JOURNAL OF HEALTHCARE SCIENCES
Volume 4 Issue 1 2024, Article ID: JOHS2024000824
http://dx.doi.org/10.52533/JOHS.2024.40113
e-ISSN: 1658-8967

Review

Sedation and Delirium Management in the Intensive Care Unit: A Comprehensive Review

Athari Alotaibi*, Mohammed Alasmari

Department of Intensive Care Unit, Security Forces Hospital, Riyadh, Saudi Arabia

Correspondence should be addressed to **Athari Alotaibi**, Department of Intensive Care Unit, Security Forces Hospital, Riyadh, Saudi Arabia. Email: alotaibi.ath@gmail.com

Received: 20 January 2024, Accepted: 23 January 2024, Published: 26 January 2024.

Abstract

In Intensive Care Units (ICUs), managing pain, sedation, and delirium is critical for patient comfort and outcomes. Historically, deep sedation was common, but advances in ventilator technology and shorter-acting sedatives have led to a shift towards lighter sedation strategies. Delirium, often linked to oversedation, is associated with increased mortality and negative long-term outcomes, emphasizing the need for balanced approaches. Current guidelines recommend an "analgesia-first" approach, promoting lighter sedation to minimize ventilation duration and facilitate early mobilization. Preferred sedatives include propofol and dexmedetomidine, with benzodiazepines generally avoided due to their association with delirium. Research suggests that early light sedation in the ICU improves clinical outcomes, including reduced mortality, shorter ventilation, and ICU stays. However, the timing of initiating light sedation, sedation assessment tools, and the combination of sedative agents present challenges in practical implementation. Multimodal sedation approaches involving various agents at lower doses aim to enhance patient comfort while minimizing side effects. Delirium-prevention strategies, including non-pharmacological interventions, are also crucial. Frameworks like the ICU Liberation Bundle and the eCASH approach emphasize patient-centered care, early assessment and intervention, and family involvement to optimize outcomes. In conclusion, achieving optimal sedation outcomes in ICU patients requires a comprehensive strategy that combines analgesia-first principles, light sedation, multimodal approaches, and delirium prevention measures.

Keywords: *Intensive Care Unit, ICU, sedation, analgesia, delirium, multimodal sedation*

Introduction

In Intensive Care Units (ICUs), patients often undergo numerous interventions, many of which are perceived as distressing. The experience of pain is a significant and frequently recalled aspect of ICU stays (1), and agitation can lead to the inadvertent removal of essential medical devices. Consequently, sedatives and analgesics are among the most commonly prescribed medications in these settings. Analgesia and sedation are pivotal for patient comfort, particularly during invasive procedures like mechanical ventilation, endotracheal intubation, and the insertion of invasive lines (2). In some cases, deep sedation becomes necessary to manage conditions such as convulsive disorders, severe agitation and discomfort, shivering during therapeutic hypothermia, elevated intracranial pressure, and for inducing amnesia during neuromuscular blockade.

The historical approach to ICU care, heavily reliant on deep sedation facilitated by primitive mechanical ventilation machines, has evolved considerably. Advancements in ventilator technology now allow synchronization with patients' respiratory efforts, reducing the need for deep sedation. Furthermore, the development of shorter-acting sedatives and analgesic drugs has played a pivotal role in this evolution.

When a patient is sedated in the ICU, their awareness and responsiveness to external stimuli are significantly reduced. A growing body of research suggests that sedative techniques significantly impact the occurrence and progression of delirium, a condition linked to increased ICU mortality and negative long-term outcomes for survivors (3-5). Recognizing this, current guidelines increasingly emphasize earlier physical activity and reduced sedation levels. The interconnectedness of pain, agitation, and delirium in the ICU is often referred to as the 'ICU triad'. The 'triad of anesthesia' concept, highlighting interactions between muscle relaxants, analgesics, and hypnotics, parallels the 'ICU triad.' (6) This analogy draws attention to the critical need for balanced, patient-centric sedation approaches that mitigate the risks of oversedation and delirium. In line with the principle of treating rather than masking disease, sedatives should be used judiciously, prioritizing specific pharmacologic and nonpharmacologic approaches for managing pain and delirium.

The evolution from intraoperative anesthetic care to modern, microprocessor-controlled ventilators marks a significant shift in managing critically ill patients. This advancement, along with the adoption of shorter-acting sedatives, underscores a paradigm shift from deep sedation to more tailored sedation strategies. These strategies aim to optimize patient outcomes by balancing the necessity of sedation against the potential risks of prolonged unconsciousness and delirium. This paper presents a narrative review of current practices, challenges, and innovations in sedation and delirium management in critically ill patients.

Methodology

In conducting this narrative review on "Sedation and Delirium Management in the Intensive Care Unit," a detailed literature search was carried out on January 12, 2024. The primary databases for this search were Medline and Cochrane, chosen for their comprehensive coverage of medical literature. Using Medical Topic Headings (MeSH) and a broad array of related terms, we meticulously searched these databases to capture a wide spectrum of research on the topic. To supplement and ensure completeness, a manual search was also performed on Google Scholar. This additional step involved scanning through the reference lists of initially identified papers, thus allowing us to uncover further significant studies that might have been missed in the database search. Our approach was inclusive, setting no limitations regarding the publication date, language, participant age, or type of publication. This strategy enabled us to gather a diverse and comprehensive collection of articles, including peer-reviewed studies, clinical guidelines, review articles, and case studies, thereby providing a holistic view of current practices and evolving trends in the management of sedation and delirium in the ICU setting.

http://dx.doi.org/10.52533/JOHS.2024.40113

Discussion

Critically ill adults in the ICU should undergo a protocol-based, stepwise evaluation of pain and sedation management, adopting an 'analgesia-first' approach, based on the 2018 practice guidelines for the prevention and management of Pain, Agitation/sedation, Delirium, Immobility, and Sleep Disruption (PADIS) (7). Light sedation, as recommended, promotes spontaneous respiration, shortens the duration of ventilation, and enables prompt mobilization. Preferred sedatives for mechanically ventilated patients include propofol and dexmedetomidine, with benzodiazepines generally avoided due to their association with increased delirium risk and extended ventilation periods **(Table 1)**. Notably, dexmedetomidine has been linked to a reduced incidence of delirium and shorter mechanical ventilation compared to benzodiazepines, although no significant difference in ventilation duration was observed between dexmedetomidine and propofol (8, 9). The specific role of benzodiazepines, particularly in patient subgroups such as those with alcohol withdrawal, remains an area for further research.

Table 1. Common Intensive Care Unit Sedation Assessment Scales

Sedation Scale	Description
Richmond Agitation-Sedation Scale (RASS) (10)	A continuous numerical scale used in ICUs to assess a patient's level of sedation and agitation. It allows healthcare providers to continuously monitor and adjust sedation, enabling individualized care for each patient.
Score: -5	Unarousable. No response to stimulus. Deep sedation. Patients in this state are unresponsive and require significant intervention.
Score: -4	Very sedated. Minimal or no response to stimulus. Patients are deeply sedated but may have some minimal responses.
Score: -3	Moderately sedated. Movement or eye opening to stimulus but no interaction. Patients are moderately sedated but may show some movements or reactions to stimuli.
Score: -2	Light sedation. Purposeful movement or eye opening to voice but no eye contact. Patients are lightly sedated and may respond to verbal cues.
Score: -1	Light sedation. Purposeful movement or eye opening to voice with eye contact. Patients are lightly sedated and responsive with eye contact.
Score: 0	Alert and calm. Responsive to verbal commands. Patients are awake, alert, and calm, following verbal commands.
Score: +1	Agitated. Anxious or apprehensive but cooperative. Patients are agitated but cooperative and may exhibit signs of anxiety.
Score: +2	Very agitated. Calms to verbal commands but anxious and restless. Patients are very agitated but can respond to verbal instructions.
Score: +3	Combative. Overtly combative or violent, immediate danger to staff. Patients are combative and pose an immediate threat to healthcare providers.
Score: +4	Very combative. Threat to staff. Requires physical restraint. Patients are extremely combative and need physical restraint for safety.
Riker Sedation-Agitation Scale (SAS) (11)	A categorical approach to ICU sedation and agitation measurement. It offers discrete categories that facilitate rapid categorization of sedation status, aiding communication and streamlined decision-making among healthcare teams.
Score: 1	Unarousable. No response to stimulus. Deep sedation. Patients in this state are unresponsive and require significant intervention.
Score: 2	Very sedated. Minimal or no response to stimulus. Patients are deeply sedated but may have some minimal responses.
Score: 3	Sedated. Movement or eye opening to stimulus but no eye contact. Patients are sedated but may show some movements or reactions to stimuli.
Score: 4	Calm and cooperative. Awake and oriented. Patients are calm, cooperative, awake, and oriented to their surroundings.
Score: 5	Agitated but follows commands. Patients are agitated but can follow verbal commands from healthcare providers.
Score: 6	Very agitated. Combative, non-purposeful movements. Patients are very agitated, exhibiting non-purposeful movements and restlessness.
Score: 7	Dangerously agitated. Overtly combative, immediate threat. Requires restraint. Patients are dangerously agitated and pose an immediate threat, requiring physical restraint.

http://dx.doi.org/10.52533/JOHS.2024.40113

Challenges with current guidelines

While these guidelines provide evidence-based recommendations, their practical application faces several challenges. Defining light sedation can be ambiguous; the goal is to keep patients alert, calm, and capable of following instructions, especially during early rehabilitation. Commonly used sedation scales, like the Richmond Agitation and Sedation Scale (RASS) (10) and Riker Sedation-Agitation Scale (SAS) (11), offer a range for light sedation, but when directly compared, neither scale demonstrates a definitive superiority.

The Riker Scale, ranging from 1 to 7, identifies scores below 4 as indicative of deeper sedation, while scores over 4 suggest a state of calmness and cooperation,

escalating to increasing agitation for scores above 5. Conversely, the Richmond Scale spans from -5 to +4, where more negative scores denote deeper sedation.

For the majority of patients undergoing mechanical ventilation in the ICU, targeting a score between 3 and 4 on the Riker Scale or between -2 and 0 on the Richmond Scale is generally considered optimal. These ranges are indicative of adequate sedation levels, balancing the need for patient comfort and safety with the goal of minimizing over-sedation. The subjective nature of these tools leads to variability in assessing the exact level of sedation required (12). Moreover, the optimal frequency for sedation assessments is yet to be established. Sedation scores often reflect the patient's condition at the time of assessment rather than their overall daily sedation status, as clinical conditions vary throughout the ICU stay. Furthermore, these guidelines do not specify the optimal timing for initiating light sedation, particularly during the first 48 hours following mechanical ventilation, a critical period that significantly influences patient mortality (13). Adherence to intended sedation depths during these initial hours is often inadequate. Additionally, the guidelines are primarily based on randomized clinical trials (RCTs) comparing individual sedative agents, while clinicians frequently use a combination of agents, including opioids. The potential benefits and synergistic effects of using lower doses of combined agents, as opposed to higher doses of single agents, have not been extensively explored.

Enhancing Sedation-Related Outcomes

RCTs on sedation, primarily involving patients on mechanical ventilation for 48–96 hours, have highlighted the impact of sedation depth during the first 48 hours in the ICU. Early light sedation has been linked to improved clinical outcomes. A meta-analysis revealed that light sedation in this initial period was associated with reduced mortality (odds ratio [OR]: 0.34), fewer days on mechanical ventilation (−2.07 days), and shorter ICU stays (−2.98 days) (2). Additionally, light sedation reduced hospital stays by approximately 5.9 days and nearly halved the incidence of delirium (OR 0.5), though these findings were not statistically significant. Further supporting the relationship between sedation management and patient outcomes in the ICU is a prospective, multicenter, longitudinal cohort study. This study provides additional evidence by establishing an independent correlation between the depth of sedation and key clinical outcomes. Specifically, it found a direct link between deeper levels of sedation and increased in-hospital mortality, higher mortality rates within 180 days, and prolonged duration of mechanical ventilation (13). Treggiari et al. also compared the use of lighter sedation to deep sedation and noted that lighter sedation did not lead to an increase in the rate of short-term adverse events. Furthermore, the long-term psychiatric outcomes in patients receiving lighter sedation were either unaffected or showed signs of improvement (14). In assessing sedation levels, the Sedation Index (SI) or Sedation Intensity Score, calculated by dividing the sum of positive RASS scores by the total number of measurements, has emerged as a useful tool (3). SI provides a continuous measure of sedation depth and is associated with 180-day survival, time to extubation, and subsequent delirium. A one-unit increase in SI corresponds to a twenty-four-hour delay in extubation, a 25% increased risk of delirium, and an almost 30% increase in mortality.

http://dx.doi.org/10.52533/JOHS.2024.40113

An ideal light sedation level, according to SI, would correspond to a RASS score of 0 or -1.

The duration of light sedation from ICU admission is critical, emphasizing the need for continuous, objective measurement of sedation depth. While SI may not directly guide sedative titration to a specific target, it highlights the significance of continuous sedation depth measurement and its potential as a standard in sedation research.

Comparing goal-directed sedation protocols with daily interruption strategies, nurse-led protocols since the 1990s have reduced both mechanical ventilation duration and ICU length of stay (LOS), along with lower sedative dosages (15). In a pivotal trial routine daily interruption of sedative infusions, compared to clinician-directed interruption, led to patients receiving less overall sedation, spending fewer days on mechanical ventilation, and having shorter ICU stays. While the trial's size limited mortality and discharge destination assessments, there was a trend towards reduced mortality and increased discharges to homes, although these were not statistically significant (16). Daily awakening trials have shown efficacy, and in the Awakening and Breathing Controlled (ABC) trial, combining spontaneous awakening trials with spontaneous breathing trials resulted in the intervention group independently breathing for more days and being discharged earlier from both the ICU and hospital, with a significantly reduced one-year mortality rate (17).

Contrastingly, when a daily interruption of sedation was incorporated into an existing protocol that already aimed at minimizing sedation levels, an increase in the total dose of benzodiazepines and opioids was observed (18). Additionally, this modification did not reduce mechanical ventilation duration or ICU stay. These conflicting findings from various studies on daily sedation interruption suggest several interpretations. One perspective is that daily interruption proves beneficial primarily when it leads to a reduction in the total sedative dosage used. Additionally, these contradictory outcomes highlight that the effectiveness of daily sedation interruption might be context-dependent, varying according to the study population, adherence to the protocol, and the management approach of the control group. In a 2010 Danish randomized controlled trial comparing a no-sedation protocol against routine sedation with daily interruptions, all mechanically ventilated patients received morphine for pain management, aligning with the 'analgesia first' approach (19). The trial found that the no-sedation protocol led to shorter ICU and hospital stays and an increase in ventilator-free days for eleven patients, suggesting the potential benefits of minimizing or foregoing routine sedation. Delirium rates increased, though, potentially due to diagnostic criteria focusing on hyperactive delirium. The study's methodology, including a transition from propofol to midazolam and the use of benzodiazepines and morphine without pain titration, may have introduced confounding factors. The overarching conclusion drawn from these various trials on sedation interruption is that minimizing sedation in ICU patients offers proven clinical benefit.

Building on the insights from Strom et al.'s trial and other investigations, the approach of opioid-based sedation versus the 'no sedation' strategy in ICU settings has gathered interest. This is especially due to opioid-based sedation's potential for increased sedative use and nursing interventions with daily interruptions. However, the more recent NONSEDA trial found no significant difference in 90-day mortality or ICU-free days between no-sedation and light sedation groups, though it did note a quicker time to extubation and fewer days with delirium and coma in certain patient groups when sedation was immediately discontinued upon ICU admission (20). These findings indicate that the effectiveness of sedation strategies may vary based on patient condition and care context.

In the realm of ICU sedation, a variety of sedatives are available, each with unique benefits and potential adverse effects. The optimal sedative choice remains elusive, but a multimodal approach, employing a combination of different sedatives at lower doses, can enhance the efficacy of each while minimizing side effects. This approach aims to improve patient comfort and alertness while

http://dx.doi.org/10.52533/JOHS.2024.40113

reducing the likelihood of delirium. Midazolam, once popular for its consistent effects and amnesic properties, fell out of favor due to its slow elimination and accumulation in cases of organ failure, leading the PADIS guidelines to advise against its use due to increased risks of delirium and prolonged mechanical ventilation (8, 9). Propofol, on the other hand, is increasingly favored for its rapid action and easy titration, despite risks of vasodilatory and adverse inotropic effects, especially at high doses or in critically ill patients (21). Dexmedetomidine is known for enhancing patient cooperation and communication (8), reducing delirium (22, 23), and aiding in its resolution (24). However, it has a slower onset, is less easily titratable than other sedatives, and can cause bradycardia and hypotension. The ongoing MENDS II trial, comparing dexmedetomidine with propofol, is expected to provide further insights into its efficacy and side effects (25).

Opioids, commonly used for pain and discomfort in ICU settings, can lead to somnolence, intestinal hypomotility, and respiratory depression at higher doses. Fentanyl, initially more easily titratable than morphine, can accumulate over prolonged use, particularly in patients with renal impairment due to the buildup of the active metabolite morphine-6-glucuronide. Remifentanil, known for its excellent titratability, organ-independent metabolism, and rapid onset and offset, can become a potent respiratory depressant at higher doses and may induce hyperalgesia and hemodynamic instability. Studies indicate that remifentanil can reduce ICU length of stay and the duration of mechanical ventilation (26, 27), with a study from the Netherlands showing its cost-effectiveness compared to conventional opioids (28).

Antipsychotics, such as haloperidol, are used to manage agitation and delirium but are not effective in preventing or treating hypoactive delirium (29, 30). The REDUCE (31) and MIND-USA (32) found no significant difference in the duration of delirium between haloperidol, ziprasidone, and placebos, though there were concerns about arrhythmias induction in patients with prolonged QTc (33). Alternative atypical antipsychotics like quetiapine, with fewer adverse effects than haloperidol, have shown promising results in reducing agitation and the duration of delirium. Support for quetiapine comes from just one small placebo-controlled trial (34). This study involved 36 patients who were randomly assigned to receive either quetiapine or a placebo. Findings showed that delirium resolved more quickly in patients treated with quetiapine. Additionally, the use of quetiapine was associated with an increase in the number of patients who were able to be discharged either to their own homes or to rehabilitation facilities. In the only study that compared haloperidol with an atypical antipsychotic, olanzapine, both drugs demonstrated equivalent efficacy (35). However, it is important to note that none of these trials made a distinction between hyperactive and hypoactive forms of delirium.

In clinical practice, medication dosage and administration should be tailored to individual patient needs, severity, and underlying pathology. For example, a patient on low-dose opioid infusion for pain might concurrently receive a consistent dose of quetiapine for agitated delirium, a basal infusion of dexmedetomidine to aid delirium resolution, and an easily adjustable propofol infusion to precisely control sedation level, aiming for a specific sedation target. This multimodal approach to sedation, combining various agents, strives to optimize patient outcomes in ICU settings, emphasizing the need for personalized care based on each patient's unique clinical profile.

A systematic approach is recommended for multimodal sedation and delirium management in ICU patients, addressing the limitations of current protocols and incorporating recent clinical trial findings **(Table 2)**.

The process starts with assessing and managing pain upon ICU admission, often involving opioid administration. Once effective analgesia is achieved, the need for therapeutic sedation is evaluated. In specific clinical conditions, such as intracranial hypertension or status epilepticus, barbiturates or benzodiazepines may be indicated, respectively. Additional sedatives like propofol and

http://dx.doi.org/10.52533/JOHS.2024.40113

dexmedetomidine can be used alone or in combination to achieve the required sedation level.

Table 2. A Multifaceted Strategy for Achieving Optimal Sedation in the Intensive Care Unit

Components	Measures
Pain	- Early recognition - Systematic assessment - Prompt and tailored treatment
Sedation	- Early light sedation/analgesia - Time-weighted sedation monitoring - Goal-directed, multimodal approach
Delirium	- Anticipating delirium risk - Recognizing early signs and symptoms - Effective delirium management

When sedation is not necessary, the existing regimen should be reviewed. For patients with a Richmond Agitation-Sedation Scale (RASS) score below -2, immediate steps should be taken to adjust the sedation, including discontinuing benzodiazepines, reducing sedative dosages, or starting a low-dose alternative agent. In cases of agitation (RASS ≥2), appropriate sedatives, such as dexmedetomidine for delirium or quetiapine for hyperactive delirium, should be administered. Propofol's use should be limited to short-term control and discontinued when safe. Non-pharmacological delirium interventions should be employed concurrently. For calm and awake patients (RASS 0 to -1), delirium screening is essential, with treatment as needed.

Delirium-prevention strategies in the ICU are increasingly recognized for their role in enhancing sedation-related outcomes. Effective management of analgesic needs is crucial, especially using tools like the Critical Pain Observation Tool for heavily sedated or non-communicative patients (36), or the Visual Acuity Score for those who can interact (37). Pharmacological research on delirium prevention encompasses trials that compare various sedative-analgesic regimens and studies focused on the use of antipsychotic medications specifically aimed at preventing delirium. Early use of analgesic adjuncts, such as low-dose ketamine, has been shown to significantly reduce the incidence and duration of delirium (38). Emphasizing light sedation can lead to better patient engagement, early mobilization, and facilitate regular delirium screening, thus enabling prompt and appropriate interventions, both pharmacological and non-pharmacological.

Dexmedetomidine is particularly favored in critical care and perioperative settings for its delirium-sparing effects and can be used alone or in combination with other treatments (23) (39, 40). Notably, dexmedetomidine has been observed to lessen both the incidence and duration of night-time delirium without adversely affecting sleep quality. In a pilot study focused on patients with hyperactive delirium, dexmedetomidine was compared with haloperidol to assess their effectiveness (41). The study found that dexmedetomidine was associated with a shorter duration to extubation and a reduced length of stay in the ICU. This result aligns with findings from a randomized trial comparing dexmedetomidine and midazolam (9, 42). In this trial, patients who were experiencing delirium at the time of enrollment exhibited a more rapid resolution of delirium when treated with dexmedetomidine compared to those who received midazolam.

Non-pharmacological strategies are also integral to delirium management protocols in critical care. These include establishing day-night routines, reducing noise levels, and implementing patient reorientation and familiarization programs (43). In their RCT, Schweickert et al. found that initiating early mobilization during breaks in sedation effectively reduced the duration of delirium by half in ICU patients (44). While these approaches are theoretically sound, empirical evidence regarding their effectiveness in reducing the incidence or duration of delirium is still limited, indicating a need for further research in this area.

Incorporating a comprehensive sedation strategy in the ICU, several frameworks have been established to optimize patient care. The eCASH approach emphasizes patient-centered care, prioritizing analgesia with minimal or no sedation and focusing on aspects like communication aids, noise reduction, early mobilization, and family

http://dx.doi.org/10.52533/JOHS.2024.40113

involvement to enhance comfort and humane care in ICUs (45). Another significant framework is the ICU Liberation Bundle, aligning with the PADIS guidelines. This model guides bedside clinicians in early assessment and intervention, encompassing awakening and breathing coordination, judicious medication selection, delirium monitoring and management, early mobility, and family participation (the ABCDEF components). This approach aims to reduce delirium, improve pain management, and mitigate long-term consequences for critically ill adults. Research has shown that even partial adherence to the ABCDEF bundle can lead to improved patient-centered outcomes. The ICU Liberation Collaborative demonstrated that compliance with this bundle is dose-dependently associated with better outcomes, including reduced hospital mortality, next-day mechanical ventilation, coma, delirium, physical restraint use, ICU readmission, and discharge to facilities other than home (46). Another multicenter study found that every 10% increase in total bundle compliance significantly decreased the incidence of delirium and coma, improving hospital survival rates (47). Additionally, full implementation of the ICU bundle in New York significantly reduced ICU and hospital costs compared to partial implementation (48). In Australia, the Victorian Pain Agitation and Delirium program, a quality improvement initiative, employs an algorithm for delirium screening, targeted sedation, and pain assessment, including routine RASS target prescription, pain assessment and management every 4 hours, and daily Confusion Assessment Method for the ICU (CAM-ICU) screening (49, 50). An audit of this program showed over 80% compliance within three months, maintained through continuous education and auditing. Thus, to achieve optimal sedation outcomes in ICU patients, a multifaceted strategy is essential. This should involve adherence to PADIS guidelines, prioritizing initial analgesia followed by light sedation, employing multimodal sedation and analgesia techniques, promoting early mobility, and integrating both pharmacologic and non-pharmacologic delirium prevention measures.

Conclusion

The growing body of evidence indicates that the management of sedation and delirium significantly enhances patient outcomes in the ICU. Emphasizing the early implementation of light sedation during the acute phase of critical illness is crucial, as it has a profound impact on mortality, the incidence of delirium, and long-term patient outcomes. There is a growing need to develop a sedation scoring system that is both practical for clinical use and incorporates time-weighted assessments to reflect patient status more accurately over time. Implementing a bundled sedation strategy that places precedence on managing pain effectively before considering sedation and combining this with early mobilization as often as possible, is fundamental for providing optimal patient care. In cases where sedation is necessary, a balanced, multimodal approach should be employed. This strategy helps patients remain alert and cooperative, reducing the likelihood of delirium. By integrating these practices, healthcare professionals can optimize patient recovery and outcomes in ICU settings.

Disclosure

Conflict of interest

There is no conflict of interest

Funding

No funding

Ethical consideration

Non applicable

Data availability

Data that support the findings of this study are embedded within the manuscript.

Author contribution

All authors contributed to conceptualizing, data drafting, collection and final writing of the manuscript.

http://dx.doi.org/10.52533/JOHS.2024.40113

References

1. Stein-Parbury J, McKinley S. Patients' experiences of being in an intensive care unit: a select literature review. American Journal of Critical Care. 2000;9(1):20.

2. Cohen D, Horiuchi K, Kemper M, Weissman C. Modulating effects of propofol on metabolic and cardiopulmonary responses to stressful intensive care unit procedures. Critical care medicine. 1996;24(4):612-7.

3. Shehabi Y, Bellomo R, Kadiman S, Ti LK, Howe B, Reade MC, et al. Sedation intensity in the first 48 hours of mechanical ventilation and 180-day mortality: a multinational prospective longitudinal cohort study. Critical care medicine. 2018;46(6):850-9.

4. Liu X, Xie G, Zhang K, Song S, Song F, Jin Y, et al. Dexmedetomidine vs propofol sedation reduces delirium in patients after cardiac surgery: a meta-analysis with trial sequential analysis of randomized controlled trials. Journal of critical care. 2017;38:190-6.

5. Nassar AP, Zampieri FG, Salluh JI, Bozza FA, Machado FR, Guimarães HP, et al. Organizational factors associated with target sedation on the first 48 h of mechanical ventilation: an analysis of checklist-ICU database. Critical Care. 2019;23(1):1-8.

6. Reade MC, Finfer S. Sedation and delirium in the intensive care unit. New England Journal of Medicine. 2014;370(5):444-54.

7. Devlin JW, Skrobik Y, Gélinas C, Needham DM, Slooter AJ, Pandharipande PP, et al. Clinical practice guidelines for the prevention and management of pain, agitation/sedation, delirium, immobility, and sleep disruption in adult patients in the ICU. Critical care medicine. 2018;46(9):e825-e73.

8. Jakob SM, Ruokonen E, Grounds RM, Sarapohja T, Garratt C, Pocock SJ, et al. Dexmedetomidine vs midazolam or propofol for sedation during prolonged mechanical ventilation: two randomized controlled trials. Jama. 2012;307(11):1151-60.

9. Riker RR, Shehabi Y, Bokesch PM, Ceraso D, Wisemandle W, Koura F, et al. Dexmedetomidine vs midazolam for sedation of critically ill patients: a randomized trial. Jama. 2009;301(5):489-99.

10. Sessler CN, Gosnell MS, Grap MJ, Brophy GM, O'Neal PV, Keane KA, et al. The Richmond Agitation–Sedation Scale: validity and reliability in adult intensive care unit patients. American journal of respiratory and critical care medicine. 2002;166(10):1338-44.

11. Riker RR, Picard JT, Fraser GL. Prospective evaluation of the Sedation-Agitation Scale for adult critically ill patients. Critical care medicine. 1999;27(7):1325-9.

12. Barbato M, Barclay G, Potter J, Yeo W, Chung J. Correlation between observational scales of sedation and comfort and bispectral index scores. Journal of pain and symptom management. 2017;54(2):186-93.

13. Shehabi Y, Bellomo R, Reade MC, Bailey M, Bass F, Howe B, et al. Early intensive care sedation predicts long-term mortality in ventilated critically ill patients. American journal of respiratory and critical care medicine. 2012;186(8):724-31.

14. Treggiari MM, Romand J-A, Yanez ND, Deem SA, Goldberg J, Hudson L, et al. Randomized trial of light versus deep sedation on mental health after critical illness. Critical care medicine. 2009;37(9):2527-34.

15. Brook AD, Ahrens TS, Schaiff R, Prentice D, Sherman G, Shannon W, et al. Effect of a nursing-implemented sedation protocol on the duration of mechanical ventilation. Critical care medicine. 1999;27(12):2609-15.

16. Kress JP, Pohlman AS, O'Connor MF, Hall JB. Daily interruption of sedative infusions in critically ill patients undergoing mechanical ventilation. New England Journal of Medicine. 2000;342(20):1471-7.

17. Girard TD, Kress JP, Fuchs BD, Thomason JW, Schweickert WD, Pun BT, et al. Efficacy and safety of a paired sedation and ventilator weaning protocol for mechanically ventilated patients in intensive care (Awakening and Breathing Controlled trial): a randomised controlled trial. The Lancet. 2008;371(9607):126-34.

18. Mehta S, Burry L, Cook D, Fergusson D, Steinberg M, Granton J, et al. Daily sedation interruption in

 http://dx.doi.org/10.52533/JOHS.2024.40113

mechanically ventilated critically ill patients cared for with a sedation protocol: a randomized controlled trial. Jama. 2012;308(19):1985-92.

19. Strøm T, Martinussen T, Toft P. A protocol of no sedation for critically ill patients receiving mechanical ventilation: a randomised trial. The Lancet. 2010;375(9713):475-80.

20. Olsen HT, Nedergaard HK, Strøm T, Oxlund J, Wian K-A, Ytrebø LM, et al. Nonsedation or light sedation in critically ill, mechanically ventilated patients. New England Journal of Medicine. 2020;382(12):1103-11.

21. Lee T. Pharmacology of propofol. Annals of the Academy of Medicine, Singapore. 1991;20(1):61-5.

22. Kawazoe Y, Miyamoto K, Morimoto T, Yamamoto T, Fuke A, Hashimoto A, et al. Effect of dexmedetomidine on mortality and ventilator-free days in patients requiring mechanical ventilation with sepsis: a randomized clinical trial. Jama. 2017;317(13):1321-8.

23. Shehabi Y, Howe BD, Bellomo R, Arabi YM, Bailey M, Bass FE, et al. Early sedation with dexmedetomidine in critically ill patients. New England Journal of Medicine. 2019;380(26):2506-17.

24. Reade MC, Eastwood GM, Bellomo R, Bailey M, Bersten A, Cheung B, et al. Effect of dexmedetomidine added to standard care on ventilator-free time in patients with agitated delirium: a randomized clinical trial. Jama. 2016;315(14):1460-8.

25. Chandrasekhar R, Hughes CG, Pun BT, Orun OM, Ely EW, Pandharipande PP. Statistical analysis plan for the maximizing the efficacy of sedation and reducing neurological dysfunction and mortality in septic patients with acute respiratory failure trial. Critical Care and Resuscitation. 2020;22(1):63-71.

26. Wilhelm W, Kreuer S. The place for short-acting opioids: special emphasis on remifentanil. Critical Care. 2008;12(3):1-9.

27. Futier E, Chanques G, Cayot Constantin S, Vernis L, Barres A, Guerin R, et al. Influence of opioid choice on mechanical ventilation duration and ICU length of stay. Minerva anestesiologica. 2012;78(1):46.

28. Al MJ, Hakkaart L, Tan S, Bakker J. Cost-consequence analysis of remifentanil-based analgo-sedation vs. conventional analgesia and sedation for patients on mechanical ventilation in the Netherlands. Critical Care. 2010;14:1-10.

29. Oh ES, Needham DM, Nikooie R, Wilson LM, Zhang A, Robinson KA, et al. Antipsychotics for preventing delirium in hospitalized adults: a systematic review. Annals of internal medicine. 2019;171(7):474-84.

30. Neufeld KJ, Yue J, Robinson TN, Inouye SK, Needham DM. Antipsychotic medication for prevention and treatment of delirium in hospitalized adults: a systematic review and meta-analysis. Journal of the American Geriatrics Society. 2016;64(4):705-14.

31. Van Den Boogaard M, Slooter AJ, Brüggemann RJ, Schoonhoven L, Beishuizen A, Vermeijden JW, et al. Effect of haloperidol on survival among critically ill adults with a high risk of delirium: the REDUCE randomized clinical trial. Jama. 2018;319(7):680-90.

32. Girard TD, Exline MC, Carson SS, Hough CL, Rock P, Gong MN, et al. Haloperidol and ziprasidone for treatment of delirium in critical illness. New England Journal of Medicine. 2018;379(26):2506-16.

33. Markowitz JD, Narasimhan M. Delirium and antipsychotics: a systematic review of epidemiology and somatic treatment options. Psychiatry (Edgmont). 2008;5(10):29.

34. Devlin JW, Roberts RJ, Fong JJ, Skrobik Y, Riker RR, Hill NS, et al. Efficacy and safety of quetiapine in critically ill patients with delirium: a prospective, multicenter, randomized, double-blind, placebo-controlled pilot study. Critical care medicine. 2010;38(2):419-27.

35. Skrobik YK, Bergeron N, Dumont M, Gottfried SB. Olanzapine vs haloperidol: treating delirium in a critical care setting. Intensive care medicine. 2004;30:444-9.

36. Gélinas C, Arbour C, Michaud C, Vaillant F, Desjardins S. Implementation of the critical-care pain observation tool on pain assessment/management nursing practices in an intensive care unit with nonverbal critically ill adults: a before and after study.

 http://dx.doi.org/10.52533/JOHS.2024.40113

International journal of nursing studies. 2011;48(12):1495-504.

37. Klein C, Caumo W, Gélinas C, Patines V, Pilger T, Lopes A, et al. Validation of two pain assessment tools using a standardized nociceptive stimulation in critically ill adults. Journal of Pain and Symptom Management. 2018;56(4):594-601.

38. Hudetz JA, Patterson KM, Iqbal Z, Gandhi SD, Byrne AJ, Hudetz AG, et al. Ketamine attenuates delirium after cardiac surgery with cardiopulmonary bypass. Journal of cardiothoracic and vascular anesthesia. 2009;23(5):651-7.

39. Shehabi Y, Bellomo R, Reade MC, Bailey M, Bass F, Howe B, et al. Early goal-directed sedation versus standard sedation in mechanically ventilated critically ill patients: a pilot study. Critical care medicine. 2013;41(8):1983-91.

40. Su X, Meng Z-T, Wu X-H, Cui F, Li H-L, Wang D-X, et al. Dexmedetomidine for prevention of delirium in elderly patients after non-cardiac surgery: a randomised, double-blind, placebo-controlled trial. The Lancet. 2016;388(10054):1893-902.

41. Skrobik Y, Duprey MS, Hill NS, Devlin JW. Low-dose nocturnal dexmedetomidine prevents ICU delirium. A randomized, placebo-controlled trial. American journal of respiratory and critical care medicine. 2018;197(9):1147-56.

42. Reade MC, O'Sullivan K, Bates S, Goldsmith D, Ainslie WR, Bellomo R. Dexmedetomidine vs. haloperidol in delirious, agitated, intubated patients: a randomised open-label trial. Critical care. 2009;13:1-10.

43. Herling SF, Greve IE, Vasilevskis EE, Egerod I, Mortensen CB, Møller AM, et al. Interventions for preventing intensive care unit delirium in adults. Cochrane Database of Systematic Reviews. 2018(11).

44. Schweickert WD, Pohlman MC, Pohlman AS, Nigos C, Pawlik AJ, Esbrook CL, et al. Early physical and occupational therapy in mechanically ventilated, critically ill patients: a randomised controlled trial. The Lancet. 2009;373(9678):1874-82.

45. Vincent J-L, Shehabi Y, Walsh TS, Pandharipande PP, Ball JA, Spronk P, et al. Comfort and patient-centred care without excessive sedation: the eCASH concept. Intensive care medicine. 2016;42:962-71.

46. Pun BT, Balas MC, Barnes-Daly MA, Thompson JL, Aldrich JM, Barr J, et al. Caring for critically ill patients with the ABCDEF bundle: results of the ICU liberation collaborative in over 15,000 adults. Critical care medicine. 2019;47(1):3.

47. Barnes-Daly MA, Phillips G, Ely EW. Improving hospital survival and reducing brain dysfunction at seven California community hospitals: implementing PAD guidelines via the ABCDEF bundle in 6,064 patients. Critical Care Medicine. 2017;45(2):171-8.

48. Hsieh SJ, Otusanya O, Gershengorn HB, Hope AA, Dayton C, Levi D, et al. Staged implementation of awakening and breathing, coordination, delirium monitoring and management, and early mobilization bundle improves patient outcomes and reduces hospital costs. Critical care medicine. 2019;47(7):885-93.

49. Ely EW, Inouye SK, Bernard GR, Gordon S, Francis J, May L, et al. Delirium in mechanically ventilated patients: validity and reliability of the confusion assessment method for the intensive care unit (CAM-ICU). Jama. 2001;286(21):2703-10.

50. Wong IM, Thangavelautham S, Loh SC, Ng SY, Murfin B, Shehabi Y. Sedation and delirium in the intensive care unit-a practice-based approach. Ann Acad Med Singap. 2020;49(4):215-25.

http://dx.doi.org/10.52533/JOHS.2024.40113