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Optimizing sedation in the ICU: the eCASH concept

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ABSTRACT

Deep sedation is known to be associated with poor long-term outcomes in critically ill patients, including cognitive and psychological complications and increased mortality. Yet many patients still receive high levels of sedation, particularly during the early days of their intensive care unit (ICU) stay. The eCASH (early Comfort using Analgesia, minimal Sedatives and maximal Humane care) concept is a three-pronged approach to minimize sedation in ICU patients by ensuring adequate and timely analgesia is received; patient-centred care is encouraged, including communication aids, noise reduction to facilitate good sleep patterns, early mobilization, and family involvement; and, when needed, sedation is targeted to individual needs and regularly reassessed, with patients kept calm, comfortable and able to cooperate.

Key words: analgesia, communication, sleep, mobilization

INTRODUCTION

Sedation has been widely and liberally used in critically ill patients, since the earliest days of intensive care units (ICUs), largely to facilitate uncomfortable mechanical ventilation. (1) But our approach to sedation has changed markedly in the last decade or so. In the early 1980s, Merriman reported the results of a survey of sedation practice in 34 ICUs in the UK. Reflecting general attitudes to sedation at the time, two thirds of the units stated that the ideal depth of sedation was to have "a patient completely detached from the environment who was woken only on occasions". (2) In a survey of American ICUs in 1990 (3), one third of respondents stated that they routinely used sedative agents in mechanically ventilated patients; 89% of the respondents stated that they used sedative agents to "suppress excessive or dangerous motor activity" and more than half said they used them "to promote sleep". Since these studies, there has been a paradigm change in our approach to sedation of ICU patients. Multiple studies have reported the harmful short and longer-term effects of oversedation. (4-6) Moreover, advances in technology have enabled development of ventilators that synchronize much better with a patient's own respiratory efforts reducing the need for deep sedation in patients receiving mechanical ventilation. The latest guidelines from the American College of Critical Care Medicine recommend that "sedative medications be titrated to maintain a light rather than a deep level of sedation in adult ICU patients, unless clinically contraindicated". (7) Importantly, sedation cannot be considered alone, but is intricately linked to analgesia and delirium in the so-called "ICU triad". (1) This more moderate approach to sedation is embodied in the eCASH (early Comfort using Analgesia, minimal Sedatives and maximal Humane care) concept (8), which we will elaborate on in this chapter.

THE HARM OF OVERSEDATION

Excessive sedation in ICU patients can have multiple negative effects, including respiratory depression and prolonged duration of mechanical ventilation (9-12), prolonged ICU and hospital lengths of stay (12), reduced survival (5, 6, 12), altered gut function (13), reduced ability to mobilize early (14) and increased risk of ICU-acquired muscle weakness (15), increased psychological stress (16), reduced interaction with family and environment, and increased cognitive dysfunction. (17) Restricted mobilization of ICU patients as a result of deep sedation is likely to increase the development of ICU-acquired weakness (18, 19), which can have prolonged effects on long-term outcomes. (20) In a study of 192 patients in 12 ICUs in New Zealand and Australia in 2012/2013, two-thirds of patients were "deeply" sedated (Richmond Agitation Sedation Scale [RASS] -3 to -5) and two-thirds of the patients did not receive early mobilization; the main reason for lack of mobilization was the degree of sedation. (14) Similar findings were reported in a one-day point prevalence study in 116 German ICUs: only 24% of mechanically ventilated patients and just 8% of patients with an endotracheal tube were mobilized out-of-bed and the biggest barrier to mobilization was deep sedation. (21)

Deep sedation may be needed in a limited number of specific ICU patients, notably those with agitation due to alcohol weaning syndromes (delirium tremens), severe respiratory failure with ventilator–patient dyssynchrony that cannot be controlled by changing ventilator settings, with refractory status epilepticus, with intracranial hypertension, and also to prevent awareness in patients receiving neuromuscular blocking agents. (1, 8) But in the majority of ICU patients, minimal sedation should be given. (7) This can be achieved by providing adequate pain relief, adjusting ventilator settings to reduce patient-ventilator dyssynchrony, providing a calm and peaceful

ICU environment that allows natural sleep cycles, and ensuring good communication with patients and relatives. (8)

THE ECASH APPROACH

The eCASH approach to sedation is three-pronged, consisting of adequate analgesia, targeted sedation, and patient-centred care. (Figure 1)

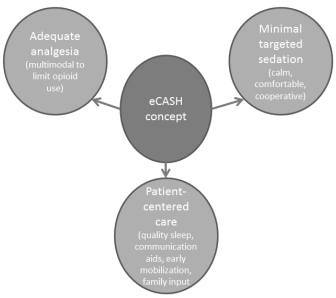

Figure 1. The three-pronged eCASH concept approach to minimal sedation: early implementation of pain control, individually titrated sedation, and patient-centred care.

Adequate analgesia

All ICU patients will experience pain at some point during their ICU stay. Pain is a highly subjective symptom and where possible should be assessed based on direct reports from the patient, using numeric rating or visual analogue scales. (22) However, many ICU patients are unable to self-report their level of pain, largely because of impaired level of consciousness, and in such patients other pain assessment tools can be used. Several scales have been developed for this purpose, but the Behavioural Pain Scale (BPS) (23) and the Critical-Care Pain Observation Tool (CPOT) (24) seem to most consistently provide accurate pain assessment in various groups of critically ill patients. (7) The BPS includes three measures of patient behaviour using clinical observation: facial expression, upper limb movements and patient-ventilator compliance. A score of 1-4 is given for each component giving a total possible score ranging from 3 (no pain) to 12. The CPOT scale includes observed measures of facial expression, body movements, muscle tension assessed by passive flexing and extension of the upper limbs, and compliance with the ventilator (or vocal sounds in non-ventilated patients). A score of 0 to 2 is given for each component, giving a possible range of 0 (no pain) to 8 points. Nevertheless, these scores are hardly needed, because good nurses can easily identify patients in pain and tend to overreact rather than under react. The important principle is to avoid treating pain with sedatives, as this is clearly wrong, and can result in delirium.

It is important to consider various patient factors, including chronic analgesic use prior to admission, when assessing need for analgesia. Intermittent increases in analgesia may also be needed prior to procedures that may be associated with (increased) pain. As pain levels can fluctuate, regular reassessment of analgesia requirements is essential.

Opioids remain the analgesic agents of choice for ICU patients and there is little difference in efficacy among the agents available. (7) The intravenous route is preferred because absorption is easier to predict than with intramuscular or enteral routes and doses can be better titrated to patient needs. Patient-controlled analgesia (PCA) may be considered in patients sufficiently alert to be able to manage it correctly. Because of the potential risks associated with cumulative doses of opioids, including respiratory depression, multimodal analgesia is recommended in which non-opioid analgesics and non-pharmacological analgesia are used in addition to opioids. Indeed, the development and appreciation of pain is complex, involving multiple pathways and receptors. Using several drugs that act on different pathways may therefore improve overall pain management while limiting the adverse effects of higher doses of any one agent. The use of paracetamol and non-steroidal anti-inflammatory drugs has been shown to reduce opioid use and adverse effects in patients following major surgery. (25, 26) Other agents, such as gabapentinoids, alpha-2-agonists and low-dose ketamine, may also be considered. Gabapentinoids are particularly indicated for neuropathic pain. (7) Ketamine (at higher doses) and the alpha-2-agonist, dexmedetomidine, have both analgesic and sedative effects.

There is little evidence to support the use of non-pharmacological approaches to analgesia in ICU patients but these strategies have no adverse effects making them potentially useful adjuncts. In a small randomized cross-over study in mechanically ventilated patients, music therapy was shown to reduce biological stress as measured by cortisol levels and tended to reduce opioid use. (27)

Targeted sedation

As noted, few ICU patients require deep sedation and for the vast majority, the aim should be to titrate sedation to levels that are as light as possible such that patients are calm, comfortable and cooperative. Minimal sedation is feasible in many patients and may be associated with shorter duration of mechanical ventilation and shorter ICU stays. (28, 29) Bedside sedation scales, such as The Richmond Agitation-Sedation Scale (RASS) and the Sedation-Agitation Scale (SAS), can be used to help monitor the quality and depth of sedation in adult ICU patients (7) and need for sedation should be reassessed regularly. In patients with suspected delirium, validated tools, such as the Confusion Assessment Method for the ICU (CAM-ICU), can be used, although these situations can be easily recognized without scoring.

When light sedation is considered necessary, non-benzodiazepine sedative agents, such as propofol or dexmedetomidine, are preferred and have been associated with reduced ICU lengths of stay and duration of mechanical ventilation. (30, 31) A pilot study of early goal-directed light sedation (targeting a RASS of between -2 and 1) using dexmedetomidine in 37 ICU patients receiving mechanical ventilation was associated with reduced use of benzodiazepines and no increased occurrence of delirium or self-extubation. (32)

Importantly, as minimal sedation slowly becomes standard in most ICUs and patients are managed with shorter-acting sedative agents, the need for sedation "holidays", as were widely adopted following the key study by Kress et al in 2000 (11), will no longer be necessary. Indeed, a meta-analysis of nine studies was unable to demonstrate a benefit of this approach on any outcome measure compared to patients managed with no sedation breaks. (33) Sedative drugs should be titrated to the lowest amount necessary to achieve the required sedation level. The need for sedation should be assessed regularly and sedative doses adjusted accordingly, with the aim of withdrawing sedatives completely as soon as possible. Sedative protocols may be of use (34), but most studies assessing protocolized sedation were conducted using benzodiazepines and there are few studies that have assessed this strategy in ICUs that use minimal sedation.

PATIENT-CENTRED CARE

Multiple non-pharmacological and treatment factors can impact on the quality of a patient's ICU stay and a multifaceted approach taking into account these factors will help reduce the need for sedation. We will elaborate further on just two key areas: sleep and communication.

Sleep quality

Poor sleep quality or sleep deprivation is common in ICU patients because of many factors, including noise, patient care activities, light levels, pain and stress. (35) Poor sleep can impact on physical and psychological functions and may increase anxiety and risks of delirium. (35) As such, strategies to encourage normal sleep by keeping regular sleep–wake rhythms, turning lights down at night, reducing noise levels and patient care activities when patients are sleeping, and using earplugs may be helpful. (8, 36, 37)

Communication

Many ICU patients have difficulty communicating during their ICU stay as a result of mechanical ventilation, sedation, confusion, etc. Yet the ability to communicate is a vital human function and problems in communicating with staff and relatives can increase a patient's levels of distress, anxiety and fear. (38-40) By using minimal sedation, patients will be more alert and better able to communicate, whether verbally or using a communication aid, such as pen and paper, a basic communication board or more complex electronic alternative communication devices. Different patients will find different systems relatively easier or more difficult to use and ICUs should ideally have several options available and staff should be familiar with their use. (41, 42) Time taken to explain such systems to family members is also valuable to improve patient-family interaction. Simple factors that can improve communication are also often initially removed from ICU patients and hearing aids and spectacles should be returned to patients as soon as possible. Importantly, as ICU patients are sedated less deeply, ICU staff will need to adapt to the increased ability of patients to communicate and find time to listen and to respond adequately and appropriately. Interventions to improve communication skills need to be encouraged. (43)

CONCLUSION

Deep sedation in critically ill patients is known to be associated with worse long-term outcomes than lighter sedation levels, and intensivists are beginning to move towards minimal sedation protocols. The eCASH concept provides a personalized, patient-centred approach to sedation using a 3-pronged approach based on adequate analgesia, sedation (when necessary) titrated to individual patient requirements, and a multimodal approach to humane intensive care, including good communication, quality sleep, early mobilization and physical activity, and unrestricted family visits and involvement.

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