VOUS ETES LE MAILLON FAIBLE !

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réanimation 2025
PARIS 11-13 JUIN

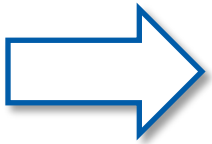
JE N'AI PAS DE CONFLIT D'INTERET A DECLARER EN RAPPORT AVEC CETTE PRESENTATION

INTRODUCTION

WHO IS CANDIDATE FOR THE WEAKEST LINK ?

INTRODUCTION

WHO IS CANDIDATE FOR THE WEAKEST LINK ?



RISK FACTORS FOR ICUAW ?

GRAND ROUNDS
AT THE JOHNS HOPKINS HOSPITAL

Mobilizing Patients in the Intensive Care Unit

Improving Neuromuscular Weakness and Physical Function

Early mobilization of patients in the hospital and the intensive care unit has a strong historical precedent. However, in more recent times, deep sedation and bed rest have been part of routine medical care for many mechanically ventilated patients. A growing body of literature demonstrates that survivors of severe critical illness commonly have significant and prolonged neuromuscular complications that impair their physical function and quality of life after hospital discharge. Bed rest, and its associated mechanisms, may play an important role in the pathogenesis of neuromuscular weakness in critically ill patients. A new approach for managing mechanically ventilated patients includes reducing deep sedation and increasing rehabilitation therapy and mobilization soon after admission to the intensive care unit. Emerging research in this field provides preliminary evidence supporting the safety, feasibility, and potential benefits of early mobilization in critical care medicine.

Needham DM. JAMA.2008; 300(14):1685-1690.

CLINICAL PRACTICE GUIDELINE: SUMMARY FOR CLINICIANS

Liberation from Mechanical Ventilation in Critically Ill Adults

An Official ATS/ACCP Clinical Practice Guideline

Question 1: Should Acutely Hospitalized Adults Who Have Been Mechanically Ventilated for More Than 24 Hours Be Subjected to Protocolized Rehabilitation Directed toward Early Mobilization or No Protocolized Attempts at Early Mobilization?

ATS/CHEST recommendation. For acutely hospitalized adults who have been mechanically ventilated for more than 24 hours, we suggest protocolized rehabilitation directed toward early mobilization (conditional recommendation, low certainty in the evidence).

Remarks. There is insufficient evidence to recommend any rehabilitation protocol over another.

Values and preferences. This recommendation places a high value on reducing the duration of mechanical ventilation and increasing the likelihood of being able to walk at discharge and a lower value on cost and resource use.

Girard TD et al. AJRCCM.2017; 195(1):120-33.
Fan E et al. Ann Am Thorac Soc.2017; 14(3): 441–3.

Executive Summary: Clinical Practice Guidelines for the Prevention and Management of Pain, Agitation/Sedation, Delirium, Immobility, and Sleep Disruption in Adult Patients in the ICU

Question. For critically ill adults, is rehabilitation or mobilization (performed either in-bed or out-of-bed) beneficial in improving patient, family, or health system outcomes compared with usual care, a different rehabilitation/mobilization intervention, placebo, or sham intervention?

Recommendation. We suggest performing rehabilitation or mobilization in critically ill adults (conditional recommendation, low quality of evidence).

Mobilization

- Improved muscle strength at ICU discharge
- Reduced duration of mechanical ventilation
- Improvement (NS) in health-related quality of life measured using the SF36 instrument within 2 months of discharge
- No effect on mortality
- Very low incidence of adverse effects

Devlin JW et al. Crit Care Med 2018; 46:1532–1548.

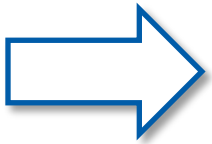
INTRODUCTION

WHO IS CANDIDATE FOR THE WEAKEST LINK ?

- RISK FACTORS FOR ICUAW ?
- BARRIERS TO IMPLEMENT MOBILISATION IN THE CRITICALLY ILL ?

INTRODUCTION

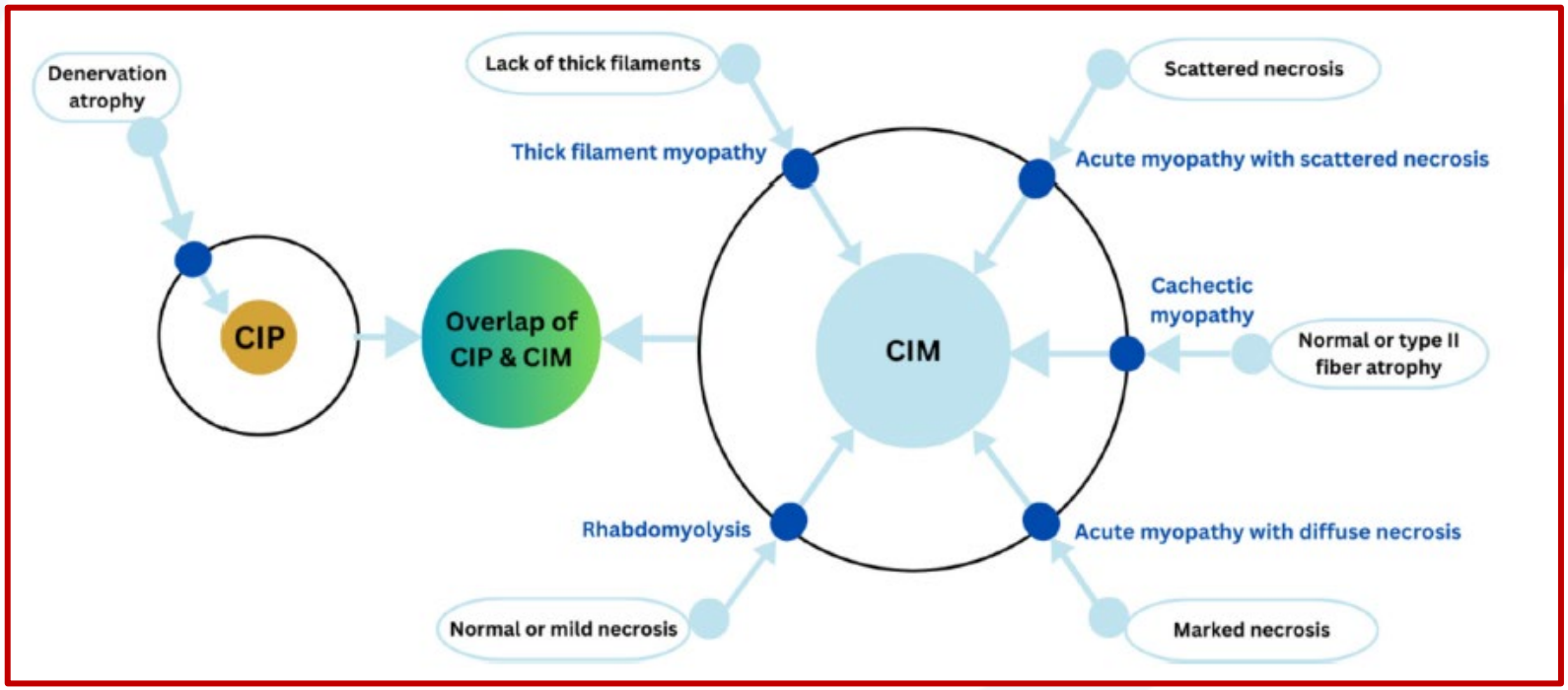
WHO IS CANDIDATE FOR THE WEAKEST LINK ?



RISK FACTORS FOR ICUAW ?

INTRODUCTION

ICU-ACQUIRED WEAKNESS



Huang A et al. J Crit Care.2025; 88:155074.

INTRODUCTION

WHAT ARE THE RISK FACTORS FOR ICU-AW ?

1. Critical Illness and Prolonged ICU Stay

- Sepsis and systemic inflammatory response syndrome (SIRS)
- Multi-organ failure
- Prolonged mechanical ventilation (especially >7 days)

2. Immobility

- Lack of early mobilization
- Sedation and neuromuscular blockade that limit movement

3. Hyperglycemia

- Poorly controlled blood glucose levels (independent of diabetes)
- Insulin resistance

4. Medications

- **Corticosteroids** (especially high doses or prolonged use)
- **Neuromuscular blocking agents** (e.g., vecuronium, pancuronium)
- Some antibiotics (e.g., aminoglycosides, which may contribute to neuromuscular toxicity)

5. Inflammation and Cytokine Storm

- Elevated levels of proinflammatory cytokines (e.g., TNF-α, IL-6)
- Underlying conditions like ARDS, COVID-19

6. Malnutrition

- Protein-energy malnutrition
- Deficiencies in micronutrients (e.g., thiamine, vitamin D)

7. Organ Dysfunction

- Especially renal and hepatic failure (which can alter drug metabolism and toxin clearance)

8. Female Sex and Older Age

- Some studies suggest a higher risk in women and elderly patients, possibly due to lower baseline muscle mass

ChatGPT. Access June the 9th 2025.

INTRODUCTION

Decreased post-ICU walking distance in 6 minutes was associated with

- **female sex,**
- **a high burden of comorbidity,**
- **exposure to systemic glucocorticoids**

Herridge MS et al. N Engl J Med.2001
De Jonghe B et al. JAMA.2002
Cheung AM et al. Am J Respir Crit Care Med 2006

INTRODUCTION

WHAT ARE THE RISK FACTORS FOR ICU-AW ?

Categories	Risk factors	Categories	Risk factors
Personal factors	Female, age	Disease factors	SOFA score, infectious disease, hyperglycemia, sepsis, septic shock, SIRS, MODS, Gram-Negative bacteremia, pneumonia, hypoproteinemia, functional dependence before admission, delirium, acute renal failure
Treatment factors	Use of aminoglucoside drugs, mechanical ventilation days, length of ICU stay, renal replacement therapy, corticosteroids, neuromuscular blockers, APACHE II score, history of mechanical ventilation, norepinephrine, SAPS score, vasoconstrictor drugs, parenteral nutrition, kidney replacement treatment days	Laboratory indicators	Calcium ion concentration, sex hormones, insulin growth factor, thyroid stimulating hormone

Yang Z et al. Medicine 2022;101:43(e31405).

INTRODUCTION

WHAT ARE THE RISK FACTORS FOR ICU-AW ?

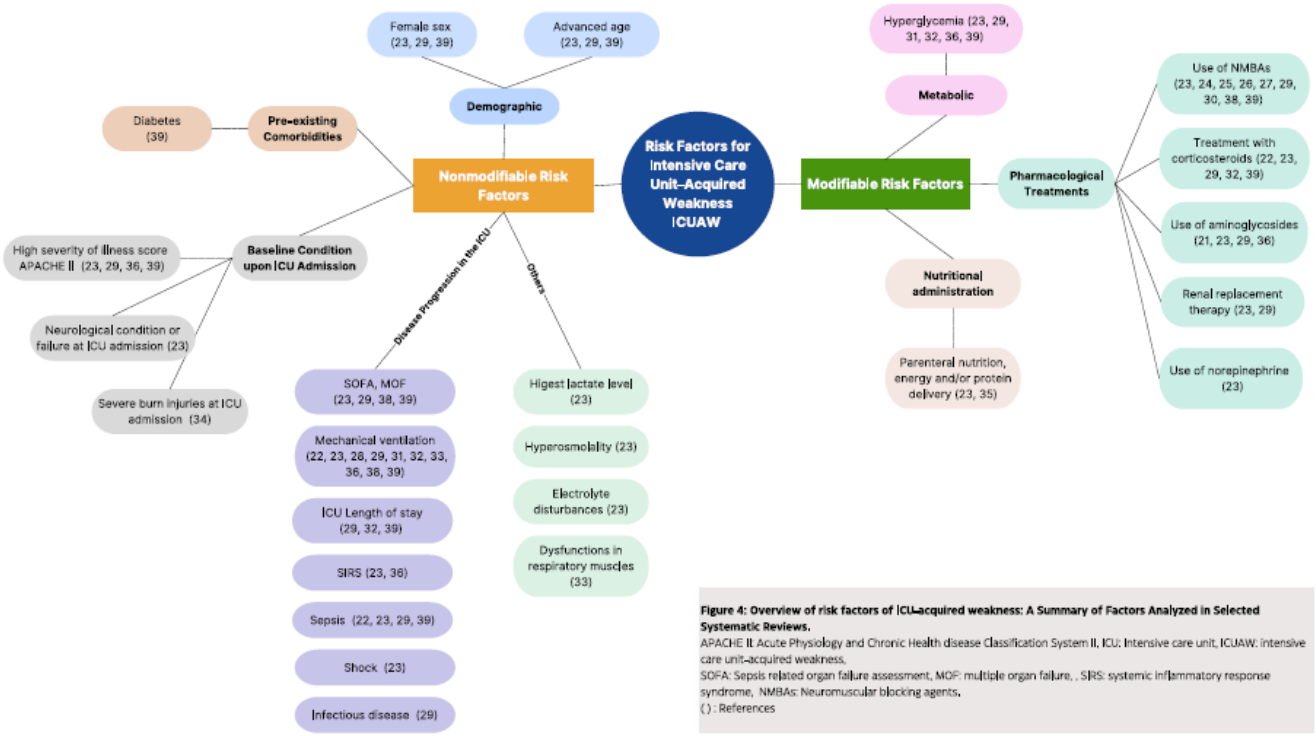
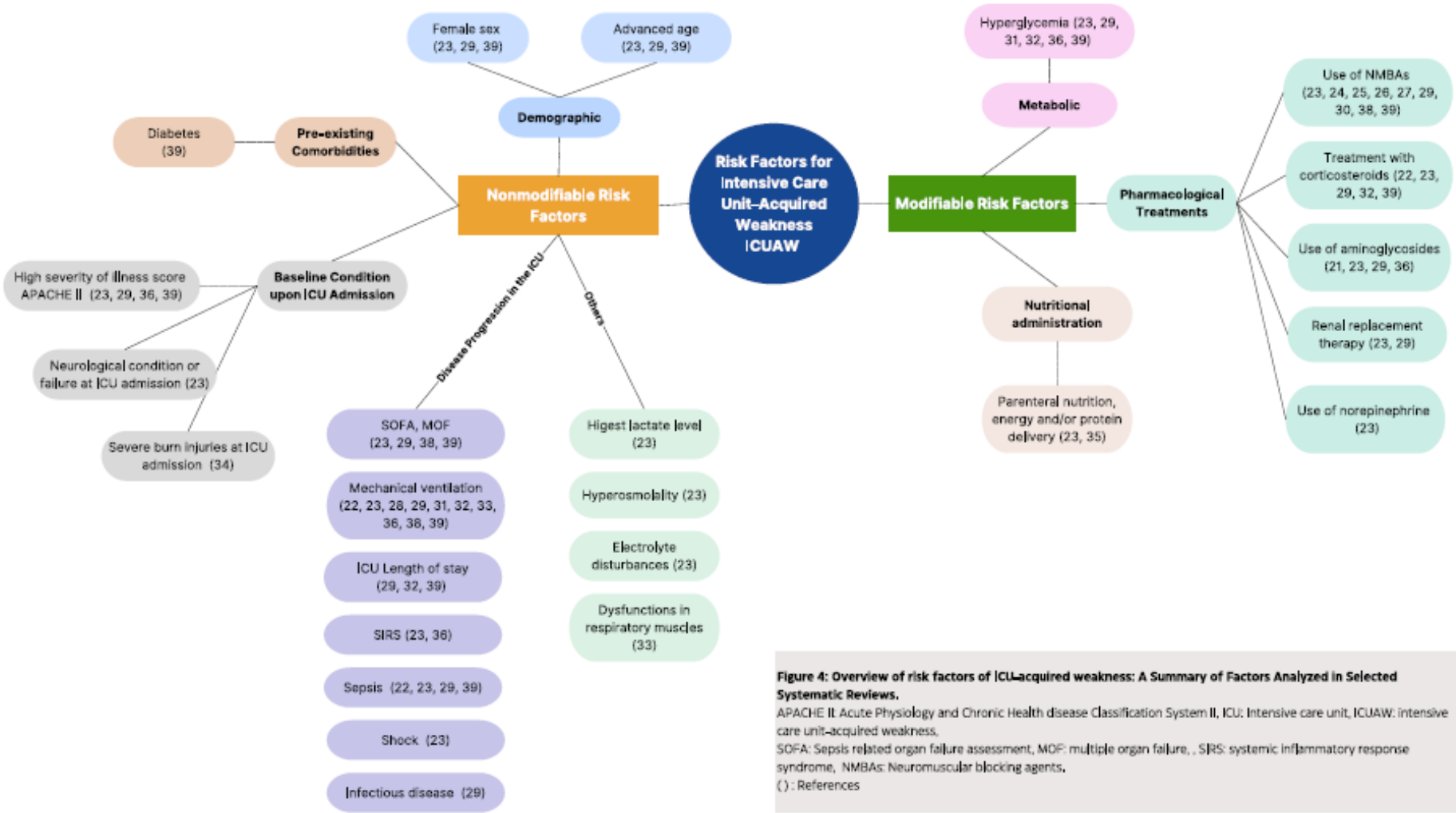


Figure 4: Overview of risk factors of ICU-acquired weakness: A Summary of Factors Analyzed in Selected Systematic Reviews.
APACHE II: Acute Physiology and Chronic Health disease Classification System II, ICU: Intensive care unit, ICUAW: Intensive care unit–acquired weakness,
SOFA: Sepsis related organ failure assessment, MOF: multiple organ failure, , SIRS: systemic inflammatory response syndrome, NMBAs: Neuromuscular blocking agents.
( ) : References

Fuentes-Aspe et al. J Intensive Care.2024; 12:33



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Fuentes-Aspe et al. J Intensive Care.2024; 12:33

INTRODUCTION

WHAT ARE THE RISK FACTORS FOR ICU-AW ?

- **MODIFIABLE:**
  - Bed rest
  - Medications: NMBA, Steroids, Aminoglycosides, …
  - Hyperglycemia

- **NON-MODIFIABLE:**
  - Age and Sex
  - SIRS / Infection / Sepsis
  - M.O.F.
  - RRT
  - SOFA, APACHE II, …

- **MIXED ?:**
  - Pre-ICU comorbidities
  - ICU LOS and Duration of M.V.

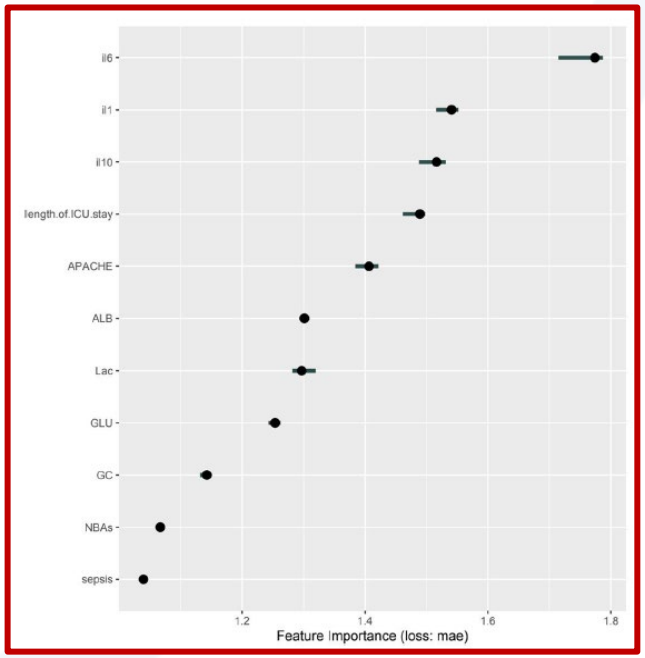
Adapted from
Hermans G et al. Crit Care.2015; 9:274.
Hiser SL et al. BMJ 2025;388:e077292.

Predictive modeling of ICU-AW inflammatory factors based on machine learning

- 527 ICU patients
- Machine learning techniques to construct six ICU-AW prediction models using different methods.
- Final single model with the best predictive performance that could help diagnose and identify patients with ICU-AW.

Table 3 LASSO regression results for significant variables related to ICU-AW

Variables	Coefficient
Sepsis	0.3337085334
Length of ICU stay	0.0388214232
APACHE II	0.0190878577
GC	0.1986876377
NBAs	0.0261176827
Albumin	−0.0084301482
Glucose	0.0039358184
Lactate	0.0722583870
IL-1β	0.0074240080
IL-6	0.0000715233
IL-10	0.0071618905



Guo Y et al. BMJ Neurol.2024; 24:483.

INTRODUCTION

WHO IS CANDIDATE FOR THE WEAKEST LINK ?

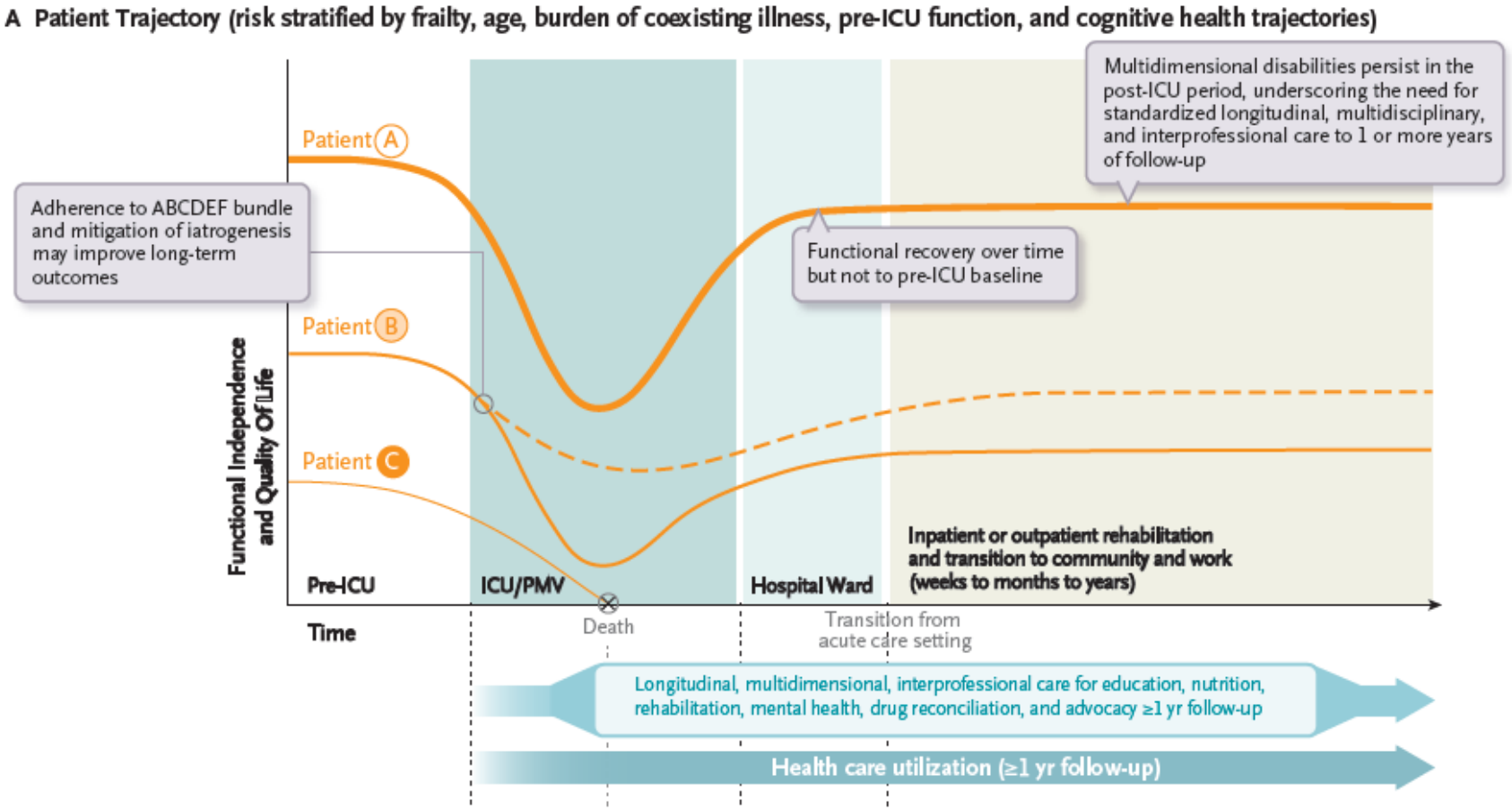
- PATIENT ?
- PHYSICIAN ?
- NURSE ?
- PHYSIOTHERAPIST ?
- (G.P. ?)

PATIENT'S PERSPECTIVE

- PRE-ICU CONDITION ?
- REASON FOR ICU ADMISSION ?
- ICU STAY ?
- POST-ICU PERIOD ?

PATIENT'S PERSPECTIVE

PATIENT'S PERSPECTIVE



Herridge MS et al. N Engl J Med 2023;388:913-24.

PATIENT'S PERSPECTIVE

- **PRE-ICU CONDITION ?**
  - ❑ Age
  - ❑ Sex
  - ❑ Malnutrition
  - ❑ Obesity ?
  - ❑ Disease related malnutrition

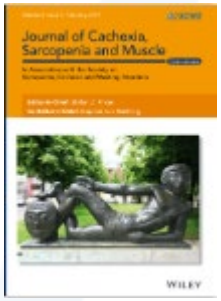
PATIENT'S PERSPECTIVE

- **PRE-ICU CONDITION ?**

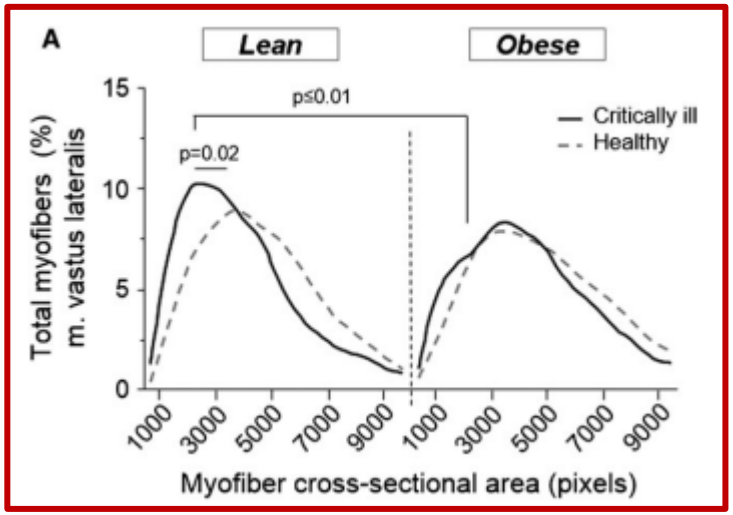
= NON-MODIFIABLE

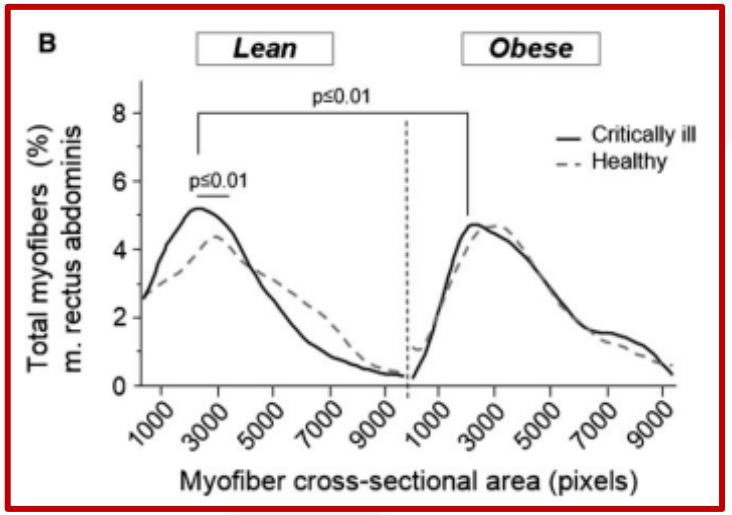
  - ❑ Age
  - ❑ Sex
  - ❑ Malnutrition
  - ❑ Obesity ?
  - ❑ Disease related malnutrition

PATIENT'S PERSPECTIVE



Premorbid obesity, but not nutrition, prevents critical illness-induced muscle wasting and weakness





Goossens C et al. J Cachexia Sarcopenia Muscle .2017; 8(1):89-101.

PATIENT'S PERSPECTIVE

- **PRE-ICU CONDITION**

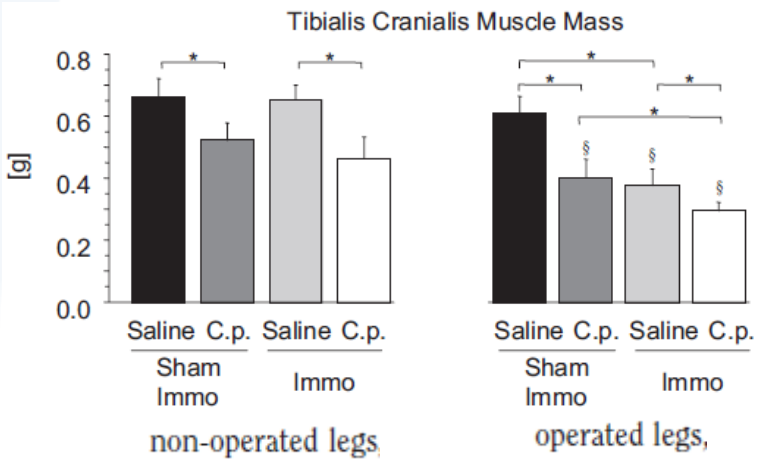
  = NON-MODIFIABLE

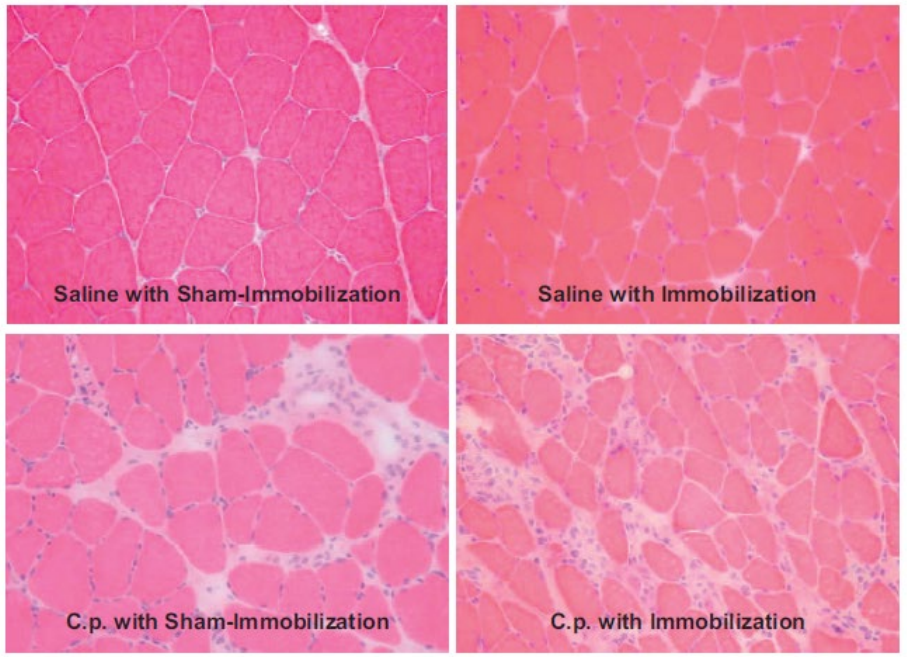
  - ❑ Age
  - ❑ Sex
  - ❑ Malnutrition
  - ❑ Disease related malnutrition
  - ❑ ~~Obesity~~

- **REASON FOR ICU ADMISSION ?**

  - ❑ S.I.R.S.
  - ❑ Sepsis

Systemic inflammatory response syndrome increases immobility-induced neuromuscular weakness*

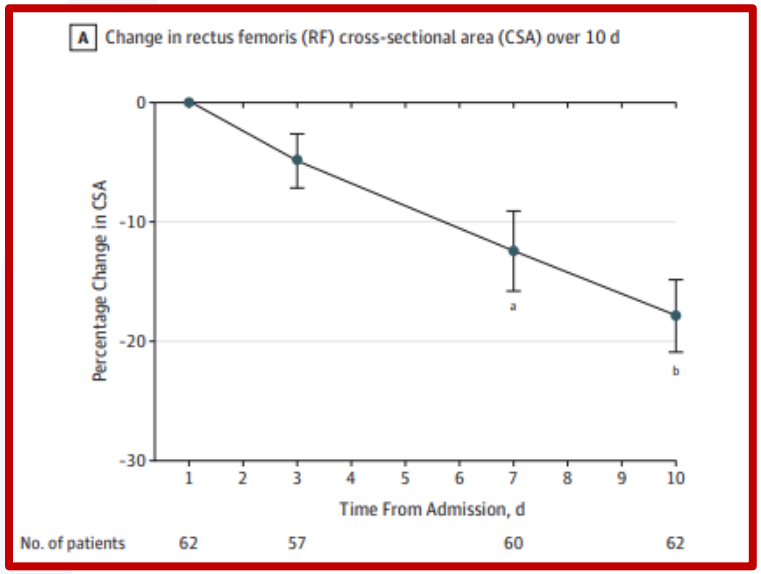




Fink H et al. Crit Care Med.2008; 36:910-6.

JAMA®
The Journal of the American Medical Association

Acute Skeletal Muscle Wasting in Critical Illness



Puthucheary et al. JAMA.2013; 310(15):1591-1600.

JAMA®
The Journal of the American Medical Association

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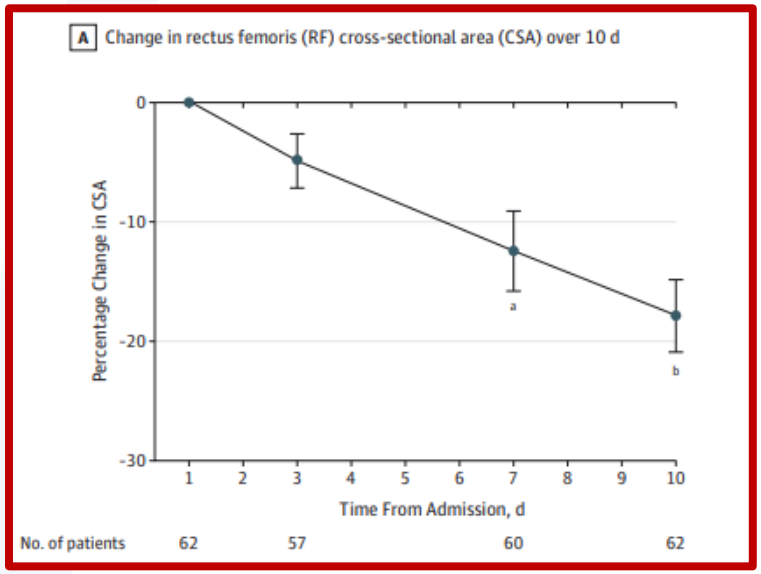

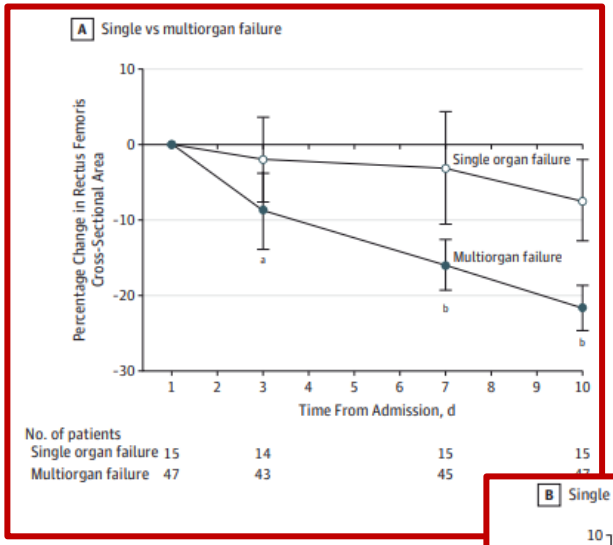

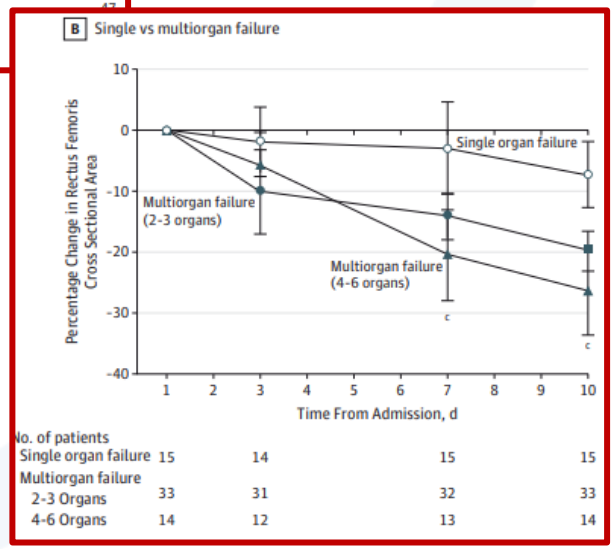

Puthucheary et al. JAMA.2013; 310(15):1591-1600.

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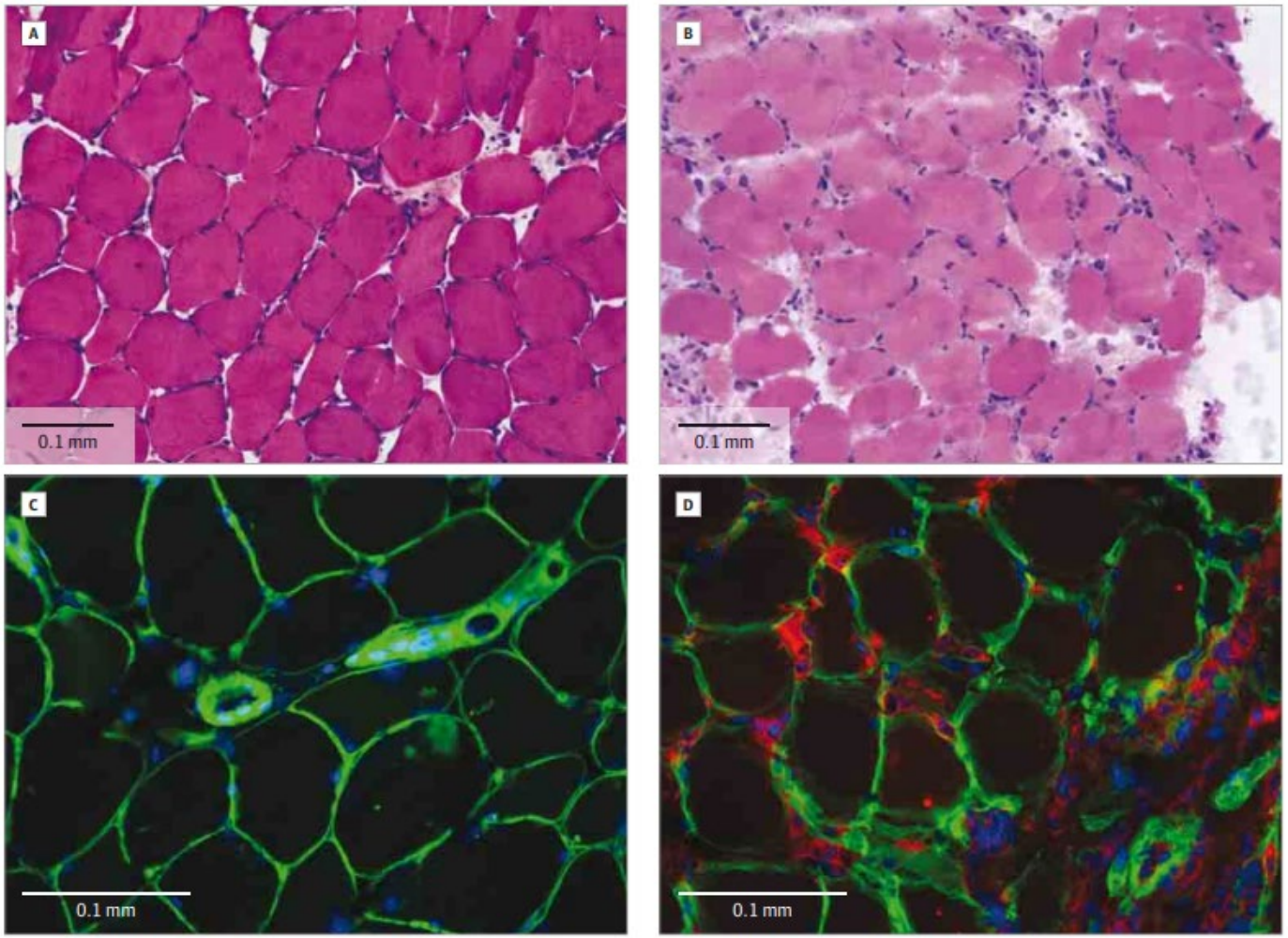
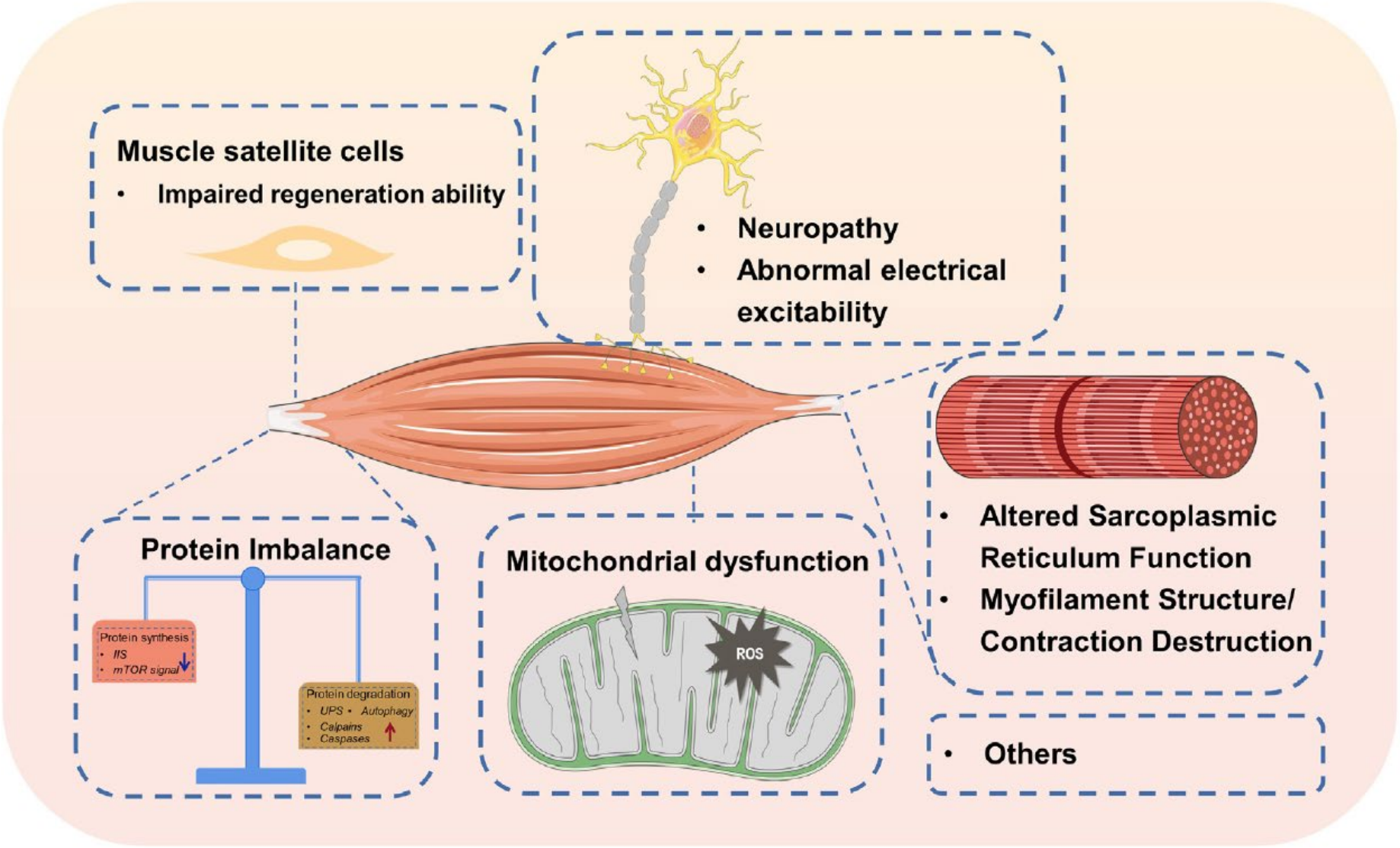
Original Investigation | CARING FOR THE CRITICALLY ILL PATIENT

Acute Skeletal Muscle Wasting in Critical Illness



Puthucheary et al. JAMA.2013; 310(15):1591-1600.



Chen J et al. J Intensive Care.2024; 4:73-80.

PATIENT'S PERSPECTIVE

DURING ICU STAY

- ❑ Malnutrition
- ❑ Glycemia
- ❑ Duration on MV
- ❑ Cytokines
- ❑ Organ Failure (Kidney, Liver, Multiple)
- ❑ RRT
- ❑ Medications received
- ❑ Mobilisation

PATIENT'S PERSPECTIVE

DURING ICU STAY

= NON-MODIFIABLE

- Malnutrition
- Glycemia
- Duration on MV
- Cytokines
- Organ Failure (Kidney, Liver, Multiple)
- RRT
- Medications received
- Mobilisation

PATIENT'S PERSPECTIVE

DURING ICU STAY

= NON-MODIFIABLE

- ❑ Malnutrition
- ❑ Glycemia
- ❑ Duration on MV
- ❑ Cytokines
- ❑ Organ Failure (Kidney, Liver, Multiple)
- ❑ RRT
- ❑ Medications received
- ❑ Mobilisation

ASK THE DOCTOR !!!

PATIENT'S PERSPECTIVE

POST ICU

= NON-MODIFIABLE

- ❑ Malnutrition
- ❑ Glycemia
- ❑ Mobilisation
- ❑ Rehab
- ❑ Post ICU consultation
- ❑ Role of the GP ?

PHYSICIAN'S PERSPECTIVE

- **PRESCRIPTION**

- ❑ MEDICATIONS
- ❑ NUTRITION
- ❑ MOBILIZATION

MEDICATIONS

- N.M.B.A.

Papazian L et al. N Engl J Med.2010; 363:1107-16.
Moss M et al. N Engl J Med 2019; 380:1997-2008.
Yang Z et al. Medicine (Baltimore) 2022;101:e31405.
Price DR et al. Crit Care Med .2017; 44:2070-8.
Bellaver P et al. Anaesth Crit Care Pain Med.2023; 42(3):101202.

- STEROIDS

Hermans G et al. Cochrane Database Syst Rev.2014;CD006832.

- INSULIN

van den Berghe G et al. N Engl J Med.2001; 345(19):1359–67.
Hermans G et al. Am J Respir Crit Care Med.2007; 175(5):480–9.
Patel B et al Chest.2014; 146:583-9.
Hermans G et al. Cochrane Database Syst Rev.2014;CD006832.

MEDICATIONS

- N.M.B.A.

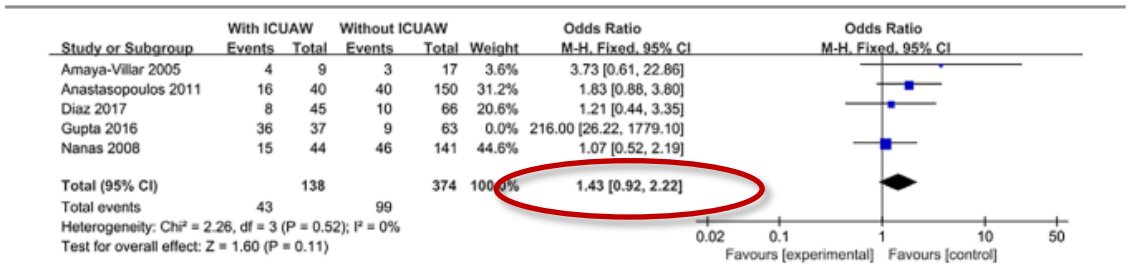
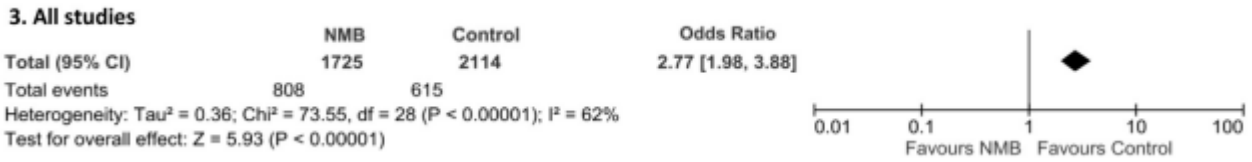


Figure 12. The meta-analysis results of using of neuromuscular blockers.

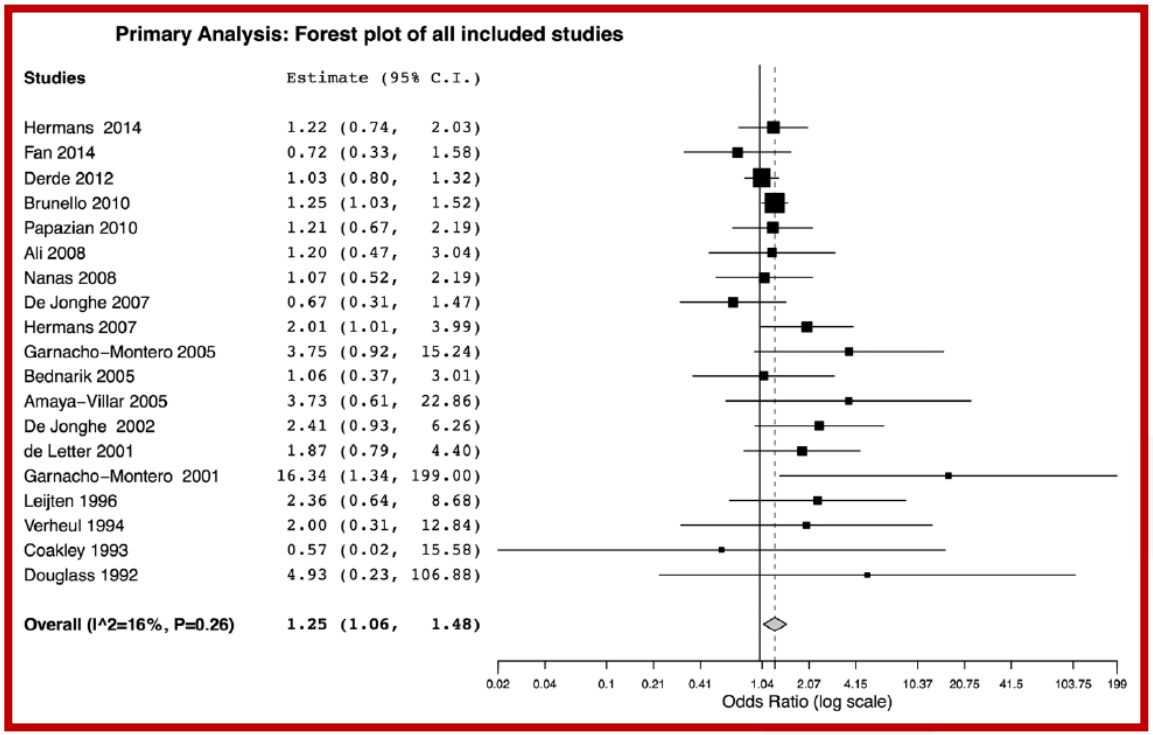
Yang Z et al. Medicine (Baltimore) 2022;101:e31405.



Bellaver P et al. Anaesth Crit Care Pain Med.2023; 42(3):101202.

MEDICATIONS

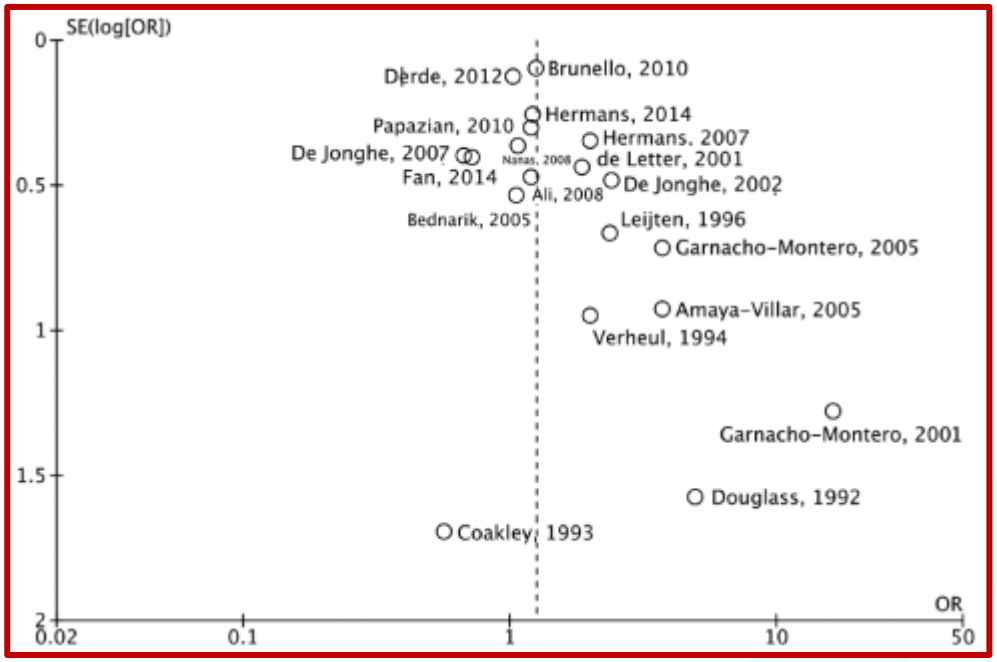
- N.M.B.A.



Price DR et al. Crit Care Med.2016; 44:2070-8.

MEDICATIONS

- N.M.B.A.



Price DR et al. Crit Care Med.2016; 44:2070-8.

MEDICATIONS

- N.M.B.A.

Modest association between NMBAs and ICUAW.
BUT

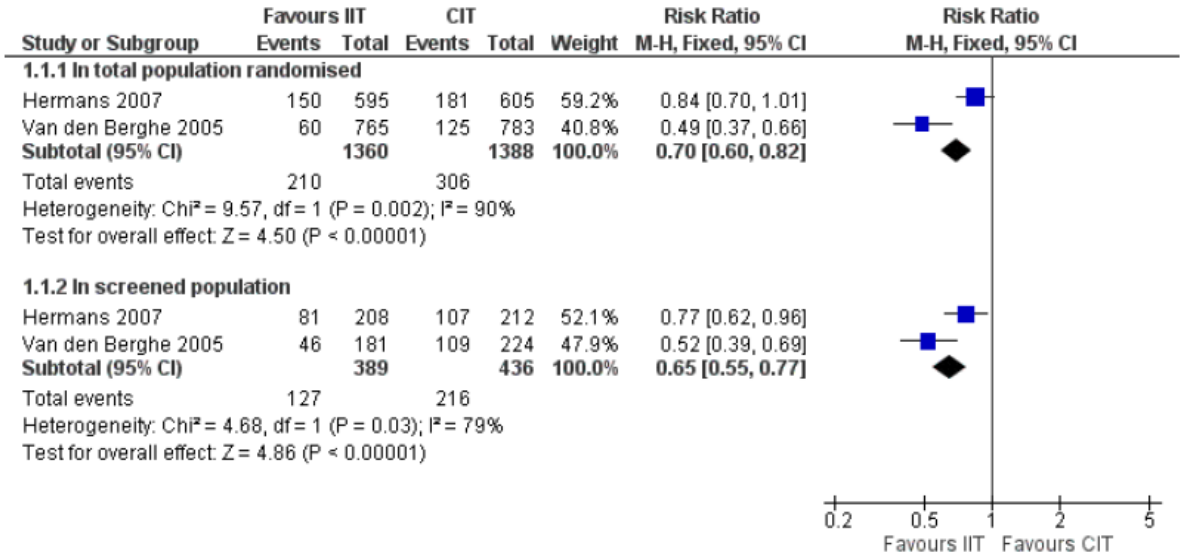
- NMBAs were less commonly associated with clinical weakness than they were with electromyography (CIP) or muscle biopsy (CIM) evidence of neuromuscular dysfunction.
- The analysis suggests an increased risk of CIP in severely septic or septic shock patients or more severely ill patients exposed to NMBAs. In this population, clinicians should be cautious with NMBAs and target early use and limited exposure to limit the harm of these drugs while reducing the risk of CIP.
- Last, we found that studies in our review at the lowest risk of bias, including the RCT and the prospective cohort studies that performed multivariable adjustment, suggested a small but not statistically significant 24–31% increased odds of developing neuromuscular dysfunction acquired in critical illness.

Price DR et al. Crit Care Med.2016; 44:2070-8.

MEDICATIONS

- INSULIN

Figure 3. Forest plot of comparison: 1 Intensive insulin therapy (IIT) versus conventional insulin therapy (CIT), outcome: 1.1 Occurrence of CIP/CIM.



Hermans G et al. Cochrane Database Syst Rev.2014;CD006832.

NUTRITION

- Enteral nutrition should be initiated within 24–48 h and advanced to the target level as quickly as tolerated in patients who are at high nutritional risk or severely malnourished.

- Parenteral nutrition should be considered as a supplemental option after 7–10 days for patients who are able to meet more than 60 % of their energy and protein requirements through enteral nutrition alone.
(role of autophagy?)

Taylor BE et al. Crit Care Med.2016; 44(2):390–438.

- Specific nutrients ?
  - ❑ High protein content ?
  - ❑ Ketogenic diet ?
  - ❑ Other?

MOBILIZATION

WHO IS CANDIDATE FOR THE WEAKEST LINK ?

BARRIERS TO IMPLEMENT MOBILISATION IN THE CRITICALLY ILL ?

(EARLY) MOB BARRIERS

WHO IS CANDIDATE FOR THE WEAKEST LINK ?

- PATIENT ?
- PHYSICIAN ?
- NURSE ?
- PHYSIOTHERAPIST ?

(EARLY) MOB BARRIERS

1. Patient-Related Barriers

- **Medical instability** (e.g., hemodynamic instability, mechanical ventilation dependence, arrhythmias)
- **Sedation and delirium** limiting patient cooperation
- **Muscle weakness or neuromuscular impairments**
- **Presence of invasive devices** (e.g., central lines, chest tubes, ECMO)
- **Pain or fatigue** that prevents participation
- **Comorbidities** (e.g., fractures, stroke, severe obesity)

ChatGPT. Access June the 10th 2025.

(EARLY) MOB BARRIERS

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ChatGPT. Access June the 10th 2025.

(EARLY) MOB BARRIERS

2. Clinician-Related Barriers

- **Knowledge and attitudes:**
  - Lack of awareness of EM benefits ✓
  - Overestimating risks or fearing adverse events ✓
- **Lack of training or experience** with mobilizing critically ill patients ✓
- **Variability in clinical judgment** about when patients are "safe to mobilize" ✓
- **Time constraints** or prioritization of other tasks in busy ICU settings
- **Interdisciplinary communication issues** (e.g., unclear responsibilities between nurses, physicians, and physiotherapists) ✓

ChatGPT. Access June the 10th 2025.

(EARLY) MOB BARRIERS

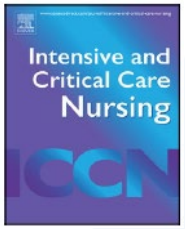
3. **Organizational and Systemic Barriers**

- **Staffing limitations:** Inadequate nurse-to-patient or therapist-to-patient ratios
- **Lack of protocols or guidelines** supporting EM
- **Limited availability of equipment:** e.g., lift devices, walkers, tilt tables
- **ICU culture:** Resistance to change, lack of leadership support
- **Scheduling conflicts** (e.g., during procedures or diagnostic tests)
- **Documentation burden** or lack of standardized documentation tools

ChatGPT. Access June the 10th 2025.

PATIENT'S PERSPECTIVE

- PHYSICAL LIMITATIONS
- PSYCHOLOGICAL BARRIERS
- LACK OF UNDERSTANDING AND AWARENESS
- CULTUTAL AND PERSONAL BELIEFS
- LACK OF INDIVIDUALIZATION



"I will get out of this" - The patients' experiences of early mobilisation in intensive care. A hermeneutic study

- 'Struggling to regain independence and normal life',
  Hope,
  Beginning of recovery
  Willingness to fight (leaving the bed)
- 'Interaction with healthcare professionals'
- 'Early mobilisation in a chaotic, confused context without control'.
  Collaboration

Sörderberg A et al. Intens Crit Care Nurs.2025; 86:103884.

PATIENT'S PERSPECTIVE

HOW TO HELP ?

The use of exergames, or technology-driven physical activities?

delivering early ICU mobilization in a fun, relaxed way.

Virtual Therapy Environments using virtual platforms like

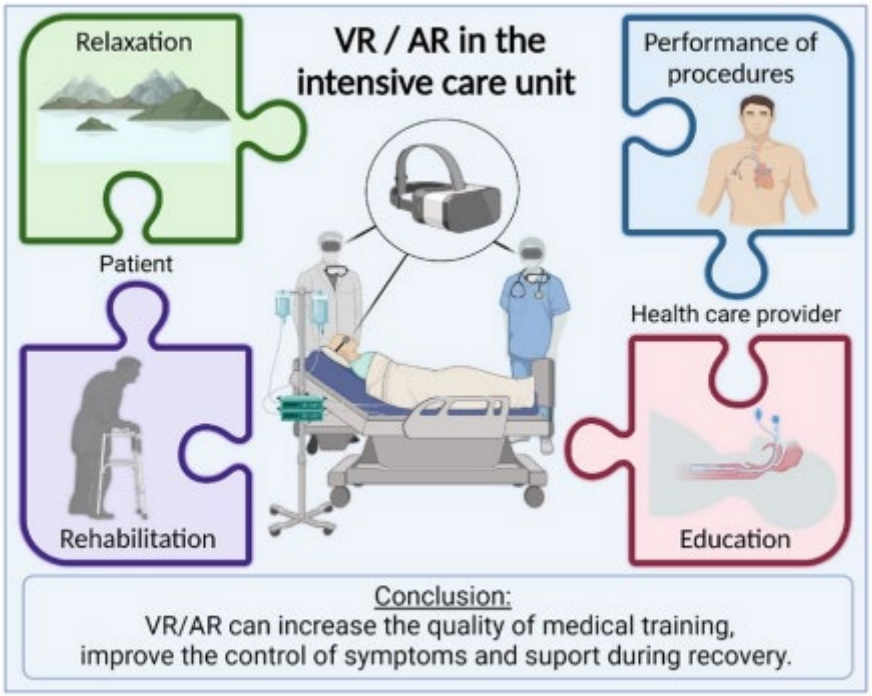
- ❑ the Xbox Kinect Jintronix© software
- ❑ the Nintendo Wii™

Virtual Reality (?)

Already used for relaxation and pain management

Kanschik et al. Ann of Intensive Care.2023; 13(1):81.

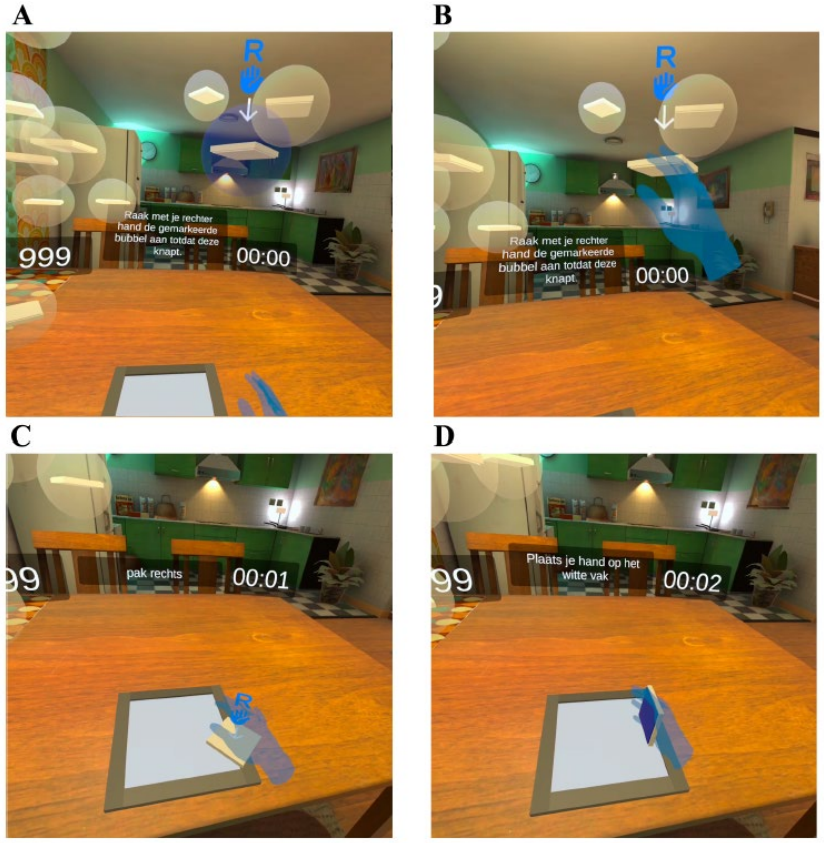
Virtual and augmented reality in intensive care medicine: a systematic review



Kanschik et al. Ann of Intensive Care.2023; 13(1):81.

The feasibility of virtual reality therapy for upper extremity mobilization during and after intensive care unit admission

- 10 adult ICU-patients (median age of 71)
  70% of male registered birth sex, mechanically ventilated for 48 h,
  willing to participate,
- VR-therapy was offered three times a week for 20 minutes in addition to standard care.
  To train upper extremity functionality, patients were instructed to complete puzzles with increasing level of difficulty.
- Feasibility based on patient satisfaction, session efficiency, and adherence levels during the training.
- Fatigue was measured after each session using the Borg Rating of Perceived Exertion Scale.
- Patients' hand-grip strength and Morton Mobility Index (MMI) were evaluated at the start of VR-therapy and after four weeks of training or at hospital discharge.



de Vries M et al. PeerJ.2025; 13:e18461.

The feasibility of virtual reality therapy for upper extremity mobilization during and after intensive care unit admission

On average, patients followed **three VR-therapy sessions of 20 min** per week with 13 min of actual training time, over the course of 1 to 3 weeks depending on their length of stay.

Session efficiency ranged from **25% to 93%.**
In total, patients adhered to 60% of the VR-therapy sessions.

MMI scores increased significantly from the start to the end of the VR-therapy training period (p = 0.005), indicating improved balance and mobility.

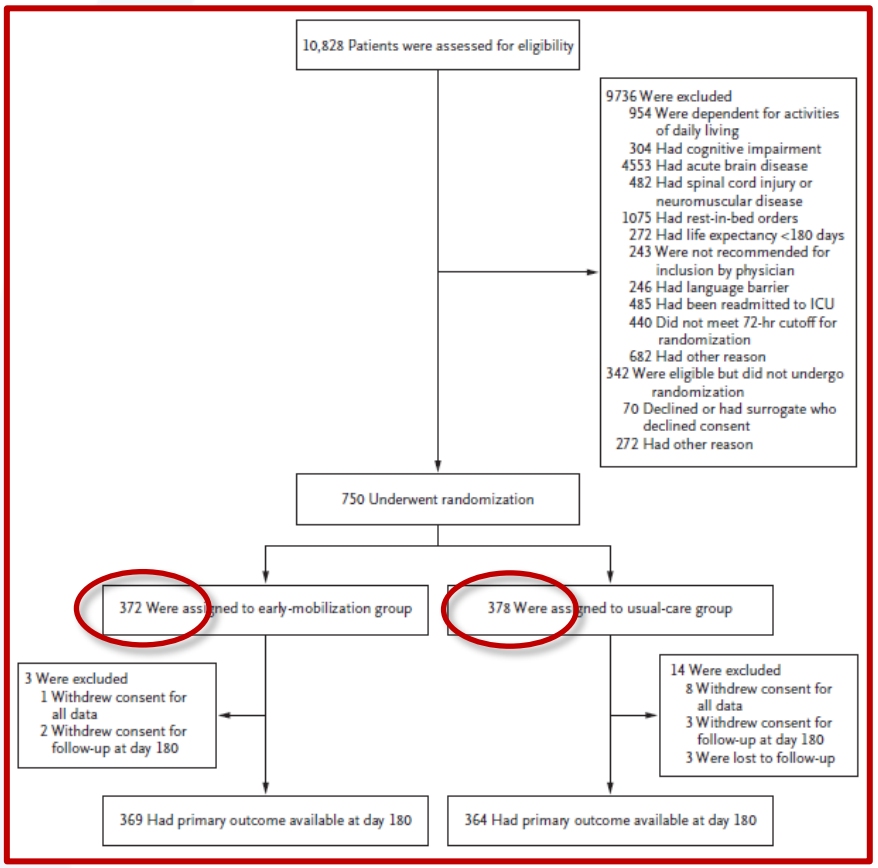
de Vries M et al. PeerJ.2025; 13:e18461.

PHYSICIAN'S PERSPECTIVE

- I am sceptical or non-believer
  - ❑ It does not improve mortality !
  - ❑ It's dangerous !
  - ❑ It is not cost-saving !

Early Active Mobilization during Mechanical Ventilation in the ICU

The TEAM Study Investigators and the ANZICS Clinical Trials Group*



Hodgson CL et al. N Engl J Med.2022; 387:1747-58.

Early Active Mobilization during Mechanical Ventilation in the ICU

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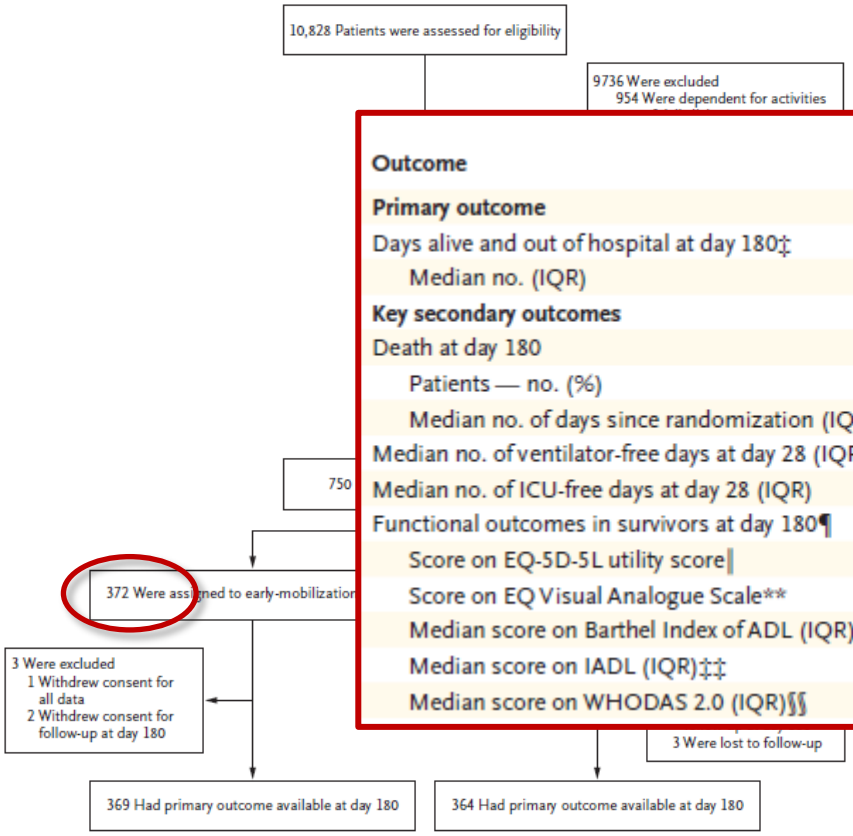
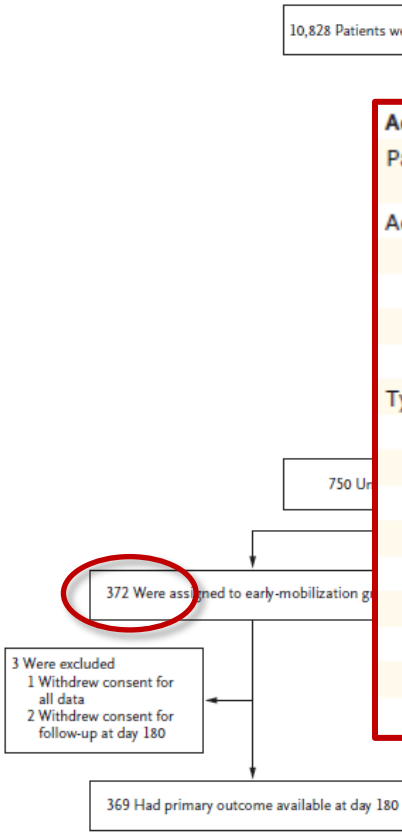


Outcome	Early Mobilization (N=371)	Usual Care (N=370)	Difference or Odds Ratio (95% CI)†	P Value
Primary outcome				
Days alive and out of hospital at day 180‡				
Median no. (IQR)	143 (21 to 161)	145 (51 to 164)	−2.0 (−10 to 6)	0.62
Key secondary outcomes				
Death at day 180				
Patients — no. (%)	83/369 (22.5)	71/364 (19.5)	1.15 (0.81–1.65)§	
Median no. of days since randomization (IQR)	17 (9 to 41)	19 (12 to 50)	−2.0 (−12.0 to 8.0)	
Median no. of ventilator-free days at day 28 (IQR)	21 (8 to 25)	21 (11 to 25)	0.0 (−1.4 to 1.4)	
Median no. of ICU-free days at day 28 (IQR)	16 (0 to 21)	17 (3 to 22)	−1.0 (−3.1 to 1.1)	
Functional outcomes in survivors at day 180¶				
Score on EQ-5D-5L utility score‖	0.7±0.3	0.7±0.3	0.0 (−0.0 to 0.1)	
Score on EQ Visual Analogue Scale**	70.2±19.7	69.0±20.1	2.0 (−5.7 to 9.7)	
Median score on Barthel Index of ADL (IQR)††	100 (100 to 100)	100 (95 to 100)	0	
Median score on IADL (IQR)‡‡	8.0 (7.0 to 8.0)	8.0 (6.0 to 8.0)	0.2 (−0.9 to 1.3)	
Median score on WHODAS 2.0 (IQR)§§	12.5 (2.1 to 33.3)	14.6 (4.2 to 38.9)	−1.8 (−6.9 to 3.4)	

Hodgson CL et al. N Engl J Med.2022; 387:1747-58.

Early Active Mobilization during Mechanical Ventilation in the ICU

The TEAM Study Investigators and the ANZICS Clinical Trials Group*



Adverse events — no. (%)¶¶				
Patients with ≥1 adverse event potentially due to mobilization — no. (%)	34 (9.2)	15 (4.1)	2.55 (1.33–4.89)§	0.005
Adverse events per patient — no. (%)				0.02
0	337 (90.8)	355 (95.9)		
1	19 (5.1)	11 (3.0)		
2	4 (1.1)	2 (0.5)		
≥3	11 (3.0)	2 (0.5)		
Type of adverse events — no. (%)‖				
Altered blood pressure	13 (3.5)	8 (2.2)		0.27
Cardiac arrhythmia	13 (3.5)	4 (1.1)		0.03
Oxygen desaturation	8 (2.2)	1 (0.3)		0.02
Pain or agitation	4 (1.1)	1 (0.3)		0.37
Removal of invasive line	2 (0.5)	2 (0.5)		1.00
Gastrointestinal	2 (0.5)	1 (0.3)		1.00
Tachypnea	3 (0.8)	0		0.25
Altered neurologic state	1 (0.3)	1 (0.3)		1.00
Other	4 (1.1)	0		0.12

Hodgson CL et al. N Engl J Med.2022; 387:1747-58.

Critical Care Medicine

The Cost-Effectiveness of Early Active Mobilization During Mechanical Ventilation in the ICU: An Economic Evaluation Alongside the Treatment of Mechanically Ventilated Adults With Early Activity and Mobilization (TEAM) Trial

- RCT – 733 patients – usual care vs Early Active Mobilization

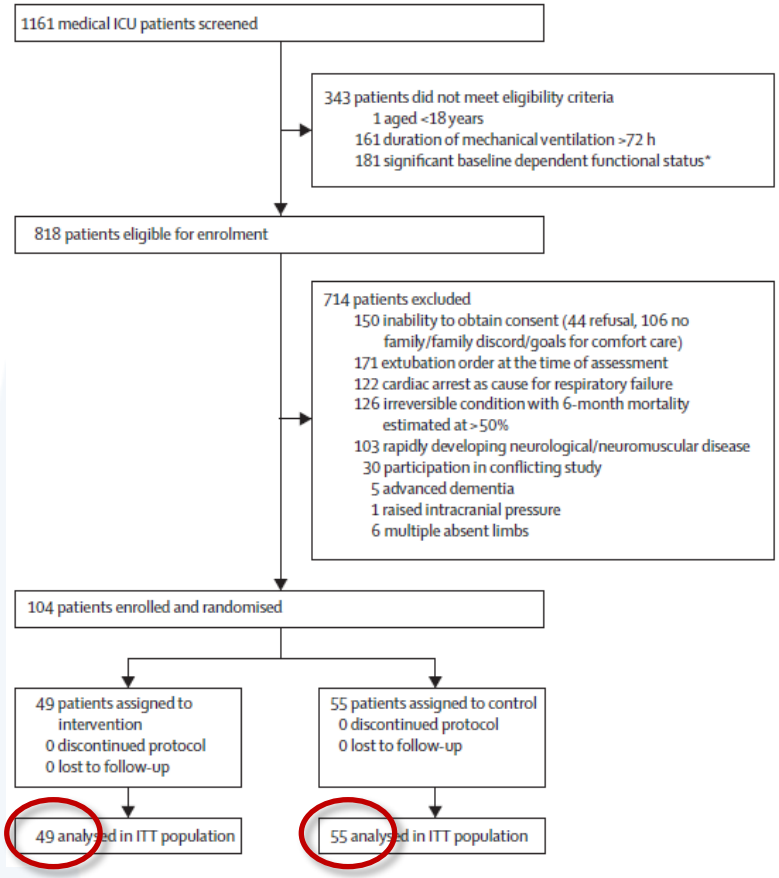
CONCLUSIONS: Our trial-based analysis found no evidence that higher-dose early active mobilization is a cost-effective intervention compared with usual care mobilization for mechanically ventilated adult ICU patients; however, results from sensitivity analyses provided some evidence that it may be cost saving if one is willing to accept poorer outcomes. Further research is necessary to determine whether there are scenarios in which early active mobilization provides value for money.

Higgins AM et al. Crit Care Med.2025; in press.

“I AM SCEPTICAL”

- I am sceptical or non-believer
  - ❑ It does not improve mortality ! **Is mortality the outcome we need ?**
  - ❑ It’s dangerous ! **Not that sure !**
  - ❑ It is not cost-saving ! **So what !**

Early physical and occupational therapy in mechanically ventilated, critically ill patients: a randomised controlled trial



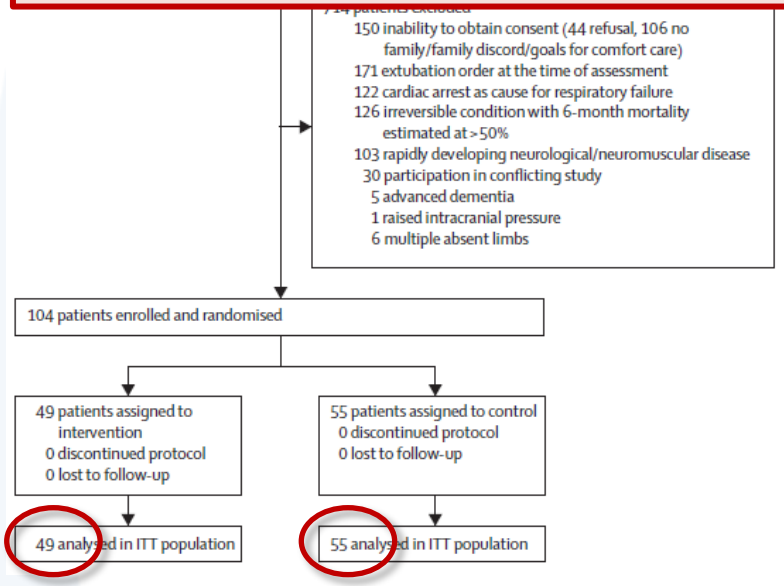
	Intervention (n=49)	Control (n=55)	p value
Return to independent functional status at hospital discharge	29 (59%)	19 (35%)	0·02
ICU delirium (days)	2·0 (0·0–6·0)	4·0 (2·0–7·0)	0·03
Time in ICU with delirium (%)	33% (0–58)	57% (33–69)	0·02
Hospital delirium (days)	2·0 (0·0–6·0)	4·0 (2·0–8·0)	0·02
Hospital days with delirium (%)	28% (26)	41% (27)	0·01
Barthel Index score at hospital discharge	75 (7·5–95)	55 (0–85)	0·05
ICU-acquired paresis at hospital discharge	15 (31%)	27 (49%)	0·09
Ventilator-free days*	23·5 (7·4–25·6)	21·1 (0·0–23·8)	0·05
Duration of mechanical ventilation (days)	3·4 (2·3–7·3)	6·1 (4·0–9·6)	0·02
Duration of mechanical ventilation, survivors (days)	3·7 (2·3–7·7)	5·6 (3·4–8·4)	0·19
Duration of mechanical ventilation, non-survivors (days)	2·5 (2·4–5·5)	9·5 (5·9–14·1)	0·04
Length of stay in ICU (days)	5·9 (4·5–13·2)	7·9 (6·1–12·9)	0·08
Length of stay in hospital (days)	13·5 (8·0–23·1)	12·9 (8·9–19·8)	0·93
Hospital mortality	9 (18%)	14 (25%)	0·53

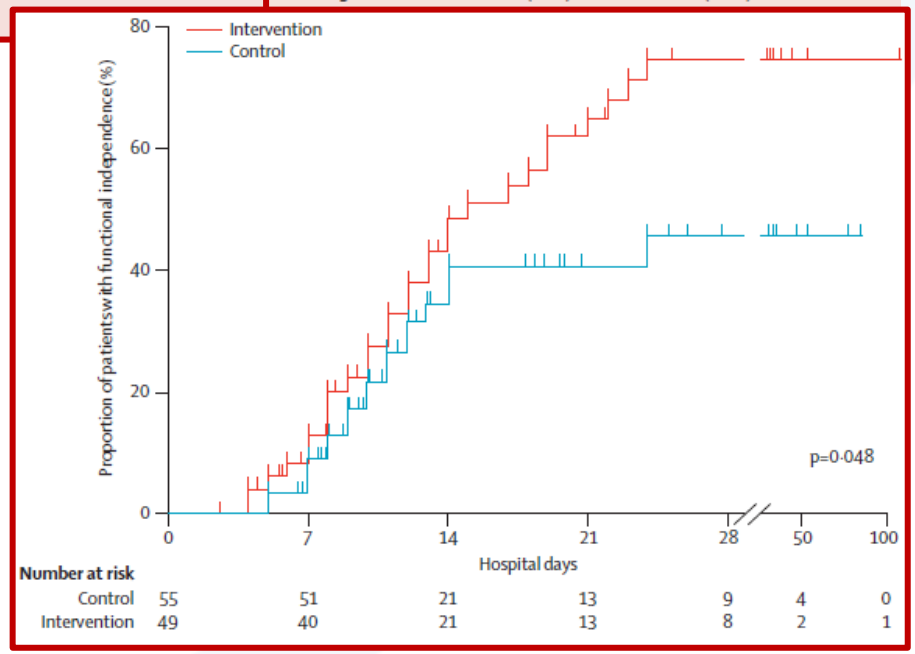
Schweikert WD et al. Lancet.2009; 373:1874–82.

Early physical and occupational therapy in mechanically ventilated, critically ill patients: a randomised controlled trial

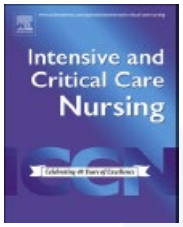
Time from intubation to first PT/OT session (days)	1·5 (1·0–2·1)	7·4(6·0–10·9)	<0·0001
Independent ADLs total at ICU discharge	3 (0–5)	0 (0–5)	0·15
Independent ADLs total at hospital discharge	6 (0–6)	4 (0–6)	0·06
MRC examination score at hospital discharge	52 (25–58)	48 (0–58)	0·38
Hand-grip strength at hospital discharge (kg-force)	39 (10–58)	35 (0–57)	0·67
Greatest walking distance at hospital discharge (m)	33·4 (0–91·4)	0 (0–30·4)	0·004
Time from intubation to milestones achieved (days)			

	Intervention (n=49)	Control (n=55)	p value
nal status at hospital	29 (59%)	19 (35%)	0·02
	2·0 (0·0–6·0)	4·0 (2·0–7·0)	0·03
	33% (0–58)	57% (33–69)	0·02
	2·0 (0·0–6·0)	4·0 (2·0–8·0)	0·02
)	28% (26)	41% (27)	0·01
discharge	75 (7·5–95)	55 (0–85)	0·05
l discharge	15 (31%)	27 (49%)	0·09

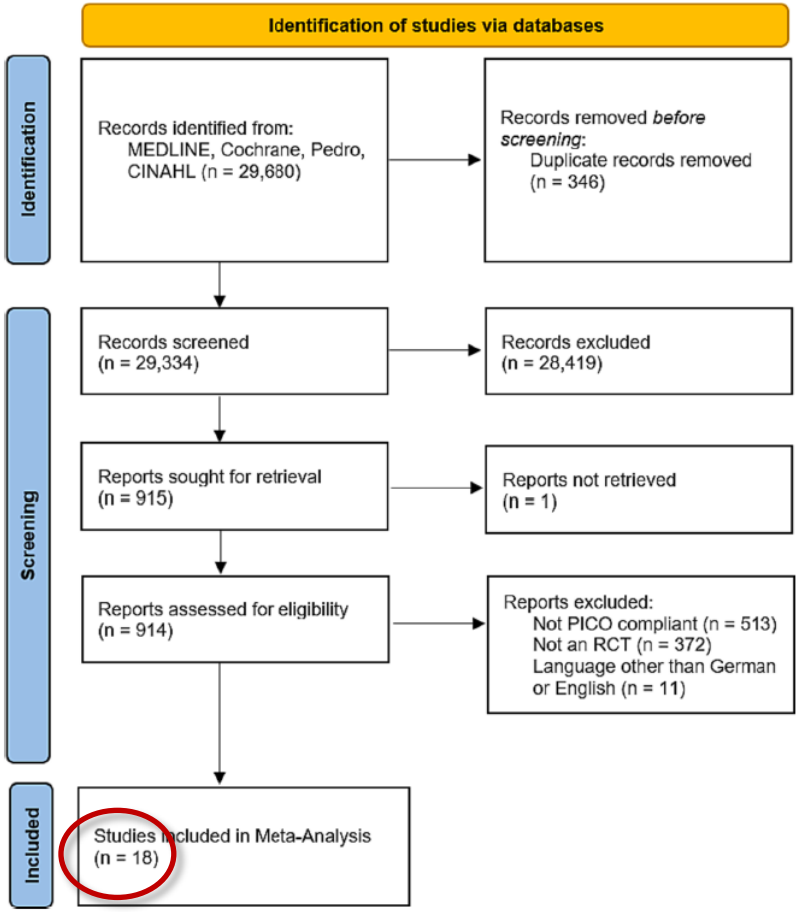




Schweikert WD et al. Lancet.2009; 373:1874–82.



Early mobilisation within 72 hours after admission of critically ill patients in the intensive care unit: A systematic review with network meta-analysis

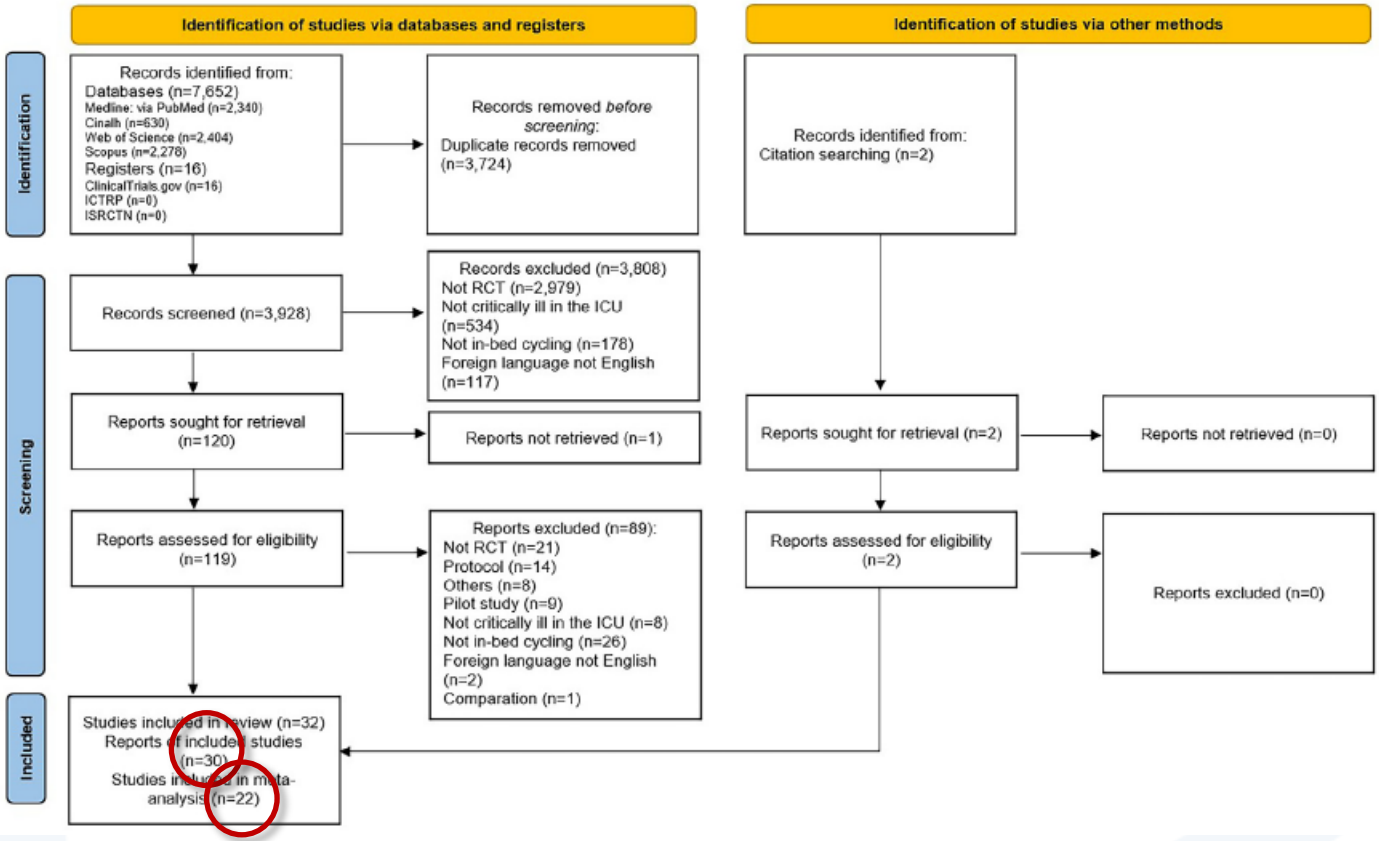


Mobilization

- Decreased ICU LOS (when associated with early nutrition)
- Decreased hospital LOS
- Positive effect on muscle strength (MRC)
- Improved physical function (FSS-ICU, Barthel Index)
- Improved QOL (SF 36)
- No effect on mortality
- Very low incidence of adverse effects

Daum N et al. Intens Crit Care Nur.2024; 80:103573.

Effects of in-bed cycling in critically ill adults: A systematic review and meta-analysis of randomised clinical trials



Pazo-Palacios R et al. Ann Phys Rehabil Med.2025; 68(5):101953.

Effects of in-bed cycling in critically ill adults: A systematic review and meta-analysis of randomised clinical trials

In-Bed Cycling + Rehab versus Rehab alone

- Decreased ICU LOS (20 studies)
- Decreased H LOS (14 studies)
- Functional status at hospital discharge (5 studies)
- Quality of life at 6 monts (SF-36: 4 studies): small effect.

- No effect on mortality and MV duration (?).

Pazo-Palacios R et al. Ann Phys Rehabil Med.2025; 68(5):101953.

nursing reports

Effectiveness of Early Mobilization and Bed Positioning in the Management of Muscle Weakness in Critically Ill People Under Invasive Mechanical Ventilation in Intensive Care: A Systematic Review of Intervention Literature Protocol

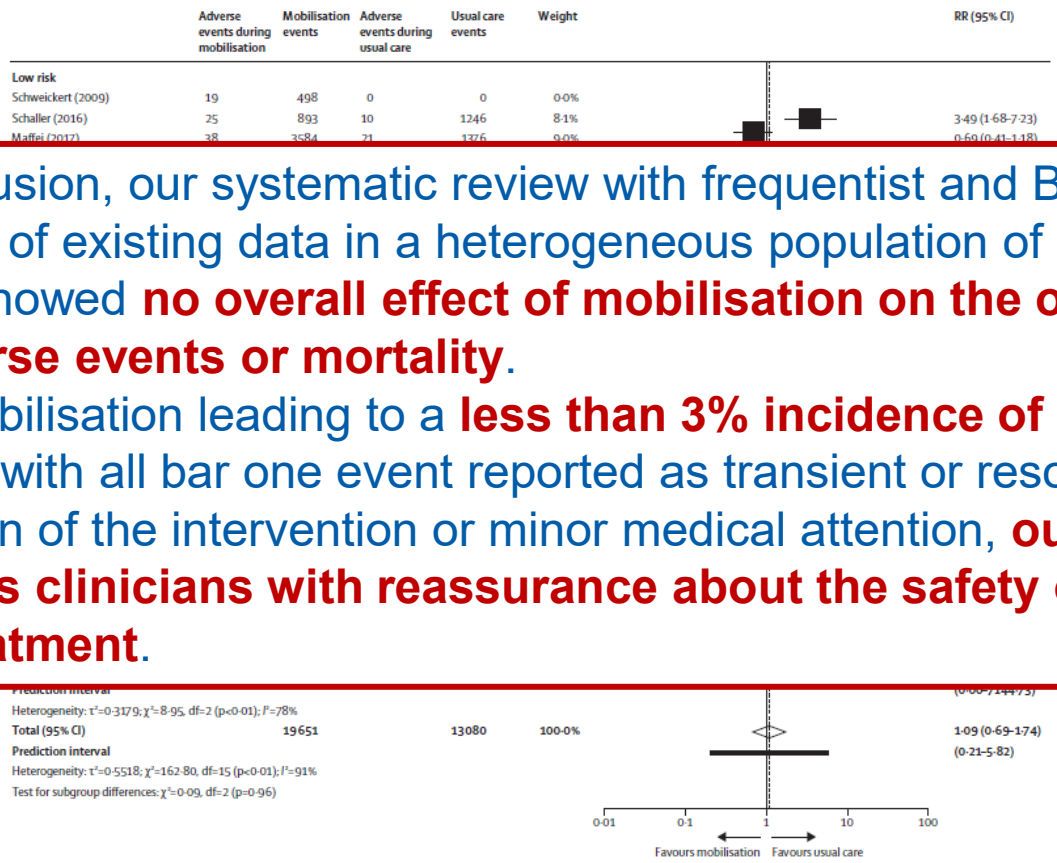
Bento I et al. Nurs Rep. 2025, 15, 75.

Association of active mobilisation variables with adverse events and mortality in patients requiring mechanical ventilation in the intensive care unit: a systematic review and meta-analysis

	Adverse events during mobilisation	Mobilisation events	Adverse events during usual care	Usual care events	Weight	RR (95% CI)
Low risk						
Schweickert (2009)	19	498	0	0	0·0%	
Schaller (2016)	25	893	10	1246	8·1%	3·49 (1·68–7·23)
Maffei (2017)	38	3584	21	1376	9·0%	0·69 (0·41–1·18)
Eggmann (2018)	1	500	3	375	3·0%	0·25 (0·03–2·39)
Fossat (2018)	106	4159	92	1190	9·8%	0·33 (0·25–0·43)
McWilliams (2018)	0	616	0	560	1·2%	0·91 (0·02–45·74)
Kho (2019)	2	393	3	198	4·1%	0·34 (0·06–1·99)
ECMO-PT Study Investigators (2020)	2	56	2	64	3·7%	1·14 (0·17–7·85)
Schujmann (2020)	22	1032	34	1449	9·0%	0·91 (0·53–1·54)
Berney (2021)	16	309	9	336	7·8%	1·93 (0·87–4·31)
Waldauf (2021)	159	932	40	894	9·7%	3·81 (2·73–5·33)
Nydal (2022)	9	54	0	0	0·0%	
TEAM Study Investigators (2022)	122	4399	80	4524	9·8%	1·57 (1·19–2·07)
Patel (2023)	7	696	0	38	2·1%	0·83 (0·05–14·25)
Total (95% CI)		**18121**		**12250**	**77·4%**	**1·11 (0·63–1·96)**
Prediction interval						**(0·16–7·68)**
Heterogeneity: τ^2=0·6685; χ^2=153·17, df=11 (p<0·01); I^2=93%						
Some concerns						
Hickmann (2018)	1	163	0	85	1·8%	1·57 (0·06–38·10)
Rahiminezhad (2022)	2	252	0	0	0·0%	
McWilliams (2023)	1	43	0	0	0·0%	
Total (95% CI)		**458**		**85**	**1·8%**	**1·57 (0·06–38·10)**
Prediction interval						
Heterogeneity: not applicable						
High risk						
Sarfati (2018)	86	829	64	487	9·8%	0·79 (0·58–1·07)
Fangzheng (2018)	0	30	3	30	2·0%	0·14 (0·01–2·65)
Borges (RBR-29495g)	35	213	21	228	9·1%	1·78 (1·07–2·96)
Total (95% CI)		**1072**		**745**	**20·9%**	**1·01 (0·45–2·26)**
Prediction interval						**(0·00–7144·73)**
Heterogeneity: τ^2=0·3179; χ^2=8·95, df=2 (p<0·01); I^2=78%						
Total (95% CI)		**19651**		**13080**	**100·0%**	**1·09 (0·69–1·74)**
Prediction interval						**(0·21–5·82)**
Heterogeneity: τ^2=0·5518; χ^2=162·80, df=15 (p<0·01); I^2=91%						
Test for subgroup differences: χ^2=0·09, df=2 (p=0·96)						

Paton M et al. Lancet Respir Med. 2024;12: 386–98.

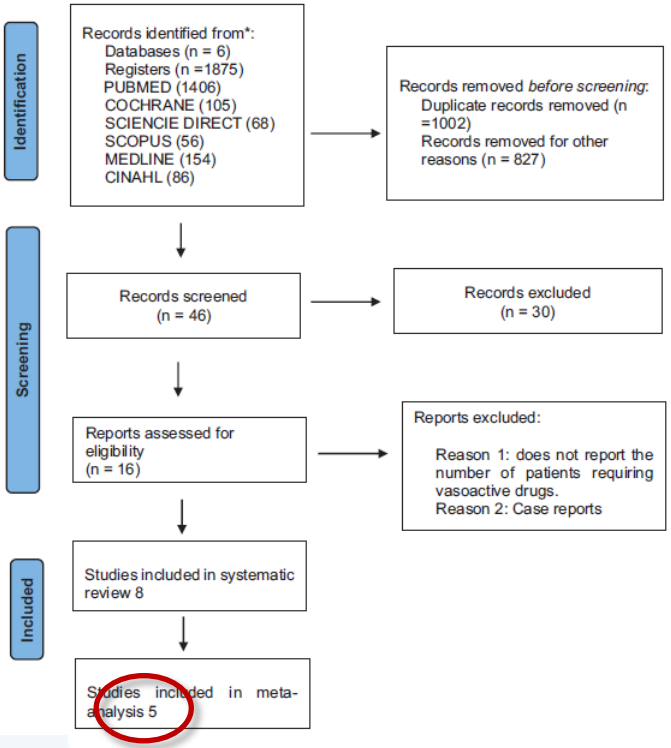
Association of active mobilisation variables with adverse events and mortality in patients requiring mechanical ventilation in the intensive care unit: a systematic review and meta-analysis



In conclusion, our systematic review with frequentist and Bayesian analysis of existing data in a heterogeneous population of critically ill adults showed **no overall effect of mobilisation on the occurrence of adverse events or mortality**.
With mobilisation leading to a **less than 3% incidence of adverse events**, with all bar one event reported as transient or resolving with cessation of the intervention or minor medical attention, **our review provides clinicians with reassurance about the safety of providing this treatment**.

Paton M et al. Lancet Respir Med. 2024;12: 386–98.

Early mobilisation in patients with shock and receiving vasoactive drugs in the intensive care unit: A systematic review and meta-analysis of observational studies



Parada-Gereda HM et al. Med Intensiva.2025; 49(4):193-204. .

Early mobilisation in patients with shock and receiving vasoactive drugs in the intensive care unit: A systematic review and meta-analysis of observational studies

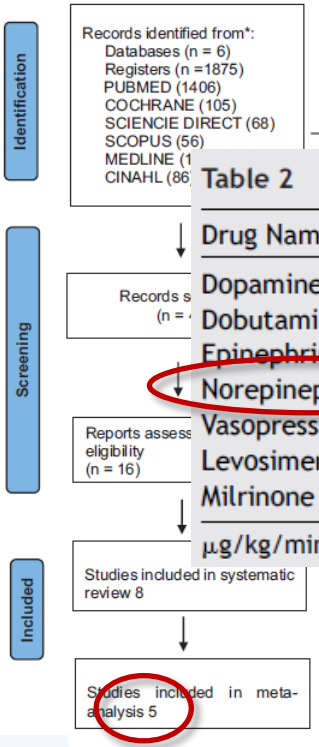


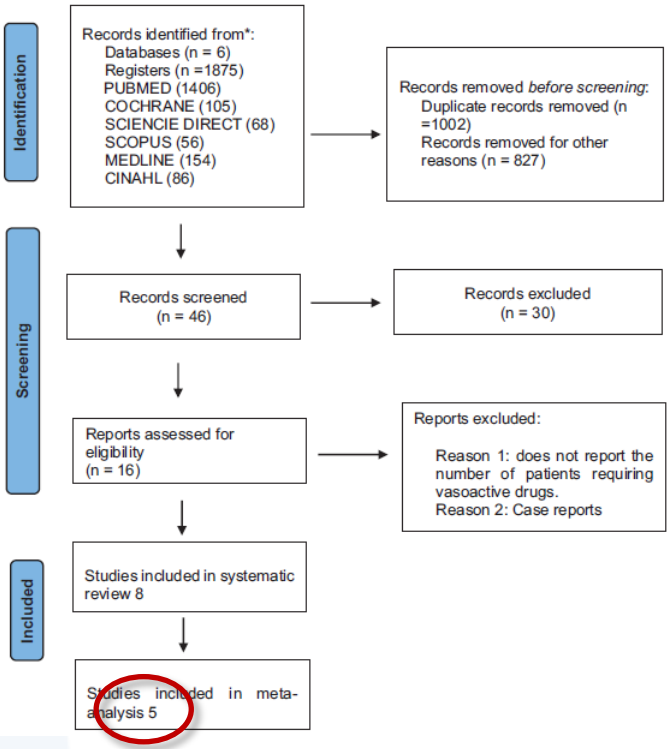
Table 2 Vasoactive Drug Dosage Classification From Boyd et al.[43]

Drug Name	Low Dose, μg/kg/min	Moderate Dose, μg/kg/min	High Dose, μg/kg/min
Dopamine	<3	3–10	>10
Dobutamine	<3	3–10	>10
Epinephrine	<0.05	0.05–0.2	>0.2
Norepinephrine	<0.05	0.05–0.2	>0.2 ~ 1mg/h
Vasopressin	<0.01	0.02–0.03	0.04
Levosimendan	<0.05	0.1	0.2
Milrinone	0-0.15	0.15–0.5	0.5

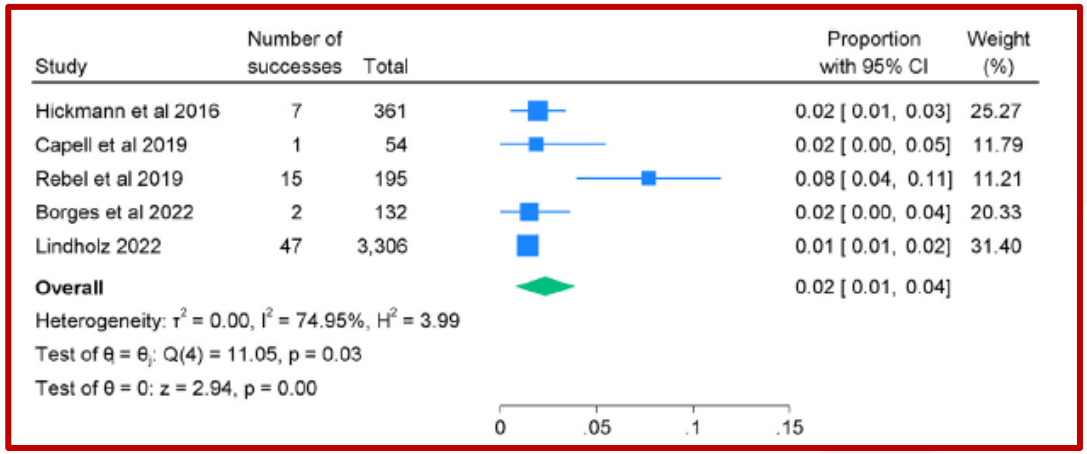
μg/kg/min: microgram/kilogram/minute.

Parada-Gereda HM et al. Med Intensiva.2025; 49(4):193-204. .

Early mobilisation in patients with shock and receiving vasoactive drugs in the intensive care unit: A systematic review and meta-analysis of observational studies

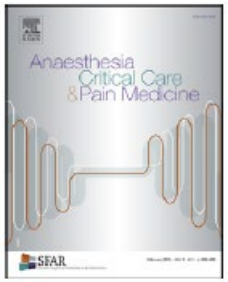


- Pooled proportion of adverse events:



- Proportion of patients who underwent E.M.
  - with low doses V. 64% (95% CI 34%---95%)
  - with moderate doses V. 30% (95% CI 7%---53%)
  - with high doses V. was 7% (95% CI 3%---16%)

Parada-Gereda HM et al. Med Intensiva.2025; 49(4):193-204. .

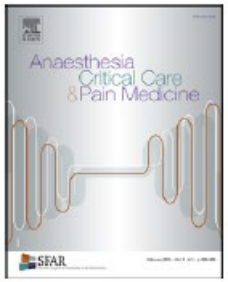


Enhancing early mobilization in critically ill patients through multidisciplinary rounds: A process-focused observational study

ROLE OF MULTISCIPLINARY ROUNDS ?

- Pre- post-intervention study
- Daily MDR
- Primary physicians, intensivists, nurses, pharmacists, dietitians, rehabilitation medicine physicians, physical therapists, and clinical engineers
- 110 versus 190 patients.

Shiota N et al. Anaesth Crit Care Pain Med.2025; 44:101485



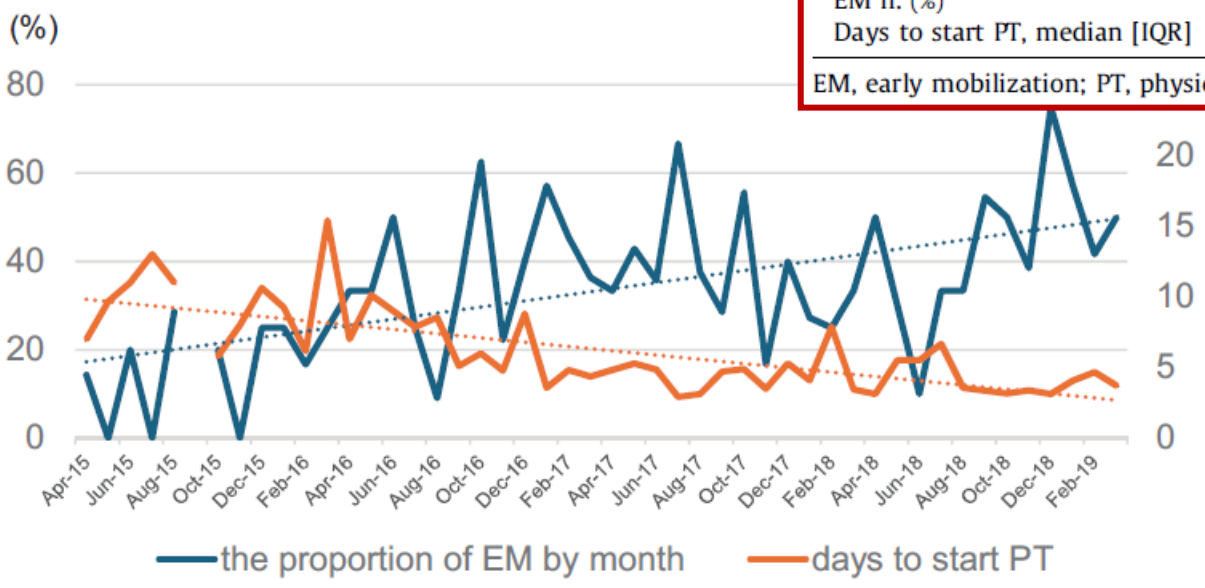
Enhancing early mobilization in critically ill patients through multidisciplinary rounds: A process-focused observational study

ROLE OF MULTISCIPLINARY ROUNDS ?

- Pre- post-intervention study

	Phase 1	Phase 2	*p* value
n	86	130	
EM n. (%)	8 (9.3)	44 (33.8)	<0.001**
Days to start PT, median [IQR]	8.00 [4.00, 13.00]	4.00 [2.00, 7.00]	<0.001**

EM, early mobilization; PT, physical therapy *: *p* value < .05, **: *p* value < .01.



Shiota N et al. Anaesth Crit Care Pain Med.2025; 44:101485

ABCDEF BUNDLE

Assess, prevent, and manage pain;

Both spontaneous awakening and breathing trials;

Choice of Analgesia and Sedation;

Delirium assess, prevent, and manage;

Early Mobility and Exercise;

Family engagement/empowerment.

Creating a Culture of an Awake and Walking Intensive Care Unit

KEY POINTS

- Sedation and immobility are modifiable risk factors for post-intensive care syndrome.
- Mobility in an Awake and Walking intensive care unit (ICU) is considered a prompt life-saving intervention used to prevent and treat delirium, agitation, and acute respiratory failure.
- The ABCDEF bundle and Awake and Walking ICU promote patient wakefulness, cognition, and mobility to mitigate long-term consequences of critical illness (ie, post-intensive care syndrome) affecting up to 70% of survivors.
- These approaches can enhance long-term outcomes by addressing risk factors like sedative use, delirium, and immobility, though the strength of evidence varies.
- Successful implementation requires creating an ICU culture focused on minimizing sedatives, enabling early mobility, and overcoming organizational barriers through tailored strategies.

Dayton K et al. Crit Care Clin.2025; 41:121–40.

TAKE HOME MESSAGE

WHO IS CANDIDATE FOR THE WEAKEST LINK ?

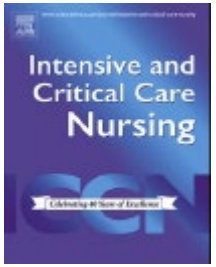
- PATIENT ?
- PHYSICIAN ?
- NURSE ?
- PHYSIOTHERAPIST ?
- (G.P. ?)

TAKE HOME MESSAGE

WHO IS CANDIDATE FOR THE WEAKEST LINK ?

- PATIENT ?
- RELUCTANT PHYSICIAN !!!
- NURSE ?
- PHYSIOTHERAPIST ?
- (G.P. ?)

TAKE HOME MESSAGE



Editorial

In critically ill patients 'time is muscle', isn't it?

Nydhal P. Intens Crit Care Nurs.2024; 81:103615.

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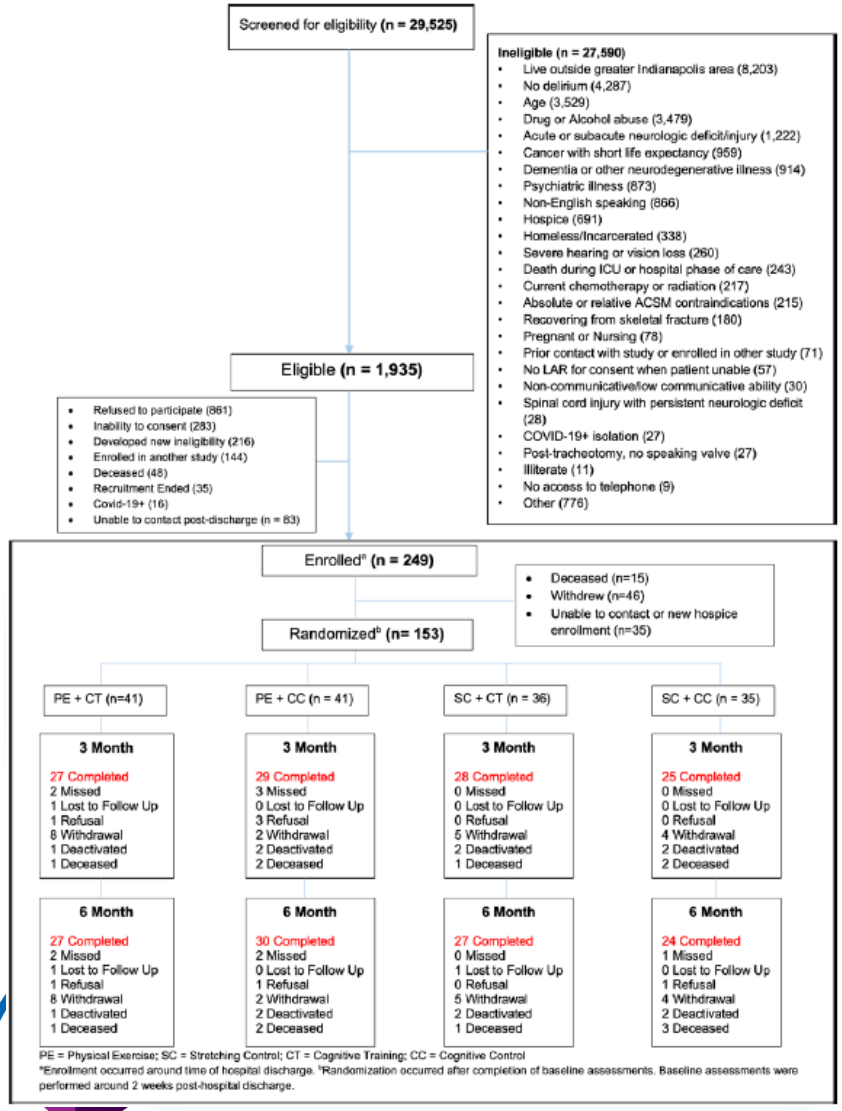
Critical Care Medicine

Improving Recovery and Outcomes Every Day After the ICU (IMPROVE): A Randomized Controlled Trial



4 groups: 12 weeks of

- physical exercise-cognitive training (PE-CT),
- physical exercise-cognitive control (PE-CC),
- stretching control-cognitive training (SC-CT),
- stretching control-cognitive control (SC-CC).

Question: We hypothesized that a 12-week combined physical exercise and cognitive training program would improve cognitive performance among older adult ICU delirium survivors.

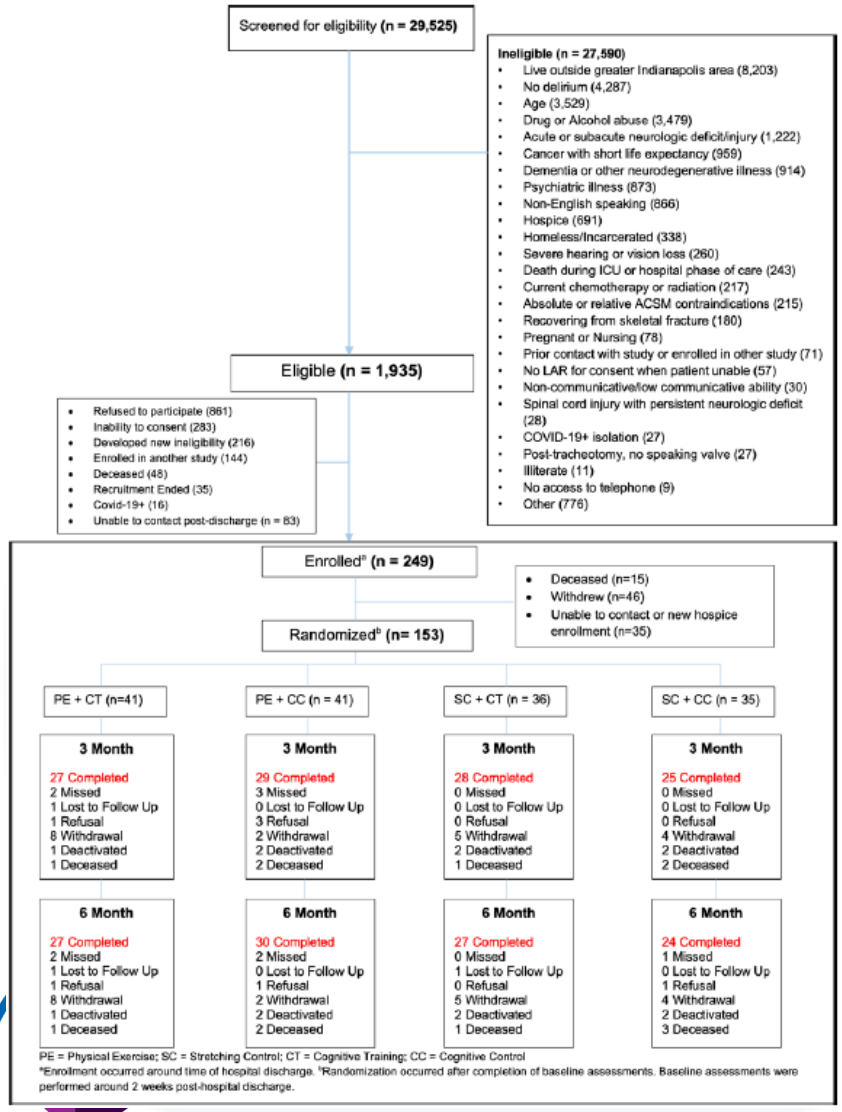
Findings: In this randomized controlled trial, the control groups had significant improvement in scores compared with the cognitive training group at 3 months (mean difference in change from baseline, 0.28; 95% CI, 0.02–0.53) and 6 months (mean difference in change, 0.29; 95% CI, 0.04–0.53).

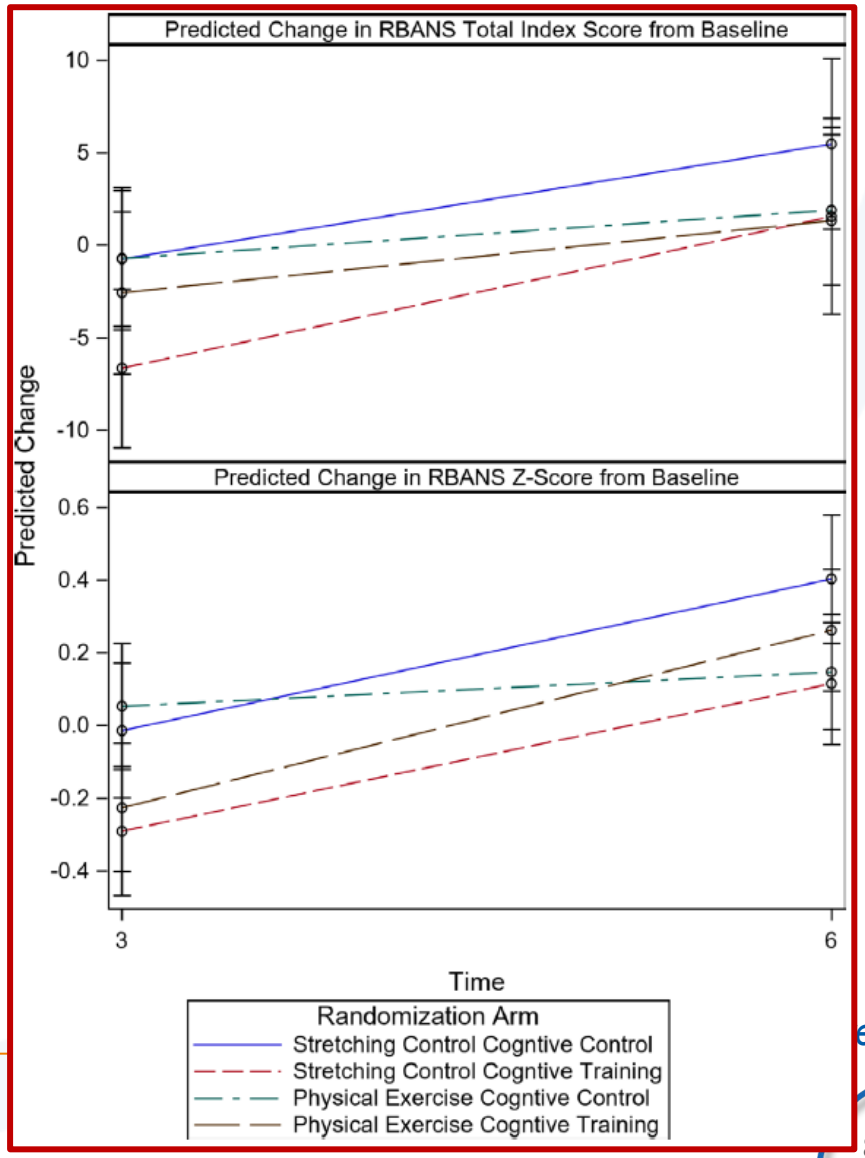
Meaning: While the trial did not achieve its target sample size, a 12-week cognitive and physical training intervention did not result in improved cognitive measures at 3 or 6 months.

Khan SH et al. Crit care Med.2025; in press

Critical Care Medicine

Improving Recovery and Outcomes Every Day After the ICU (IMPROVE): A Randomized Controlled Trial





12. Fan E, Dowdy DW, Colantuoni E, et al. Physical complications in acute lung injury survivors: a two-year longitudinal prospective study. Crit Care Med 2014; 42: 849-59.
13. Needham DM, Wozniak AW, Hough CL, et al. Risk factors for physical impairment after acute lung injury in a national, multicenter study. Am J Respir Crit Care Med 2014; 189: 1214-24.