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Series on Early Mobilisation of Critically Patients

Introduction

Patients in the intensive care unit (ICU) often receive heavy sedation and bed rest, particularly while mechanically ventilated (Needham et al. 2007; Weinert & Calvin 2007; Winkelman et al. 2005). This immobility may contribute to ICU-acquired neuromuscular weakness, which can be severe and long lasting in some ICU survivors. (De Jonghe et al. 2002; Fletcher et al. 2003; Herridge et al. 2003). To improve this complication of critical illness, there is growing interest in early mobilisation of patients in the ICU setting (Herridge 2008; Korupolu et al. 2009; Needham 2008; Perme and Chandrashekar 2009). Existing studies indicate that early mobilisation is safe and associated with improved physical function, shortened length of stay, and improved weaning from mechanical ventilation. In this article, we discuss issues related to the safety and screening of critically ill patients for early mobilisation.

Early Mobilisation in the ICU

Early mobilisation aims to reduce the deleterious effects of bed rest and post-ICU impairments in muscle strength, range of motion and physical functioning. In many ICUs, physical therapy (PT) and occupational therapy (OT) begin only once a patient appears ready for weaning from mechanical ventilation and sedation is reduced, or once patients are extubated (Morris et al. 2008; Schweickert et al. 2009). This delay in rehabilitation therapy is associated with physical impairment after ICU discharge (Korupolu et al. 2009; Schweickert et al 2009).

In contrast to this traditional approach to ICU care, an "early mobilisation" programme starts from patients' initial physiologic stabilisation and continues throughout the entire ICU stay (Bailey et al. 2007). This approach minimises heavy sedation and introduces physical medicine and rehabilitation therapies even while patients are receiving life support therapies, such as mechanical ventilation and vasopressor infusions. Such programmes frequently start within 48 hours of initiation of mechanical ventilation (Morris et al. 2008; Schweickert et al. 2009).

Screening and Safety Issues

Early mobilisation of ICU patients presents challenges, including poor cardiopulmonary reserve, changes in mental status (e.g., sedation and delirium), and the need for medical devices and equipment (e.g., lines, tubes, mechanical ventilator and monitors). These challenges necessitate careful screening to ensure patient safety during mobility activities. We discuss four important publications which demonstrate screening and safety issues related to early mobilisation in ICU patients (Bailey et al. 2007; Morris et al. 2008; Schweickert et al. 2009; Stiller et al. 2004).

The first study specifically evaluated the effect of mobilisation on the haemodynamic and respiratory status on acutely ill ICU patients (Stiller et al. 2004). In this study, after a comprehensive screening process, 69 mobilisation activities were performed on 31 patients. The most frequently reported activities were sitting on the edge of the bed and standing. A total of 3 (4%) sessions resulted in desaturation that responded to a temporary increase in the inspired fraction of oxygen.

The second study involved mechanically ventilated medical, surgical and trauma patients in a respiratory ICU. A total of 1,449 activity events were performed on 103 patients including sitting on the edge of the bed, sitting in a chair, and ambulation (Bailey et al. 2007). Of these activities, 41% were performed on intubated patients. Criteria for initiation of mobility therapy included patient response to verbal stimulation (neurologic criteria), FiO2 ≤0.6 and positive end-expiratory pressure (PEEP) ≤10 cm H2O (respiratory criteria), and the absence of orthostatic hypotension and catecholamine drips (circulatory criteria). Adverse events were prospectively defined as: (1) fall to knees, (2) feeding tube removal, (3) systolic blood pressure >200 or <90 mmHg, (4) oxygen saturation <80%, and (5) extubation. Such events occurred in <1% of all patient activities with no extubation events recorded. All adverse events were immediately corrected with no need for additional therapy, cost, or length of stay.

The third study is a non-randomised, controlled trial of medical ICU patients with acute respiratory failure (Morris et al. 2008). In this study, an early mobility protocol was started within 48 hrs of mechanical ventilation. In the early mobility group, 106 patients received graduated PT activities, including turning, active resistance, sitting on the edge of the bed, and active transfer from bed to chair. The criteria to limit or withhold mobilisation activities included hypoxia with frequent desaturations below 88%, hypotension (mean arterial pressure <65 mmHg), administration of a new vasopressor agent, new documented myocardial infarction, dysrhythmia requiring the addition of a new antiarrhythmic agent, an increase in the PEEP or a change to assist-control mode of ventilation once in a weaning mode. No events of death, near death, cardiopulmonary resuscitation or removal of a medical device were reported during physical therapy in these patients.

Finally in a recently published randomised controlled trial of acute reparatory failure patients, 498 therapy sessions were performed on 104 patients in a medical ICU (Schweickert et al. 2009). Only one adverse event (desaturation <80%) was reported in this study. Activity events included range of motion exercises, bed mobility, sit to stand, transfer from bed to chair, and walking. The criteria to withhold therapy included MAP <65 or >110 mmHg, systolic blood pressure >200 mmHg, heart rate <40 or >130 beats per minute, respiratory rate <5 or >40 breaths per minute, and oxygen saturation <88%.

Based on the above studies and experience with the Critical Care Physical Medicine and Rehabilitation programme in our medical ICU at Johns Hopkins Hospital, we have proposed a screening algorithm (Figure 1) for initiation of early mobility therapy (Korupolu et al. 2009). In general, active mobilisation activities are deferred in patients who are deeply sedated or comatose, and who have unstable blood pressure or require at least moderate doses of infusions of vasoactive medications.

To maximise safety, it is important that mobilisation activities be tailored to each patient's individual circumstances. Clinical judgment is always required on the part of all ICU clinicians and rehabilitation therapists involved in patient care since not all circumstances can be anticipated. Moreover, providing a graduated level of activity and carefully evaluating patients' prior and current clinical response to each activity are vital for the safety of early mobility therapy. Consequently, even patients who do not fully meet circulatory and respiratory criteria may be able to safely

participate in mobilisation activities with close monitoring (Bailey et al. 2007).

Conclusion

Early mobilisation and rehabilitation therapy may reduce the deleterious effects of bed rest in the ICU. Existing studies and our clinical experience indicate that screening for patients' level of consciousness, haemodynamic and respiratory stability, and other relevant factors is key for safe delivery of mobilisation activities in critically ill patients. Further research is required to study the physiological effects and outcomes of mobilising critically ill patients to continue the evolution of evidence-based guidelines (Gosselink et al. 2008; Tan et al. 2009).

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