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Defining new barriers to mobilisation in a highly active intensive care unit – have we found the ceiling? An observational study

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ABSTRACT

Background: Mobilisation of intensive care (ICU) patients attenuates ICU-acquired weakness, but the prevalence is low (12–54%). Better understanding of barriers and enablers may inform practice.
Objectives: To identify barriers to mobilisation and factors associated with successful mobilisation in our medical /surgical /trauma ICU where mobilisation is well-established.
Methods: 4-week prospective study of frequency and intensity of mobilisation, clinical factors and barriers (extracted from electronic database). Generalized linear mixed models were used to describe associations between demographics, clinical factors and successful mobilisation.
Results: 202 patients accounted for 742 patient days. Patients mobilised on 51% of patient days. Most frequent barriers were drowsiness (18%), haemodynamic/respiratory contraindications (17%), and medical orders (14%). Predictors of successful mobilisation included high Glasgow Coma Score (OR = 1.44, 95%CI=[1.29–1.60]), and male sex (OR = 2.29, 95%CI=[1.40–3.75]) but not age (OR = 1.05, 95%CI=[1.01–1.08]).
Conclusions: Our major barriers (drowsiness, haemodynamic/respiratory contraindications) may be unavoidable, indicating an upper limit of feasible mobilisation therapy in ICU.

Introduction

Immobility due to bed rest and sedation is a major contributor to ICU-acquired weakness (ICU-AW), which is associated with extended ICU and hospital stays,[1] increased duration of mechanical ventilation,[2,3] delirium, functional deficits post-discharge,[4] increased mortality and a lower quality of life.[4–6] Despite these concerns, the point prevalence of mobilisation of ICU patients is low, especially for mechanically ventilated patients.[7–9] Across 38 ICUs in Australia and New-Zealand, observing 498 patients, over half were immobile, 86% did not walk and mechanically ventilated patients maximally mobilised to sitting over the bed edge.[7] A German point-prevalence study revealed similar low levels of mobilisation from 783 patients across 168 ICUs, with 24% of patients mobilised out of bed, while one patient with an endotracheal tube marched on the spot.[8]

The barriers to early mobility in the ICU have been extensively described.[10–14] Mobilisation of critically ill patients can be arduous and time-consuming due to extensive preparation, slow incremental increases in physical exertion, and careful monitoring and management of airways, cannulas and other tubing. Patient-related barriers to mobilisation include haemodynamic or respiratory instability, sedation, agitation, patient refusal and the perceived risk of dislodging vascular access devices.[7,10,11,14] Canadian data revealed that early mobilisation was not a priority for 49% of ICU clinicians, indicating a generally poor awareness of the benefits of mobility.[13,15] Furthermore, in a recent comprehensive systematic review, lack of interprofessional communication and coordination was found to be a barrier to mobilisation in ICU survivors.[14] A 'lack of a mobility culture' is difficult to overcome, but lasting improvements have been achieved in an eight bed respiratory ICU, attributed to 'interprofessional champions' and educating ICU staff.[16]

In contrast, our ICU has maintained a strongly positive interdisciplinary 'mobilisation culture' for more than 12 years,[10,17,18]

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whereby our medical, physiotherapy and nursing staff work collaboratively to facilitate out-of-bed mobilisation as a priority. In 2012, we reported that patients were mobilised on 54% of patient days in our ICU,[10] which to our knowledge is at the highest end of published rates for a tertiary ICU in Australia or New Zealand. We previously identified placement of femoral lines, respiratory/haemodynamic/neurological instability and timing of medical procedures as the major barriers to mobility.[10] However, given that mobilisation practice is dependent on ICU culture, the mobilisation prevalence and barriers may have changed with staff turnover and ICU expansion. Thus, we aimed to explore the following in our single tertiary Australian ICU:

- To determine whether any improvements or regressions in mobilisation practice that have occurred in mobilising ICU patients since our previous audit,[10]
- To identify the current barriers to mobilising patients, and
- To identify any patient parameters which were predictive of successful mobilisation

Methods

Study design and participants

A 4-week prospective audit of usual practice was conducted (October–November 2016) in our Australian mixed medical-surgical, combined ICU and High Dependency Unit. All patients admitted to the ICU over the age of 16 years, and patients already in the ICU at the onset of the audit, were included in the study. The study was approved by the Australian Capital Territory Health Research Ethics and Governance Office, Low-Risk Sub-Committee (ETHLR.16.160), Australian National University Human Research Ethics Committee (ANU HREC protocol 2016/579) and the University of Canberra Human Research Ethics Committee (ETHLR.16–160). A Waiver of Consent was approved for the study and it was registered with the Australian and New Zealand Clinical Trials register (ACTRN12616001420437).

De-identified data was extracted from the MetaVision archive database (iMDsoft, USA). Physiotherapy and nursing notes were interrogated to identify the frequency and type of mobility performed, reasons for not mobilising (as perceived by the clinician) and adverse events during mobilisation. Mobility intensity was quantified according to the ICU Mobility Scale (IMS). Briefly, the IMS categorises a level of mobility of a patient where 0 indicates immobile and the maximum 10 indicates independent walking away from the bed space. The IMS has been well characterised in terms of its validity to report mobility milestones, its feasibility and inter-rater reliability between healthcare professionals.[19] The following patient vital signs and physiological parameters were extracted: Glasgow Coma Score (GCS), heart rate (HR), mean arterial pressure (MAP), ear temperature (Temp), respiratory rate (RR), haemoglobin saturation (SpO_2), mechanical ventilation status (V – ventilated, NV – not ventilated), fraction of inspired oxygen (FiO_2) and fluid balance. Parameters were recorded as those occurring most recently prior to mobilisation, or, for immobile patients, at 9:00am. All barriers to mobilisation were clinician-reported, such that ‘haemodynamic instability’ or ‘insufficient respiratory reserve’ are interpreted by the clinician relative to the patient’s recent status. Thus the barriers identified reflect actual clinical reasoning of the bedside clinicians, rather than arbitrary parameters.

Mobilisation technique and description

Our ICU’s mobilisation practice has been described previously.[10,18] To allow comparison with the previous audit (which predates the development of the IMS) we stratified mobilisation as follows: ‘Active mobilisation’ requires the patient to walk away from the bed space or march on the spot with or without assistance (equivalent to IMS ≥6). ‘Active transfer’ requires patients to mobilise between a bed and a chair with weight bearing, with or without assistance (equivalent to IMS 4–5). Passive transfer involves patients passively transferred between a bed and a chair without weight bearing, such as in a sling lifter (IMS = 2).

Adverse events

Adverse events were defined *a priori* as falling to the floor, cardiac arrest, rapid atrial fibrillation, ventricular tachycardia or other dangerous arrhythmia during mobility, oxygen saturation less than 80% for greater than 3 minutes, unplanned extubation, or loss of an invasively inserted line.[20]

Data analysis

Two generalized linear mixed models were used to infer associations between demographics, clinical factors and successful mobilisation. The two major outcome measures were, first, mobilisation success defined by a session of active mobility, active transfer or passive transfer; and secondly, whether the patient achieved an IMS ≥ 4 (i.e. ICU mobility scale score of weight bearing mobility or more, to distinguish more active mobilisation from relatively passive mobilisation). Explanatory variables in the multivariate analyses included patient demographics (age, sex, ICU length of stay), and physiological parameters (APACHE II, GCS, HR, MAP, Temp, RR, SpO_2, mechanical ventilation status, FiO_2 and fluid balance). All physiological parameters in the multivariate analyses were treated as continuous variables, apart from mechanical ventilation status. The statistical tests were two-sided and p values less than 0.05 were considered statistically significant. Data are reported as odds ratio (OR) with 95% confidence intervals. Statistical analysis was conducted using Statistical Packaging for the Social Sciences (SPSS, IBM Corporation, New York) and R Statistical Package (Version 3.0.2).

Results

Patient demographics

This study captured 202 patients (105 medical, 83 surgical, 14 trauma) totalling 742 patient days (Table 1). 61% (126) of the

Table 1
Clinical and demographic characteristics of the sample

Clinical and demographic characteristics	
Age *years*	63 (16)
Sex *male* (%)	126 (62.4%)
Disease Severity *APACHE II* (%)	
< 10	29 (14.4%)
10–20	102 (50.5%)
21–30	58 (28.7%)
> 30	13 (6.4%)
ICU Admission Reason (%)	
Medical	105 (52.0%)
Surgical	83 (41.1%)
Trauma	14 (6.9%)
ICU Length of Stay (%)	
< 2 days	81 (40.1%)
2–7 days	97 (48.0%)
> 7 days	24 (11.9%)
Acute Hospital Length of Stay *days* (range)	21 (1–307)

Data reported as mean (standard deviation) unless otherwise stated.