Analgesia-based sedation: Effects on ventilator days and delirium

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Managing critically ill patients and their pain, agitation, and delirium is a constant balancing act for healthcare providers in the ICU. Delirium is prevalent among up to 80% of sedated and mechanically ventilated patients. Sedatives, including benzodiazepines, propofol, and dexmedetomidine, are routinely administered to ICU patients in conjunction with opioids to allay patients’ anxiety, reduce recall of unpleasant ICU experiences, improve patient tolerance of mechanical ventilation, and provide treatment for substance withdrawal. However, according to the Society of Critical Care Medicine (SCCM), benzodiazepine use may be a risk factor for delirium in adult ICU patients.

The ICU Delirium and Cognitive Impairment Study Group defines delirium as a disturbance of consciousness from acute and fluctuating inattention accompanied by changes in cognition and perceptual disturbances that impair a patient’s ability to receive, process, store, and recall information. Delirium in ICU patients is one of the strongest predictors of increased length of stay, ventilator days, and reintubation. Delirium also increases the risk of post-intensive care syndrome, which may cause devastating long-term effects on cognitive status, physiologic tolerance to activity, and quality of life. Furthermore, delirium increases healthcare costs and mortality. For these reasons, the SCCM recommends maintaining light levels of sedation in adult ICU patients to improve clinical outcomes.

Objectives. Monitoring critically ill patients for delirium with valid and reliable delirium assessment tools enables clinicians to potentially detect and treat delirium sooner, and possibly improve outcomes. With this in mind, the authors’ facility decided to implement a weight-based sedation protocol emphasizing analgesics over benzodiazepine-based sedation. The purpose of this retrospective chart review was to observe and assess the mechanically ventilated patient on either benzodiazepines or analgesia-based sedation and note the incidence of delirium. Furthermore, researchers collected data on the mean ventilator days and mean delirium duration in order to strengthen or rebut the findings of the SCCM.

Methods
Setting. The authors’ institution serves as the county hospital and level 1 trauma center for approximately 1.47 million individuals living in San Antonio, Texas. Within this system, the medical ICU is a 22-bed unit with a steady flow of intubated patients, often with comorbidities. The staff includes physicians, physician assistants, NPs, and critical care nurses with a 2:1 patient-to-nurse ratio. Because the hospital is a teaching facility, many students and new medical professionals rotate through the medical ICU.

Study tools. Prior to data collection, a new weight-based sedation protocol was developed by a multidisciplinary team of nurses, physicians, and pharmacists based on the guidelines set by the SCCM (see Summary of the weight-based protocol). Prior to implementation of this protocol, nursing staff were educated on its correct use, which incorporated patient weight in dosing considerations. This patient-specific dosing enabled nurses to administer sedation without the supervision of a physician.

The Richmond Agitation Sedation Scale (RASS) was used to assess level of sedation with the goal of achieving moderate levels of sedation. Protocols such as this one allow for the safe administration of medication while also enforcing lighter sedation with a RASS goal of 0 (alert and calm) to −3 (moderate sedation).

In order to assess sedation-associated delirium, nursing staff used the Confusion Assessment Method for the ICU (CAM-ICU). The CAM-ICU is an easy and efficient tool for evaluation of delirium. The CAM-ICU also shows an increase in
reliability, sensitivity, and specificity among nurses and physicians without psychiatric experience.\textsuperscript{9,10}

ICU nurses were taught prior to and during the study with in-services, handouts, and individual education with frequent chart audits done by the unit float nurse during each shift. The float nurse also monitored charting to ensure each patient received an explanation of the intervention during data collection, and explained when to sedate patients based on the new protocol prior to nurse implementation and patient contact. Both the CAM-ICU and sedation protocol were readily available at the nurses' station with a flash card copy of the CAM-ICU at the bedside for immediate reference.

After assessment, each patient's RASS score, CAM-ICU score (positive or negative), and assessment findings were listed in the electronic medical record (EMR) with the explanation for each score listed under a dropdown.

**Participants.** To assess the intervention, 142 charts of mechanically intubated patients over age 18 admitted between July 2014 and March 2016 were reviewed via EMR chart audit. Of these 142 chart audits, 65 patients solely used analgesics as a source of sedation and 77 were administered benzodiazepines as sedation. Institutional review board approval was applied for through the authors' facility and was determined not necessary; further approval to perform the study was obtained through the hospital system.

**Exclusion criteria.** Primary diagnosis along with comorbidities was considered...
Mean delirium days
Average delirium time was 4.24 days using benzodiazepines versus 1.94 with analgesia.

Percent of patients with delirium incidence
Delirium incidence was higher among benzodiazepine-sedated patients (49%) compared with 26% among analgesia-sedated patients.

Mean ventilator days
Average ventilator days of patients with benzodiazepine sedation were 4.3 days compared with analgesia sedation at 3.7 days.

during exclusion criteria. To increase the validity of the study and prevent skewing of data, certain patient populations were excluded from the data collected. Patients who were chronically ill and transitioned from endotracheal intubation to tracheostomy were excluded; this did not provide for an extubation date, and most of these patients experienced delirium for reasons other than sedation. Similarly, patients who expired on the ventilator were excluded due to the lack of an extubation time. Patients who had extensive psychiatric illness were excluded, because this served as a barrier to CAM-ICU assessment. Also, patients with an illness that required heavy sedation or benzodiazepine use such as patients undergoing alcohol withdrawal or patients under hypothermia protocol were excluded, because most of these patients had a RASS score of -4 or -5, which was heavier sedation than allowed by the sedation protocol. Patients who did not consistently adhere to the RASS goal set by the protocol (0 to -3) could not have a CAM-ICU assessment, which excluded them from data collection.

Quantitative variables. Types and class of sedation, CAM-ICU scores, ventilator days, and incidence and duration of delirium were collected. The multidisciplinary team who created the protocol made sedation recommendations with consideration for expected duration of sedation. For instance, dexmedetomidine was not utilized as sedation, despite not being a benzodiazepine, when infused greater than 48 hours as this may prolong extubation in patients with liver dysfunction after discontinuation of the medication.

Literature review. A literature review for data regarding only the medical intensive care patient population was not available because many of the previous studies similar to this one were done on ICUs containing variable patient populations. Most data that were available reinforced the SCCM recommendation of light sedation over heavy sedation, but were not unified on how to achieve this with sedation options. Research varied on which sedation method provided the best results with little-to-no difference in ventilator days with protocols utilizing strictly analgesia, precluding pertinent quantitative data or conclusive statements that could impact this study.

Statistical methods. The mean ventilator days and incidence and duration of delirium were calculated from the data collected utilizing Microsoft Excel's math/trigonometry functions. Data were represented by bar graphs for a side-by-side comparison of analgesia-based sedation and benzodiazepine sedation (see Mean delirium days, Percent of patients with delirium incidence, and Mean ventilator days).
Results

Intervention results validated the SCCM’s recommendation to decrease use of benzodiazepines and supported the correlation between analgesia-based sedation and positive patient outcomes. First, the mean delirium duration was 4.24 days with benzodiazepines versus 1.94 days under analgesia-based sedation. In addition, the incidence of delirium was higher among benzodiazepine-sedated patients (49%) compared with 26% among analgesia-sedated patients. Also, mean ventilator days for patients treated with benzodiazepine sedation was 4.3 days versus 3.7 days for analgesia-based sedation.

In addition to the quantitative data, a few unintended consequences of the weight-based sedation protocol were recorded. At first, experienced nursing staff resisted the new protocol because the prior sedation orders were less specific in regards to dosing and allowed staff to sedate the patient based on judgment alone. However, the specificity of the analgesia-based sedation protocol allowed the team to tailor the amount of sedation for each patient, allowing for safer dosages. In addition, the CAM-ICU assessment tool required additional training to reduce ambiguity when assessing arousal and alertness. Further education of the nursing staff resolved this issue prior to data collection in order to have accurate and reliable quantitative data.

Discussion

After evaluation of the data, this study confirms that benzodiazepine use may be a risk factor for the development of delirium in adult ICU patients. Study results indicate that the use of benzodiazepine-based sedation can significantly prolong the duration and incidence of delirium. The use of analgesia-based sedation coupled with twice-daily CAM-ICU monitoring and protocol-regulated RASS scores in comparison with frequent benzodiazepine use decreased the time of intubation and delirium and is recommended for ICU sedation.

The independent variable regarding choice of sedation greatly influenced the results and served as the basis for this study. The ICU study population should be considered when interpreting results for generalizability. Other limiting factors that may have influenced the results would be the initial resistance of nursing staff to change bedside practice, the goal RASS for sedation (which was patient-population specific), patient comorbidities, and physician interpretation of patient readiness to extubate. Observer bias was eliminated by the retrospective study design; that is, extracting quantitative data from the EMR.

Conclusions

Discouraging benzodiazepine use in the adult, mechanically-ventilated ICU patient has elicited a change in the culture of how practicing physicians order sedation. Following the SCCM’s guidelines, nurses have been able to discuss sedation options with physicians to benefit their patients. In this facility, benzodiazepine-based sedation has become a last resort when sedating patients over any length of time.

Future studies on the rate of self-extubation with lighter sedation levels are indicated. Furthermore, studies involving different patient populations may also be indicated.

References


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