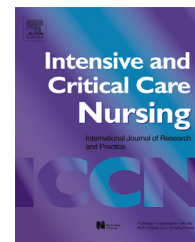




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ORIGINAL ARTICLE

# Impact of mobilisation therapy on the haemodynamic and respiratory status of elderly intubated patients in an intensive care unit: A retrospective analysis



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Received 26 December 2014; received in revised form 26 January 2016; accepted 6 February 2016

## KEYWORDS

Haemodynamics;  
Intensive care unit;  
Lung function;  
Mobilisation

## Summary

**Objectives:** This study identified respiratory and haemodynamic parameters affected by limited mobilisation therapy in elderly, critically ill, intubated patients in an intensive care unit.

**Methods:** Over 18 months, we retrospectively assessed physiological changes during 43 mobilisation therapy sessions in 23 patients requiring mechanical ventilation for >48 h. We compared heart rate, mean arterial blood pressure, respiratory rate, partial pressure of oxygen in arterial blood/inspired fraction of oxygen and lactate before and after mobilisation therapy, which entailed sitting on the edge of a hospital bed without back support. We analysed baseline characteristics and therapy duration.

**Results:** Patients' median age was 75 (interquartile range: 65–79) years, and the median Acute Physiology and Chronic Health Evaluation II score was 27 (26–31). Average therapy duration was 1 h (0.5–2 h). Therapy did not significantly modify heart rate or arterial blood pressure but increased the partial pressure of oxygen in arterial blood/inspired fraction of oxygen ratio significantly, from 218.8 (135.4–271.7) to 237.3 (167.2–284.9;  $p=0.007$ ), indicating improved lung function.

**Conclusion:** In this retrospective review, mobilisation therapy had no adverse effect on elderly, critically ill, intubated patients' haemodynamic status and appeared to improve the  $\text{PaO}_2/\text{FIO}_2$  ratio; further research is required to confirm this finding.

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### Implications for Clinical Practice

- Mobilisation therapy had no adverse effect on the haemodynamic status of elderly, critically ill, intubated patients.
- Mobilisation therapy could improve lung function in terms of the PaO<sub>2</sub>/FIO<sub>2</sub> ratio.
- We recommend earlier and more frequent implementation of mobilisation therapy.

## Introduction

The goal of intensive care is to decrease short-term mortality. However, it is also important to focus on long-term health and well-being (Angus and Carlet, 2003). In a study conducted by Herridge et al. (2003), half of the patients were unable to return to work due to persistent fatigue, weakness and poor functional status one year after discharge. Weakness tends to occur following prolonged immobilisation, high doses of corticosteroids and/or neuromuscular blockers and intensive care unit (ICU)-acquired weakness (De Jonghe et al., 1998, 2002).

Mobilisation therapy, which involves actions such as ambulating and sitting on the edge of the bed or in a chair, is believed to prevent or attenuate this weakness and reduce the duration of mechanical ventilation and ICU/hospital stays (Chiang et al., 2006; Martin et al., 2005; Morris et al., 2008; Needham et al., 2010; Pohlman et al., 2010; Schweickert et al., 2009). The number of reports showing that early mobilisation therapy in intubated patients is feasible and safe has increased since 2004 (Bourdin et al., 2010; Chiang et al., 2006; Martin et al., 2005; Morris et al., 2008; Needham et al., 2010; Pohlman et al., 2010; Schweickert et al., 2009; Stiller et al., 2004; Zafiroopoulos et al., 2004; Zanni et al., 2010). However, few studies have examined the impact of mobilisation therapy on respiratory and haemodynamic parameters in ICU patients (Stiller et al., 2004; Zafiroopoulos et al., 2004; Zanni et al., 2010). Furthermore, no studies have been conducted to investigate elderly, critically ill, intubated patients' respiratory and haemodynamic responses to mobilisation therapy limited to sitting on the edge of the bed. In addition, there are many barriers to therapy such as concern over endotracheal tube or drain dislodgment, need for sedation and time constraints for nurses and physicians. Therefore, further studies are required to determine the safety, efficacy and applicability of closely monitored therapy sessions conducted by ICU personnel for elderly, critically ill, intubated patients.

## Methods

### Aim

The aim of this study was to determine whether respiratory and haemodynamic parameters would be affected by mobilisation therapy, limited to sitting on the edge of the bed, in elderly, critically ill, intubated patients during ICU hospitalisation.

### Study subjects

A retrospective observational study was conducted between January 1, 2011 and June 30, 2012 in the ICU of our

hospital. A convenience sample of subjects who were older than 60 years of age and required mechanical ventilation and intubation for more than two days was recruited. These subjects were required to satisfy a number of inclusion criteria: (1) intubation and ventilation for more than two days following ICU admission; (2) immobilisation for at least two days before therapy onset; and (3) ability to sit on the edge of a hospital bed without back support before extubation. We selected patients who had undergone more than two days of mechanical ventilation, to ensure that we included critically ill patients at risk of developing physical debilitation. The exclusion criteria were as follows: (1) previous brain surgery; (2) evidence of neurological compromise; (3) admission to the ICU following cardiac arrest; and (4) previous tracheostomy. We used the first three exclusion criteria because these patients found it difficult to respond to verbal stimulation; in addition, it is easy to implement mobilisation therapy for tracheostomy patients. The study was approved by the institution with which the authors were affiliated. We obtained written consent from subjects' next of kin prior to mobilisation therapy.

### Mobilisation therapy

We selected six criteria for mobilisation therapy initiation: (1) response to verbal stimulation; (2) heart rate (HR) of <120 beats/min; (3) systolic blood pressure of >90 mmHg, with no unstable arrhythmia; (4) respiratory rate of <30 breaths/min; (5) ratio of partial pressure of oxygen in arterial blood to the inspired fraction of oxygen (PaO<sub>2</sub>/FIO<sub>2</sub> ratio) of >100; and (6) lactate level of <30 mg/dl. Therapy was not initiated unless all of these criteria were fulfilled. These parameters were measured daily by more than three ICU physicians. We recorded HR, mean arterial blood pressure (mAP), PaO<sub>2</sub>/FIO<sub>2</sub> ratio, lactate and the extent of atelectasis using computed tomography before and after each therapy session. We also observed the length of time that subjects were able to sit on the edge of a hospital bed without back support.

Mobilisation therapy sessions typically begin with the patient seated on the edge of a hospital bed without back support; the patient then sits in a chair following transfer from the hospital bed and ultimately progresses to ambulation (Hopkins et al., 2007). In the present study, therapy was limited to sitting on the edge of the bed because of the severity of patients' conditions. We provided a table for patients to lean against, as shown in Fig. 1. Two nurses and a physician eased the patient into a sitting position to ensure that tubes and catheters remained in place comfortably and all connections between the patient and equipment remained secure. Therapy ceased when any of the following occurred: (1) HR of  $\geq 140$  beats/min, (2) new cardiac arrhythmia, (3) systolic arterial blood pressure of  $\leq 90$  mm Hg or  $\geq 180$  mm Hg, (4) respiratory rate of  $\geq 35$  breaths/min,

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