

The long-stay ICU patient

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Abstract

The physical, psychological and cognitive effects of a prolonged stay on the intensive care unit (ICU) can be profound. Physical challenges include difficulty in weaning the patient from mechanical ventilation, problems with sedation, and critical illness neuropathy and muscle wasting. Psychological aspects include the development of delirium, post-traumatic stress disorder and cognitive dysfunction. It is essential that these patients are appropriately assessed and managed to minimize the long-term impact of these problems.

Keywords cognitive dysfunction; delirium; long-stay intensive care unit; post-traumatic stress disorder; rehabilitation; sedation; weakness; weaning

The physical, psychological and cognitive effects of a prolonged stay on the intensive care unit (ICU) can be profound. This article will review these issues.

Physical issues

Weaning from mechanical ventilation

Prolonged ventilation is associated with complications including upper airway injury, nosocomial infection, ventilator-induced lung injury and requirement for long-term sedation. Mechanical ventilation should therefore be discontinued as soon as possible, necessitating daily assessment to determine whether ventilatory support and the artificial airway are still needed.

Weaning describes the process of withdrawing ventilatory support and its replacement with spontaneous ventilation. Prolonged weaning has been described as patients who fail at least three attempts or are still ventilated 7 days after the first spontaneous breathing trial. Prolonged weaning is a common problem affecting up to 25% of patients on an ICU¹ and is associated with increased morbidity and mortality and healthcare costs. Failure

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Learning objectives

After reading this article, you should be able to:

- list the main causes of failure to wean from mechanical ventilation
- describe the approaches to the management of sedation in the long-stay patient
- list the common risk factors associated with the development of delirium
- outline the management of delirium.

of a patient to wean should prompt the clinician to evaluate the cause(s) of the ongoing respiratory failure (Table 1).

For further information on practical aspects of weaning, see *Anaesthesia and Intensive Care Medicine* 2007; 8: 489–94.

Sedation

Correct sedation management is an important yet difficult aspect of intensive care. Appropriate sedation allows (1) minimization of the physical and psychological stresses associated with acute illness and trauma and (2) allows patient cooperation with organ support and associated nursing care. Agitated patients will have a higher autonomic activity, with increased oxygen consumption and catabolism and may reduce the efficiency of supportive care, particularly ventilation. Combinations of sedatives that work via different mechanisms are more effective than single agents alone (Table 2).

The pharmacokinetics, particularly the context-sensitive half-life, are important to consider when choosing which drug to use. Propofol is often favoured: it has rapid onset, easy and rapid titratability and, most importantly for patients on the long-stay ICU, has rapid dissipation of clinical effect, providing excessive infusion rates are not employed.

A propofol infusion syndrome has been described in critically ill children and adults undergoing long-term propofol infusion at high doses. Principal features of the syndrome consist of cardiac failure, rhabdomyolysis, severe metabolic acidosis and renal failure.³ The syndrome can be lethal and caution is suggested when using prolonged (>48 hours) propofol sedation at doses higher than 5 mg/kg/h, particularly in patients with acute neurological or inflammatory illnesses.³ In these cases, alternative sedative agents should be considered. Tolerance may also develop at high doses, necessitating the use of alternative sedative agents.

Continuous intravenous sedation may prolong the duration of mechanical ventilation and length of stay on the ICU.⁴ A daily sedation hold has been shown to reduce the duration of mechanical ventilation by more than 2 days, and total ICU stay by 3.5 days.⁵ Daily sedation holds are a key element of the ventilator care bundle promoting best practice in ventilated patients.

Oversedation can also result in drug withdrawal reactions. The α_2 -adrenoreceptor agonists dexmedetomidine and clonidine may be useful in the management of drug withdrawal reactions but can also be used as sedative agents within their own right. A study comparing dexmedetomidine with propofol in patients requiring short-term postoperative sedation showed that the two agents provide similar sedation acceptable to clinicians and

Pathophysiologies that may have an impact on the ability to wean a patient from mechanical ventilation

Pathophysiology	Consider
Respiratory load	<ul style="list-style-type: none"> Imposed work of breathing <ul style="list-style-type: none"> Inappropriate ventilator settings Resistance of respiratory circuit (small endotracheal tube, HME) Reduced lung compliance <ul style="list-style-type: none"> Pneumonia (ventilator associated) Pulmonary oedema (cardiogenic or non-cardiogenic) Pulmonary fibrosis Pleural effusion Reduced chest wall compliance <ul style="list-style-type: none"> Abdominal distension (ileus, constipation, ascites) Obesity Hyperinflation (COPD/asthma) <ul style="list-style-type: none"> Auto-PEEP results in load on inspiratory muscles Reduced compliance Increased alveolar dead space
Cardiac load	<ul style="list-style-type: none"> Pre-existing cardiac dysfunction Increased cardiac workload leading to myocardial dysfunction: hypertension; tachycardia; increased metabolic demand; unresolved sepsis
Neuromuscular	<ul style="list-style-type: none"> Depressed central drive <ul style="list-style-type: none"> Metabolic alkalosis Sedative/hypnotic medications Peripheral muscle weakness <ul style="list-style-type: none"> Critical illness Neuropathy/Myopathy Phrenic nerve palsy (post-operative)
Neuropsychological	<ul style="list-style-type: none"> Delirium Anxiety, depression
Metabolic	<ul style="list-style-type: none"> Electrolyte abnormalities <ul style="list-style-type: none"> Hypokalaemia hypophosphataemia Endocrine disorders <ul style="list-style-type: none"> Hypothyroidism Hypoadrenalism Fever
Nutrition	<ul style="list-style-type: none"> Raised BMI Malnutrition Overfeeding (increased CO₂ production)
Anaemia	

BMI, body mass index; COPD, chronic obstructive pulmonary disease; HME, heat and moisture exchanger; PEEP, positive end-expiratory pressure.

Table 1

patients, with dexmedetomidine reducing analgesic requirement and heart rate.⁶ Paradoxical agitation, tolerance, dependence and addiction have not been described with dexmedetomidine, unlike the γ -amino-butyric acid (GABA)-related agents; however, rebound hypertension may be a problem with clonidine.

Weakness

Physical recovery in patients on the ICU can be prolonged. This can be attributable to critical illness neuropathy and muscle wasting, which occurs at a rate of 2% per day.⁷ Treating systemic inflammation, maintaining physical activity, good nutrition, treatment of concomitant medical disease and avoidance of

precipitating factors (corticosteroid and neuromuscular blockers, electrolyte disturbance, hyperglycaemia and fluid overload) will minimize the development of weakness and facilitate rehabilitation by allowing patients to exercise to the best of their ability (see *Anaesthesia and Intensive Care Medicine* 2008; 10: 141–3).

Psychological issues

Critical illness can have significant effects on psychological and psychosocial outcomes, with a particularly high incidence in the 30–50 age group.⁸ Anxiety, depression and post-traumatic stress

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