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Ten Overlooked Mistakes During Early Mobilisation in the Intensive Care Unit

An overview of the most common mistakes in decision making and the practice of early mobilisation in the intensive care unit.

Introduction

Early mobilisation (EM) is a therapeutic strategy implemented to avoid and overcome impairments developed due to critical illness and ICU stay. Several benefits have been described throughout the literature such as overcoming ICU acquired weakness, reduction in days of mechanical ventilation and stay, greater functionality inside the ICU, higher levels of independence, and lower health care costs, among others. The main objective of this article is to highlight the most common mistakes in decision making and the practice of EM.

Here are ten overlooked mistakes during early mobilisation in the ICU:

1. Unnecessary, profound and prolonged sedation

Patients undergoing critical illness that require mechanical ventilation or any other invasive procedure require sedatives and analgesic medication. Such pharmacological agents intend to provide comfort, stability and pain management during their stay in the ICU (Reade et al. 2014). Although indications for profound sedation have been precisely listed, numerous patients will still undergo deep sedation without such indication (Oyler et al. 2018; Moreira et al. 2016). Apart from the patients in need of deep sedation (RASS -4/-5), patients should be awake, alert and cooperative (RASS 0/-1) to ensure all the benefits described in the ABCDEF bundle (Devlin et al. 2018). EM plays an essential role in this bundle but inadequate sedation levels are to this day one of the most common barriers for such practice. Profound seda-

tion in patients that can be included in an early mobilisation programme can have a negative impact on the functional progression, perpetuate immobility effects and prolong the length of stay inside the ICU (Hodgson et al. 2021).

2. Lack of individualisation in deciding the start of EM

Many EM protocols establish a need of initiating the rehabilitation process in the first 24 hours of stay inside the ICU (Hodgson et al. 2021). This will not be accomplished in all scenarios. The decision of initiating an EM programme must be based on the clinical status, not the time inside the ICU. In some cases, rehabilitation programmes can start in the very early stages of critical illness (Hodgson et al. 2014a), in some other cases, especially in acute respiratory distress syndrome (ARDS), instability in critically ill patients can maintain for even weeks. Nevertheless, in neurocritical patients, the early start of the rehabilitation process does impact the functional outcomes of the patient and is a race against time (Hernández et al. 2021). Decision making inside the ICU is an individual process for every patient and rehabilitation cannot be seen as a strict-time protocol.

3. Immobility during extracorporeal support: ECMO and CRRT

Extracorporeal support (ES) is more and more commonly seen in ICUs these days. Extracorporeal membrane oxygenation (ECMO) and continuous renal replacement therapy (CRRT) are some of the most popular among the utilisation of ES therapies.

ECMO configurations are mainly split into two categories: veno-venous (VV) ECMO which provides oxygenation support when conventional treatment fails in severe ARDS and veno-arterial (VA) ECMO that is used in patients who require haemodynamic support due to numerous cardiac centred pathologies (Shekar et al. 2020). Also, CRRT can be seen during ICU stay in patients that have or develop kidney injury. Any of these therapies have to be applied through vascular access catheters or cannulas that can limit mobility in such patients which commonly translates to prolonged immobility due to the fear of catheter removal during mobilisation (Abrams et al. 2022a). Nevertheless, enough documentation on secure practices in such therapies has been available for some years now, especially in well-coordinated and experimented ICU personnel. Hence, it has been described that patients undergoing extracorporeal therapies have a high risk of developing functional deterioration, muscle mass loss and post-intensive care syndrome (PICS) (Hayes et al. 2018). EM must be used as a prevention strategy to avoid these negative outcomes derivative from immobility.

EM is a safe practice in extracorporeal therapies, but special care and knowledge must be taken into consideration before and during mobilisation especially with ECMO cannulas. If femoral access has been established, a hip flexion $>90^\circ$ must be avoided (Raurell et al. 2021), as well as continuous monitorisation in ECMO pressures (mainly the extraction pressure which should be the only negative pressure), precaution with stitches in the cannula attaching it to the patient's leg and ensuring cannulas are maintained in place. ECMO parameters (FiO_2 , revolutions or CO_2 sweep) may be modified by the perfusion team to provide a safer exercise tolerance, but no clear evidence has been reported for such matter (Mossadegh 2017). Similar to the previous statement, no evidence has been documented in the consideration of patient self-induced lung injury (P-SILI) as a limitation for mobilisation practices. Hence, monitorisation of tidal volume (TV) and respiratory rate (RR) is recommended during exercise intervals, as well as oxygenation and respiratory drive. It's

important to mention that physiological response to exercise should raise these levels as a normal response. Nonetheless, protective ventilation has to be maintained during these intervals. CRRT tends to have fewer complications during mobilisation due to the smaller catheters needed. The correct functioning of the machine should be checked, the pressures being needed, as well as the haemodynamic response to exercise. Extracorporeal therapies are a big challenge for the whole ICU personnel, including rehabilitation, and a meticulous evaluation of clinical stability in patients during such therapies is key for safe exercise practices (Abrams et al. 2022b).

▲ a frequent mistake during EM is underestimating the patient's capacity to accomplish higher mobility and functional levels ▶▶

4. Interventions without functional objectives

Throughout critical illness, patients must receive EM. This intervention has to have functional goals and for this matter, the implementation of tools that evaluate the patient's level of functionality is needed, otherwise poor or no evaluation will result in an inadequate exercise prescription (Parry et al. 2017). Some of the most common and useful tools are the Medical Research Council Sum Score (MRC-SS), handgrip strength through dynamometry (Piva et al. 2019), ICU Mobility Scale (IMS) (Tipping et al. 2016; Hodgson et al. 2014b) and the Chelsea Critical Care Physical Assessment Tool (CPAx) (Corner et al. 2016). The use of such tools will encourage taking patients to their maximum level of functionality and can guide the next steps towards higher functionality levels. Recent studies have correlated the success in the weaning process with greater scores in MRC and handgrip strength. A frequent mistake during EM is underestimating the patient's capacity to accomplish higher mobility and functional levels. This can perpetuate immobility and

waste time with interventions that have no real benefit. For example, why should a physiotherapist decide to move passively (with no effort applied by the patient) the patient's arms if the patient is capable of doing it themselves? Shouldn't the patient be encouraged to actively move and develop strength through exercise? Overload and progression of muscle strength are essential pillars of any exercise applied to the human body. Also, a common approach during EM is centred on strengthening peripheral muscles and excluding some essential components of the human body biomechanics: core musculature, anti-gravitational muscles and proprioception.

5. Delayed rehabilitation in the neurocritical patient

A common neurocritical phrase used among professionals is "brain is time". In acute brain injuries, we run against time in every aspect, including the rehabilitation process. Brain plasticity in the early stages of such pathologies must be taken as an advantage to promote functionality and avoid the permanent establishment of physical and mental impairments. Better outcomes have been found in patients battling critical illness due to a neurological diagnosis when they start their rehabilitation process in the early stages of the pathology's course (Olkowski et al. 2017). A particular group of patients among the neurological pathologies are patients with stroke. Large studies have found the need for initiating rehabilitation after 24 hours of symptoms appearing. In some other cases, patience will reward; in patients with an elevation in intracranial pressure (ICP) such as cerebral haemorrhage or traumatic brain injury, physical interventions should wait until surgical or pharmacological interventions have overpowered the bleed or reason for high ICP (Hernandez et al. 2021; Kumar et al. 2020).

Mobilisation in the neurocritical patient is safe and has no impact on the variation of mean arterial pressure (MAP), ICP or cerebral perfusion pressure (CPP) (Zink et al. 2021). Some interventions may even be an alternative for high ICP management such as early verticalisation of patients, which is known to be safe and can be done even while being mechanically ventilated (Lachance et

al. 2021). Also, early ambulation is related to a reduction in the risk of vasospasm in subarachnoid haemorrhage. Precaution in head positioning, as well as functional positioning and segment alignments, is a fundamental practice for these patients at any stage of their stay in the ICU.

6. Absence of verticalisation or ambulation during mechanical ventilation

Patients in need of mechanical ventilation must not be condemned to bed rest or low mobility levels during this period. Patients capable of maintaining an upright position and with enough strength (gained or never lost) to stand up should be submitted to training intervals that include verticalisation, standing up, marching in place or ambulation (Raurell et al. 2021). In order to achieve such high levels of mobility in these patients the cooperation of a multidisciplinary team must be established into

the routine care (Yang et al. 2021; Miranda et al. 2017). Benefits have been reported in these interventions such as greater lung aeration, easier diaphragmatic pull and neurological stimulation (Hickmann et al. 2021; Hernandez et al. 2021). A simplistic view of the weaning process will avoid professionals to believe that a mechanically ventilated patient can't walk. To think that weaning is merely a muscular issue and does not involve a whole systemic approach (airway integrity, lung parenchyma, cardiac functionality, neurologic status, electrolytic balance, among others) is an obsolete and easy way of conducting therapeutic decisions towards failure. Nonetheless, an immense mistake would be to delay the extubating procedure once the patient is ready for it. Something important to mention is that weakness among respiratory muscles is more common than peripheral musculature weakness; this also explains the reason for

finding patients undergoing severe respiratory muscle weakness being able to walk (Dres et al. 2017).

7. Excluding POCUS

Many pulmonary centred interventions are traditionally guided through auscultation, but this tool has a low sensibility and specificity in the evaluation of such clinical scenarios. Ultrasound evaluation has gained the power to the point it has become the fifth cornerstone of physical exploration (Narula et al. 2018). Physiotherapists and rehabilitation staff have to integrate ultrasound evaluation into their daily basis (Hayward et al. 2018; Hayward et al. 2020; Arnold et al. 2020; Hansell et al. 2021; Vieira et al. 2020). Pulmonary, diaphragmatic and muscular ultrasound can guide interventions and decision making in clinical scenarios such as non-invasive mechanical ventilation, utilisation of positive

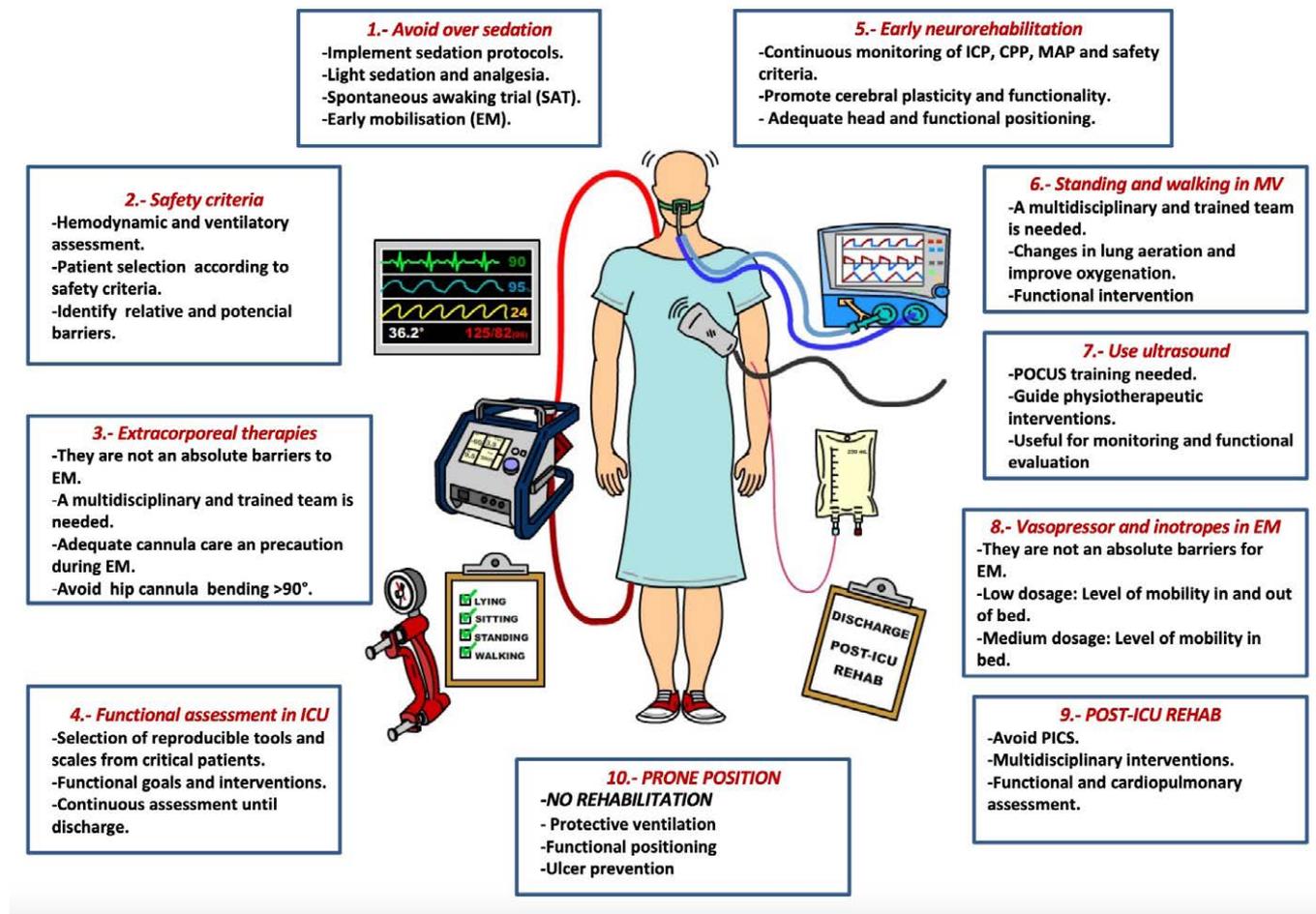


Figure 1. Practical solutions in early mobilisation

expiratory pressure (PEP) device, inspiratory muscle training (IMT), verticalisation, hyperinflation, lung expansion therapies, among others (Bertolone et al. 2021; Leech et al. 2015). Hence, it is a remarkable tool during the weaning process of mechanical ventilation through diaphragmatic, lung and cardiac evaluation. Muscular evaluation can also be accomplished through echography by measuring muscle thickness and the Heckmatt scale. Finally, some interesting findings can be made during such evaluation, findings that can even put the patient at risk. Pneumothorax, pleural effusions, cardiac tamponade, high ICP and other life-threatening situations have been found during the physiotherapeutic evaluation and these could have gone unnoticed if echography was not available (Ntoumenopoulos et al. 2021; Le Neindre et al. 2016).

8. Vasoactive and inotropic medication as a barrier for early mobility

Some of the everyday pharmacological agents used in the treatment of critical illness are vasoactive and inotropic drugs. These drugs are mainly used for shock treatment and the optimisation of haemodynamics and must not be considered a contraindication for the start of an EM programme but should definitely be a precaution in the decision making of such start (Hodgson

et al. 2014a). Secure and feasible practices have been reported during the administration of such drugs, although these practices can only be implemented in patients undergoing moderate to low dosages of these agents. Haemodynamic monitoring before and during the implementation of EM in patients receiving vasoactive and/or inotropic agents is fundamental, not only for the identification of haemodynamic stability but also the cardio-circulatory response to exercise (Jacob et al. 2021).

9. Poor post-ICU follow up

When a patient is discharged from the ICU the main objective should be to reincorporate the patient back into his/her social role. This starts with assuring the patient is able to execute basic life activities such as hygiene care, movement and ambulation, talking, eating, etc. The process of reincorporation will eventually evolve in the need of developing more complex motor and mental skills and will finish with the individual's complete independence (Colbenson et al. 2019). During this process functional, mobility, independence and cardiopulmonary evaluations have to be done and will guide future interventions or discharge from the rehabilitation programme (Inoue et al. 2019). Continuing with rehabilitation after ICU discharge will

have a direct impact on the patient's quality of life and recovery from impairments established due to critical illness. Patient follow-up after ICU discharge is part of the finishing with what started as a critical illness; failing to give a proper follow-up after discharge will only highlight the lack of interest in the patient's future (Nakanishi et al. 2021; Rousseau et al. 2021).

10. Mobilisation during prone position

The prone position is a widely known strategy in the treatment of ARDS. This strategy is used to optimise mechanical ventilation and improve oxygenation (Guérin et al. 2017; Johnson et al. 2021). Prone positioning translates into severe ARDS, severe oxygenation impairment and is one of the few absolute contraindications of EM (Raurrell et al. 2021; Hodgson et al. 2014a). During this phase, EM or any other physiotherapeutic strategy must be held up, except correct segment alignment, prevention of pressure ulcers and protective ventilation. No evidence has been provided that recommends EM during prone position in severe ARDS.

Conflict of Interest

None. ■

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