal outcome of ICU - pre-existing diagnosis of neuromuscular weakness, acute stroke, or status epilepticus - cardiorespiratory instability - contra-indication for EN, including mechanical or functional bowel obstruction, high output fistula, severe necrotizing pancreatitis - pregnancy			**Group 1: Cycle ergometry with standard EN** (Jevity®, Abbott, Chicago, IL, USA) **Group 2: Cycle ergometry with protein-enriched EN** (veryhigh-protein formula Promote®, Abbott)	**Conventional PT with EN:** - (MOTOmed viva2, Medimotion, Carmarthenshire, Wales, United Kingdom, SA39 9AZ)	**Primary endpoint:** - MV duration **Secondary outcomes:** - ICU mortality - ICU LOS - hospital LOS - reintubation rate	**Primary endpoint:** - MV duration n.s. **Secondary outcomes:** - no significant differences	2
	Per Branch							
	22	Control group 1: 19 Control group 2: 21						

EN = enteral nutrition, ICU = intensive care unit, LOS = length of stay, MV = mechanical ventilation, n.s. = not significant, PT = physiotherapy, pts = patients

Cycle ergometry combined with either standard enteral nutrition or with protein-enriched enteral nutrition seems to have no effect on MV duration.

#2130

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#2130 **Watanabe 2022** PMID: 35415279 DOI: 10.2490/prm.20220013 **Specification of study:** Retrospective single-center study	177 patients admitted to the ICU from January 2016 to March 2019 **Inclusion criteria** - pts > 18 years **Exclusion criteria** - ICU discharge within 48h - unable to walk independently before hospitalization, were neurologically impaired - difficulty communicating - mobility-limiting conditions (e.g., unstable pelvic fractures) - considered terminal or at the end of life/ died during the ICU stay			**EM**	**Late mobilisation**	**Primary outcome** - independent gait at discharge **Secondary outcome** - medical costs - 90-day survival and durations of ICU - hospital stays	**Primary outcome** - independent gait at discharge: (OR: 4.47, 95% CI: 1.39–17.43, P=0.011) **Secondary outcome** - medical costs: Intervention= 19,210 [11,107– 26,620] , control= 28,789 [20,969– 41,853]; p>0.0001 - 90-day survival(%): intervention=80 (94), control= 70 (76) ; p<0.0001 - ICU LOS (days): intervention= 4 [3–5] , control= 7 [4–10]; p <0.0001 - hospital LOS (<28 days): (OR:0.29,95%CI: 0.11-0.75, P=0.010)	4
	Per Branch							
	N=85	N=92						

CI = confidence interval, EM = early mobilization, ICU = intensive care unit, LOS = length of stay, OR = odds ratio, pts =patients

EM, which refers to achieving the strength to sit on the edge of the bed within the first 5 days of the ICU stay, might be an adequate target to improve clinical outcomes.

#2131

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#2131 **Campos 2022** PMID: 35412472 DOI: 10.1097/CCM.0000000000005557 **Specification of study:** RCT	139 pts **Inclusion criteria:** - > 18years old - <48h in ICU - expected to stay mechanically ventilated for >48h **Exclusion criteria:** - inability to walk prior to admission -neuromuscular disease - spinal cord injuries - epilepsy - risk of death within 24h - musculoskeletal and skin conditions		92 drop-outs: (49 I, 43 C) reasons: - death - transferred to other hospital - palliative care - could not be assessed with FSS-ICU at ICU discharge	**EM+ NMES** **-** on quadriceps and tibialis anterior - once a day 60 min, 5d/week until ICU discharge	**EM**	**Primary endpoint:** FSS-ICU at ICU-discharge, hospital discharge and day of awakening **Secondary outcomes:** - MRC-SS - PFIT - Bathel index	**Primary endpoint:** - FSS-ICU at ICU discharge: I: 28 vs C: 18 p=0.004 on the first day awake: I: 22 vs C: 12 p=0.019 at hospital discharge: I: 33 vs C: 25 p=0.014 **Secondary outcomes:** at ICU discharge: - MRC-SS: 58.5 vs 50 p=0.001 - PFIT: 11 vs 7 p=0.001 - Barthel index: n.s. at first day awake: - MRC-SS: 54 vs 42 p=0.011 - PFIT: 9 vs 5 p=0.025 at hospital discharge: - MRC-SS: 59 vs 52 p=0.010 - PFIT: 11 vs 9 p=0.005 - Barthel index: n.s.	2
	Per Branch							
	N=21 (EM+NMES)	N=26 (EM)						

C = control, EM = early mobilisation, FSS-ICU = functional status score for ICU, I = intervention, ICU = intensive care unit, MRC-SS = medical research council sum-score, NMES = neuro-muscular electrical stimulation, PFIT = the physical function test in the ICU, pts = patients

Early neuromuscular electrical stimulation in addition to early mobilisation improves functional status and improves muscle strength in ICU patients.

#2132

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#2032 **Sumin 2022** PMID: 35410009 DOI: 10.3390/ijerph19074329 **Specification of study:** Observational study	60 pts **Inclusion criteria:** - elective heart or intrathoracic vessel surgery with complications (increasing ICU stay by 3 d or prolonged MV) **Exclusion criteria**: - patient refusal - severe comorbidity (neurological or orthopedic) - cognitive dysfunction - post-op delirium - agonizing patients - fatal post-op complications (hospital death)			**Group 1:** achieved > 300m in 6MWT before discharge	**Group 2:** achieved < 300m in 6MWT before discharge	**Outcome:** factors determining functional status at discharge	**Factors that determined functional status:** - lower-extremity muscle strength 3d post-op: G1: 16.7 [13.2; 25.1] vs. G2: 12.6 [9.1; 14.9]; p = 0.001 - lower handgrip strength 3d post-op: G1: 28.0 [24.0; 35.0] vs. G2: 18.0 [15.0; 27.0]; p = 0.002 - foot extensor strength (MD 0.308; p= 0.019) - longer aortic clamping time (MD −0.401; p= 0.001) - longer ICU-LOS: G1: 5.5 [3.0; 6.0] vs. G2: 7.5 [3.0; 12.0]; p <0.001	3
	Per Branch							
	n = 31	n = 29						

ICU = intensive care unit, MV = mechanical ventilation, 6MWT = 6-minute walking test

Lower muscle strength, longer aortic clamping time and longer ICU stay are independent factors for reduced functional status after cardiac surgery.

#2134

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#2134 **Sakai 2022** PMID: 35358285 DOI: 10.1371/journal.pone.0266348 **Specification of study:** Retrospective cohort study	257 pts **Inclusion criteria:** - <18 years - received intensive treatment - sepsis diagnosed - BI score > 69 **Exclusion criteria:** - head injuries - burns - spinal injuries - lower limps with multiple fractures - septic shock - unresponsive to treatment - expected mortality within 48h			**After assigning a specialized physical therapist**	**Before assigning a specialized physical therapist**	**Primary outcome:** ADL recovery (BI ≥ 70 considered as ADL independence) **Secondary Outcome:** - hospital LOS - discharge Outcome Sample size calculation: 64 per group with an effect size of 0.5 and 80% power	**Primary outcome:** - independence in ADLs: BI ≥ 70: 39 (45%) vs. 39 (66%), p = 0.022 **Secondary outcome:** - hospital LOS: 28 (16-46) days vs. 18 (10-39); p = 0.016 - discharge to home: 41 (48%) vs. 32 (54%) p = 0.44)	4
	Per Branch							
	59	86						

ADL = activities of daily living, BI = Barthel index

Assigning a physical therapist to a patient with sepsis shortened the number of days until begin of rehabilitation.

#2135

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#2135 **Han 2022** PMID: 35301878 DOI: 10.1177/030 00605221087 031 **Specification of study:** RCT	140 pts **Inclusion criteria:** - 50 years or older - elective CABG for the first time between January 2019 and June 2018 **Exclusion criteria:** - exercise-induced syncope or ventricular arrhythmias - inability to exercise and walk owing to comorbidities - MV > 24h - fraction of inspired oxygen >55% - new ischemic electrocardiographic changes		16 pts (9 due to pain, 7 due to lack of motivation)	**SGR (+UC)** = respiratory exercises and daily walking exercises **IGR (+UC)** = early CR + general ward rehabilitation	**Usual care**	**Primary outcome:** - activities of daily living (Barthel Index score) **Secondary outcomes:** - post-operative LOS - PPC - atrial fibrillation during hospitalization - complications within 30 days of discharge (i.e., death, need for reoperation, atrial fibrillation, deep sternal infection, stroke, and re-admission to the hospital)	**Primary outcomes:** - Barthel Index score for UC (75.3±12.1) significantly lower than both SGR (86.2±14.1) and IGR (89.1±15.5) p1 = 0.013, p2 = 0.001 - no significant difference in Barthel Index scores between SGR and IGR groups p3=0.321 **Secondary outcomes:** - ICU and post-operative hospital LOS for IGR group statistically shorter compared with UC group and SGR group (p<0.05) - PPC (p1 = 0.740, p2 = 0.740, p3 = 1.000) and atrial fibrillation (p1 = 0.538, p2 = 0.682, p3 = 0.437): n.s. - complications higher in UC than SGR and IGR (p1 = 0.011, p2 = 0.011, p3 = 1.000)	2 → 3 (high risk of bias)
	Per Branch							
	SGR-Group (n = 47) IGR group (n =47)	UC group (n = 46)						

CABG = coronary artery bypass grafting, CR = cardiac rehabilitation, IGR = intensive care unit group rehabilitation, LOS = length of stay; post-operative pulmonary complications, MV = mechanical ventilation, n.s. = not significant, pts = patients, p1 = p-value of the SGR group vs. the UC group, p2 = p-value of the IGR group vs. the UC group, p3 = p-value of the IGR group vs. the SGR group, SGR = single general ward rehabilitation, UC = usual care

Early rehabilitation during the ICU stay and on the general ward results in significant improvements in functional independence.

#2136

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#2136 **van den Oever 2022** PMID: 35285178 DOI: 10.14814/phy2.15213 **Specification of study:** prospective, observational study	10 pts. **Inclusion criteria:** - > 18y - mechanically ventilated - capable of active in-bed cycling **Exclusion criteria:** - contra indications for physical exercise			**Motorized cycling ergometer** (MOTOmed Letto2) 5 min rest, 1min passive cycling, 2 min unloaded cycling	**Non-motorized cycle ergometer** (Lode) no passive cycling, resistance increased by 2 W every minute	**Outcomes:** - VO_2, VCO_2 and workload versus time - HR, SpO_2 - VCO_2 removal and workload versus time - VCO_2 and heart rate versus VO_2 - EqO_2 and $EqCO_2$ versus time - VE versus time - VE versus VCO_2 - PaO_2 and $PaCO_2$ vs time - respiratory exchange ratio vs time - tidal volume versus expiratory minute volume	- VO_2 max was not achieved by any patients - all remaining parameters increased during exercise, but no statistical analysis was performed	3 → 4
	Per Branch							
	2	8						

$EqCO_2$ = ventilatory equivalents for CO2, EqO_2 = ventilatory equivalents for O2, VE = expiratory minute volume, W = watt

Exercise by motorized and non-motorized cycle ergometer was feasible even though it did not reach maximal exercise capacity.

#2139

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#2139 **Borges 2022** PMID: 35244377 DOI: 10.21470/1678-9741-2021-0140 **Specification of study:** Systematic review without meta analysis	14 RCTs from 2020 (n = 1170 pts)[1-14] **Inclusion criteria:** - RCTs describing EM protocols - Pts following cardiac surgery			**Early mobilisation:** immediate postoperative period or 1st postoperative day	**Standard of care**	Prescription of early mobilization	Prescription of early mobilization: - n = 14 studies prescribed early mobilization in patients undergoing cardiac surgery - EM is performed once or twice daily - EM duration 10-30 minutes - intensity of mobilization: a) n = 2 studies aim for a low value using the borg scale b) n = 2 studies aim for a maximal increase in heart rate of 20 bpm c) n = 1 study aims for the highest possible intensity d) n = 9 studies did not report intensity	1 → 3 (qualitative analysis only without meta-analysis)
	Per Branch							

EM = early mobilisation, pts = patients, RCT = randomized controlled trial

Early mobilisation in patients undergoing cardiac surgery is performed with different intensities up to twice daily for a maximum of 30 min.

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#2142

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#2142 **Nakamura 2022** PMID: 35182302 DOI: 10.1007/s11748-022-01786-7 **Specification of study:** Retrospective cohort study	121.024 patients who underwent open/endovascular aortic surgery and were admitted to the ICU **Inclusion criteria** - patients >18 - ICU admission - underwent aortic surgery **Exlusion criteria** - patients < 18 years - discharged from hospital within 3 days of aortic surgery			**Early rehabilitation** (rehabilitation program prescribed by physicians, physical therapists, or occupational therapists within 3 days of aortic surgery)	**Usual care**	**Primary outcome** - physical function at discharge measured by the Barthel index score **Secondary outcome** - in-hospital mortality, -ICU LOS - hospital LOS - total hospitalization costs	**Primary outcome** - Barthel index score: difference= 4.0 (95%CI: 2.8 to 5.2) , p<0.001 **Secondary outcome** - in-hospital mortality (%): difference= −2.5 (95% CI : −3.0 to −2.0); p <0.001 - ICU LOS (days): difference= −1.7 (95% CI−2.0 to −1.4); p <0.001 - hospital LOS (days): difference= −5.2 (95% CI: −6.8 to −3.7) <0.001 - total hospitalization costs (x100000 yen) : difference= −4.9 (95% CI: −6.6 to −3.1); p<0.001	4
	Per Branch							
	N=44746	N=76278						

CI = confidence interval, ICU = intensive care unit, LOS = length of stay

Early rehabilitation within 3 days of aortic surgery was associated with improved physical functions at discharge, shorter ICU and hospital stays, and lower hospitalization costs without increased mortality.

#2145

Reference, Study Type	Cases and Controls (Participant #, Characteristics) Total	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
#2145 **Rossi 2022** PMID: 35086328 DOI: 10.4081/monaldi.2022.2087 **Specification of study:** Retrospective observational study	n = 84 pts **Inclusion criteria:** - age > 18 years - ARDS pts in ICU - MV > 24 hours - laboratory-confirmed COVID-19 diagnosis - treatment by respiratory physiotherapist during ICU stay **Exclusion criteria:** - cognitive impairment - neuromuscular, orthopaedic, or any other disease hindering ambulation **Per Branch**		**Early physiotherapy** (including respiratory and rehabilitation activities; *not further described*): - in ICU/IMCU: ○ twice a day, ≥ 40 minutes per session ○ starting as soon as sedation was reduced and clinical conditions were stable *(not further described)* - in general wards: ○ one session per day ○ assignment of autonomous work		**Primary outcome:** - number and type of physiotherapy treatments performed during hospitalization - number of physiotherapy-related AEs **Secondary outcomes:** - physiotherapy treatments performed during hospitalization - first time sitting out of bed, stand and walking - 6MWT - 1m-STST - MRC-SS of upper and lower extremities - functional independence in ADL assessed by Barthel Index - ICU LOS - hospital LOS - duration of MV - discharges at home, to in-patient rehabilitation or transferred to other hospital - in-hospital deaths for any cause - MMS	**Primary outcome:** - number and type of physiotherapy treatments performed during hospitalization: ○ number of physiotherapy entries registered during the hospital stay (Median [IQR]): 60.5 [36-93] ○ type of physiotherapy treatments at first assessment: ▪ 12% sitting on the edge of bed ▪ 88% In-bed interventions - number of physiotherapy-related AEs ○ number of AEs (n [%]): 32 (0.58%) ▪ n = 5 in ICU ▪ n = 27 in IMCU ▪ n = 0 in general ward **No detailed assessment was carried out because higher-quality evidence is available on this topic.**	4

ADL = activities of daily living, AE = adverse events, ARDS = acute respiratory distress syndrome, ICU = intensive care unit, IMCU = intermediate care unit, LOS = length of stay, MMS = Manchester mobility score, MRC = medical research council sum score, MV = mechanical ventilation, pts = patients, 1m-STST = 1-minute sit-to-stand test, 6MWT = 6-minute walking test

Early physiotherapy is feasible and might be safe in critically ill COVID-19 patients.

#2146

Reference, Study Type	Cases and Controls (Participant #, characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
Watanabe 2021 DOI: 10.2490/prm.20210054 PMID: 35083381 **Specification of study:** Single-Center, retrospective, cohort study	patients at ICU between April 2019 and March 2020 → 54 pts **Inclusion criteria:** - age > 18 years - mechanical ventilation in ICU >48 hours **Exclusion criteria:** - BI <70 before admission - unable to walk independently before hospitalization - neurological complications - Lack of communication skills because of diseases - Terminal / end of life care			**High doses of rehabilitation** via the median of the daily mean RATs	**Low dose of rehabilitation** via the median of the daily mean RATs	No sample size calculation (retrospective study) **Primary Outcome:** - rate of ADL dependence at discharge (BI < 70) **Secondary Outcomes**: - medicals costs duration of MV - lengths of ICU and hospital stay - rate of discharge to home - hospital survival rate - incidence of delirium during ICU - incidence of ICU-AW at ICU discharge	**Baseline Characteristics:** - median of daily mean RATs during entire ICU admission period was 3.6 (IQR 1.4 – 9.6) -> pts were divided into high-dose (>3.6) and low-dose (<3.6) rehabilitation group **Primary Outcomes:** - rate of ADL dependence at discharge was significantly lower in the high-dose rehabilitation group (81%) than in the low-dose rehabilitation group (22%), p < 0.001 **Secondary Outcomes:** - incidence of ICU-AW at ICU discharge was significantly lower in high-dose rehabilitation group (70%) in low-dose rehabilitation group (37%), adjusted p = 0.016 -no significant differences in other secondary outcomes **Post-hoc Sensitivity Analysis** - increased RATs during entire ICU admission period and ICU admission after meeting criteria for physiological stability was significantly associated with lower ADL dependence at discharge (p < 0.001) - higher RATs from low-level activity before meeting the criteria for physiological stability showed significant association with lower ADL dependence at discharge (p=0.047)	4
	Per Branch							
	27	27						

ICU = intensive care unit, pts = patients, BI = Barthel Index, RATs = Rehabilitation Activity Time score, MV = mechanical ventilation, ICU-AW = intensive care unit-acquired weakness, IQR = interquartile range; ADL= activities of daily living

ADL dependence was lower among those who underwent high-dose rehabilitation.

No detailed assessment was carried out because higher-quality evidence is available on this topic.

#2148

Reference, Study Type	Cases and Controls (Participant #, Characteristics)			Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total								
#2148 **Dos Santos Moraes 2021** PMID: 35076492 DOI: 10.3390/clinpract12010002 **Specification of study:** retrospective observational study	121 patients at ICU with different mobility level **Inclusion criteria** - aged ≥18 years who were admitted to the ICU for medical or elective surgical reason **Exclusion criteria** patients with: - neurodegenerative disease - spine and/or lower limb fractures, amputation of one or both lower limbs - diagnosis of cerebrovascular accident in the acute or chronic phase or in which any conditions that contraindicate or make it impossible to increase mobility				- low mobility (n=28) - moderate mobility(n=33) - high mobility (n=60)	**No control group**	**Endpoints (not more precisely defined)** - ICU discharge - mortality	**Outcomes** - low mobility (n=28): 45 times more likely to die (OR = 45.3; 95% CI = 3.23–636.3) and 88 times less likely to be discharged from the ICU (OR = 0.22; 95% CI = 0.002–0.30); both p<0.05 - moderate and high mobility levels were not associated with the investigated outcomes	4
	Per Branch								
	N=28	N=33	N=60						

CI = confidence interval, ICU = intensive care unit, OR = odds ratio

Patients with low mobility had a higher chance of death and a lower chance of discharge from the ICU. Moderate and high mobility were not associated with the investigated outcomes.

#2150

Reference, Study Type	Cases and Controls (Participant #, Characteristics)				Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total									
#2150 **Kinoshita 2022** PMID: 35054051 DOI: 10.3390/jcm11020357 **Specification of study:** retrospective cohort study	7 patients with corona virus disease (COVID-19) in the ICU under MV from a university hospital who received rehabilitation under ventilator control until 31 May 2021 **Inclusion criteria** - patients admitted to ICU - received rehabilitation **Exclusion criteria** - age< 18 years - low ADL independence 2 weeks before admission - not receiving ventilator management				3 (non-survivor)	**Early rehabilitation** A: from the third day of admission under deep sedation, ROM training, 20 min of sitting on the edge of the bed B: next day after admission, ROM training, 20 min of sitting on the edge of the bed C: next day after admission, ROM, 20 min of sitting on the edge of the bed D: with a 6-L reservoir mask on admission day, ROM, 20 min of sitting on the edge of the bed	**No control group**	**Endpoints (not more precisely defined)** - period from intubation to extubation - ICU LOS - the extent of ADL improvement during ICU admission - mortality rate - the number of severe adverse events during rehabilitation	**Outcome** - time from intubation to extubation (days): 4.9 ± 1.1 - ICU stay (days): 11.8 ± 5.0 - ADL: was severely impaired (FIM=36.5 (28.0–40.5), BI=22.5 (3.75–40.0)) - mortality: 42.8% (3 non-survivor) - no serious adverse events during rehabilitation	4
	Per Branch									
	Subject A	Subject B	Subject C	Subject D						

ADL = activities of daily living, BI = Barthels index, CI = confidence interval, FIM = functional independence measure, ICU = intensive care unit, LOS = length of stay, MV = mechanical ventilation, OR = odds ratio, ROM = range of motion

Early rehabilitation in the acute disease stage is essential for improving physical functions.

#2152

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#2152 **Elkbuli 2022** PMID: 35026443 DOI: 10.1016/j.jss.2021.11.011 **Specification of study:** retrospective cohort analysis	11.937 patients **Inclusion criteria** - adult patients (aged ≥18 y) - suffered traumatic injury - evaluated/treated in our trauma centre - received PT services during their hospital stay **Exclusion criteria** - paediatric patients (aged <18 years) - patients who were transferred to another facility or died prior to hospital discharge		N=138 (did not meet the inclusion criteria	**TBI trauma patients** Early PT : n=311 - early-intermediate(24-48h) : n=280 - late intermediate(48-72h): n=133 - late (>72h): n=411	**Non-TBI trauma patients** early PT : n=4782 - early-intermediate (24-48h) : n=2416 - late intermediate (48-72h): n=1035 - late (>72h): n=2431	**Primary outcome** - hospital discharge disposition **Secondary outcome** - hospital LOS - ICU LOS **Tertiary outcome** measures were complication rates	**Primary outcome** - intervention: (n=1035) 60% lower odds of being discharged home without services (P < 0.05), significantly increased hospital and ICU length of stay (Hospital LOS, ICU-LOS) (P < 0.05), significantly higher odds of complications (VTE, pneumonia, pressure ulcers, ARDS) (P < 0.001). – control: (n=411) 76% lower odds of being discharged home without services (P < 0.05), significantly longer Hospital LOS /ICU-LOS (P < 0.05) **Secondary outcome** - hospital LOS (days): 3.6 ± 4.3 (n=4782), 4.7 ± 4.9 (n=2416), 5.9 ± 4.7∗ 18.6 ± 28.7∗ <0.001 - ICU-LOS (days): 0.79 ± 2.71 (n=4782), 1.2 ± 3.3(n=2416) , 1.4 ± 3.2 (n=1035), 8.16 ±18.33 (n=2431); p<0.001 **Tertiary outcome** - delayed PT initiation: higher complication rates of DVT (P < 0.001), pneumonia (P < 0.001), pressure ulcers (P < 0.001), PE (P < 0.001), ARDS (P < 0.001), and VAP (P < 0.001)	4
	Per Branch							
	N=10.664	N=1.135						

ARDS = acute respiratory distress syndrome, DVT = deep vein thrombosis, ICU = intensive care unit, LOS = length of stay, PE = pulmonary embolism, PT = physical therapy, TBI = traumatic brain injury

Among traumatically injured patients, early PT is associated with decreased odds of complications, shorter H-LOS and ICU-LOS, and a favourable discharge disposition to home without services

#2153

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
#2153 **Sasano** **2022** PMID: 35018344 DOI: 10.1097/CCE.0000000000000604 **Specification of study:** retrospective cohort study	99 adult patients admitted to ICU at the Nagoya City University West Medical Center from January 1, 2015, to December 31, 2020 **Inclusion criteria** - Pts expected to stay in the ICU for at least several days **Exclusion criteria** - elevated intracranial pressure, spinal instability, neuromuscular paralytics - active bleeding, bed-rest order - score on the Richmond Agitation-Sedation Scale of +2 or higher		**out-of-the-ICU activities** include visiting indoor area, visiting our outdoor garden, and bathing	**No control group**	**primary outcome** - the occurrence rate of physical safety events, (unintentional removal of medical devices, patient agitation requiring the discontinuance of the session, falling, and injury requiring medical treatment) **secondary outcome** - the occurrence rate of adverse physiologic change(defined as the occurrence of the following after the mobility session)	**Primary outcome** - rate of physical events: 27 potential safety events detected in 24 sessions across 14 patients - one event (0.2%; 95% CI, 0.006–1.3%) of dislodgement of a tracheostomy tube occurred when the patient transitioned to sitting on the edge of bed **Secondary outcome** - in 23 sessions (5.7%; 95% CI, 3.6–8.4%) out of the 406 sessions: 26 adverse physiologic changes occurred among 13 patients	4
	Per Branch						

CI = confidence interval, ICU = intensive care unit, LOS = length of stay, OR = odds ratio, pts = patients

An out-of-the-ICU program can be provided safely to adult ICU patients, provided that it is supervised by a dedicated intensivist with an appropriately trained multiprofessional staff and equipment on-site.

#2154

Reference, Study Type	Cases and Controls (Participant #, characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
2154 Frade-Mera 2021 DOI: 10.1111/nicc.12740 PMID: 34994034 **Specification of study:** Prospective, observational multicentre Cohort Study	80 ICUs were screened in Spain -> 668 pts were included **Inclusion criteria:** - IMV >48 hours **Exclusion criteria:** - pregnant women - those referred to the ICU from other Hospitals - primary neurologic or neuromuscular pathology - unable to walk (mobility aids allowed) - recent limb amputees - users of orthopaedic devices - BMI > 35	n = 63 (lost to follow up)	**ABCDE-Bundle**	**standard of care**	Sample Size Calculation: 531 pts **Primary Outcomes:** - pain level - Level of cooperation via Hermans' five commands - patient days with delirium - Patient days with physical restraint - Level of mobility via IMS - implementation of bundle components ABC, D and E **Secondary Outcome:** - cumulative drug dosing by IMV **Tertiary Outcomes**: - need for reintubation / tracheostomy - ICU LOS - IMV days - bed rest days - ICU mortality - development of ICUAW via MRC-score base at first awakening **Independent variables** - Protocols with analgosedation algorithms (ABC in the bundle) - Delirium prevention and management protocols (D in the ABCDE bundle) - early mobilization protocols (E in the ABCDE bundle)	- 605 patients were studied from 80 ICUs resulting in 5214 days with IMV. **Primary Outcomes**: - pain level: not assessed on 83.6% of days (95% CI 81.1-86.1), found to be zero on 11.1% days (95% CI 8.9-13.1), mild to moderate on 3.2% (95% CI 2.1-4.2), moderate to severe 1.9% (95% CI 0.8-2.8) and very intense on 0.2% days (95% CI 0.08-0.5) - level of cooperation: sufficient to make the MRC feasible on 20.7days (95% CI 17.9-23.4) - pts days with delirium: 4.2% of days (95% CI 2.8-5.5) - physical restraint applied on 25.2% of days (95% CI 22.2-28.1) - immobility (IMS of 0) on 69.6% of days (95% CI 66.6-72.2) - 133 (22.0%) were admitted to an ICU that implemented a protocol with analgosedation algorithms - delirium prevention and management protocol (D) was applied in 68 (11.2%) patients, and these patients had more pain assessments, a higher level of cooperation, and more MRC assessments; they had no lower incidence of delirium or greater mobility - early mobilization protocol (E) was applied in 51 (8.4%) pts. These patients received more pain assessments, registering no differences in level of cooperation, but more days of mobility with an IMS score of 1 to 2 **Seconday Outcome**: - patients who were admitted to an ICU that implemented a protocol with analgosedation algorithms for dose management and adjustment (ABC) received more opioids (remifentanil IVI, and fentanyl bolus and tramadol in divided doses) and more metamizole as a bolus and divided dose alike. Likewise, they received more dexmedetomidine IVI, more midazolam boluses, and also cisatracurium IVI and rocuronium boluses - pts admitted to an ICU that implemented a delirium prevention and management protocol received more metamizole IVI, fewer fentanyl boluses, less benzodiazepine IVI and in bolus and more propofol and dexmedetomidine IVI - pts admitted to an ICU that implemented early mobilization protocol received more remifentanil, propofol and dexmedetomidine **Tertiary Outcomes**: - ICUs that applied analgosedation and mobilization protocols had more 1:2 nurse-to-patient ratios and very few shift-dependent ratios ($p < 0.001$) - ICUs with delirium and mobilization protocols had higher nurse-to-patient ratios of 1:3 and/or 1:4 ($p < 0.0001$) - ICUs implementing an analgosedation protocol had higher rates of IMV than other ICUs, and they had more physiotherapy hours, younger patients, and a tendency towards lower comorbidity - pts had shorter stays in ICUs that applied bundle protocols, and fewer days of IMV in ICUs that applied a delirium ($p= 0.006$) or mobilization bundle component ($p = 0.03$)	4
	Per Branch						

Pts = patients, ICU = intensive care unit, IMV = invasive mechanical ventilation, BMI = Body Mass Index, MRC = Medical Research Council, IMS = ICU mobility scale, LOS = length of stay, ICUAW = intensive care unit acquired weakness, BI = Barthel Index, SOFA = Sequential Organ Failure Assessment, APACHE II = Acute Physiology and Chronic Health Evaluation II, IVI = intravenous injection

The implementation rate of ABCDE bundle components was very low, but when implemented, patients had a shorter ICU stay, more analgesia dosing, and lighter sedation.

#2155

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#2155 **Cordeiro 2021** (PMID: 34988326) DOI: not available **Specification of the study:** Prospective cohort study	n = 170 patients **Inclusion criteria:** - age > 18 years - elective valve replacement surgery (aortic and/or mitral) **Exclusion criteria:** - patients with cognitive impairment that prevented functional evaluation - death - > 4 p.o. days in the ICU			**Cohort A:** walking at least 15 m in the ICU until discharge	**Cohort B:** not able to walk ≥ 15 m	**Primary outcome:** - functionality assessed with FMI scale and Perme scale **Secondary outcomes:** - adverse events during walking	**Primary outcome:** - cohort A showed a smaller decrease in FIM scale than cohort B (27 ± 3 vs. 36 ± 5, p < 0.001) - cohort A showed higher FIM total scores at ICU and hospital discharge than cohort B (98 ± 4 vs. 89 ± 7 and 120 ± 3 vs. 112 ± 1, p < 0.001 respectively) - cohort A showed higher FIM motor scores at ICU and hospital discharge than cohort B (68 ± 3 vs. 61 ± 2 and 88 ± 3 vs. 81 ± 3, p < 0.001 respectively) - Perme scale showed no significant differences between cohorts **Secondary outcomes:** - AEs during walking (n [%], no p-value stated): o lower limb pain 9 [13%] o palpitation 7 [10%] o dyspnea 4 [6%] o dizziness 7 [10%] o nausea 4 [6%]	3
	Per Branch							
	Cohort A n = 71	Cohort B n = 99						

FIM = functional independence measurement, ICU = intensive care unit, Perme = Perme intensive care unit mobility score, p.o. = post-operative

Early ambulation in patients undergoing elective valve replacement surgery might be associated with greater functionality at ICU and hospital discharge.

#2158

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#2158 **O'Neil 2022** PMID: 34978322 DOI: 10.1093/jbcr/irab248 **Specification of study:** retrospective cohort study	127 pts from 2015 to 2019 in a burn ICU while using an early mobilization algorithm **Inclusion criteria:** - mechanically ventilated pts. **Exclusion criteria:** - extubation or death before therapy evaluation			**Active group** (sitting on edge of bed or higher)	**Inactive group** (in bed mobility or dependent transfer)	**Outcomes:** - %TBSA - tracheostomy rate - LOS - mortality	**Outcomes (no significance level given):** - %TBSA burnt: AG: 14.11 vs IG: 25.31 - tracheostomy rate: AG: 25% vs. IG: 26% - LOS (d): AG: 20.95 vs. IG: 27.58 - mortality: AG: 9% vs. IG: 23%	4
	Per Branch							
	95	32						

AG = active group, ICU = intensive care unit, IG = inactive group, LOS = length of stay, %TBSA = percentage of total body surface area

No detailed assessment was carried out because higher-quality evidence is available on this topic.

#2159

Reference, Study Type	Cases and Controls (Participant #, Characteristics)			Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total								
2159 Mayer 2021 DOI: 10.1093/ptj/pzab301 **Specification of study:** Retrospective cohort study	315 pts from 2010 to 2019 **Inclusion criteria:** - >18y - requiring ECMO > 72h **Exclusion criteria:** -pediatric pts. -pregnant individuals -prisoners -requiring ECMO < 72 hour				**Rehabilitation during ECMO** OR **Rehabilitation received after ECMO**	**No rehabilitation**	**Primary outcome:** in-hospital mortality **Secondary endpoint:** - hospital LOS - discharge destination - 30-day readmission rates	**Primary outcome:** - in-hospital mortality: during ECMO: 103/218 (47%) vs. after ECMO: 26/70 (37%) vs. no rehabilitation: 27/27 (100%); p < 0.001 **Secondary outcomes:** -hospital LOS: rehabilitation during ECMO (44.8/SD 49.4) vs. rehabilitation after ECMO (40/SD 39) vs. no rehabilitation (10/SD 8.3), p<0.001 - no significant differences at discharge destination and 30-day-readmission rates	4
	Per Branch								
	during ECMO: 218	after ECMO: 70	no rehabilitation: 27						

ECMO = extracorporeal membrane oxygenation; LOS=Length of stay

The patient functional response during physical rehabilitation is an important indicator of illness and potential recovery.

No detailed assessment was carried out because higher-quality evidence is available on this topic.

#2163

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#2163 **Afxonidis 2021** PMID: 34946461 DOI: 10.3390/healthcare9121735 **Specification of study:** RCT	78 pts undergoing elective CABG or valvular surgery **Inclusion criteria:** - GCS=15, - physically able to perform proposed activities **Exclusion criteria:** - emergency/non-elective surgery - hemodynamic instability - dyspnea/invasive ventilator support/oxygen saturation <90% - neurological disorders - mobile disabilities			**Early and enhanced physiotherapy care:** 1 early PT session on the day of the operation + 3 daily PT sessions during the first 3 days of ICU or until discharge.	**Standard of care** (twice per day, from first post-operative day until discharge)	**Primary endpoints:** - ICU-LOS - hospital LOS **Secondary outcomes:** - hemodynamic measurements - laboratory measurements	**Primary endpoints:** - ICU- LOS: 23.2d intervention group vs 25.4d control(MD: 2.2h, 95% CI 1.3- 3.2 h, p<0.001) - hospital LOS: 8.1d intervention groups vs 8.9d control (MD: 0.8d, 95% CI 0.6-1d, p<0.001) **Secondary outcomes:** - hemodynamic measurements: n.s. - laboratory measurements: n.s.	2
	Per Branch							
	39	39						

CABG = coronary artery bypass grafting, GCS = Glasgow coma scale, LOS = length of stay, PT = physio therapy, pts = patients, RCT = randomized controlled trial

Early and enhanced physiotherapy care decreases the length of ICU stay and hospital stay.

#2164

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#2164 **Thiolliere 2021** PMID: 34844035 DOI: 10.1016/j.jcrc.2021.11.007 **Specification of study:** a cohort study (ancillary study of RCT)	276 patients **Inclusion criteria:** - patients >70 years - admitted to the ICU for more than 48h **Exclusion criteria:** - death before day 180 - lost to follow-up - ADL - score not available			**Out-of-bed mobilisation**	**No out-of-bed mobilisation**	**Endpoints:** impact of OoB mobilization on the decreased 6-month autonomy	**Outcome:** - 6-month ADL score: (OoB 6 [4.5-6] vs. no-OoB 4.5 [3-6]) p=0.001 - non-OoB-mobilization patients had a greater risk of 6-month decreased autonomy (aOR 2.43 [1.18; 4.98])	3
	Per Branch							
	226 intervention	50 control						

ADL- Score = activities of daily living score, OoB = out-of-bed

Conclusions: Mobilisation during the ICU stay of elderly ICU patient survivors was associated with a lower decreased autonomy at 6 months.

#2167

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
2167 De Azevedo 2021 (PMID: 34773985 DOI: 10.1186/s12871-021-01492-6) **Specification of study:** Single-center RCT	211 pts **Inclusion criteria:** - expected ICU stay 4 days **Exclusion criteria:** - pregnant - moribund - under ventilation > 96h before enrolment - unable to walk without assistance before the acute illness - severe cognitive impairment before hospitalization - neuromuscular diseases - acute pelvic fracture - unstable spinal trauma - severe liver disease - death <48h - early extubation - fiO2 > 60% - cannot provide nutrition - physical limitations		**HPE Group:** n=41 (Death, FiO2 >60%, cannot provide nutrition, physical limitation, protocol violation) **Control Group:** n=69 (Death, early Extubation, misjudged criteria, cannot provide nutrition, bronchopleural fistula, FiO2 > 60%, other reason)	**Early exercise + High protein** (1.48 g/kg/day): -2 daily sessions of cycle ergometry exercise (15 min each) - immediately after randomization until discharge	**Routine physiotherapy + Protein** 1.19g/kg/day: - passive + active movement -2x a day)	**Primary endpoint:** - PCS score at 3 and 6 months **Secondary outcomes:** - handgrip strength at ICU discharge - ICU /hospital mortality Sample size calculation: no power calculation reported	**Primary endpoint:** - PCS was higher in the intervention group at 3 months (p = 0.01) and 6 months (p = 0.01) **Secondary outcome:** - ICU-acquired weakness was identified in 16 (28,5%) and 26 (46,4%) pts in intervention and control groups (p=0.05) - ICU mortality rates in intervention and control groups were 23 (26.4%) and 41 (43,6%) (p = 0.01) - hospital mortality rates were 31.2% and 53.4% (p=0.002) - 6-months mortality rates were 33.3% and 54.2 % (p=0.005) in intervention and control group - no difference in LOS/ duration of MV	2
	Per Branch							
	99	112						

h = hours, LOS = length of stay, MV = mechanical ventilation, PCS = physical component summary, pts = patients

This study showed that a high-protein intake and resistance exercise improved the physical quality of life and survival of critically ill patients.

#2171

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
#2171 **Prasobh 2021** PMID: 34535456 DOI: 10.1136/bmjoq-2020-001256 **Specification of study:** Retrospective analysis	1.320 pts from 2015 to 2019 **Inclusion criteria:** - > 14y - undergoing CABG, valve repair or replacement, or aortic dissection surgery - admitted to the CTICU **Exclusion criteria:** - requiring mechanical or circulatory devices to maintain haemodynamic stability - GCS < 13 - complications that limited mobility (stroke, open sternum) - limited preoperative mobility **Per Branch** 1320		- mobility-level checklist - initiating PT referrals - patient and family engagement (booklet with mobilisation advice) - enhancing the mobilisation experience (pain control) - color-coded risk categories - adopting technology (telemonitoring) - protocol for initiation and termination of mobilisation - visual reminders - communication of mobility level (during multidisciplinary rounds)		**Outcomes:** - patients who progressed (%) - time to out-of-bed-mobilisation - IMS - FIM	**Outcomes:** - patients who progressed (%): initially 55%, after 1 year 95% - time to out-of-bed-mobilisation: postintervention 11.74h vs. preintervention: 22.77h (p<0.05) - IMS: postintervention: 7.23 vs. Preintervention: 3.96 (p = 0.00) - FIM: postintervention: 58.62 vs. Preintervention: 54.23 (p = 0.00)	4

CABG = coronary artery bypass graft, CTICU = cardiothoracic intensive care unit, FIM = functional independence measure, GCS = Glasgow coma scale, IMS = ICU mobility scale

The implementation of an early mobiliastion protocol reduces the time to out-of-bed mobilisation and increases the IMS level reached and functional independence.

#2172

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
2172 Wang 2021 (PMID: 34406169 DOI: 10.1097/CCM.0000000000005285) **Specification of study:** systematic review with meta-analysis	60 publications (57 RCTs, 3 controlled clinical trials)[1-60] 5352 pts **Inclusion criteria** - RCTs and CCTs - adults ≥18y admitted to an ICU - English language **Exclusion criteria** - pts with head injuries, cerebrovascular accidents, burns, and spinal injuries - physical rehabilitation delivered only after discharge from ICU - speech and swallowing rehabilitation - cognitive rehabilitation		**Physical rehabilitation**	**Standard care**	**Outcomes:** - muscle strength - physical function - mortality - health-related quality - duration of MV - MV free days at day 28 - ICU and Hospital LOS	**Significant outcomes:** 1) MV (46 studies) - overall: MD -0.18d (95% CI: -0.37 to 0.02) - low dose CG: MD -1.6d (95% CI: -2.49 to -0.71) for - functional intervention: MD -1.15d (95% CI: -1.99 to -0.30) 2) ICU LOS (47 studies) - overall: MD -0.80d (95% CI: -1.37 to -0.23) - low dose CG: MD -1.87d (95% CI: -3.16 to -0.58) - functional intervention: MD -1.31d (95% CI: -2.46 to -0.16) 3) hospital LOS - overall: MD -1.75d (95% CI: -3.03 to -0.48) - low dose CG: MD -2.45d (95% CI:-4.05 to -0.84) - functional intervention: MD -1.90d (95% CI: -3.74 to -0.06) **Non-significant outcomes:** 4) mortality n.s. 5) muscle strength n.s. 6) physical function - at hospital discharge MD 0.22 (95% CI: 0.00 to 0.44) - at ICU discharge n.s. - at 6 months n.s. 7) MV free days n.s. 8) HRQL at 6 months n.s. subgroup analysis by intervention was not possible analysis by dosage was not possible	1
	Per Branch						

CCT = controlled clinical trial, d = days, ICU = intensive care unit, LOS = length of stay, MV = mechanical ventilation, pts = patients, RCT = randomized controlled trial, y = years

Physical rehabilitation seems to have a benefit in relation to ICU LOS, hospital LOS and physical function.

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#2173

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#2173 **Iwai 2021** PMID: 34395932 DOI: 10.2490/prm.20210030) **Specification of study:** single-center retrospective before/after study	713 consecutive pts admitted to ICU **Exclusion criteria:** - <18y - LOS < 48h - cardiac surgery pts.			**Phase II:** dedicated PT allocated to ICU (1x/day 20-60 min)	**Phase I:** no dedicated PT	- days to first rehabilitation - number of Interventions - duration of MV - LOS - extubation	**Significant differences between the groups:** days to first rehabilitation: phase I: 4.0 (2.5–8.0) vs. phase II: 1.0 (1.0–1.0); p <0.001 number of interventions: phase I: 29 (25.4%) vs. phase II: 90 (67.2%); p <0.001 **No significant differences between the groups:** - duration of MV - ICU-LOS - hospital LOS - extubation	4
	Per Branch							
	330	383						

LOS = length of stay, MV = mechanical ventilation, PT = physical therapy

No detailed assessment was carried out because higher-quality evidence is available on this topic

#2174

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#2174 **Koyuncu 2022** PMID: 34346134 DOI: 10.1111/jocn.15986 **Specification of study:** a quasi-experimental non-randomized study with historic control	51 patients **Inclusion criteria:** - adults >18 years - underwent major abdominal surgery - had an American Society of Anesthesiologists score of less than 4 - did not have a communication disorder - had no diagnosis to limit mobilization **Exclusion criteria:** - emergency surgery - postoperative complications - no toleration of mobilization		N = 9 (excluded in control group 2x emergency surgery, 2x post-surgical complications) (excluded in intervention group 2x emergency surgery, 2x post-surgical complications, 1x receiving inotropic support in the postoperative period)	Mobilisation training by research nurse the evening before operation + application of a mobilization protocol on the 0th postoperative day	Mobilisation postoperatively by the nurses according to the decision of the nurse and physician in the intensive care unit (ICU) on the day of the operation	**Endpoints**: - time to mobilization after ICU admission - ICU LOS - hospital LOS - higher sleep quality	**Significant differences between the groups in:** - time to mobilization after ICU admission (6.22 ± 1.95 hours vs 12.21 ± 3.76 hours) p<0.05 - ICU LOS (2(1-2) vs 4(1-7)) p<0.001 - hospital LOS (7 (5-11) vs 12 (7-24)) p<0.001 - higher sleep quality (8 (5 – 10) vs 4 (1 – 8) p<0.001	4
	Per Branch							
	21 intervention	25 control						

LOS = length of stay

Conclusions: The structured mobilization protocol is effective in the management of early mobilization and improvement of patient care outcomes.

#2175

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
#2175 **Patrick 2021** PMID: 34333616 DOI: 10.4037/ccn2021689 **Specification of study:** Retrospective review	**Total** 9 patients 242 therapy sessions **Inclusion criteria:** - mobilized patients (agitation sedation scale of -1 to 0) - no fluctuation ECMO flow from 3- 5 L/min - stable hemoglobin levels for the previous 12 hours **Exclusion criteria:** - patients receiving ≥ 2 vasopressors - significant bleeding **Per Branch** 9 intervention		**Implementation of standardized mobility protocol**	**No control**	**Endpoints:** - safety	**Outcome:** patients experienced the following complications: - chugging (1 patient) - decrease in flow rate (2 patients) - bleeding at the cannula site (2 patients) - neck hyperextension (1 patient) - fear/anxiety (1 patient) - shortness of breath (2 patients)	4

ECMO = extracorporal membrane oxygenation

Conclusions: Patients receiving extracorporeal membrane oxygenation before lung transplant, including those with femoral cannulation, can be mobilized safely with the use of an interprofessional ambulation protocol. Further evaluation is indicated, including research on clinical outcomes.

#2178

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#2178 **Nakamura 2021** PMID: 34229920 DOI: 10.1016/j.jjcc.2021.06.004 **Specification of study:** retrospective nationwide study	5.147 patients **Inclusion criteria:** - admitted to coronary and cardiac ICU units - admitted for AMI - received PCI on the day of admission - admitted to the ICU on the day of admission **Exclusion criteria:** - younger than 18 years - received cardiopulmonary resuscitation - received ECMO			**Early rehabilitation**	**Standard of care**	**Primary endpoints:** - ADL at discharge (Barthel index) **Secondary endpoints:** - in Hospital mortality - ICU LOS - Hospital LOS - total hospialization cost	**Primary outcome:** no significant differences between the groups in: - ADL at discharge (control 78.9±37 vs intervention 83.2±33) p=0.3 **Secondary outcomes:** significant differences between the groups in: (control vs intervention) -in Hospital mortality (9.4 vs 5.5) p<0.001 -hospital LOS (27.2±24 22.5±20) p<0.001 -ICU LOS (7.7±6 vs 6.7±6) p=0.001 -hospitalization cost (31.5±20 26.9±15) p=0.001	4 → 3 (large cohort – national database)
	Per Branch							
	5147 intervention	26456 standard of care						

ADL = activities of daily living, AMI = acute myocardial infarction, LOS = length of stay, PCI = percutaneous coronary intervention

Conclusions: No correlations were observed between early rehabilitation and ADL at discharge. However, the present results suggest that early rehabilitation is safe and associated with lower hospital costs and shorter hospital stays after AMI.

#2180

Reference, Study Type	Cases and Controls (Participant #, Characteristics) Total	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
2180 Katsukawa 2021 (PMID: 34199207 DOI: 10.3390/jcm10122607) **Specification of study:** Multi-center retrospective observational study	390 pts **Inclusion criteria:** - adult tracheal intubated pts - on MV on ICU **Exclusion criteria:** - MV <48h - <18 year - no activity of daily living independence before hospitalization - receiving end-of-life care - neurological pts - bed rest **Per Branch**	n = 251 (discharge from ICU with in-bed exercise only), n = 52 (extubated before mobilization)	**Active mobilisation**		<u>Sample size calculation:</u> No power calculation reported. **Endpoint:** -occurrence of PSE	**Primary endpoint:** - PSE occurred in 11,5% of cases (62% systolic blood pressure instability, 23% heart rate instability, 15% desaturation) - occurrence of PSE was higher if mobilization was carried out on 1st day of ICU admission (p <0.05) - more pts with PSE were administered vasopressors before mobilization (p<0.05). - rate of participation of a physical therapist in mobilization was lower in group with PSE (p <0.05) - highest occurrence rate of PSE was for standing (event rate = 205.1 per 1000 sessions). - adverse events: no accidents, such as line/ tube removal or falls or any severe, life-threatening event	4

ICU = intensive care unit, MV = mechanical ventilation, PSE = patient-related safety event, pts= patients

The highest activity level was identified as a risk factor for PSE occurrence, and close vigilance is required during mobilization in the standing position regarding circulatory dynamics.

#2181

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#2181 **Jin 2021** PMID: 34150113 DOI: not available **Specification of study:** prospective cohort	172 pts **Inclusion criteria:** - pts with RF requiring MV - > 18y - MV duration > 24h - no treatment affecting ERN **Exclusion criteria:** - inability to communicate - unstable hemodynamics - elevated ICP - fractures - contraindications to mobilization - instable pulmonary ventilation function			**Early rehabilitation nursing** (exercise plan, in-bed mobilization, respiratory care, respiratory muscle training)	**Routine nursing**	**Outcomes:** - vital signs 1 week after intervention - ABG - spirometry - ICU-LOS - duration of MV - hospital LOS - complications - SAS and SDS - QoL (SGRQ negatively correlated)	**Outcomes:** - vital signs 1 week after intervention: temp.: 37.38±0.63 vs. 38.05±0.6; p < 0.001 RR: 24.12±2.86 vs. 28.05±2.23; p < 0.001 HR: 90.75±8.61 vs. 103.12±8.15; p < 0.001 - ABG: PaO_2 (mmHg): 94.15±3.78 vs. 88.62±3.45; p < 0.001 - $PaCO_2$ (mmHg): 39.15±4.05 vs. 43.75±3.18; p < 0.001 - SpO_2 (%): 97.56±4.85 vs. 85.63±2.72; p < 0.001 - spirometry: increased FEV1, FEV1/FVC and FEV1% in intervention (p< 0.05), values only in graph. - ICU-LOS (d): 6.52±1.66 vs. 8.76±1.45; p < 0.001 - duration of MV (d): 4.35±1.85 vs. 5.88±2.17; p < 0.001 - hospital LOS (d): 11.78±2.89 vs. 14.96±3.53; p < 0.001 - SGRQ: 69.39±7.15 vs. 80.18±4.85; p < 0.001 - complications: n.s. - SAS and SDS: n.s.	3
	Per Branch							
	RG = 92	GG = 80						

ABG = arterial blood gas analysis, ERN = early rehabilitation nursing, GG = general group, HR = heart rate, ICP = intracranial pressure, MV = mechanical ventilation, QoL = quality of life, RF = respiratory failure, RG= recovery group, RR = respiratory rate, SAS = self-rating anxiety scale, self-rating depression scale; SGRQ = St. George's respiratory questionnaire

Early rehabilitation nursing improves physiological values as well as hospital and ICU length of stay and reduces duration of mechanical ventilation.

#2182

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
#2182 **Abrams 2021** PMID: 34077700 DOI: 10.1513/AnnalsATS.202102-151OC **Specification of study:** single-center, retrospective study	**Total** 177 patients 2.706 active physical therapy sessions **Inclusion criteria:** - patients > 18 years - active physical therapy - receiving ECMO for cardiopulmonary failure **Exclusion criteria:** - significant hemorrhaging - unstable arrhythmia - hemodynamic instability despite high-dose vasopressors - severe hypoxemia - sedation precluding active patient participation - use of neuromuscular blockade **Per Branch** 177 intervention		**Physical therapy**	**No control**	**Endpoints:** - factors predicting possible intensity of physical therapy - safety - feasibility	**Outcomes:** - 138 (78%) achieving out-of-bed activity **Increased odds of achieving OoB associated with:** - bridge-to-transplant (odds ratio [OR], 17.2; 95%confidence interval [CI], 4.12–72.1) - venovenous ECMO (OR, 2.83;95% CI, 1.29–6.22) - later cannulation year (OR, 1.65; 95% CI,1.37–1.98) - higher Charlson comorbidity index (OR, 1.53; 95% CI,1.07–2.19) **Decreased odds of OoB activities:** - invasive mechanical ventilation (OR, 0.11; 95% CI, 0.05–0.25) - femoral cannulation (OR, 0.19; 95%CI, 0.04–0.92) - AEs in 2% of sessions	4

AE = adverse event, MV = mechanical ventilation, OoB = out-of-bed

Several patient- and ECMO-related factors were associated with achieving higher intensity of early mobilization inpatients participating in rehabilitation. Physical therapy with femoral cannulation was safe and feasible, and complications related to mobilization were uncommon.

#2200

Reference, Study Type	Cases and Controls (Participant #, characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
2200 van Delft 2021 PMID: 33260011 DOI: 10.1016/j.jcrc.2020.11.014 **Specification of study:** A mixed methods systematic review	18 articles[1-18] up to 5 November 2020 (13 RQ1, 5 RQ2) **Inclusion criteria:** -concerned family participation on the ICU -one or more physiotherapy-related tasks (i.e., passive/active exercises such as range of motion, foot flexion, limb exercises, positioning, mobilization/transfer/ambulation, or respiratory techniques/breathing training) as part of their family participation intervention -reported results on relative involvement in physiotherapist-related tasks **Exclusion criteria:** -Studies solely focusing on family involvement in conversations, medical decisions, ICU rounds, nursing tasks (e.g., washing, bathing, feeding), occupational tasks, or studies on family visiting hours				No sample size calculation due to study design No endpoints defined **Defined RQ:** -RQ 1: What are the perceptions of patients, their relatives and staff on family participation in physiotherapy-related tasks of critically ill patients? -RQ 2: What are the effects of interventions involving ICU family participation in physiotherapy-related tasks on patient outcomes, their relatives and/or staff?	**Results:** - Passive tasks like massage and passive exercises were acceptable for family participation, active tasks less positively received. -Quantitative evidence: majority of patients, relatives, and staff value family participation in physiotherapy care, with 77% of patients in favor of it. - involving ICU family members in physiotherapy-related tasks can lead to positive outcomes for the family, such as improved psychological well-being, but did not show significant effects on patient physical functioning.	1 → 5 (no quantitative analysis, no RCTs)
	Per Branch						

RQ = research question; ICU = Intensive Care unit

Patients, relatives, and staff had positive attitudes towards family participation in physiotherapy-related tasks for critically ill patients.

No detailed assessment was carried out because higher-quality evidence is available on this topic.

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#2215

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
#2215 **Amundadottir 2019** PMID: not available DOI: 10.1080/21679169.2019.1645880 **Specification of study:** a randomized controlled trial	50 patients **Inclusion criteria:** - ICU patients 18-80 years of age - requiring MV >48 hours - ambulate independently before the onset of acute illness - cooperate and comply with assessment and intervention for one year after the ICU discharge **Exclusion criteria:** - poor survival outcome - admission to the hospital more than two weeks prior to ICU admission - contraindication for upright mobilsation		At 12 months after ICU discharge 5 pts in interventio n (3 deceased, 2 lost to follow up), 3 pts in control group (2 deceased, 1 lost to follow up)	**Intensive twice-daily mobilization**	**Daily mobilisation**	**Endpoints:** - duration of MV - ICU LOS - hospital LOS **Secondary endpoints:** - health-related quality of life - physical function	**Primary outcomes:** no significant differences between the groups in: (intervention vs control) - duration of MV (8.8 vs 7.8) (p=0.89 - ICU LOS (12.4 vs 11) p=0.86 - hospital LOS (36.9 vs 24.6) p=0.29 **Secondary outcomes:** no significant differences between the groups in: (intervention vs control) ICU discharge, 3, 6, 12 months - health-related quality of life (SF-36v2 score) 4 weeks before ICU: (44.1 vs 46.1) p=1 3 months: (36.3 vs 37.4) p=1 6 months: (38.5 vs 37.3) p=1 12 months: (38.3 vs 40.2) p=1 - physical function (MRC-SS) ICU discharge: (40.2 vs 42.4) p=0.99 3 months: (52.9 vs 54.5) p=1 6 months: (55 vs 54.4) p=1 12 months: (56.9 vs 55.9) p=1	2
	Per Branch							
	29 intervention	21 control						

LOS = length of stay, MRC-SS = medical research council sum-score, MV = mechanical ventilation, SF-36v2 = short form-36 health survey version 2

The intensive twice-daily mobilisation group neither started upright mobilization early nor yielded superior short- or long-term outcomes compared to the daily mobilisation group. Both groups showed poor physical health-related quality of life and exercise capacity one year after ICU discharge.

#2239

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
#2239 **Wappel 2021** PMID: 32817444 DOI: 10.4187/respcare.07840 **Specification of study:** retrospective analysis	32 patients **Inclusion criteria:** - age >50 years - tracheostomy on PMV for at least 14 d during acute hospitalization - requiring PMV for >6 h/d - able to participate in MRP activities - preadmission Barthel Index>70 - all extremities intact and mobile - meeting clinical criteria for ICU-acquired weakness **Exclusion criteria:** - acute superimposed cardiopulmonary disease - cognitive impairment - severe functional impairment related to neuromuscular dysfunction	1 withdrew before randomization	MRP+HPRO (n=10) MRP+LPRO (n=5) UC+HPRO (n=8) UC+LPRO (n=8)		**Endpoints:** effects of MRP on - weaning - discharge home	**Outcome:** significant differences between the groups in: MRP+HPRO vs UC+LPRO - weaning (90% vs 38%) p=0.045 - discharge home rate (70% vs 13%) p=0.037 **No significant differences between the groups in:** MRP+HPRO vs MRP+LPRO - rate of discharge home (70% vs 20%) p=0.10	4 → 5
	Per Branch						

HPRO = high protein, LPRO = low protein, MRP = mobility-based rehabilitation programs, PMV = prolonged mechanical ventilation, UC = usual care

Combining high protein with mobility-based rehabilitation was associated with increased rates of discharge home and ventilator weaning success in survivors of critical illness. Further studies are needed to evaluate the role of combined exercise and nutrition interventions in this population.

#3000

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
3000 Reinprecht, 2003 (PMID: 12794427 DOI: 10.1097/01.CCM.0000063453.93855.0A) **Specification of study:** Retrospective analysis	17 pts in NICU **Inclusion criteria:** - SAH diagnosis - ARDS diagnosis - treatment by prone position **Exclusion criteria:** Not specified		1: missing data	**PP**	**SP**	**Outcomes:** **measured during PP and SP on the same patient:** - hemodynamics - arterial oxygenation measured in torr - ventilatory setting - ICP + CPP - brain tissue oxygen partial pressure	**Significant differences between groups in:** - increase in PaO2 from 97.3 ±20.7 torr (mean ± SD) in the SP to 126.6 ± 31.7 torr in the PP (p < .0001) -increase in brain tissue oxygen partial pressure from 26.8 ± 10.9 torr to 31.6± 12.2 torr (p < 0.0001) - ICP increased from 9.3 ± 5.2 mm Hg to 14.8± 6.7 mm Hg (p < 0.0001) -CPP decreased from 73.0±10.5 mm Hg to 67.7± 10.7 mm Hg (p < 0.0001)	4
	Per Branch							
	17	17						

ARDS = acute respiratory distress syndrome, CPP = cerebral perfusion pressure, ICP = intracranial pressure, PP = prone position, pts = patients, SAH = subarachnoid hemorrhage, SP = supine position

Prone positioning in patients with SAH and ARDS led to improved arterial oxygenation and brain tissue oxygen partial pressure, but also increased ICP and decreased CPP.

#3001

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
3001 Beuret 2002 (PMID: 12029403 DOI: 10.1007/s00134-002-1266-x) **Specification of study:** prospective, randomized, controlled study	53 pts **Inclusion criteria:** - invasive ventilation - GCS ≤ 9 **Exclusion criteria:** - <18 years - ICU-LOS < 48h - acute poisoning - severe hypoxia (PaO_2/FIO_2 < 150) - hemodynamic failure - anterior flail chest - vertebral or long bone fracture - orthopedic traction - ICP ≥ 20mmHg.		SP: 2 death within 24h	**PP:** 4h/day beginning within 24h of intubation	**SP:** continuously with head elevated at 20°	**Primary endpoint:** - incidence of lung worsening defined by increase of lung Injury Score of at least 1 point **Secondary Outcome:** - incidence of VAP Sample size calculation: reduction in incidence from 60 to 25% with 66 pts. per arm (alpha= 5%, power= 80%)	**Primary endpoint**: - incidence of deterioration of pulmonary funciton was lower in the PP group (12%) than in the SP group (50%) (p=0.003) **Secondary outcome:** - incidence of VAP was 20% in the PP group and 38.4% in the SP group (p=0.14)	2
	Per Branch							
	25	28						

GCS = Glasgow coma scale, ICU-LOS = intensive care unit length of stay, ICP = intracranial pressure, MV = mechanical ventilation, PP = prone positioning, pts = patients, SP = supine positioning, VAP = ventilator-associated pneumonia

Prone positioning reduced the incidence of deterioration of pulmonary functionand showed a reduction of VAP.

#3002

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
3002 Bein 2004 (PMID: 15372177 DOI: 10.1007/s00101-004-0754-5) **Specification of study:** prospective randomized trial	52 pts **Inclusion criteria:** - > 18 years - ARDS (paO2/FIO2 ratio < 200 mmHg) - Bilateral infiltration in chest X-ray **Exclusion criteria:** - cardiac pulmonary oedema - acute brain injury - acute shock syndrome - contraindication PP		7 (5 IPP, 2 CPP) due to acute complications	**Incomplete PP (135° PP)**	**Complete PP (180° PP)**	**Primary endpoint**: - oxygenation (after 6h) **Secondary outcomes:** - AE - PaCO2 No sample size calculation	**Significant differences between groups in:** - significant increase of PaO2/FiO2 ration in complete PP 139±54mmHg to 206±75mmHg incomplete PP) vs (142±46mmHg to 253±107mmHg CPP), p< 0.05 **No significant difference between groups in:** - PaCO2 - safety: the incidence of side effects tended to be increased during the CPP	2
	Per Branch							
	27 pts. in 135° PP	25 pts. in 180° PP						

ARDS = acute respiratory distress syndrome, ICP = intra cranial pressure, IPP = incomplete prone position, MAP = mean arterial pressure, PEEP = positive end expiratory pressure, PP = prone position, pts = patients

Incomplete prone positioning improves oxygenation but is inferior to complete prone positioning.

#3003

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
3003 Hering 2001, (PMID: 11323351 DOI: 10.1097/00000539-200105000-00027) **Specification of study:** Cross-over study	16 pts on MV with ALI included within 24h. Every pt. received PP and SP **Exclusion criteria:** - unstable cardiovascular function - diuretics - renal transplant or replacement therapy - cerebral injury -unstable spine - peritonitis			**Prone positioning** for 180 min.	**Supine positioning** for 180 min.	**Outcomes:** - intraabdominal pressure - cardiovascular function - renal function	**Outcomes:** intraabdominal pressure: PP: 14 ± 5 mmHg vs SP: 12 ± 4 mmHg ($p < 0.05$) cardiovascular function: - CI: 4.4 vs. 4.1 L/min·m^2 ($p < 0.05$) - MAP: 82 vs. 77 ($p < 0.01$) - PaO_2/FiO_2: 267 vs 220 ($p < 0.05$) - HR, ITBVI, CVP, SVRI, pH: n.s. renal function: - RF: 15.5 vs 19.1 ($p < 0.05$) - RVRI: 15078 vs 11762 ($p < 0.05$) U_{vol}, ERPFI, ERBFI, GFRI: n.s.	3
	Per Branch							
	16	16						

ALI = acute lung injury, CI = cardiac index, CVP = central venous pressure, ERPFI = effective renal plasma flow Index, HR = heart rate, ITBVI = intrathoracic blood volume index, MAP = mean arterial pressure, PP = prone positioning, RF = renal function, RVRI = renal vascular resistance index, SP = supine positioning, SVRI = systemic vascular resistance index, U_{vol} = urine volume,

Prone positioning increases intraabdominal pressure, cardiac index, mean arterial pressure and oxygenation while reducing renal function.

#3004

Reference, Study Type	Cases and Controls (Participant #, Characteristics) Total	Primary Results	Evidence Grade
#3004 **Kirkpatrick 2013** PMID: 23673399 DOI: 10.1007/s00134-013-2906-z **Specification of study:** Clinical Practice Guideline	n = 5 publications [1-5] **Inclusion criteria:** - patients with abdominal compartments syndrome *(No data available)* **Definition of EM** *No data available*	Recommendations - no recommendations regarding mobilization Suggestions regarding mobilisation: - 3. potential contribution of body position to elevated IAP to be considered among patients with, or at risk of, IAH or ACS suggested [GRADE 2D] *Grading of quality level of evidence following GRADE recommendations (1 = high recommendation, 2 = weak recommendation; A to D = Quality level of evidence)*	1

ACS = abdominal compartment syndrome, EM = early mobilisation, GRADE = grading of recommendations, assessment, development and evaluations, IAH = intraabdominal hypertension, IAP = intraabdominal pressure, pts = patients

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#3005

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
3005 Cheatham 2009 (PMID: 19487946 DOI: 10.1097/CCM.0b013e3181a021fa) **Specification of study:** A prospective, cohort study	→ 132 patients 12 international ICUs 392 IAP measurements **Inclusion criteria:** - aged>18 years - sedated (per study-site protocol) - on mechanical ventilation - demonstrated at least one risk factor for IAH or ACS **Exclusion criteria:** - unable to tolerate changes in body position (because of spinal precautions, intracranial hypertension, hemodynamic instability, etc) - intravesicular pressure measurements were contraindicated		Triplicate intravesicular pressure measurments at least 4h apart with patients in: - 15° degree - 30° degree head of bed elevated position	Triplicate intravesicular pressure measurments at least 4h apart with patients in: - supine position	**Primary endpoints:** - measured IAP values	**Primary outcome:** significant differences between the groups in: (control vs intervention) - IAPsupine and IAP15°was 1.5 mm Hg (1.3–1.7) p<0.0001 - APsupine and IAP30°was 3.7 mm Hg (3.4 – 4.0) p<0.0001	3
	Per Branch						

ACS = abdominal compartment syndrome, APP = abdominal perfusion pressure, IAH = intra-abdominal hypertension, IAP = intra-abdominal pressure, ICU = intensive care units, VAP = ventilator-associated pneumonia

Conclusions: Head of bed elevation results in clinically significant increases in measured IAP. Consistent body positioning from one IAP measurement to the next is necessary to allow consistent trending of IAP for accurate clinical decision making. Studies that involve IAP measurements should describe the patient's body position so that these values may be properly interpreted.

#3006

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
3006 Ehrmann 2021 (PMID: 34425070 DOI: 10.1016/S2213-2600(21)00356-8) **Specification of study:** randomised, controlled, multinational, open-label meta-trial	1126 pts **Inclusion criteria:** - > 18 years - acute hypoxaemic respiratory failure due to proven COVID-19-pneumonia **Exclusion criteria** - consent - haemodynamica unstable - BMI > 40 - pregnancy - contraindication for awake PP		n=5 (withdrew consent)	**Awake prone position** - (patients in the awake prone positioning group were instructed and assisted to lie in the prone position for as long and as frequently as possible each day. The duration of each proning session was recorded by bedside nurses)	**Standard of care**	**Primary endpoint:** - treatment failure (defined as intubation or death) **Secondary outcome:** - mortality **Sample Size calculation:** based on previews reports primary outcome incidence was estimated between 60-70% in standard care group, 90% power **Sample size** was 1000 pts	**Primary endpoint**: treatment failure within 28 days: - awake proning: 223 (40%) vs SOC: 257 (46%); p=0.025 **Secondary outcome:** - no difference in mortality	2
	Per Branch							
	567 awake PP	**559** SOC						

BMI = body mass index, h = hours, PP = prone position, Pts = patients, SOC = standard of care

Awake prone positioning of patients with hypoxemic respiratory failure due to COVID-19 reduces the incidence of treatment failure and the need for intubation without any sign of harm.

#3007

Reference, Study Type	Cases and Controls (Participant #, characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
3007 Taylor 2021 PMID: 33356977 DOI: 10.1513/AnnalsATS.202009-1164OC **Specification of study:** A cluster randomized pilot trial	40 patients at 1 quaternary referral center **Inclusion criteria:** - adult patients - submitted to ICU by one of the study teams - positive SARS-CoV-2 test within 7 days - suspected COVID-19 pneumonia and experienced: 1) room air oxygen saturation <93% 2) oxygen requirement of 3 L per minute or greater without the need for mechanical ventilation **Exclusion criteria:** - unable to self-turn - spinal instability - facial or pelvic fractures - open chest or abdomen - altered mental status - anticipated difficult airway - signs of respiratory fatigue - receiving end-of-life care		1 intervention patient did leave the study hospital	**APPS + UC**	**Usual care**	**Endpoints:** Clinical outcomes: - S/F ratio - S/F ratio below 315 - hospital LOS Safety: - AEs	**Results:** Differences in (no p value given): (Control vs intervention) -S/F ratio (216 vs 253) -S/F ratio below 315 (42h vs 20h) -Hospital LOS (5 vs 6) -AE (0 vs 1)	2 → 3 (pilot trial, bias risk)
	Per Branch							
	28 APPS + UC	13 UC						

PP = prone position, UC = usual care, APPS = awake prone positioning strategy, LOS = length of stay

A definitive trial evaluating the effect of prone positioning in non-intubated patients with COVID-19 is warranted, but several barriers must be addressed to ensure that the results of such a trial are informative and readily translated into practice.

#3011

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
3011 Gad 2021 https://doi.org/10.1080/11101849.2021.1889944 **Specification of study:** prospective randomized comparative study	30 pts. **Inclusion criteria:** - positive nasopharyngeal/oropharyngeal covid-19 swab is confirmed, - >18 years old - SaO2 <90% (5–10O2l/min simple face mask) - PaO2/FiO2 <200 - <200, respiratory rate > 24 b/m - bilateral lung infiltration in CT chest - not explained by cardiac failure - ready to co-operate pp or NIV **Exclusion criteria:** - need invasive and immediate ventilation - RR>40b/m - use accessory muscle - systolic pressure <100 mmHg, -unable or unwilling trail of PP and NIV			Awake PP group	Awake NIV group	**Primary outcomes:** - improved in oxygenation and avoiding intubation within the first 3 days of critical care admission (arterial blood gas at admission then daily after the procedure for frequent 3 days) **Secondary outcomes**: - reducing in ICU stay - reducing in hospital stay	**Primary outcome:** - mean SaO_2 (on simple face mask 5–10 l/min) at admission 79 ± 8.47%in PP group, 82 ± 7.05% in NIV group -SaO_2 and tension was significantly increased mean SaO2 93 ± 5.9%, mean PaO2 107 ± 12 mmHg PP group - mean arterial pCO_2 was decreased significantly in NIV group 239.34 ± 5.12 mmHg compare to PP group 43.41 ± 3.2 mmHg (day3) p-value <0.001 -PH (n.s) **Secondary outcomes**: - regarding ICU or hospital duration of stay (n.s)	2 → 3
	Per Branch							
	15	15						

CT = computer tomography, ICU = intensive care unit, NIV = non-invasive ventilation, n.s. = not significant, PP = prone position, pts =patients

Awake prone positioning and non-invasive ventilation showed marked improvement in SaO2 and PaO2 in COVID-19 patients with improvement in clinical symptoms with reduced rate of intubation and superiority of NIV in hypercapnic patients.

#3019

Reference, Study Type	Cases and Controls (Participant #, characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
3019 Drakulovic 1999 PMID: 10584721 DOI: 10.1016/S0140-6736(98)12251-1 **Specification of study:** RCT	90 pts from June 1, 1997, until May 31, 1998 **Inclusion criteria**: - mechanically ventilated pts. **Exclusion criteria**: - abdominal surgery (<7d) - neurosurgical intervention (<7d) - shock refractory to vasoactive drugs or volume - endotracheal intubation (<30d)		4 (intervention group): 1 died, 3 withdrawn due to reintubation (protocol violation)	**Semirecumbent body position** (45°)	**Supine body position** (0°)	**Primary Endpoint:** - frequency of clinically suspected pneumonia **Secondary outcomes**: - frequency of microbiologically confirmed pneumonia	**Primary Endpoint**: - frequency of clinically suspected pneumonia: Intervention 8% vs control 34% (95% CI for difference 10-4, p=0.003) **Secondary outcome**: - frequency of microbiologically confirmed pneumonia: Intervention 5% vs control 23% (95% CI for difference 4-33, p=0.018)	2
	Per Branch							
	39	47						

Pts = patients, RCT = randomized controlled trial, d = days, CI = confidence interval

The semirecumbent body position reduces the risk of pneumonia in mechanically ventilated patients.

#3020

Reference, Study Type	Cases and Controls (Participant #, characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
3020 Borges, 2016 PMID: 27170538 DOI: 10.1123/jpah.2015-0614 Specification of study: RCT	34 pts between January and October 2015 **Inclusion criteria:** - underwent CABG **Exclusion criteria:** - use of intra-abdominal balloon pump or other invasive femoral devices - surgical reintervention - death - prolonged hospital stay (>10d)			**Conventional physiotherapy + aerobic exercise with cycle ergometer**	**Conventional physiotherapy**	**Primary Endpoint**: - mortality risk (InsCor score) **Secondary Endpoints**: - Spirometry /pulmonary function (FVC, FEV1, PEF) - respiratory muscle strength / manovacuometry (MIP, MEP) - 6-MWT - MV duration (hours) - ICU stay (days) - Hospital discharge (days)	**Primary Endpoints**: - mortality risk n.s. (P=0.49) **Secondary Endpoints**: -pulmonary function from preoperative to hospital discharge (FVC P=0.001; FEV1 P=0.001; PEF P=0.02 for Intervention and P=0.01 for Control) - MEP decreased (P=0.006 for intervention and P=0.004 for Control) - 6-MWT decreased in control group (P = 0.01) - difference in intergroup at hospital discharge (P = 0.03) -difference in MIP, MV duration and ICU stay(n.s.)	2
	Per Branch							
	15	19						

CABG = coronary artery bypass grafting, RCT = randomized controlled trial, pts = patients, 6-MWT = 6-Minute Walk Test, FVC = forced vital capacity, FEV1 = forced exspiratory volume, PEF = Peak Expiratory Flow, MIP = maximal inspiratory pressure, MEP = maximal expiratory pressure, ICU = Intensive Care Unit, MV = mechanical ventilation,

Aerobic exercise after CABG may help maintain functional capacity but had no impact on pulmonary function and respiratory muscle strength when compared with conventional physiotherapy.

#3032

Reference, **Study Type**	**Cases and Controls (Participant #, Characteristics)** **Total**	**Drop-out Rate**	**Intervention**	**Control**	**Optimal Population**	**Primary Results**	**Evidence Grade**
3032 Kimmoun 2015 (PMID: 26538308 DOI: 10.1186/s13613-015-0078-4) **Specification of study:** Retrospective study	17 patients who received PP during VV-ECMO between January 2012 and January 2014 **Inclusion criteria** - patients with severe ARDS as defined by the BERLIN consensus **Exclusion criteria** - patients under vasopressor treatment - pts after open chest cardiac surgery **Per Branch**		Pre-PP parameters compared with post-PP (27 sessions were performed, identical duration of 24 h)	no control	**Endpoints (not defined in detail)** - PaO2/FiO2 ratio (Horowitz-Index) - respiratory system compliance - tidal volume	**Endpoints** - PaO2/FiO2 : significantly increased from 111 (84–128) to 173 (120– 203) mmHg ; ($p < 0.0001$) - PaO2/FiO2 ratio increased by over 20 % in 14/14 sessions for late sessions (≥7 days) and in 7/13 sessions for early sessions (< 7days); p=0.01 - respiratory system compliance: increased from 18 (12–36) to 32 (15–36) ml/cmH2O; ($p < 0.0001$) - tidal volume: increased from 3.0 (2.2–4.0) to 3.7 (2.8–5.0) ml/kg; ($p < 0.005$)	4

ARDS = acute respiratory distress syndrome, FiO2 = inspiratory oxygen concentration, ICU = intensive care unit, pts = patients, PP = prone position, PaO2 = partial oxygen content, VV-ECMO = veno-venous extra-corporal membrane oxygenation

When used in combination with VV-ECMO, 24 h of prone positioning improves both oxygenation and respiratory system compliance.

#3035

Reference, **Study Type**	**Cases and Controls (Participant #, Characteristics)** **Total**		**Drop-out Rate**	**Intervention**	**Control**	**Optimal Population**	**Primary Results**	**Evidence Grade**
3035 Giani 2021 (PMID: 32941739 DOI: 10.1513/AnnalsATS.202006-625OC) **Specification of study:** Multicenter retrospective cohort study	240 patients treated in six Italian ECMO referral centers between January 2014 and December 2018 **Inclusion criteria** - adult patients with a diagnosis of ARDS according to the Berlin definition - treated with VV- ECMO support **no exclusion criteria mentioned**			**Prone group** (start of first PP session = 4 (2–7) days; 326 PP maneuvers, mean duration of pronation cycles = 15 (12–18) hours	**Supine group**	**Primary outcome** - efficacy and safety of the application of PP in patients with ARDS supported with V-V ECMO (duration of ECMO support, length of stay in the ICU, ICU mortality) **Secondary outcome** - association of PP and hospital mortality	**Primary outcome** - ECMO duration (days): intervention = 16 vs. control = 10; p=0.0344) - ICU LOS (days): intervention=35 (21–50), control=26 (15–51); p=0.0102 - alive at ICU discharge: intervention= 33 (21–48), control=30 (19–57); p=0.4352 **Secondary outcome** - hospital mortality: intervention= 36 (34%) vs. control= 61 (49.6%); P = 0.017) - PP during ECMO: Odds ratio (95% CI) = 0.499 (0.285–0.872); p=0.0147	4
	Per Branch							
	N=107	N=133						

ARDS = acute respiratory distress syndrome, CI = confidence intervall, ECMO = extracorporeal membrane oxygenation, ICU = intensive care unit, PP = prone positioning, VV-ECMO= veno-venous ECMO

PP during ECMO improved oxygenation and was associated with a reduction of hospital mortality.

#3039

Reference, **Study Type**	**Cases and Controls (Participant #, Characteristics)**		**Drop-out Rate**	**Intervention**	**Control**	**Optimal Population**	**Primary Results**	**Evidence Grade**
	Total							
3039 Rilinger 2020 (PMID: 32641155 DOI: 10.1186/s13054-020-03110-2) **Specification of study:** retrospective data report of a single-centre registry	158 patients with severe ARDS requiring VV ECMO support between October 2010 and May 2018 at the Interdisciplinary Medical Intensive Care Unit at the Medical Centre, University of Freiburg, Germany **No inclusion/exclusion criteria defined**			**Prone position**	**Supine position**	**Primary outcome** - successful ECMO weaning (defined as being free from ECMO and alive for at least 48 h after decannulation) - ICU and hospital survival	**Primary outcome** - weaning successful: 74 (46.8%, n=158) , intervention= 18 (47.4%) and control= 56 (46.7%); p= 0.940 - ICU survival: 58 (n=158, 36.7%), intervention= 14 (36.8%) and control= 44 (36.7%); p=0.984 - hospital survival: 58 (n=158, 36.7%), intervention=14 (36.8%) and control= 44 (36.7%); p=0.984 - no significant differences in VV ECMO weaning rate (pp= 47.4% vs. sp= 46.7%, p = 0.94) and hospital survival (pp= 36.8% vs. sp=36.7%, p = 0.98) - no difference in hospital survival (pp=36.8% vs. sp=36.8%, p = 1.0) or VV ECMO weaning rate (pp=47.4% vs. sp=44.7%, p = 0.82)	4
	Per Branch							
	N=38	N= 120						

ICU = intensive care unit, PP = prone position, SP = supine position, VV-ECMO = veno-venous extracorporal-membrane oxygenation

In this propensity score matched cohort of severe ARDS patients requiring VV ECMO support, prone positioning at any time was not associated with improved weaning or survival.

#3041

Reference, **Study Type**	**Cases and Controls (Participant #, Characteristics)**		**Drop-out Rate**	**Intervention**	**Control**	**Optimal Population**	**Primary Results**	**Evidence Grade**
	Total							
3041 Jagan 2020 (PMID: 33063033 DOI: 10.1097/CCE.0000000000000229) **Specification of study:** Retrospective analysis of prospectively collected clinical data	105 non-intubated, coronavirus disease-infected patients 9 between March 24, 2020, and May 5, 2020, to CHI Health St. Francis in Grand Island, Nebraska **Inclusion criteria** - ≥19 years - COVID-infected **Exclusion criteria** - Pregnancy - need of intubation/ventilation			**Prone group** (tolerated awake self-proning)	**Supine group**	**primary outcome** - need for intubation during the hospital stay **secondary outcome** - serial peripheral capillary oxygen saturation measured by pulse oximetry to the Fio2 ratios - in-hospital mortality - hospital discharge disposition(home, died, nursing home)	**primary outcome** - risk of intubation: lower in proned group after adjusting for disease severity using SOFA scores (adjusted hazard ratio, 0.30; 95% CI, 0.09–0.96; p = 0.043) or APACHE II scores (adjusted hazard ratio, 0.30; 95% CI, 0.10–0.91; p = 0.034) **secondary outcome** - <u>discharge disposition(%)</u> home: supine = 41.5, proned= 72.5; p < 0.001 died: supine= 24.6, proned=0.0 nursing home: supine=9.2, proned=5.0 - pulse oximetry to the Fio2 ratios were statistically similar for both groups - mortality: intervention=0% vs control= 24.6% (p < 0.001; NNT = 5; 95% CI, 3–8)	4
	Per Branch							
	N=40	N=65						

APACHE = acute physiology and chronic health evaluation, CI = confidence interval, FiO2 = inspiratory oxygen concentration, NNT = number needed to treat, SOFA = sequential organ failure assessment

Awake self-proning was associated with lower mortality and intubation rates in coronavirus disease 2019-infected patients.

#3043

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop -out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
3043 Perez-Nieto 2022 (PMID: 34266942 DOI: 10.1183/13993003.00265-2021) **Specification of study:** retrospective, multicentre observational study	827 non-intubated patients with COVID-19 admitted to 27 hospitals in Mexico and Ecuador between 1 May 2020 and 12 June 2020 **Inclusion criteria** - age over 18 years - positive test for SARS-CoV-2 or imaging study compatible with COVID-19 - clinical record available in accordance with the official Mexican standard or equivalent in Ecuador - room air SpO2 <94% - two or more of the following symptoms: eye pain, cough, fever, dyspnoea, headache, myalgia, arthralgia or odynophagia **Exclusion criteria** - voluntarily discharged from hospital - pts referred to another hospital prior to outcome ascertainment - those with incomplete clinical records (insufficient information to calculate SpO2 /FIO2 or when unable to ascertain if the patient was managed in a prone or supine position)			Prone position	Supine position	**primary outcome** - successful orotracheal intubation for invasive mechanical ventilation **secondary outcome** - death during in-hospital follow-up	**Primary outcome** - intubation: control=130 (40.4%), intervention= 119 (23.6%); p<0.0001 - pp= protective factor for intubation even after multivariable adjustment (OR 0.35, 95% CI 0.24–0.52; p<0.0001) **Secondary outcome** - control=120 (37.3%), intervention= 100 (19.8%); p<0.0001 (adjusted OR 0.38, 95% CI 0.26–0.55)	4
	Per Branch							
	N=505	N=322						

CI = confidence interval, OR = odds ratio, pp = prone position, pts = patients, SARS-CoV-2 = severe acute respiratory syndrome coronavirus 2

Awake prone positioning in hospitalized non-intubated patients with COVID-19 is associated with a lower risk of intubation and mortality.

#3048

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
3048 Patman 2001 (PMID: 11552858 DOI: 10.1016/s0004-9514(14)60294-4) **Specification of study:** RCT	236 pts **Inclusion criteria:** - elective or semi-urgent cardiac surgery **Exclusion criteria:** - severe asthma, chronic airflow limitation, bronchiectasis or ankylosing spondylitis - post-operatively: unstable cardiovascular status (systolic blood pressure < 100 or > 180mmHg or MAP < 60 or > 110mmHg) - arrhythmias that compromised cardiovascular function, or excessive blood loss from subcostal catheters (> 100mL/hr) - perioperative neurological complication		26 pts treatment group: 7 control group: 19 (Reason: 18 prolonged ventilation for more than 24 hours; 3 died in ICU; 5 slow awake from anaesthesia)	**Physiotherapy** during intubation and after extubation	**Physiotherapy** only after extubation	**Primary endpoints:** - length of intubation period - ICU LOS - hospital LOS - maximal daily incentive spirometry values - incidence of post-operative pulmonary complications	**Primary endpoints:** - no significant difference in any outcome parameter - Intubation (hours): 13.0 (SD:4.8) vs. 12.7 (SD:4.7) p=0.85 - ICU stay (hours): 42.7 (SD:42.4) vs. 36.7 (SD:26.8) p=0.56 - Hospital stay (days): 9.2 (SD:4.5) vs. 9.6 (SD:4.7) p=0.25	2
	Per Branch							
	101	109						

ICU = intensive care unit, LOS = length of stay, MAP = median arterial pressure, pts = patients

In this study physiotherapy interventions during the intubation period did not improve outcomes in patients after cardiac surgery.

#3050

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
3050 Van der Peijl 2004 (PMID: 15111138 DOI: 10.1016/j.athoracsur.2003.10.091) **Specification of study:** RCT	**Total** 309 pts after CABG surgery, randomized by 30-day period, not by patient. **Exclusion criteria:** - post-op complications - severe comorbidities - mental disorders **Per Branch** HFE: 166 / LFE: 143	HFE: 32 (3 pulmonary complications, 8 other cardiac surgery, 5 re-thoracotomy, 1 death, 9 hemodynamic instability, 3 serious rhythmic disturbances, 2 combinations with other surgery, 1 cerebrovascular accident) LFE: 31 (2 pulmonary complications, 8 other cardiac surgery, 1 re-thoracotomy, 3 death, 12 hemodynamic instability, 1 serious rhythmic disturbances, combinations with other surgery, 3 operated in wash out period)	**High frequency exercise:** -RoM, muscle strength and coordination, walking and stair climbing. -2x/day incl. weekend, starting on day 1 post-surgery	**Low frequency exercise:** - RoM, muscle strength and coordination, walking and stair climbing. -1x/day excl. weekend, starting on 1. Weekday after surgery	**Primary outcomes:** - functional milestones: sitting, walking, group exercise therapy, climbing stairs - fatigue and dyspnoe (RPE scale) - semistructured interview day before surgery (selfcare, locomotion, FIM) - quantity of physical activity (portable activity monitor) - satisfaction	**Primary outcomes:** - functional milestones: sitting, walking and group exercise were achieved faster by HFE ($p = 0.0048$, $p = 0.0072$, $p<0.00005$), stairs: n.s. - RPE: n.s. - FIM: n.s. - quantity of physical activity: n.s. - pts satisfaction: HFE more satisfied ($p < 0.05$)	2 → 3 (indirectness)

CABG = coronary artery bypass graft, FIM = functional independence measure, HFE = high frequency exercise, LFE = low frequency exercise, pts = patients, RoM = range of motion, RPE = rating of perceived exertion

High frequency exercise programs lead to a faster achievement of functional milestones while not increasing the perceived exertion.

3053

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
3053 Routsi 2010 DOI: 10.1186/cc8987) **Specification of study:** RCT	142 pts. (52 analyzed) between September 2007 and June 2009 **Inclusion criteria:** - all pts admitted to ICU - APACHE II at admission ≥ 13 **Exclusion criteria:** - <18 years - pregnancy - obesity (BMI >35 kg/m2) - preexisting neuromuscular disease (e.g., myasthenia Gravis, Guillain-Barré disease) - diseases with systemic vascular involvement such as systemic lupus erythematosus - technical obstacles that did not allow the implementation of EMS such as bone fractures or skin lesions (e.g., burns) - end-stage malignancy - cardiac pacemakers - brain death		90pts/63.3% EMS group: 2 withdrew their consent, 28 died, 3 prolonged neuromusclular blocking agents, 2 no EMS sessions Control group: 22 died, 22 impaired cognitive state	daily EMS sessions	No EMS	**Primary outcome:** - diagnosis of CIPNM as assessed with the MRC scale for muscle strength **Secondary outcomes:** - duration of weaning from MV - ICU LOS	**Primary outcome:** - CIPNM was diagnosed in 3 patients in EMS group compared to 11 patients in control group (OR = 0.22; CI: 0.05 to 0.92, p=0.04) - MRC score was significantly higher in patients of EMS group compared to control group [58 (33 to 60) vs. 52 (2 to 60) respectively, median (range), p=0.04) **Secondary outcomes:** - weaning period shorter in pts of EMS group vs. control group [1 (0 to 10) days vs. 3 (0 to 44) days, respectively, median (range), p=0.003] -ICU LOS not significantly different (mean (range), 14 (4 to 62) vs. 22 (2 to 92), days, respectively, log rank test, p=0.11)	2
	Per Branch							
	EMS group (n=70) (24 analyzed)	control group (n=72) (28 analyzed)						

ICU=intensive care unit; APACHE II= Acute Physiology and Chronic Health Disease Classification System II, BMI = body mass index, CI = confidence interval, CIPNM= Critical illness polyneuromyopathy, EMS = electrical muscle stimulation, LOS = length of stay, MRC = medical research council, MV = mechanical ventilation, OR = odds ratio, pts = patients

EMS prevents the development of CIPNM and results in shorter MV duration.

3060

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
3060 Gerovasili, 2009 (PMID: 19814793 DOI: 10.1186/cc8123) **Specification of study:** randomized study	49 pts **Inclusion criteria:** - all pts admitted to ICU during study period **Exclusion criteria:** - age under 18 years - pregnancy - obesity (BMI >35 kg/m2) brain death - preexisting neuromuscular disease (e.g. myasthenia gravis) - diseases with systemic vascular involvement such as lupus erythematosus - technical obstacles that did not allow the implementation of EMS such as bone fractures or skin lesions (e.g. skin burns) - end- stage malignancy - pacemakers - ICU stay of less than 48 hours		**EMS:** 5 pts excluded due to oedema, 6 pts died or were discharged before 2nd measurement **Control:** 6 pts excluded due to oedema, 5 pts died or were discharged before 2nd measurement and 1 patient could not be measured due to technical problems	daily EMS sessions of both lower extremities	No EMS	**Primary outcome:** - muscle mass (evaluated with US, by measuring the CSD of vastus intermedius and the rectus femoris of the quadriceps muscle)	**Primary outcome:** - 26 pts evaluated - CSD of the right rectus femoris decreased significantly less in EMS group (-0.11 ± 0.06 cm, -8 ± 3.9%) compared to control group (-0.21 ± 0.10 cm, -13.9 ± 6.4%; p<0.05) - CSD of the right vastus intermedius decreased significantly less in EMS group (-0.10 ± 0.05 cm, -12.5 ± 7.4%) compared to control group (-0.29 ± 0.28 cm, -21.5 ± 15.3%; p<0.05)	2
	Per Branch							
	EMS group (n=24)	Control group (n=25)						

CSD = cross sectional diameter, EMS = electrical muscle stimulation, pts = patients, US = ultrasonography

EMS was able to preserve muscle mass in critically ill patients.

#3065

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
3065 Karic 2016 (PMID: 27058204 DOI: 10.3171/2015.12.JNS151744) **Specification of study:** Prospective interventional study	168 pts with aSAH pts in the neuro-intermediate ward **Exclusion criteria:** - age < 18 years - history of SAH -traumatic brain injury -neurodegenerative disorder		2 pts: (1 thrombo-embolic complication, 1 death)	**EM and rehabilitation** in addition to SOC	**SOC**	**Endpoints**: - treatment variables - frequency and severity of cerebral vasospasm - cerebral infarction acquired in conjunction with the aSAH - acute and chronic hydrocephalus - pulmonary and thromboembolic complications	**Significant Outcomes:** treatment variables the intervention group had a significantly - earlier mobilization for days 1-7 ($p < 0.01$) - higher mobilization level at discharge (Step 5 vs. Step 4, $p = 0.004$) - significantly less clinical vasospasm in the early rehab group ($p=0.03$) **Not significant outcomes:** - cerebral vasospasm: 5 in control, 10 in intervention - time from ictus to vasospasm (median 8 days (range 3-18) vs. 7 (range 4-22)) - cerebral infarction acquired after the ictus (40% vs. 29%) - LOS (13.9 (3-37) vs. 14.5 (2-61)) - no unintended removal of lines/tubes - clinical status at discharge (GCS score 13.9 ± 1.9 vs. 14.1 ± 1.5))	3 → 4 (indirectness)
	Per Branch							
	92	76						

aSAH = after aneurysmal subarachnoid hemorrhage, EM = early mobilization, LOS = length of stay, pts = patients, SOC = standard of care

Early rehabilitation of patients after aSAH is safe and feasible in intermediate care patients.

#3066

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
3066 Karic 2016 (PMID: 27494170 DOI: 10.2340/16501977-2121) **Specification of study:** Prospective, controlled, interventional study	168 aSAH pts in the neuro-intermediate ward being poor-grade WFNS (3-5) **Inclusion criteria:** - adults (>18 years) - South-East health region - with aSAH - admitted to the NIW at Oslo University Hospital after aneurysm repair **Exclusion criteria:** - history of SAH - traumatic brain injury - neurodegenerative disorder that could interfere with aSAH-aquired disability			**EM and rehabilitation:** - in addition to standard treatment	**Standard of care**	**Primary endpoints:** - global functional outcome (Rankin Scale, Glasgow Outcome Scale Extended) **Secondary endpoints:** - clinical data - LOS - intervention data	**Significant differences between groups:** - initiation of early rehabilitation (WFNS 3-5 median 7.4 days (range 1-23), WFNS 1-2 0.9 (0-20) - application of early rehabilitation (WFNS 1-2 median 9 days (range 1-36), WFNS 3-5 10 (1-26)) **No significant differences between groups in:** - mRS and GOSE (univariate: 0.982 (0.69-1.39), p=0.922 multivariate 1.30 (0.836-2.037), p=2.42) - LOS (control 14.5 (range 2-61) vs. intervention 14.4 (3-37))	3 → 4 (indirectness)
	Per Branch							
	94	77						

aSAH = after aneurysmal subarachnoid hemorrhage, EM = early mobilization, GOSE = Glasgow outcome scale extended, LOS = length of stay, mRS = modified ranking scale, pts = patients, WFNS = World Federation of Neurosurgery Scale

Early mobilisation and rehabilitation probably increase the chance of a good functional outcome in poor-grade aneurysmal subarachnoid hemorrhage patients admitted to intermediate care.

#3067

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
3067 Pun 2019 (PMID: 30339549 DOI: 10.1097/CCM.0000000000003482) **Specification of study:** Prospective, multicenter, cohort study	17.228 pts **Inclusion criteria:** - > 18 years - admitted to participating medical, surgical, cardiac, or neurologic ICU **Exclusion criteria:** - death or discharge from the ICU within 24 hours of ICU admission - undergoing active life support withdrawal and/or "comfort care-only" within 24 hours of ICU admission **Total** **Per Branch** 17.228	2002 (no full 24 hours in ICU)	**Complete performance of ABCDEF Bundle:** - pts receive every eligible bundle element on any given day)	**Proportional performance:** - percentage of eligible bundle elements performed on any given day	**Endpoints:** - mortality - ICU discharge - hospital discharge - mechanical ventilation - coma - delirium - pain - restraint use - ICU readmission - ICU discharge destination	**Significant differences between groups in:** complete ABCDEF Bundle performance was associated with lower likelihood of: - hospital death within 7 days (AOR, 0.32; CI0.17-0.62) - next-day MV (AOR, 0.28; CI, 0.22-0.36) - coma (AOR, 0.35; CI, 0.22-0.56) - delirium (AOR, 0.60; CI, 0.49-0.72) - physical restraint use (AOR, 0.37; CI, 0.30-0.46) - ICU readmission (AOR, 0.54; CI, 0.37-0.79) - discharge to a facility other than home (AOR, 0.64; CI, 0.51-0.80) => all $p < 0.002$ - significant pain was more frequently reported as bundle performance proportionally increased ($p = 0.0001$)	3

AOR = adjusted hazard ratio, CI = confidence interval, ICU = intensive care unit, MV = mechanical ventilation, pts = patients

ABCDEF bundle performance showed significant and clinically meaningful improvements in outcomes including survival, mechanical ventilation use, coma, delirium, restraint-free care, ICU readmissions, and post-ICU discharge disposition.

#3069

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
3069 Zeckey 2015 (PMID: 25391530 DOI: 10.3233/THC-140869) **Specification of study:** Retrospective study	Trauma pts of a level 1 trauma center 2000-2009, 283 pts **Inclusion criteria:** - multiple trauma pts (ISS ≥ 16, age > 16y) with associated severe chest trauma (AIS_{Chest} ≥ 3) - primary admission within 6 h after trauma - plain radiographs of the chest at admission and 24 h thereafter, CT of the head, spine, chest, abdomen, and pelvis **Exclusion criteria:** - penetrating thoracic trauma - AIS_{Head} > 2 - steroidal and non-steroidal anti-inflammatory medication - hormone replacement - chronic diseases of the lungs - liver or kidneys and vascular obstruction.			**CLRT:** -5 to 7 days therapy with 62° rotation to each side was applied	**Lung protective ventilation strategy**	**Endpoints:** - mortality - ARDS - MODS - ALI - SIRS - Sepsis No sample size calculation (retrospective study)	**Significant differences between groups in:** Pts with CLRT had significantly increased - MV time (532.1 ± 320.7; 135.8 ± 245.8 hours, p < 0.0001) - ICU LOS (25.7 ± 13.4; 9.1 ± 11.0 days, p < 0.0001) - hospital LOS (38.4 ± 21.1, 24.4 ± 17.6 days, p < 0.0001) - blood replacement (PRBC 22.9 ± 26.6 vs. 10.5 ± 14.1, p < 0.01; FFP 16.6 ± 20.9 vs. 7.0 ± 11.4, p = 0.01; PRP 2.6 ± 5.7 vs. 0.9 ± 2.1 p = 0.01 **Higher incidence of** - SIRS (65% vs. 34% p = 0.001) - sepsis (53.1% vs. 19.5% p = 0.001) - MODS (21.3% vs. 2.4% p 0= 0.001) - mortality (12.5% vs. 5.7% p = 0.044) In CLRT group **After multivariate logistic regression analysis for mortality revealed:** - CLRT OR 0.96 [0.34; 2.74], p > 0.05 - age (</≥ 40y): OR 2.71 [0.88; 8.41], p > 0.05 - TTS OR 4.47 [1.68; 11.91], p = 0.0027) - PRP requirement OR 9.86 [3.04; 31.94] p = 0.0001)	4
	Per Branch							
	160	123						

AIS = abbreviated injury scale, CLRT = continuous lateral rotation therapy, FFP = fresh frozen plasma, ICU = intensive care unit, ISS = injury severity score, MV = mechanical ventilation, LOS = length of stay, PRP = platelet-rich plasma, PRBC = packed red blood cells, pts = patients, TTS = thoracic trauma severity score

CLRT shows signal of harm in several clinical endpoints.

#3071

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
3071 Altinay, 2022 (PMID: 34411633 DOI: 10.1016/j.bjane.2021.07.029) **Specification of study:** retrospective cohort study	**Total** 72 pts **Inclusion criteria:** - >18 years of age - monitored and treated in the ICU for acute respiratory failure due to COVID-19 pneumonia - received conventional oxygen therapy with nonrebreather mask oxygen **Exclusion criteria:** - supported with noninvasive or invasive MV to respiratory acidosis (pH <7.30 and PaCO2 >50 mmHg) - PaO2/FiO2 ratio <150 - GCS <12 points - hemodynamic instability - primary pulmonary pathologies other than pneumonia - nasal high-flow therapy - applied awake PP < 12 hours in 1 day **Per Branch** 25 | 23	APP: 24 (PP performed less than 12 hours a day due to non-compliance)	**APP** 12-18 hours	**Non-APP**	**Endpoints:** - SpO2, PaO2/FiO2, pH, PaCO2, and PaO2 (initial and at 24th hour) - ICU stay period - ventilator free period (day) - mortality rate - Intubation requirements	**Endpoints:** - initial SpO2, pH, PaO2, and PaO2/FiO2 (n.s.); initial PaCO2 values in APP group higher ($p < 0.001$); APP group higher 24th-hour SpO2 and PaO2 values ($p = 0.001$ and $p = 0.002$); decrease in pH value higher in non-APP group ($p = 0.002$); PaO2 increased in APP and decreased in non-APP ($p < 0.001$); PaCO2 decreased in APP and increased in non-APP ($p = 0.007$); SpO2 increased in APP higher ($p = 0.016$) - ICU stay period (n.s.) - ventilator free period (day) (n.s.) - mortality rate lower in APP group ($p = 0.020$) - intubation requirements lower in APP group ($p = 0.001$)	4

APP = awake prone position, GCS = Glasgow coma scale, ICU = intensive care unit, n.s. = not significant, PP = prone position, pts = patients

Awake prone position application in patients receiving non-rebreather mask oxygen therapy for respiratory failure due to COVID-19 pneumonia improves oxygenation and decreases the intubation requirements and mortality.

#3074

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
3074 Morris 2016 (PMID: 27367766 DOI: 10.1001/jama.2016.7201) **Specification of study:** RCT	**Total** - 300 pts **Inclusion criteria:** - admission to a medical ICU - 18 years or older - MV or NIV and an arterial oxygen partial pressure to fractional inspired oxygen < 300 **Exclusion criteria:** - inability to walk without assistance, cognitive impairment prior to the acute ICU illness - acute stroke - BMI >50 - neuromuscular disease impairing weaning - acute hip Fracture - unstable cervical spine or pathologic fracture - MV > 80h or current hospitalization >7 days - orders for do not intubate - moribund or enrolled in another research Study **Per Branch** 150 | 150	- 0 for primary analysis - 135 for 6 month follow up (66 intervention: 69 control)	**Standardized rehabilitation therapy:** - PROM - PT - progressive resistance exercise - 3x/d for 7d/week until hospital discharge	**Usual care**	**Primary endpoint:** - hospital LOS **Secondary outcomes:** - physical function - health related QoL **Power analysis**: 326 pts to provide 80% power for 30% decrease in median hospital LOS using two-sided 5% significance, 20% in-hospital mortality + 5% withdrawal lower mortality stopped at 300 pts.	**Primary endpoint:** - hospital LOS n.s. (p=0.41) **Secondary outcomes:** - short physical performance battery score at 6 months (9.0 (8.3 to 9.7); 8.0 (7.2 to 8.7); p=0.04) - SF-36 physical functioning scale score at 6 months (55.9 (50.0 to 61.7); 43.6 (37.5 to 49.7); p=0.001) - functional performance inventory score (2.2 (2.1 to 2.4); 2.0 (1.9 to 2.2); p=0.02) - ventilator free days n.s. - ICU LOS n.s. - discharge destination n.s.	2

ICU = intensive care unit, LOS = length of stay, MV = mechanical ventilation, NIV = noninvasive ventilation, n.s. = not significant, PROM= passive range of motion, PT = physical therapy, pts = patients, RCT = randomized clinical trial

Standardized rehabilitation therapy seems to have a benefit in relation to physical functioning at 6 months.

#3079

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
3079 Cunha 2022 (PMID: 35475866 DOI: 10.36416/1806-3756/e20210374) **Specification of study:** Retrospective Multicenter cohort study	574 pts **Inclusion criteria:** - 18 years - suspected or confirmed diagnosis of COVID-19 - invasive MV - PaO2/FIO2 ratio < 150 mmHg - PP **Exclusion criteria:** - awake PP without mechanical ventilation			**Positive response to prone positioning** (> 20 mmHg improvement in PaO_2/FiO_2 ratio)	**Negative response to prone positioning** (< 20 mmHg improvement in PaO_2/FiO_2 ratio)	**Primary outcome:** variables associated to a positive response **Secondary outcome:** predictive factors of mortality	**Primary outcome:** - SAPS III 63 [52-75] vs. 68 [56-79]; p = 0.01 - SOFA score 9 [6-12] vs. 10 [7-13]; p = 0.04 - D-dimer (ng/ml) 9.224 [891-4.452] vs. 10.534 [1.146 – 6.376]; p = 0.04 - RR (breaths/min) 28 [24-32] vs. 30 [25-34]; p < 0.001 - PaO_2 (mmHg): 74 [63-82] vs. 77 [65-84]; p = 0.04 - $PaCO_2$ (mmHg): 53 [43-59] vs. 56 [47-61]; p = 0.01 - initial PaO2/FiO2 ratio (mmHg): 84 [41-111] vs. -9.2 [-21 - 7]; p < 0.001 - Complications 10 (2.4) vs 21 (13.0); p < 0.001 **Secondary outcome:** - mortality 67.2% vs. 74.7%, p = 0.08 - increased risk of mortality associated with: a) age (OR = 1.04 [95 CI: 1.01-1.06]) b) time to first PP session (OR = 1.18 [95 CI: 1.06-1.31]) c) number of sessions (OR = 1.31 [95% CI: 1.00-1.72]) d) proportion of pulmonary impairment (OR = 1.55 [95% CI: 1.02-2.35]) e) immunosuppression (OR = 3.83 [95% CI: 1.35-10.86])	4
	Per Branch							
	412	162						

FiO_2 = inspired fraction of oxygen, OR = odds ratio, PaO_2 = partial pressure of arterial oxygen, PP = prone positioning, RR = respiratory rate, SAPS = simplified acute physiology score, SOFA = sepsis-related organ failure assessment

A positive response to prone positioning is predicted by SAPS III, SOFA score and initial PaO2/FiO2 ratio; mortality might be predicted by age, time to first PP session, number of sessions, proportion of pulmonary impairment and immunosuppression.

#3080

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
3080 Abu-Khaber 2013 https://doi.org/10.1016/j.ajme.2013.03.011 **Specification of study:** RCT	80 pts **Inclusion criteria:** - critically ill patients - mechanical ventilation > 24h **Exclusion criteria:** - < 18 years - pregnancy - BMI >35 kg/m2 - pre-existing neuromuscular disease - receiving muscle relaxant - diseases with systemic vascular involvement - technical obstacles that do not allow the implementation of EMS such as bone fractures or skin lesions (e.g. burns) - end-stage malignancy - cardiac pacemakers - cervical spine fractures, hemiplegia, quadriplegia of neurological origin - impaired cognitive state **Per Branch** 40 / 40	2	**NMES**	**No-NMES**	**Outcomes:** - MRC - MV duration - ventilator free survival until day 28 - mortality Day 28	- **MRC** (mean ± SD; control vs. intervention): a. day 2: 50.23 ± 5.51 vs. 49.28 ± 6.88, p = 0.465 b. day 3: 46.43 ± 7.21 vs. 45.25 ± 9.64, p = 0.094 c. day 4: 43.70 ± 9.32 vs. 46.86 ± 10.88, p = 0.041 d. day 5: 40.69 ± 10.48 vs. 45.83 ± 11.39, p = 0.044 e. day 6: 39.63 ± 10.30 vs. 43.00 ± 12.07, p = 0.046 f. day 7: 37.27 ± 13.43 vs. 43.37 ± 9.85, p = 0.049 g. day 14: 32.89 ± 16.89 vs. 37.91 ± 11.14, p = 0.047 h. day 21: 19.60 ± 4.34 vs. 29.67 ± 8.87, p = 0.037 i. day 28: 21.00 ± 9.76 vs. 20.60 ± 5.68, p = 0.091 - **Duration of MV** (mean ± SD; control vs. intervention): 11.97 ± 8.07 vs 9.01 ± 8.01, p = 0.048 - **Ventilator free survival until day 28** (mean ± SD; control vs. intervention): 14.73 ± 9.70 vs. 15.18 ± 9.65, p = 0.421 - **Mortality Day 28**, n (%) (control vs. intervention): 6 (15) vs. 4 (10), p-value not stated	3 (downgraded for high risk of bias)

MRC = medical research council, MV = mechanical ventilation, NMES = neuromuscular electrical stimulation, pts = patients, RCT = randomized controlled trial

NMES increased muscle strength in critically ill patients.

#3082

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
3082 Esperatti 2022 (PMID: 34996496 DOI: 10.1186/s13054-021-03881-2) **Specification of study:** prospective multicenter cohort study	335 pts from 6 ICU centers in Argentine **Inclusion criteria:** - ≥ 18 years with confirmed COVID-19-related ARF - requiring HFNO for at least 4h **Exclusion criteria:** - respiratory failure secondary to a different etiology - decreased level of consciousness - presence of shock requiring vasopressors - immediate need for intubation - use of positive-pressure ventilation prior to HFNO - pts with do-not-intubate orders			**AW-PP:** - ≥ 6 h/day	**No PP**	**Primary endpoint:** - endotracheal intubation - hospital mortality	**Significant differences between groups in :** - endotracheal Intubation: 44 (23%) of AW-PP vs 79 (53%) of no-PP were intubated OR 0,27 (95% CI 0.14-0.47) adjusted OR 0.36 (95% CI 0.2-0.7) - hospital mortality: 21 (11%) of AW-PP vs 47 (32%) No-PP died in hospital OR 0.58 (0.19-1.77) adjusted OR 0.50 (95% CI 0.19-1.31)	3
	Per Branch							
	187	148						

AW-PP = awake prone position, ICU = intensive care unit, PP = prone position, pts = patients

In the study population, AW-PP for ≥ 6 h/day reduced the risk of endotracheal intubation, and exposure ≥ 8 h/d reduced the risk of hospital mortality.

#3083

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
3083 Fazzini 2022 (PMID: 34774295 DOI: 10.1016/j.bja.2021.09.031) **Specification of study:** Systematic review and meta-analysis	14 publications (2.352 pts), 8 prospective cohort studies, 4 retrospective cohort studies, 2 RCTs **Inclusion criteria:** - at least 20 adult pts with hypoxaemic respiratory failure secondary to ARDS or coronavirus - received PP with any oxygen delivery **Exclusion criteria:** - PP in intubated pts - PP combined or mixed to lateral positioning - follow-up < 7 days			**APP**	**SP**	**Primary endpoint:** - change in oxygenation pre and post PP reported as PaO2/FiO2 (P/F) ratio or SpO2/FiO2 (S/ F) ratio **Secondary outcomes**: - rate of tracheal intubation - mortality - adverse events	**Significant differences between groups in:** - improvements of PaO2/FiO2 ratio: MD -23.10; 95% CI: -34.80 to 11.39; p= 0.0001; I^2=26%) after PP - mortality: OR 0.57 (95% CI: 0.36-0.93; P=0.02 I^2=51%) **No significant differences between groups in:** - intubation rates - adverse events	1 → 2 (not only RCTs included)
	Per Branch							
	1041 (44%)	1311 (56%)						

ARDS = acute respiratory distress syndrome, PP = prone position, pts = patients, RCT = randomised controlled study

Prone positioning can improve oxygenation amongst non-intubated patients with acute hypoxaemic respiratory failure when applied for at least 4 h over repeated daily episodes. Awake proning appears safe, but the effect on tracheal intubation rate and survival remains uncertain.

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#3085

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
3085 Ibarra-Estrada 2022 (PMID: 35346319 DOI: 10.1186/s13054-022-03950-0) **Specifikation of study:** RCT	- 430 pts **Inclusion criteria** - aged≥18 years with COVID-19 - pulse oximetry <90% despite receiving oxygen at 15 L/min through a non-rebreather mask - initiated on HFNC **Exclusion criteria:** - severe respiratory failure requiring immediate intubation - do-not-intubate/resuscitate orders - laparotomy within 2 weeks - pregnancy - vasopressor requirement to maintain median arterial pressure >65 mmHg			**Awake prone positioning** + HFNC	**Usual care** + HFNC	**Primary endpoint:** - intubation until day 28 **Secondary outcomes:** - being alive without intubation at day 28 - mortality at 28 days - HFNC duration - use of NIV - time to intubation - days of invasive ventilation - hospital LOS - physiological response to the 1st prone session - AEs	**Primary endpoint:** - intubation until day 28: 65 of 216 (30%); 92 of 214 (43%); [CI95] 0.54–0.90, p=0.006 **Secondary outcomes:** - hospital LOS (11 [IQR 9–14] vs 13 [IQR 10–17] days, p=0.001) - no significant differences in all other outcomes	2
	Per Branch							
	216	214						

CI = confidence interval, HFNC = high-flow nasal cannula, IQR = interquartile range, LOS = length of stay, NIV = non-invasive ventilation, pts = patients, RR = risk ratio

Awake prone positioning seems to have a benefit on intubation rate and hospital length of stay.

#3087

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
#3087 **Kwakman 2022** PMID: 35124345 DOI: 10.1016/j.jcrc.2022.154000 **Specification of the study:** RCT	**Total** 40 pts in a single center **Inclusion criteria:** - MV for ≥48 h - able to follow instructions - bilateral quadriceps muscle strength ≥2 according to the MRC - able to sit unsupported on the edge of the bed **Exclusion criteria:** - contraindications for pt - inability to walk independently prior to ICU admission - ICU readmission amputations or fractures in the lower extremities - cognitive impairments and imminent to death - traumatic brain injury or stroke **Study duration**: till pts able to ambulate with walking aids and minimal physical support for balance assistance **Per Branch** 19 | 21	6 pts(4 intervention :1 death, 3 other reason; 2 usual care: death)	**Bodyweight supported treadmill training:** -daily except on weekend - until the pts were able to ambulate with walking aids - duration of BWSTT individually determined by the performance of the 1st training session - varied between walking just a few steps and walking for several minutes	**Supervised physiotherapy sessions:** - daily - including ambulation training, pulmonary physiotherapy, active strength exercises, transfer training, cycling, balance training, IMT and mobilizing out of bed	**Primary endpoint:** - number of days to independent ambulation **Secondary outcomes:** - maximum walking distance reached during hospital stay (2 Minutes Walking Test) - muscle strength 7 days after inclusion - functional mobility - hospital LOS; - symptoms of posttraumatic stress **Sample size calculation:** using data from two previous studies de-scribing the feasibility of BWSTT and usual care the required sample size was 88 (44 + 44) pts, assuming a 10% dropout rate	**Primary endpoint:** - median (IQR) time to independent ambulation 4 (3 to 7) days in the intervention group, vs 8 (4 to 23) days in the usual care group (p = 0.017), hazard ratio of 2,41 (95%CI, 1.11 to 5.23) **Secondary outcomes:** - hospital LOS shorter (24 days) in the intervention group vs control (42 days) p=0.037 - all other outcomes n.s	2→ 3 (high risk of bias)

BWSTT = bodyweight supported treadmill training, ICU = intensive care unit, LOS = length of stay, MRC = medical research council, MV = mechanical ventilation, pt = physio therapy, pts = patients

BWSTT seems a promising intervention to enhance recovery of ambulation and shorten hospital length of stay of ICU patients, justifying a sufficiently powered multicenter RCT.

#3088

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop -out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
3088 Seo 2019 https://doi.org/10.14474/ptrs.2019.8.3.134 **Specification of the study:** RCT	16 pts admitted to ICU **Inclusion criteria:** - communicative - had no contractures or limitations of the upper limb joints - in the ICU for at least 5 days - able to walk independently before admission to the ICU **Exclusion criteria:** - chronic respiratory failure before admission to the ICU - damage to the leg, pelvis, and back, trauma surgery - severe pressure ulceration, neurological diseases affecting muscle strength - signed a do not resuscitate consent form **Total** **Per Branch** 8 | 8		**Exercise:** - postural and passive or active exercises - 5 days a week - for 30 min during ICU stay	**Bedside ergometer exercise:** - endurance and strength training - 5 days a week -for 30 min during ICU stay	**Primary endpoints:** - muscle strength via MRC - FSS - QoL via SF-36 **Secondary outcomes:** - ICU LOS - duration of MV no power analysis	**Primary endpoint:** - MRC Score [mean (SD)] (pre and post intervention), 10.87 (7.14) exercise vs 5.00 (1.69) ergometer, p = 0.041 - both groups had a significant increase in MRC Score (p<0.05) - FSS [mean (SD)], 6.12 (2.58) exercise vs 1.62 (1.06) ergometer, p = 0.001 - both groups had a significant increase in FSS (p<0.05) - QoL: 71.19 (7.93) exercise vs 41.11 (5.02) ergometer, p=0.001 - ICU LOS, 22.37 (8.86) exercise vs 24.00 (4.27) ergometer, p > 0.05 - duration of MV, 14.50 (7.23) exercise vs 13.50 (4.10) ergometer, p > 0.05	2 → 3 (pilot trial)

FSS = functional status scale, ICU = intensive care unit, LOS = length of stay, MRC = medical research council, MV = mechanical ventilation, pts = patients, QoL= quality of life, RCT = randomized controlled trial, SD = standard deviation, SF-36 = short form 36

Exercise seems to be more effective than bedside ergometer in loss of strength, function and HRQL.

#3090

Reference, Study Type	Cases and Controls (Participant #, characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
3090 Lago 2022 PMID: 35176099 https://doi.org/10.1371/journal.pone.0264068 **Specification of study:** Analysis of two randomized controlled crossover studies	41 pts admitted to a Brazilian University Hospital ICU divided in two sub-studies using a cut-off of 72h: -Acute phase: septic shock < 72h -Late phase: sepsis or septic shock > 72h **Inclusion criteria:** **-**Sepsis or Septic shock. **Exclusion criteria:** -Age ≥ 85y or < 18y, Pregnancy, BMI > 35 kg/m2 -Neuromuscular disease or blocker in the last 24h -Fractures, burns, skin lesions, vascular impairment diseases, severe lower extremity edema -Instability: vital parameters -Presence of chest tubes -Thrombocytopenia < 20.000/mm3, Thromboembolic disease or deep vein thrombosis -Agitation		4 pts in group 1 (3 in the acute phase and 1 in the late phase) excluded due to IC-related issues	**Group 1:** intervention protocol followed by the control protocol -Intervention: pt kept in dorsal decubitus position with headboard lifted at 30° and lower limbs raised at 20°, receiving a 30min NMES on the gastrocnemius muscle to generate visible contraction and articular movement. -Control: same positioning as intervention without NMES. Wash-out period: 4-6h between phases	**Group 2:** control protocol followed by the intervention protocol, with a 4-6h wash-out period	**Endpoints:** measurement through IC during baseline, intervention and control of: - VO2 - EE - VCO2 - RQ	**Ouctomes**: -Intragroup comparison: Within the acute phase group and the late phase group no statistically significant difference was found between baseline, intervention and control measures of VO2, EE and VCO2. The only statistically significant difference was in the acute phase group between RQ at baseline and during intervention (0,70 vs 0,68, p < 0,05) -Intergroup comparison: in the acute phase significantly higher VO2 and EE and significantly lower RQ compared to the late phase	2
	Per Branch							
	Acute phase: 9 pts Late phase: 11 pts	Acute phase: 10 pts Late phase: 11 pts						

Pt = patient, SOFA = Sequential Organ Failure Assessment, MAP = Mean Arterial pressure, HR = Heart Rate, ICP = Intracranial Pressure, NMES = Neuromuscular Electric Stimulation, IC = Indirect Calorimetry, VO2 = Oxygen Consumption, EE = Energy Expenditure, VCO2 = Carbon Dioxide Production, RQ = Respiratory Quotient

Both within and after the first 72h since diagnosis of sepsis or septic shock in the ICU, NEMS does not cause clinically relevant metabolic changes.

#3092

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop -out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
3092 Musso 2022 (PMID: 35488356 DOI: 10.1186/s13054-022-03937-x) **Specification of the study:** controlled non-randomized trial	**243 pts** Study duration: termination of PP after pts had defined PaO2/FiO2 values after 2h of last PP-session **Inclusion criteria:** - acute moderate to severe acute hypoxemic respiratory failure due to SARS-CoV-2 pneumonia - with NIV and prolonged PP **Exclusion criteria:** - consent - pregnancy - hemodynamically unstable or need of urgent endotracheal intubation - palliative care			**PP:** - initiated within 24h after ICU admission - at least 1 PP session lasting > 8h over night	**SP**	**Primary endpoint:** - occurrence of NIV failure within 28 days of enrolment (intubation/death) **Secondary outcome:** - clinical outcomes at day 28	**Primary endpoint:** - NIV failure occurred in 14 (17%) of PP pts vs 70 (43%) of controls , [HR=0.32, 95% CI 0.21–0.50; p<0.0001] **Secondary outcome:** - PP therapy was associated with improved oxygenation and an earlier decline in inflammatory markers and D-dimer	3
	Per Branch							
	81	162						

NIV = non invasive ventilation, PP = prone position, pts = patients, SP = supine position

Early prolonged PP is safe and is associated with lower NIV failure, intubation and death rates in noninvasively ventilated patients with COVID-19-related moderate-to-severe hypoxemic respiratory failure. Early dead space reduction and reaeration of dorso-lateral lung regions predicted clinical outcomes in the study population.

#3098

Reference, Study Type	Cases and Controls (Participant #, characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
3098 Dantas 2012 DOI: 10.1590/S0103-507X2012000200013 Specification of study: RCT	59 pts between February 2009 and February 2011 **Inclusion criteria:** - MV and adequate cardiovascular reserve - < 50% variation in resting HR and SBP <200 mmHg or >90 mmHg - Adequate respiratory reserve - SpO_2 >90% with FiO_2 <60% - No signs of respiratory distress and RR <25 breaths per minute - No physical exercise program prior to study enrollment **Exclusion criteria:** - Intracranial hypertension - Inability to walk without assistance before acute illness in the ICU - Cognitive impairment, neuromuscular disease, stroke - BMI >40, unconsolidated fracture - MV > 7 days - Postoperative recurrence - Cancer therapy in the previous 6 months		31 out of 59 pts dropped out due to death (47%) - Intervention group n = 12 - Control group n = 19 Leaving 14 pts per group	**5-stage mobilization protocol:** - 2x a day - Daily	**Passive mobilization:** - Mobilization of all limbs - 5x week - Active-assisted exercises according to pts improvement and cooperation	**Sample size calculation:** 50 pts per group (Study is underpowered) No primary endpoint defined **Extracted Outcomes:** - Peripheral Muscle Strength (assessed as MRC) - Respiratory Muscle Strength (assessed as MIP and MEP)	**Results:** - MRC Score (Control vs. Intervention): a) Baseline 39.21 ±14.63 vs. 49.29 ± 11.02 (p<0.001) b) After protocol: 40.29 ± 10.51 vs. 55.86 ± 4.4 (p<0.001) - MIP, cmH_2O (Control vs. Intervention): a) Baseline: 67.86 ± 33.72 vs. 52.71 ± 12.69 (p=0.12) b) After Protocol: 73.86 ± 34.26 vs. 66-64 ± 26.44 (p=0.53) - MEP, cmH_2O (Control vs. Intervention): a) Baseline: 61.71 ± 27.83 vs. 47.14 ± 19.14 (p=0.11), b) After Protocol: 62.79 ± 21.50 vs. 59.07 ± 23.95 (p=0.66) - No reporting on adverse events	2 → 3 (under-powered, high risk)
	Per Branch							
	26	33						

Pts = Patients, HR = Heart Rate, SBP = Systolic Blood Pressure, SpO_2 = Saturation of partial oxygen, ICU = Intensive Care Unit, BMI = Body Mass Index, MV = Mechanical Ventilation, MIP = Maximal Inspiratory Pressure, MEP = Maximal Expiratory Pressure

Early Mobilization increases inspiratory and peripheral muscle strength.

#3099

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
3099 KURTOĞLU, 2015 https://doi.org/10.5152/tftrd.2015.04378 **Specification of study:** observational-cohort study	30 pts **Inclusion criteria:** - COPD patients who developed respiratory failure - satisfying the criteria for the need of ICU - followed for at least 24 h in the ICU **Exclusion criteria:** - unstable cardiovascular disease (unstable angina, aortic valve disease) - uncontrolled hypertension - malignancy - liver and/or kidney failure - severe systemic chronic diseases - orthopedic problems (fracture, joint subluxation, etc.) that could interfere with rehabilitation programs - with fever and who are under the probable effects of acute medication changes were not included in the study		- same as control - additional NMES to auxiliary respiratory muscles applied 20min a day	- prescribed upper extremity ROM exercises - passively by a physician - controlled breathing techniques	**Endpoints:** - arterial blood gas measurements - peak heart rate per minute - breathing frequency per minute - oxygen saturation - quality of Life (SGRQ and SF-36) - functional capacity by FIM	**Endpoints:** - arterial blood gas measurements: no results stated - peak heart rate per minute: different between the group on the 15th and 30th days ($p<0.001$, $p=0.008$); between the baseline and 30th day intragroup changes in both groups ($p=0.03$, $p<0.001$) - breathing frequency per minute: 30th day between the groups ($p=0.003$); between the baseline and 30th day intragroup changes in both groups ($p<0.001$) - oxygen saturation: between the groups on the 8th day ($p=0.01$); intervention group between the baseline and the end of the third day ($p=0.005$) - quality of Life (SGRQ and SF-36); SGRQ n.s. different at baseline and 30th day between groups; SF-36, improved to the 30th day in control and intervention groups ($p=0.02$, $p=0.021$) - functional capacity by FIM: all subsets and overall scores improved significantly in both groups from the first day to the last (no p-value stated)	3
	Per Branch						
	15	15					

COPD = chronic obstructive pulmonary disease, FIM = functional independent measurement, ICU = intensive care unit, NMES = neuromuscular electrical stimulation, n.s. = not significant, pts = patients, ROM = range of motion, SF-36 = short form-36, SGRQ = St. George's respiratory questionnaire

This study revealed positive effects of neuromuscular electrical stimulation in addition with therapeutic exercises on the cardiorespiratory system in the short run,

3100

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
3100 Shen 2017 (https://www.sciencedirect.com/science/article/pii/S1873959817300169) **Specification of study:** pilot RCT	**Total** 25 pts **Inclusion criteria:** - adults with sepsis (20-90 years) - MV for longer than 72h **Exclusion criteria:** - skin defect or infection around the thighs - acute myocardial infarction within one week - life-threatening cardiac arrhythmia - pregnancy - dying pts with life expectance shorter than 1 month - severe encephalopathy with coma + no spontaneous breath drive - uncontrolled seizure - patient is fully awake and has adequate muscle power to cooperate active limb exercise - air-born contagious diseases (eg. tuberculosis, influenza) - moderate to severe adult respiratory distress syndrome with requirement of neuromuscular blocker - pts with ECMO **Per Branch** EMS group (n=18) / Control group (n=7)	7 (6 EMS group: expired /dropped, 1 control group expired)	**electric muscle stimulation** (both quadriceps and biceps, 32 min with minimal voltage, 5x/week)	**Passive mobilisation** (arm biceps or thigh quadriceps limb)	**Primary outcome:** - duration of MV **Secondary outcome:** - mortality - hand grip strength	**Primary outcome:** - mean duration of MV was 6 days (IQR 6-15) in control group and 6.5 days (IQR 5-10) in EMS group (p = 0.85): n.s. **Secondary outcomes:** - hospital mortality was not different in both groups (p = 1.0) - 8/25 (32%) could perform hand grip strength test; 2-5 kg hand strength were measured; handgrip result much lower than normal reference (20-33 Kg for population older than 70 years-old)	2 → 3 (pilot RCT)

ECMO = extracorporeal membrane oxygenation, EMS = electrical muscle stimulation, MV = mechanical ventilation, n.s. = not significant, pts = patients

EMS did not reduce duration of mechanical ventilation or mortality.

#3101

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
3101 McCaughey 2019 (PMID: 31340846 DOI: 10.1186/s13054-019-2544-0) **Specification of study:** RCT	20 pts **Inclusion Criteria:** - ≥ 18 years of age - dependent on MV due to critical illness **Exclusion Criteria:** - expected to be ventilated for < 24 hours - already ventilated for > 72 hours - pregnant - non- pharmacological paralysis (e.g. spinal cord injury) - physical obstacles that prevent abdominal FES (e.g. abdominal trauma, pacemaker), - diagnosed terminal illness - no response to abdominal FES (e.g. lower motor neuron impairment or obese) - abdominal surgery within 4 weeks prior to potential inclusion			**Breath synchronized NMES:** - of the abdominal muscles -30 min 2x day - 5 days a week	**Sham**	**Primary endpoint:** - feasibility **Secondary outcomes:** - change from baseline in rectus abdominis thickness (mm) - change from baseline in diaphragm thickness (mm) - change from baseline in rectus abdominis thickness (mm) - change from baseline in combined lateral abdominal muscle thickness (mm) - change from baseline in external oblique thickness (mm) - change from baseline in internal oblique thickness (mm) - change from baseline in transversus abdominis thickness (mm) - duration of MV (days) - ICU LOS (days) - mortality	**Primary endpoint:** - feasibility (Session compliance in %, median [IQR]: control 97.2 [7.4] vs intervention 92.1 [5.77], p = 0.384 **Secondary outcomes:** - change from baseline in rectus abdominis thickness (mm): n.s - change from baseline in diaphragm thickness (mm): n.s - change from baseline in combined lateral abdominal muscle thickness (mm): n.s - change from baseline in external oblique thickness (mm): n.s - change from baseline in internal oblique thickness (mm): n.s - change from baseline in transversus abdominis thickness (mm): only significant difference on day 3: MD (95%CI): 1.04 (.10 – 1.98), p = 0.032 - duration of MV (days), median: control not estimable, intervention 11, p = 0.011 - mortality: values not stated, p = 0.629	2
	Per Branch							
	10	10						

FES = functional electrical stimulation, MV = mechanical ventilation, NMES = neuromuscular electrostimulation, pts = patients, RCT = randomized control trail

ICU length of stay and duration of mechanical ventilation duration were shorter in the abdominal FES than the control group.

#3102

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
3102 Abdellaoui 2011 (PMID: 21349913 DOI: 10.1183/09031936.00167110) **Specification of study:** RCT	15 pts **Inclusion criteria:** - acute exacerbation COPD Stage 2 (forced expiratory volume in one second/forced vital capacity ,70%) - ICU admission - < 75 years of age - BMI < 30 kg/m^2 - no locomotor or neurological condition or disability that could limit the ability to perform - no pacemaker		17 pts included -> 2 dropouts due to 1 readmission to ICU and 1 withdrew consent	**NMES**	**Sham-NMES**	**Derived outcomes:** - MVC - 6MWD - muscle fiber size - adverse events	**Derived outcomes:** - MVC (kg), median [IQR]: control 3 [1 – 5] vs intervention 10 [4.7 – 11.5], p = 0.02 -6MWD (meter), median [IQR]: control 58 [43 – 115] vs intervention 165 [125 – 203], p = 0.008 - muscle fiber size (Type I): p = 0.009 in favor of NMES - muscle fiber size (Type IIx): p = 0.16 - no adverse events	2
	Per Branch							
	9	6						

ICU = intensive care unit, MVC = maximal voluntary contraction, NMES = neuromuscular electrostimulation, pts = patients, RCT = randomized control trial, 6MWD = 6-min walking distance

Following COPD exacerbation, NMES is effective in counteracting muscle dysfunction and decreases muscle oxidative stress.

#3103

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
3103 Gerovasili 2009 (PMID: 19814793 DOI: 10.1186/cc8123) **Specification of study:** Randomized study	49 pts **Inclusion criteria:** **-** ICU pts - APACHE II > 13 at admission **Exclusion criteria:** - < 18 years - pregnancy - obesity (BMI >35 kg/m2) - brain death - preexisting neuromuscular disease (e.g. myasthenia gravis, Guillain-Barré) - diseases with systemic vascular involvement such as lupus erythematosus -technical obstacles that did not allow the implementation of EMS such as bone fractures or skin lesions (e.g. skin burns) - end- stage malignancy - pacemakers - ICU stay < 48 hours		23pts/46.9% (10 pts died, 12 excluded due to oedema, 1 technical reasons)	**NMES**	**Sham-NMES**	**Derived outcomes:** - cross sectional diameter change between randomization and day7/8 via ultrasound - duration of MV	**Significant changes between groups in:** - cross sectional diameter change M. rectus femoris right (cm), mean ± SD: control -0.21 ± 0.10 vs intervention -0.11 ± 0.06, p = 0.009 - cross sectional diameter change M. rectus femoris left (cm), mean ± SD: control -0.19 ± 0.16 vs intervention -0.13 ± 0.10, p = 0.07 -cross sectional diameter change M. vastus intermedius right (cm), mean ± SD: control -0.10 ± 0.05 vs intervention -0.11 ± 0.06, p = 0.034 - cross sectional diameter change – M. vastus intermedius left (cm), mean ± SD: control -0.22 ± 0.26 vs intervention -0.09 ± 0.05, p = 0.018 **No significant differences between groups in:** - duration of MV (days), mean ± SD control: 9 ± 3 vs intervention 9 ± 2	3
	Per Branch							
	24	25						

ICU = intensive care unit, MNES = neuromuscular electrostimulation, MV = mechanical ventilation, pts = patients

NMES reduces muscle loss measured via ultrasound in the ICU.

#3104

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
3104 Karatzanos 2012 (PMID: 22545212 DOI: 10.1155/2012/432752) **Specification of study:** Secondary analysis of RCT	142 **Inclusion criteria:** - ICU pts - APACHE II at admission ≥ 13 **Exclusion criteria:** - < 18 years - pregnancy - obesity (BMI >35 kg/m2) - brain death - preexisting neuromuscular disease (e.g. myasthenia gravis) - diseases with systemic vascular involvement such as lupus erythematosus - technical obstacles that did not allow the implementation of EMS such as bone fractures or skin lesions (e.g. skin burns) - end- stage malignancy - pacemakers - ICU stay < 48 hours		90 pts/63.3% EMS group - 28 died - 11 impaired cognitive state - 7 dropouts Control group - 22 died - 22 impaired cognitive state	**NMES**	**Sham-NMES**	**Derived outcomes:** - MRC score - hand grip strength	**Derived outcomes:** - MRC score, median [IQR]: control 52 [40-58] vs intervention 58 [51-60], p = 0.04 - hand grip strength (kg), mean ± SD: control 14.8 ± 10.7 vs intervention 21.4 ± 10.8, p = 0.18	4
	Per Branch							
	70	72						

EMS = electrical muscle stimulation, ICU = intensive care unit, MRC = Medical Research Council, NMES = neuromuscular electrostimulation

NMES improves muscle strength in ICU patients.

#3106

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
3106 Gruther 2010 (PMID: 20549166 DOI: 10.2340/16501977-0564) **Specification of study:** RCT	**Total** 46 pts **Inclusion criteria:** - ICU pts - >19 years of age **Exclusion criteria:** - ICU stay <14 days - highly trained athletes (muscle layer thickness total > 10 cm) - implantable cardioverter defibrillators - neuromuscular disorders - myopathy - paresis of the stimulated muscles - epilepsy - allergic reactions to the electrodes - peripheral oedemas counteracting NMES - heavy ischemia of the lower extremities - BMI > 30 - incisions or open wounds on the leg that might be stressed **Per Branch** 23 | 23	13 pts (no reasons stated)	**NMES** - M. vastus intermedius and M. rectus femoris - 1 session/day - 5 session/week - Total of 4 weeks 2 groups: - acute patients n = 8 - long-term patients n = 8	**Sham-NMES** - low currency to avoid muscle contraction 2 groups: - acute patients n = 9 - long-term patients n = 9	**Outcome:** MLT difference between baseline and week 4 by ultrasound	**Outcome:** MLT at baseline (Mean, SD): - acute patient group a) intervention: 28.9 (6.6), p-value not stated b) control: 32.9 (9.7), p-value not stated - long-term patient group: a) 18.4 (4.2), p-value not stated b) 18.6 (5.9), p-value not stated MLT after 4 weeks (Mean, SD): - acute patient group a) intervention: 18.3 (3.2), p = 0.002 b) control: 20.1 (5.4), p < 0.001 - long-term patient group a) 19.3 (3.8), p = 0.036 within-group comparison, p = 0.013 between-group comparison b) 18 (5.8), p-value not stated	2 → 3 (down-graded)

BMI = body mass index, ICU = intensive care unit, MLT = muscle layer thickness, NMES = neuromuscular electrical stimulation, pts = patients, RCT = randomized controlled trial

NMES has a positive effect on muscle layer thickness when started late.

#3107

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
3107 Zanotti 2003 (PMID: 12853536 DOI: 10.1378/chest.124.1.292) **Specification of study:** RCT	24 pts **Inclusion criteria:** - chronic hypercapnic respiratory failure due to COPD - invasive MV via a tracheostomy - presence of severe peripheral muscle atrophy - clinically stable state **Exclusion criteria:** - treated with systemic corticosteroids and neuromuscular blocking agents for > 5 days while in the ICU - history of diseases other than COPD - neurologic disease - need for treatment with systemic steroids during the rehabilitation period			**ES + ALM** - surface electrodes positioned bilaterally on the quadriceps femoris and vastus glutei muscles - stimulation duration 30 min	**ALM**	**Primary outcomes:** - peripheral muscle strength assessed with MRC score **Secondary outcomes:** - cardiorespiratory function: a) SpO_2 b) HR c) RR - number of days needed to transfer from bed to chair	**Primary outcome:** - no statistically significant differences in baseline strength between groups. - MRC increase, mean ± SD (control vs. intervention): 1.25 ± 0.75 vs. 2.16 ± 1.02; p = 0.02 **Secondary outcome:** - no statistically significant differences in SpO_2, HR and RR between groups. - number of days needed to transfer from bed to chair, mean ± SD (control vs. intervention): 14.33 ± 2.53 vs. 10.75 ± 2.41; p = 0.001	2 → 3 (high risk of bias)
	Per Branch							
	12	12						

ALM = standard physical rehabilitation protocol of active limb mobilization, ES = electrical stimulation, HR = heart rate, MRC = medical research council, RR = respiratory rate, SpO_2 = saturation of inspired oxygen

NMES improves muscle strength in ICU patients and shortens the number of days needed to enable transfer from bed to chair.

#3108

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
3108 Meesen 2010 (PMID: 21992890 DOI: 10.1111/j.1525-1403.2010.00294.x) **Specification of study:** partially randomized controlled trial with intraindividual element	25 pts **Inclusion criteria:** - day after admission - expected prolonged sedation and ventilation **Exclusion criteria:** - still able to move their limb actively despite the sedation - signs of recent ischemia or infarction < 7 days ago - severe orthopedic or vascular damage - augmented risks for NMES - open wounds, hemodialysis, or an arterial catheter at the stimulation area		6pts (no reasons stated)	**NMES** - electrodes placed on m. rectus femoris and m. vastus medialis - duration of stimulation 30 min	**No NMES**	**Outcomes:** - muscle mass modeled from thigh circumference - cardio-respiratory parameters a) HR b) RR c) SpO_2 d) DBP	**Outcomes:** - muscle mass, mean ± SD a) *intervention group;* stimulated leg: 0.035 ± 0.015; p < 0.0001 b) *intervention group;* non-stimulated leg: -0.027 ± 0.015; p < 0.0001 c) *control group:* -0.025 ± 0.014; p < 0.0001 - muscle mass, type 3 test of fixed effects: a) intervention group: stim. leg vs. non-stim. leg: 0.062; p < 0.0001 b) intervention vs. control: 0.060; p < 0.0001 - cardiorespiratory parameters: no significant differences between groups	2 → 3 (pilot and some concern risk)
	Per Branch							
	11	14						

DBP = diastolic blood pressure, HR = heart rate, NMES = neuromuscular electrical stimulation, Non-stim. = non-stimulated, RR = respiratory rate, SpO_2 = saturation of inspired oxygen, Stim. = stimulated

NMES increases muscle mass in ICU patients.

#3109

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
3109 Poulsen 2011 (PMID: 21150583 DOI: 10.1097/CCM.0b013e318205c7bc) **Specification of study:** Intraindividual RCT	8 pts **Inclusion criteria:** - septic shock - ICU pts **Exclusion sriteria:** - focus on infection in or trauma to the lower extremities - predicted ICU stay of < 7 days - severe respiratory or circulatory instability that precluded transportation to CT scan - BMI > 35 kg/m^2 - diabetic complications			**NMES**	**No NMES**	**Primary endpoint:** - muscle volume change via CT	**Primary endpoint:** - muscle volume change (%), median [IQR]: control - 2.3 [-0.6 – -3.1] vs intervention-2.9 [-0.4 – -3.6], p = 0.12	2 → 3 (pilot and some concern risk)
	8							

BMI = body-mass-index, ICU = intensive care unit, IQR = interquartile range, NMES = neuromuscular electric stimulation, pts = patients, RCT = randomized controlled trial

NMES improves muscle mass in ICU patients.

#3110

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
3110 Rodriguez 2012 (PMID: 21715139 DOI: 10.1016/j.jcrc.2011.04.010) **Specification of study:** RCT - intraindividual	16 pts **Inclusion criteria:** - 18 years or older - sepsis - requiring MV ≥ 1 organ failure other than respiratory dysfunction within 48 hours of admission according to a SOFA ≥ 3 **Exclusion criteria:** - previous or ongoing neurologic diseases -orthopedic injuries that could interfere with evaluation of strength - cardiac pacemakers - metallic prosthesis - previous immobilization for > 5 days - pregnancy - need of neuromuscular blockers infusion - high risk of imminent death - previous poor performance status with an Eastern Cooperative Oncology Group score > 2			**NMES**	**No NMES**	**Primary outcomes:** - MRC score - arm circumference change - thigh circumference change - M. biceps brachii thickness ultrasound	**Primary outcomes:** MRC score at awakening: - biceps, median [IQR]: control 3 [1 – 4] vs intervention 3 [2 – 4], p = 0.014 - quadriceps, median [IQR]: control 2 [2 – 3] vs intervention 3 [2 – 3], p = 0.025 - quadriceps + biceps, median [IQR]: control 5 [3 – 6] vs intervention 6 [6 – 7], p = 0.009 MRC at last day of NMES: -biceps, median [IQR]: control 3 [2 – 4] vs intervention 4 [3 – 4], p = 0.005 - quadriceps, median [IQR]: control 3 [2 – 3] vs intervention 3 [3 – 4], p = 0.034 - quadriceps + Biceps, median [IQR]: control 6 [4 – 7] vs intervention 7 [5 – 8], p = 0.009 - arm circumference change (cm): control and intervention values not stated, p = 0.615 - thigh circumference: control and intervention values not stated, p = 0.979 - M. biceps brachii thickness: control and intervention values not stated, p = 0.290	2 → 3 (pilot trial)
	8	8						

MV = mechanical ventilation, NMES = neuromuscular electric stimulation, pts = patients, RCT = randomized controlled trial

NMES improves muscle strength in ICU patients.

#3111

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
3111 Hirose 2013 (PMID: 23561945 DOI: 10.1016/j.jcrc.2013.02.010) **Specification of study:** Cohort Study	**Total** 15 pts **Inclusion criteria:** - coma within the first 24 hours of hospitalization - first-time stroke or TBI - no other associated thoracic or abdominal injury - age between 16 and 75 years - paralysis of one or both lower limbs - ability to live independently before the acute - brain insult - no known muscle disease **Per Branch** 9 | 6		**NMES**	**No NMES**	**Primary endpoint:** - CT-CSA for the lower limb	**Significant differences between groups in:** - CT-CSA on day 14 (%) - M. quadriceps femoris, mean ± SD: control 87.5 ± 2.8 vs intervention 98.7 ± 2.4, p < 0.00 - M. biceps femoris, mean ± SD: control 87.5 ± 4.5 intervention 99.8 ± 2.7, p < 0.001 - M. tibialis anterior, mean ± SD: control 87.8 ± 5.8 intervention 101.2 ± 2.7, p < 0.001 - M. Gastrocnemius, mean ± SD: control – 89.1 ± 4.8 intervention 99.3 ± 2.0, p < 0.001	3 → 4 (small sample size)

CS = cross sectional area, NMES = neuromuscular electric stimulation, TBI = traumatic brain injury

NMES improves muscle mass in ICU patients.

#3113

Reference, Study Type	Cases and Controls (Participant #, Characteristics) Total	Recommendations
3113 Berry A 2017 https://aci.health.nsw.gov.au/__data/assets/pdf_file/0005/239783/ACI17131_PAM_Guideline.pdf **Specification of study:** Clinical guideline	SR of 35 studies in 2015: (3 case series, 10 cohort, 2 diagnostic, 3 observational, 4 QA, 7 SR, 6 RCT studies) **Inclusion criteria:** - adult pts in ICU receiving MV **Definition of EM** Development of a PAM program for critically ill adult ICU pts from the time of admission until discharge	**Assessment and clinical practice** 1. A dedicated physical activity and movement program should be implemented to aid in the recovery of critically ill pts. 2. Early physical activity and movement is feasible and safe for critically ill pts and should be incorporated into usual practice. 3. All patients admitted to the ICU should be screened on a daily basis for inclusion in a PAM program. This assessment should be documented in the patient's medical record. Where feasible this screening should occur within 24 hours of admission. 4. The program, based on the patient's current activity level, should be developed in consultation with a multidisciplinary team. 5. In addition to the physical benefits PAM should be implemented to support patients' psychosocial needs and reduce concerns such as anxiety, depression and sleep disorders/disturbances that may impact the patient after discharge from the ICU. 6. The minimum human resources for safely ambulating the ventilated patient must be three staff members, one of whom is experienced and will act as team leader. The actual number of staff will be based on pre-mobility assessment. A Medical Officer with accreditation in advanced airway skills must be available on site. 7. The equipment that may be required includes a portable ventilator and/or manual resuscitator bag, portable suction and oxygen, IV pole, monitoring equipment, a walking frame and a wheelchair to follow. 8. The development of a dedicated multidisciplinary team is essential for the successful implementation and maintenance of a patient physical activity and movement plan. **Infection prevention** 9. Clinicians are to undertake a risk assessment to identify the risk of contamination and mucosal or conjunctival splash injuries during PAM activities. PPE (including goggles/face shield/gloves and gown/apron) as per NSW 2007 Infection Control Policy are to be worn according to this risk assessment. 10. Clinicians must adhere to the Five Moments of Hand Hygiene. 11. To reduce the risk of microbial transmission, equipment utilized for each patient must be cleaned as per the NSW Infection Control Policy and ASA Standard 4187 prior to and following use. **Work, health and safety** 12. Clinical staff undertaking patient physical activity and movement must undertake a risk assessment of the intended activity/ies to protect the health and safety of the patient and all staff involved. **Governance** 13. Education and training should be given to key stakeholders regarding the benefits/importance of physical activities and movement in the ICU patient. 14. Medical, nursing or physiotherapy ownership of a patient physical activity and movement plan should be determined. 15. Hospital executive support, in terms of management/budgetary maintenance of a patient physical activity and movement program, should be available. 16. Evaluation of a patient physical activity and movement program should occur following implementation, with regular audits for compliance conducted as a component of the ICU's routine quality improvement program. A number of valid and reliable ICU specific outcome measures are available to assist evaluation process.

ICU = intensive care unit, MV = mechanical ventilation, PAM = physical activity and movement, pts = patients, QA = quality assurance, RCT = randomized controlled trial, SR = systematic review

#3114

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
3114 Prasobh 2021 (DOI: 10.1097/JAT.0000000000000140) https://journals.lww.com/jacpt/fulltext/2021/01000/early_mobilization_of_patients_receiving.6.aspx **Specification of study:** Systematic Review	5 publications (3 retrospective cohort, 2 prospective cohort, 528 pts) **Inclusion criteria:** - clinical trials and cohort studies - outcome mobilization and safety of critically ill patients - receiving vasoactive drugs (2010-2018) **Exclusion criteria:** - did not report number of pts receiving vasoactive drugs or the number of mobilization sessions **Per Branch**		Early mobilisation	Bed rest or immobilized	**Primary endpoint:** - safety of early mobilization of patients on vasoactive drugs (adverse events) - relationship between dosage of vasoactive drugs and level of mobility achieved	**Primary endpoint:** - no severe adverse events (such as fall to the ground, cardiac arrest, unplanned extubation) - hypotension most commonly cited adverse event - no evidence on specific doses of vasoactive drugs allowing safe mobilization	1 → 3 (not only RCTs, no metaanalysis)

Evidence determining specific doses of vasoactive drugs that would allow safe mobilization of patients in critical care is lacking

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#3116

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
3116 Nakamura 2020 (PMID: 32800385 DOI: 10.1016/j.clnu.2020.07.036) **Specification of study:** RCT	117 pts **Inclusion criteria:** **-** admitted to the ICU **Exclusion criteria:** - < 20 years - unable to use EN - lower limb injury including infection - amputation and limb ischemia - death before day 10 - early expected discharge from ICU - DNR or early death prognosis - CT-unable cases - ECMO - pacemaker - inability to obtain informed consent - Included in other trials - physicians advise against inclusion		Without EMS: 9 pts. excluded after randomization (death, discharged alive earlier) With EMS: 8 pts. Excluded after randomization (death, discharged alive earlier)	**Rehabilitation:** - with belt-type EMS - either high protein or medium protein	**Standard rehabilitation:** - high protein or medium protein	**Primary endpoint:** **-** femoral muscle volume change **Secondary outcomes:** - FSS-ICU at hospital discharge - Barthel at ICU discharge - EQ-5D at hospital discharge - ICU and hospital LOS - MV days - ADL and quality of life scores - 28-day survival rate - duration of EN, oral intake restart, EN failure - diarrhea and vomiting events - PIICS criteria - pneumonia during stay	**Primary endpoint:** **-** femoral muscle volume loss 12.9 ± 8.5% in the high-protein group and 16.9 ± 7.0% in the medium-protein group (p = 0,0059) - muscle volume loss was significantly less in the high-protein group only during the EMS period (no declared p-value) **Secondary outcomes:** - no significant difference in ADL, FSS-ICU, Barthel-Index, QOL sore, survival rate, ICU and hospital LOS, duration of MV, EN failure, vomiting, diarrhea or pneumonia occurrence - proportion of PIICS lower in high-protein group compared to medium-protein group (11.7% vs. 26.3%, p = 0.041) (Based on protein differentiation)	2
	Per Branch							
	69: 38 high 31 medium protein	65: 30 high 35 medium protein						

ADL = activities of daily living, DNR = do not resuscitate, ECMO= extracorporeal membrane oxygenation, EMS = electrical muscle stimulation, EN = enteral nutrition, ICU = intensive care unit, LOS = length of stay, pts = patients, QOL = quality of life

A high protein delivery target provides greater benefit for muscle volume maintenance than medium protein delivery, but only with active early rehabilitation using belt-type EMS.

#3118

Reference, Study Type	Cases and Controls (Participant #, characteristics) Total	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
3118 Abrams 2022 PMID: 34077700 https://doi.org/10.1513/AnnalsATS.202102-151OC **Specification of study:** A retrospective study	1 center from April 2009 to January 2020 → 177 pts., 2706 APT session **Inclusion criteria:** -≥ 18 years old -APT while receiving VV- or VA-ECMO **Exclusion criteria:** -not perform any APT while receiving ECMO support **Per Branch** 177	n/a	**APT**	**n/a**	No sample size calculation (retrospective study) **Primary Endpoints:** - achieving any out-of-bed activity (IMS score ≥4, including standing, marching on the spot or walking) vs. only IBPT activity during ECMO support **Secondary Endpoints:** -frequency and intensity of mobilization with femoral cannulation (based on IMS score achieved) -AEs	**Primary Results:** - 138 patients (78%) achieving out-of-bed activity **Secondary Results:** -108 (61%) pts. ambulated (1284 sessions), 34 of whom had femoral cannulae (250 sessions) -Bridge-to-transplant (OR 17.2, 95% CI [4.12–72.1]), VV ECMO (OR 2.83, 95% CI [1.29–6.22]), later cannulation year (OR 1.65, 95% CI [1.37–1.98]) and higher CCI (OR 1.53, 95% CI [1.07–2.19]) associated with increased odds of achieving OOB vs. IBPT, whereas invasive MV (OR 0.11, 95% CI [0.05-0.25]) and femoral cannulation (OR 0.19, 95% CI [0.04–0.92) associated with decreased odds of performing OOB activities -AEs occurred in 2% of sessions	4

pts. = patients; APT = active physical therapy; VV = veno-venous; VA = veno-arterial; ECMO = extracorporeal membrane oxygenation; ICU = Intensive Care unit; IMS = ICU Mobility Scale; IBPT = in-bed physical therapy; OR = odds ratio; CCI = charlson comorbidity index; OOB = out-of-bed; MV = mechanical ventilation; AE = Adverse events

Physical therapy with femoral cannulation is safe and feasible, and complications related to mobilization are uncommon.

No detailed assessment was carried out because higher-quality evidence is available on this topic.

#3120

Reference, Study Type	Cases and Controls (Participant #, characteristics) Total	Recommendations

3120 NICE 2009 (www.nice.org.uk/guidance/cg83)
 	
Specification of study: Clinical guideline
	n = 15 publications
	
	Inclusion criteria:
	- adults with rehabilitation needs as a result of a period of critical illness that required level 2 and level 3 critical care
	
	Exclusion criteria:
	- adults receiving palliative care
	- clinical subgroups of patients whose specialist rehabilitation needs are already routinely assessed and delivered as part of their care pathway
	
	Definition of EM
	
	No definition of EM
		Key recommendations regarding rehabilitation:
		- ensure the short-term and medium-term rehabilitation goals are reviewed, agreed and updated throughout the patient's rehabilitation care pathway.
		- ensure the delivery of the structured and supported self-directed rehabilitation manual, when applicable.
		- during the patient's critical care stay:
		  ○ as early as clinically possible, perform a short clinical assessment to determine the patient's risk of developing physical and non-physical morbidity
		  ○ for patients at risk of physical and non-physical morbidity, perform a comprehensive clinical assessment to identify their current rehabilitation needs. This should include assessments by healthcare professionals experienced in critical care and rehabilitation.
		  ○ for patients at risk, agree short-term and medium-term rehabilitation goals, based on the comprehensive clinical assessment. (The patient's family and/or carer should also be involved.)
		  ○ the comprehensive clinical assessment and the rehabilitation goals should be collated and documented in the patient's clinical records.
		  ○ for patients at risk, start rehabilitation as early as clinically possible, based on the comprehensive clinical assessment and the rehabilitation goals. Rehabilitation should include:
		  ▪ measures to prevent avoidable physical and non-physical morbidity, including a review of previous and current medication
		  ▪ an individualized, structured rehabilitation program with frequent follow-up reviews. The details of the structured rehabilitation program and the reviews should be collated and documented in the patient's clinical records.
		- before discharge from critical care:
		  ○ for patients who were previously identified as being at low risk, perform a short clinical assessment before their discharge from critical care to determine their risk of developing physical and non-physical morbidity
		  ○ for patients at risk, and patients who started the individualised, structured rehabilitation programme in critical care, perform a comprehensive clinical reassessment to identify their current rehabilitation needs. The comprehensive reassessment should pay particular attention to:
		  ▪ Physical, sensory and communication problems
		  ▪ Underlying factors, such as pre-existing psychological or psychiatric distress
		  ▪ Symptoms that have developed during the critical care stay, such as delusions, intrusive memories, anxiety, panic episodes, nightmares, flashback episodes or depression (see the NICE guideline on the prevention, diagnosis and management of delirium).
		  ○ for patients who were previously identified as being at risk during critical care, the outcomes of the comprehensive reassessment should inform the individualised, structured rehabilitation programme
		  ○ for patients at risk, agree or review and update the rehabilitation goals, based on the comprehensive reassessment. The family and/or carer should also be involved, unless the patient disagrees.
		  ○ ensure that the transfer of patients and the formal structured handover of their care are in line with the NICE guideline on acutely ill patients in hospital. This should include the formal handover of the individualised, structured rehabilitation programme.
		  ○ give patients the following information before, or as soon as possible after, their discharge from critical care. Also give the information to their family and/or carer, unless the patient disagrees.
		  ▪ information about the rehabilitation care pathway.
		  ▪ information about the differences between critical care and ward-based care. This should include information about the differences in the environment, and staffing and monitoring levels.
		  ▪ information about the transfer of clinical responsibility to a different medical team (this includes information about the formal structured handover of care recommended in the NICE guideline on acutely ill patients in hospital.
		  ▪ if applicable, emphasise the information about possible short-term and/or long-term physical and non-physical problems that may require rehabilitation.
		  ▪ if applicable, information about sleeping problems, nightmares and hallucinations and the readjustment to ward-based care.

EM = early mobilization

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#3121

Reference, Study Type	Cases and Controls (Participant #, Characteristics)		Drop -out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total							
3121 ECMO-PT Study Investigators, 2020 (PMID: 32179935 DOI: 10.1007/s00134-020-05994-8) **Specification of the study:** Pilot RCT	20 pts **Inclusion criteria**: - ≥18 years - functionally independent prior to current admission - va-ECMO or VV-ECMO for at least 24h **Exclusion criteria:** - in ICU > 5 days prior to commencement of ECMO - received ECMO < 72h - not expected to recover physical function in 90 days - unable to communicate in English			**Early goal-directed physiotherapy**	**Standard care physiotherapy**	**Primary endpoint:** - feasibility (increased duration of activity and higher IMS) - safety (adverse and serious adverse events) **Secondary outcomes:** - strength measured with MRC score - KATZ ADL - ICU and hospital LOS ICU and hospital mortality	**Primary endpoint:** - total time of EM higher in intervention (133 (82-220) vs. 27.5 (20.4-31) minutes, p = 0,002) - no increase in medium level of mobilization (IMS 2.67 (0 – 5.3) vs. 1.5 (1 – 4.7)) -two safety events in each group **Secondary outcomes:** - no difference for ICU LOS and mortality - increased functional independence in intervention (Katz activities of daily living 6 [6–6] vs. 5 [4, 5])	2 → 3 Small pilot RCT
	Per Branch							
	10	10						

ECMO = extracorporeal membrane oxygenation, ICU = intensive care unit, IMS = intensive care unit mobility scale, KATZ ADL = Katz index of independence in activities of daily living, LOS = length of stay, MRC = medical research council, pts = patients, VA = venous arterial, VV = venous venous

Early mobilizstion was safe and feasible. In the intervention group, there was a signal for improved functional independence in the activities of daily living at hospital discharge

#3122

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Recommendations
	Total	
3122 Murray 2016 (PMID: 27755068 DOI: 10.1097/CCM.0000000000002027) **Specification of Study:** Clinical Practice Guideline	6 studies **Inclusion criteria:** patients receiving continuous infusions of a NMBA	**Should patients receiving continuous infusions of a NMBA receive physiotherapy to improve mortality, quality of life, or exercise capacity?** **recommendation**: we suggest that patients receiving a continuous infusion of NMBA receive a structured regimen of physiotherapy (weak recommendation, very low quality of evidence)
	Definition of EM	
	No definition of EM	

EM = early mobilisation, NMBA = neuromuscular blocking agent

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#3123

Reference, Study Type	Cases and Controls (Participant #, Characteristics)	Drop-out Rate	Intervention	Control	Optimal Population	Primary Results	Evidence Grade
	Total						
Barnes-Daly 2016 (PMID: 27861180 DOI: 10.1097/CCM.0000000000002149) **Specification of study:** prospective cohort study	6.064 ventilated and non-ventilated general medical and surgical ICU patients enrolled between January 1, 2014, and December 31, 2014 **Inclusion criteria (not clearly defined)** - surgical ICU patients - adults **Exclusion criteria** - active ethanol/drug withdrawal - open abdomen - significant hemodynamic or respiratory instability - new coronary ischemia - therapeutic neuromuscular blockade - intubation within the previous 6 hours without stabilization		**Total and partial bundle compliance (daily measured)** - **ABCDEF** bundle compliance accounting for total compliance (all or none) or for partial compliance ("dose" or number of bundle elements used) - **A**= Assess, prevent, and manage pain; **B**= Both spontaneous awakening trials (SATs) and spontaneous breathing trials (SBTs); **C**= Choice of Sedation/Analgesia; **D**= Delirium monitoring and management; **E**= Early mobility and exercise; **F**= Family engagement and empowerment	No control group	**Outcome** (not clearly defined) - hospital mortality -delirium-free days - coma-free days	<u>hospital mortality:</u> n = 586 [9.7%] - for every 10% increase in total bundle compliance: 7% higher odds of hospital survival (odds ratio, 1.07; 95% CI, 1.04–1.11; p < 0.001) - for every 10% increase in partial bundle compliance: 15% higher hospital survival (odds ratio, 1.15; 95% CI, 1.09–1.22; p < 0.001) - delirium- and/or coma-free days mean (95% CI): 1.61 (1.55–1.67) - with both total bundle compliance: incident rate ratio, 1.02; 95% CI, 1.01–1.04; p = 0.004 - with partial bundle compliance: incident rate ratio, 1.15; 95% CI, 1.09–1.22; p < 0.001	3
	Per Branch						
	N=6064						

CI = confidence interval, ICU= intensive care unit

Higher bundle compliance was independently associated with improved survival and more days free of delirium and coma after adjusting for age, severity of illness, and presence of mechanical ventilation.

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