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Research paper

Barriers to implementing expert safety recommendations for early mobilisation in intensive care unit during mechanical ventilation: A prospective observational study

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At the conclusion of this article a Continuing Professional Development activity is attached

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ABSTRACT

Background: Early mobilisation in the intensive care unit (ICU) has been consistently reported as feasible and safe with minimal adverse events; however, invasive mechanical ventilation patients are rarely actively mobilised. An expert consensus group developed and published recommendations using a traffic light system on safety criteria to promote active mobilisation of invasive mechanical ventilation patients.
Objectives: The aim of this study was to determine whether, in clinical practice, the safety consensus recommendations resulted in (1) increased early mobilisation in patients assessed as appropriate to mobilise based on the risk classification and (2) early mobilisation without adverse events.
Methods: A prospective observational study of 100 patients requiring invasive mechanical ventilation (IMV) for greater than 24 h admitted to the ICU at The Alfred Hospital. Patients were assessed daily (Monday to Friday) to determine their ability to perform early mobilisation.
Results: Data were collected on 100 patients, resulting in 280 physiotherapy–patient interactions during IMV. Of the 100 patients, five patients actively mobilised out of bed during IMV. No adverse event occurred during active physiotherapy–patient interactions. There were 15 physiotherapy–patient interactions that had a low risk of an adverse event, and on nine (60.0%) of these physiotherapy–patient interactions, patients were actively mobilised out of bed with the main reported barrier being time constraints. Of 208 physiotherapy–patient interactions where there were significant potential risks of an adverse event identified for mobilising, active out of bed mobilisation did not occur, with sedation being reported as the main barrier in 170 (82%) patients.
Conclusions: The translation of expert consensus recommendations for early mobilisation into clinical practice was poor. Clinicians were safe and conservative in the implementation of early mobilisation during IMV.

1. Background

Research investigating early mobilisation in the intensive care unit (ICU) is important, with more than 15 randomised or controlled trials with varying outcomes in the past 10 years.[1] Practice change has been advocated in early mobilisation of invasive mechanical ventilation patients and these are demonstrated in international practice guidelines.[2] Early mobilisation has been consistently reported as safe and feasible in ICU, with less than 3% of adverse events occurring during active exercise.[3] Whilst it is important that consideration is given to the risks and benefits of early mobilisation, it is possible that undue concern about adverse events may result in mobilisation being withheld in patients where it may be beneficial.[4]

Tipping et al.[1] systematically reviewed 14 randomised controlled trials (RCTs) and controlled clinical trials of mobilisation

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in ICU. It found that active mobilisation and rehabilitation in the ICU improved muscle strength, walking ability, and days alive out of hospital.

To this end, a multidisciplinary, international expert consensus group developed recommendations on the safety criteria for active mobilisation of critically ill patients during invasive mechanical ventilation (IMV).[4] The consensus group used a traffic light system for recommendations to assist clinicians in evaluating the safety of mobilisation. “Red” indicated a significant potential risk or consequence of an adverse event; active mobilisation should not occur unless specifically authorised by the treating intensive care specialists. “Yellow” indicated a potential risk or consequence of an adverse event but may be outweighed by the potential benefits of mobilisation. The precautions or contraindications should be clarified with the team before mobilisation. “Green” indicated that there is a low risk of an adverse event if the patient is mobilised and to proceed as usual according to each ICU's protocols and procedures. The safety criteria were divided into four categories: respiratory, cardiovascular, neurological, and other considerations (including vascular lines and surgical or medical conditions).

While this expert group had significant experience in early mobilisation, both in clinical practice and in clinical trials, the safety consensus recommendations have not yet been tested. To determine their utility in clinical practice, it is important to determine whether they identify patients at significant risk, potential risk, and low risk accurately to guide clinical decisions for implementation of early mobilisation and to minimise adverse events.

Therefore, the aim of this study was to determine in clinical practice whether adherence to the safety consensus recommendations resulted in (1) increased implementation of early mobilisation in patients and (2) early mobilisation without adverse events.

2. Methods

2.1. Study design and patients

A prospective observational study was conducted of 100 consecutive patients receiving IMV admitted to ICU at The Alfred Hospital. Patients were eligible for inclusion if they were aged more than 18 years and received IMV for greater than 24 h. Patients were excluded if they were imminently dying or the goals of ICU admission were comfort measures. The clinical researcher screened all ICU patients daily (Monday to Friday) for eligibility and provided the treating clinician with a data collection sheet to complete for each individual patient. Data were not collected on the weekends because of limited staffing due to a modified weekend physiotherapist service that exists in our ICU. The physiotherapists involved in the study had completed a department competency training for early mobilisation, the ICU course training with lectures, and simulated patient session where the safety consensus recommendations were taught in a training module. The Alfred Human Research Ethics Committee approved this study with a waiver of consent.

2.2. Collection of demographic and hospital data

Patient demographics were collected including age, gender, admission diagnosis, operative management, comorbidities (using the Functional Comorbidity Index[5]), and Acute Physiology and Chronic Health Evaluation.[6] The duration of IMV, ICU and hospital length of stay, mortality at ICU and hospital discharge, and discharge destination were also collected.

2.3. Collection of daily data

Data were collected for the first 6 days (inclusive of the first 24 h) of IMV, as this was greater than the average length of IMV at this centre. This included physiological information including blood pressure, oxygen saturation and heart rate and rhythm, administration of vasoactive drugs, the Richmond Agitation and Sedation Scale score (RASS),[7] Confusion Assessment Method in the Intensive Care Unit (CAM ICU),[8] and the highest level of mobility using the ICU mobility scale (IMS).[9,10] The IMS records the patients' highest level of mobility on an 11-point scale, from 0 (passively moved in-bed only) to 10 (independent mobility greater than 5 m). Early mobilisation was defined for this study as any active exercise where the patients could assist with the activity using their own muscle strength (IMS $\geq$1), and mobilising out of bed was defined as sitting on the edge of the bed, standing, stepping, and walking (IMS $\geq$3).[4] Serious adverse events during mobilisation were defined a priori as a fall, cardiac arrest, unplanned extubation, loss of an invasive line, and new onset of atrial or ventricular tachyarrhythmia and were recorded throughout the study period.

2.4. Risk of an adverse event

Using a checklist developed from the expert safety consensus recommendations on active mobilising during IMV, patients were identified as having a low, potential, or significant potential risk of an adverse event. It was possible for a patient to have several different risks of an adverse event recorded across the categories simultaneously. When a patient had several risks of an adverse event, patients were put in the highest category of risk. For patients who did not receive active out of bed mobilisation (IMS$\leq$2), the treating ICU physiotherapist reported the barriers to mobilisation. The level of mobilisation achieved by a patient was a combination of the physiotherapist's clinical judgement and utilisation of the consensus recommendations.

2.5. Statistical analysis

Statistical analysis was completed using SPSS (version 23, IBM Corp, Armonk, New York, USA). Data were assessed for normality using the Shapino–Wilks test. Descriptive statistics were reported as mean and standard deviations for normally distributed data, medians and interquartile range for nonnormally distributed data or number and percentage.

3. Results

3.1. Patient characteristics

A total of 100 patients met the inclusion criteria and were enrolled in the study (Fig. 1). Patient demographic data and hospital outcomes are presented in Table 1.

The data capture 280 physiotherapy–patient interactions during IMV from the 100 patients recruited. Patients were receiving IMV via endotracheal tube (ETT) on 256 (91%) physiotherapy–patient interactions and via a tracheostomy on 24 (9%) physiotherapy–patient interactions.

3.2. Early mobilisation and perceived barriers to mobilisation in the whole cohort

Of the 100 patients, five patients mobilised out of bed (IMS $\geq$3) during IMV, for a total of 12/280 (4%) physiotherapy–patient

interactions. The highest mobility achieved during IMV was marching on the spot (IMS = 6). No adverse event occurred during active physiotherapy–patient interactions. The main physiotherapy-reported barriers for patients who did not mobilise out of bed (IMS 0–2) were sedation (37.7%), neurological instability (13.4%), and haemodynamic instability (11.1%) (Fig. 2). These were recorded according to previously reported themes of the barriers and enablers of early mobilisation in ICU.[11]

Of the total cohort, 54 (19.3%) physiotherapy–patient interactions occurred with a noradrenaline dosage greater than 10 mcg/min (range 11–75 mcg/min), and these patients were not actively mobilised out of bed. One patient mobilised out of the bed with a continuous noradrenaline infusion at 4 mcg/min. The Confusion Assessment Method for Intensive Care Unit was positive on 110 (39.2%) physiotherapy–patient interactions, indicating delirium, and was identified as a potential risk of an adverse event. These patients were not mobilised out of bed.

3.3. *Risk of an adverse event identified by the consensus recommendation*

(1) Low risk of an adverse event during active mobilisation

There were 15/280 (5.4%) physiotherapy–patient interactions that had a low risk of an adverse event identified for mobilisation using the safety consensus recommendations. Patients with a low risk of an adverse event were mobilised out of bed on nine (60.0%) occasions during IMV (Table 2). Time constraints was the main physiotherapy reported barrier on three (50.0%) occasions where patients were identified as low risk of an adverse event but were not mobilised, followed by respiratory instability in two (33.3%). Mobilisation of patients during IMV only occurred with senior physiotherapists.

(2) Potential risk of an adverse event during active mobilisation

There were 57/280 (20.4%) physiotherapy–patient interactions that had a potential risk of an adverse events identified for mobilisation. Patients with a potential risk of an adverse event were mobilised out of bed on three (5.3%) occasions, completed active in-bed exercise on 20 (35.1%) occasions, and completed no active exercise on 34 (60.0%) occasions (Table 2). The main reason for a potential risk of an adverse event was sedation (33.8%) and respiratory instability (16.9%).

(3) Significant potential risk of an adverse event during active mobilisation

There were 208/280 (74.3%) physiotherapy–patient interactions that had a significant potential risk of an adverse event identified for mobilising. Out of bed mobility (IMS ≥ 3) did not occur during any of these interactions. There were 194 (93.3%) physiotherapy–patient interactions where patients did no active exercise (IMS = 0) and 14 (6.7%) interactions where patients completed active in-bed exercises (IMS = 1). Sedation was the main reason for a significant potential risk, with 170 (82%) physiotherapy–patient interactions having a Richmond Agitation and Sedation Scale score of less than −2. Other significant potential risks identified included extracorporeal membrane oxygenation (ECMO) and intracranial pressure (ICP) management, in 33 (11.8%) and 33 (11.8%) physiotherapy–patient interactions, respectively.

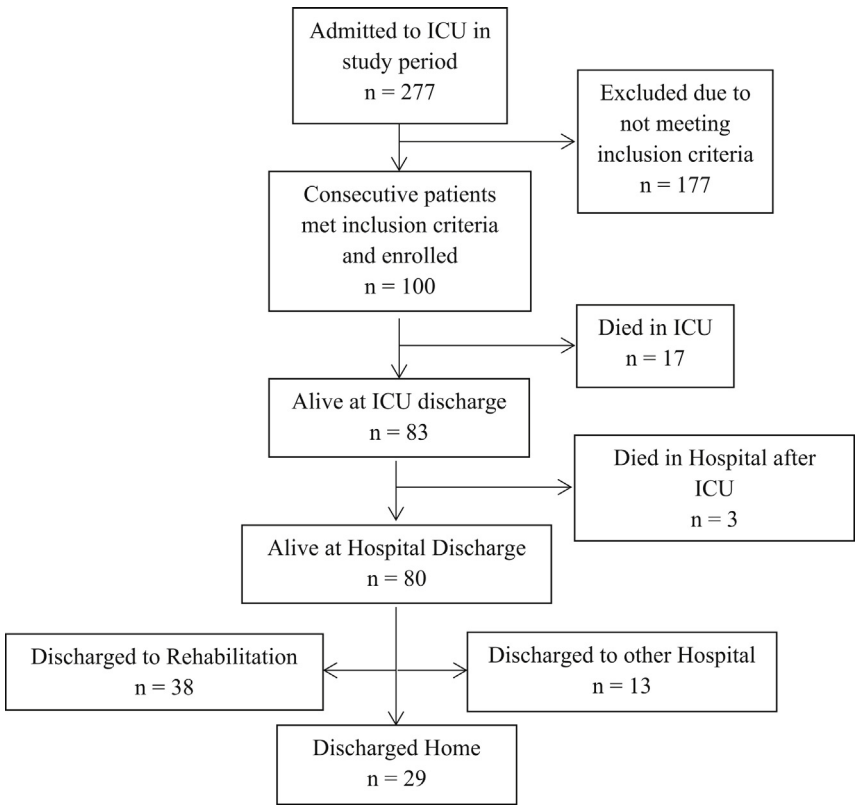

Figure 1. Consort diagram. ICU, intensive care unit.

Table 1
Patient demographics and hospital outcomes.

Demographic data	Total
Age, median (IQR)	55.5 (38.5–66.5)
Sex, males, n (%)	73 (73)
APACHE II, median (IQR)	17.0 (12.5–21.0)
Duration of invasive mechanical ventilation (days), median (IQR)	4.0 (2.0–9.0)
ICU length of stay (days), median (IQR)	7.0 (4.0–12.0)
Hospital length of stay (days), median (IQR)	17.0 (10.0–30.5)
Functional comorbidity Index (/18), median (IQR)	1.0 (1.0–2.0)
Admission diagnosis, n (%)	
Trauma	36 (36)
Cardiovascular	21 (21)
Medical/other	15 (15)
Neurological	13 (13)
Respiratory	12 (12)
Musculoskeletal/Skin	3 (3)
Operative management, n (%)	
Emergency	59 (59)
Elective	13 (13)
Mortality at ICU discharge, n (%)	17 (17)
Mortality at hospital discharge, n (%)	20 (20)
Discharge destination, n (%) (excluding deaths)	
Home	29 (36.3)
Rehabilitation	38 (47.5)
Other hospital	13 (16.3)

APACHE II = Acute Physiology and Chronic Health Evaluation; ICU = intensive care unit; IQR = interquartile range; n = number of patients.

4. Discussion

4.1. Key findings

This prospective study measured the implementation of expert safety criteria for early mobilisation during IMV, and it was found, in our ICU, that there was poor translation of expert consensus recommendations into clinical practice. There were very few patients identified at low risk of an adverse event during mechanical ventilation; however, of this group, early mobilisation did not occur in 40% of the physiotherapy–patient interactions. In this group, the main reported barrier was time constraints or a lack of staff resources. Patients with a potential risk of an adverse event were identified and not mobilised out of bed, mainly due to sedation and respiratory instability. Patients with a significant risk of an adverse event were appropriately identified and were not actively mobilised, with the main reported barrier being sedation. Sedation was a commonly reported barrier to early mobilisation and due to this study being completed at a tertiary, high acuity ICU encompassing major trauma, transplant, medical and surgical patients, many patients required a period of sedation due to medical instability.

In this study, the drivers of clinical decision-making were potentially modifiable in the majority of patients with either sedation interruption, changing the placement of invasive lines, and extra staff resources. There also needs to be education and strategies in place to educate the multidisciplinary team and address environmental factors such as equipment and resources limiting early mobilisation.

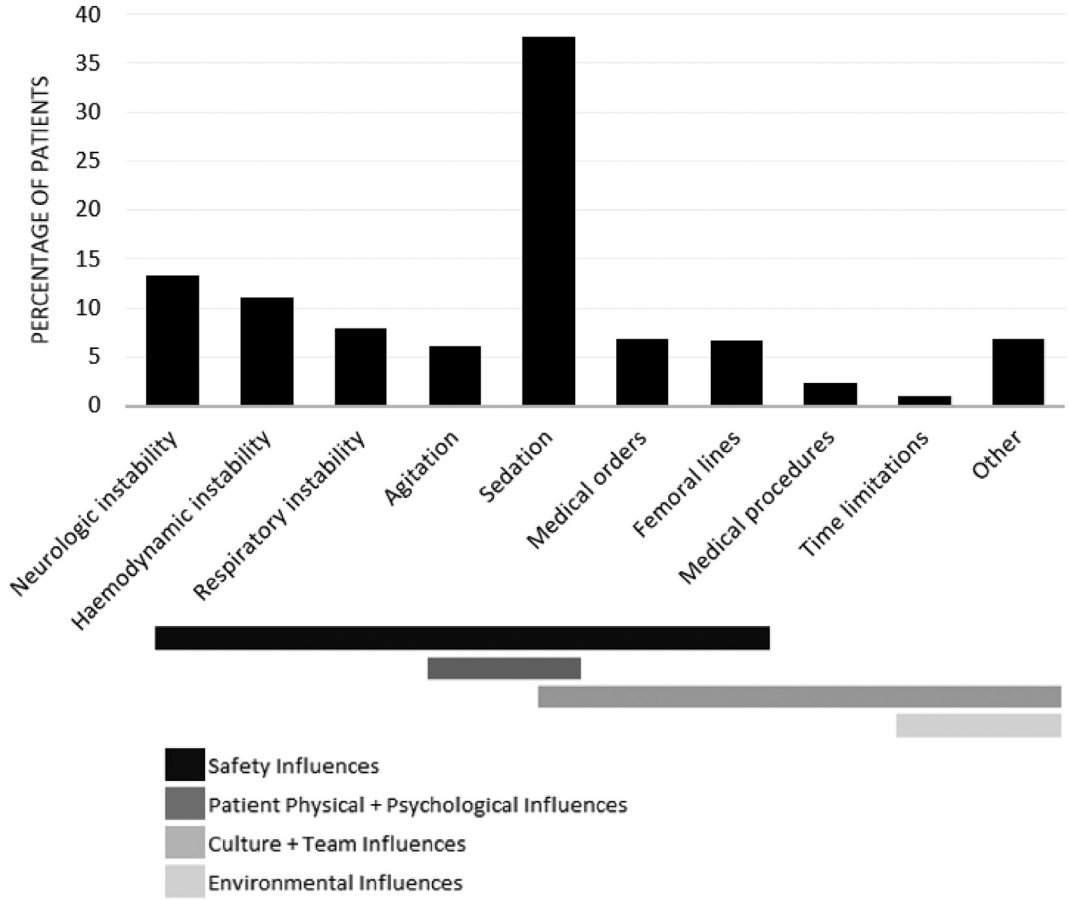

Figure 2. Physiotherapist reported barriers to out of bed mobilisation and associated themes (n = 494 total barriers reported. Note: patients many have multiple barriers).

Table 2
Mobilisation and identified level of risk.

Identified level of risk	No active exercise (IMS = 0)	In-bed active exercise or passively transferred out of bed (IMS = 1–2)	Out of bed exercise (IMS ≥3)	Total, n (%) (n = 280)
Low risk, n (%)	3 (20.0)	3 (20.0)	9 (60.0)	15 (6)
Potential risk, n (%)	34 (60.0)	20 (35.1)	3 (5.3)	57 (20)
Significant potential risk, n (%)	194 (93.3)	14 (6.7)	0 (0)	208 (74)

IMS = intensive care unit mobility scale; n = number of patients.

4.2. Relationship to previous studies

Similar to the current study, a prospective observational study of mobilisation practice during IMV enrolled 192 patients from 12 ICUs in Australia and New Zealand.[12] There were 1288 physiotherapy–patient interactions while patients were on IMV, and no early mobilisation occurred in 1079 (84%) of these interactions. A total of 122 (63.5%) patients did not receive early active mobilisation. The main reported barrier to mobilisation was sedation, with nearly half of the cohort too sedated for active mobilisation on days 1 and 2 in ICU and >30% on days 3 and 4.[12] Low rates of active mobilisation during IMV have also been demonstrated in both an audit of usual practice[13] and a point prevalence study.[14] The point prevalence study completed by Berney et al.[14] demonstrated that no patients receiving IMV sat out of bed or walked, which aligns with our findings of low rates of mobilisation of invasive mechanical ventilation patients.

More recently, a systematic review of the safety of early mobilisation reported low incidence of adverse events and demonstrated that physical rehabilitation is safe in the ICU.[3] Early mobilisation of patients during IMV in the ICU is rarely practiced, and the safety consensus recommendations have not increased rates of active mobilisation, possibly due to sedation practices and lack of staff resources. Future research needs to identify which patients can safely participate in active mobilisation even in the presence of a potential risk of an adverse event. There have been three recent point prevalence studies completed showing various ranges of early mobilisation in IMV patients between 16 and 33%.[15–17] This might be different to our study as they are completed in different countries and have different patient populations.

4.3. Barriers to early mobilisation

Parry et al.[11] identified that the barriers to physical activity in ICU fit into five main themes: (i) patient physical and psychological influences; (ii) safety influences; (iii) culture and team influences; (iv) motivation and beliefs regarding the benefits and risks; and (v) environmental influences. The barriers identified in this study mainly involve cultural, team, and safety factors (Fig. 2).

An interprofessional survey of perceived barriers and facilitation to early mobilisation of critically ill patients found that 58% of clinicians did not feel adequately trained to mobilise patients during IMV. The results also established that clinicians were not fully aware of the benefits of early mobilisation, and 49% of respondents did not perceive it as a priority.[18]

A systematic review identifying barriers to delivering the Awakening, Breathing Coordination, Delirium, and Early mobility/exercise (ABCDE) bundle to minimise adverse outcomes for IMV patients found 107 barriers and identified four classes of ABCDE barrier.[19] These barriers included patient-related (patient instability), clinician-related (lack of knowledge and staff safety concerns), protocol-related (unclear protocol criteria), and ICU contextual barriers (interprofessional team coordination).[19] Similarly, a previous study also concluded that the major barriers to mobilisation in ICU were unit culture, lack of resources, prioritisation, and leadership.[20] Barber et al.[20] suggested that multidisciplinary team planning, organisation, and strong leadership were seen as vital from medical, nursing, and physiotherapy staff to increase mobility levels in the intensive care. This study demonstrated that only senior physiotherapist mobilised patients and that junior staff appear more conservative when mobilising IMV patients. When making early mobilisation a priority within the unit with interdisciplinary goals, a change in unit culture and education could assist with improving the confidence and utilising the appropriate resources to mobilise IMV patients in our ICU. The use of an early mobilisation protocol, clinical leadership, and the safety consensus recommendations could address several of the barriers to early mobilisation identified by these previous studies.

4.4. Strength and limitations

There were several strengths of this study, including the prospective design and that it was conducted in a large tertiary ICU. Patients included in this study were a mixed cohort of medical, surgical, and trauma patients increasing the generalisability of the results. Owing to the high acuity of patients, unfortunately there were 17 patients who died during the study who initially met the inclusion criteria. The main limitation of this study was that it was conducted in a single centre and therefore is not necessarily indicative of practices in other tertiary ICUs. Further replication of this study needs to be completed in other centres. The main reported barriers to mobilisation were also only reported by the physiotherapists as we only collected data from the physiotherapy–patient interactions. Therefore the results do not represent the perceived barriers from the other team members (i.e. the nursing and medical staff). At our centre, all mobility sessions during IMV involve a physiotherapist as well as nursing staff.

4.5. Future directions

This study has demonstrated several areas for future research. First, there is evidence of a strong link between sedation management and early mobilisation, and future studies should address this with appropriate sedation protocols or sedation minimisation.[12,21] Second, there is a need to examine the effects of a dedicated leadership team to champion early mobilisation in ICU with increased education to particularly target the patients who have a potential risk of an adverse event and increase the rates of mobilisation.[22] In addition, targeted education for junior therapists could have a positive impact on their attitudes and behaviours towards early mobilisation. Finally, the need for additional staff resources was identified in the current study and should be tested as an intervention to increase the implementation of early mobilisation during mechanical ventilation.

5. Conclusions

The translation of expert consensus recommendations for early mobilisation into clinical practice was poor in our ICU. Critically ill patients receiving IMV are commonly identified by

physiotherapists at an increased risk of an adverse event during early mobilisation, but many of the drivers of clinical decision-making are modifiable, including sedation practices and staff resources. Physiotherapists were safe and generally overly conservative in their management of patients during IMV, commonly not mobilising patients in or out of bed regardless of having a low, potential, or significant risk of an adverse event.

Ethics approval and consent to participate

The Alfred Human Research Ethics Committee Project no: 423. Consent to participate is not applicable.

Consent for publication

Not applicable.

Availability of data and material

The data sets used and/or analysed during the current study are available from the corresponding author on reasonable requests.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.aucc.2018.05.005.

To answer the Continuing Professional Development Questions - go to page 191 http://dx.doi.org/10.1016/S1036-7314(19)30104-3

References

[1] Tipping CJ, Harrold M, Holland A, Romero L, Nisbet T, Hodgson CL. The effects of active mobilisation and rehabilitation in ICU on mortality and function: a systematic review. Intensive Care Med 2017;43(2):171–83.
[2] Fan E, Del Sorbo L, Goligher EC, Hodgson CL, Munshi L, Walkey AJ, et al. An official American thoracic society/European society of intensive care medicine/society of critical care medicine clinical practice guideline: mechanical ventilation in adult patients with Acute respiratory distress syndrome. Am J Respir Crit Care Med 2017;195(9):1253–63.
[3] Nydahl P, Sricharoenchai T, Chandra S, Sari Kundt F, Huang M, Fischill M, et al. Safety of patient mobilization and rehabilitation in the intensive care unit. Systematic review with meta-analysis. Ann Am Thorac Soc. 2017;14(5):766–77.
[4] Hodgson CL, Stiller K, Needham DM, Tipping CJ, Harrold M, Baldwin CE, et al. Expert consensus and recommendations on safety criteria for active mobilization of mechanically ventilated critically ill adults. Crit Care 2014;18(6):658.
[5] Groll DL, To T, Bombardier C, Wright JG. The development of a comorbidity index with physical function as the outcome. J Clin Epidemiol 2005;58(6):595–602.
[6] Knaus WA, Draper EA, Wagner DP, Zimmerman JE. APACHE II: a severity of disease classification system. Crit Care Med 1985;13(10):818–29.
[7] Sessler CN, Gosnell MS, Grap MJ, Brophy GM, O'Neal PV, Keane KA, et al. The Richmond agitation-sedation scale: validity and reliability in adult intensive care unit patients. Am J Respir Crit Care Med 2002;166(10):1338–44.
[8] Ely EW, Inouye SK, Bernard GR, Gordon S, Francis J, May L, et al. Delirium in mechanically ventilated patients: validity and reliability of the confusion assessment method for the intensive care unit (CAM-ICU). JAMA 2001;286(21):2703–10.
[9] Hodgson C, Needham D, Haines K, Bailey MJ, Ward A, Harrold M, et al. Feasibility and inter-rater reliability of the ICU mobility scale. Heart Lung 2014;43(1):19–24.
[10] Tipping CJ, Bailey MJ, Bellomo R, Berney S, Buhr H, Denehy L, et al. The ICU mobility scale has construct and predictive validity and is responsive: a multicenter observational study. Ann Am Thorac Soc 2016;13(6):887–93.
[11] Parry SM, Knight LD, Connolly B, Baldwin C, Puthucheary Z, Morris P, et al. Factors influencing physical activity and rehabilitation in survivors of critical illness: a systematic review of quantitative and qualitative studies. Intensive Care Med 2017;43(4):531–42.
[12] Team Study Investigators. Early mobilization and recovery in mechanically ventilated patients in the ICU: a bi-national, multi-centre, prospective cohort study. Crit Care 2015;19(1):81.
[13] Leditschke IA, Green M, Irvine J, Bissett B, Mitchell IA. What are the barriers to mobilizing intensive care patients? Cardiopulm Phys Ther J 2012;23(1):26–9.
[14] Berney SC, Harrold M, Webb SA, Seppelt IM, Patman S, Thomas P, et al. Intensive care unit mobility practices in Australia and New Zealand: a point prevalence study. Crit Care Resusc 2013;15(4):260–5.
[15] Nydahl P, Ruhl AP, Bartoszek G, Dubb R, Filipovic S, Flohr HJ, et al. Early mobilization of mechanically ventilated patients: a 1-day point-prevalence study in Germany. Crit Care Med 2014;42(5):1178–86.
[16] Jolley SE, Moss M, Needham DM, Caldwell E, Morris PE, Miller RR, et al. Point prevalence study of mobilization practices for acute respiratory failure patients in the United States. Crit Care Med 2017;45(2):205–15.
[17] Sibilla A, Nydahl P, Greco N, Mungo G, Ott N, Unger I, et al. Mobilization of mechanically ventilated patients in Switzerland. J Intensive Care Med 2017. 885066617728486.
[18] Anekwe DE, Koo KK, de Marchie M, Goldberg P, Jayaraman D, Spahija J. Interprofessional survey of perceived barriers and facilitators to early mobilization of critically ill patients in Montreal, Canada. J Intensive Care Med 2017. 885066617696846.
[19] Costa DK, White MR, Ginier E, Manojlovich M, Govindan S, Iwashyna TJ, et al. Identifying barriers to delivering the awakening and breathing coordination, delirium, and early exercise/mobility bundle to minimize adverse outcomes for mechanically ventilated patients: a systematic review. Chest 2017;152(2):304–11.
[20] Barber EA, Everard T, Holland AE, Tipping C, Bradley SJ, Hodgson CL. Barriers and facilitators to early mobilisation in Intensive Care: a qualitative study. Aust Crit Care 2015;28(4):177–82.
[21] Hodgson CL, Bailey M, Bellomo R, Berney S, Buhr H, Denehy L, et al. A binational multicenter pilot feasibility randomized controlled trial of early goal-directed mobilization in the ICU. Crit Care Med 2016;44(6):1145–52.
[22] Schaller SJ, Anstey M, Blobner M, Edrich T, Grabitz SD, Gradwohl-Matis I, et al. Early, goal-directed mobilisation in the surgical intensive care unit: a randomised controlled trial. Lancet 2016;388(10052):1377–88.