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An evaluation of patient-specific characteristics on attainment of target sedation in an intensive care unit

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ABSTRACT

Background: Sedation of mechanically ventilated patients should optimize comfort and safety while avoiding over-sedation and adverse outcomes. To our knowledge, characteristics associated with attaining target sedation are unknown.
Objectives: Evaluate current sedation practice at a single center and explore which patient characteristics are associated with attaining target sedation.
Methods: This is a single-center, retrospective chart review of sedated, ventilated patients in a medical/surgical ICU. Demographic and clinical data were collected. Univariate and multivariate logistic regression analyses were used with attaining target sedation as the dependent variable.
Results: Of the 100 patients included (median 60.5 years), 50 attained target sedation. Univariate analyses (a = 0.10) revealed factors associated with target sedation were age (P = 0.08), history of alcohol abuse (P = 0.08), multiple comorbidities (P = 0.09), and delirium monitoring (P = 0.002). Multivariate analysis revealed an association between delirium monitoring/documentation and attaining target sedation (P = 0.005; OR 9.2; 95% CI 2.3–36.8).
Conclusions: Patients without appropriate delirium monitoring/documentation had significantly reduced likelihood of achieving target sedation.

Introduction

Optimal sedation is a balance between ensuring a patient is comfortable and free of agitation and the risk of over-sedation, which may lead to adverse outcomes. For many patients in the intensive care unit (ICU), a lighter level of sedation has been associated with improved outcomes, such as decreased prevalence and duration of delirium, shorter duration of mechanical ventilation, and fewer adverse effects such as hypotension and tachycardia.[1–3] Some mechanically ventilated patients, such as those with increased intracranial pressure, severe respiratory failure, neuromuscular blockade, or therapeutic hypothermia, require a deeper level of sedation to ensure safety, comfort, and amnesia when indicated.[4] Therefore, each patient should have an individualized sedation goal. Many characteristics may contribute to attaining target sedation, but demographic and clinical characteristics have not been previously analyzed.

The Society of Critical Care Medicine (SCCM) guidelines prefer non-benzodiazepines, such as propofol and dexmedetomidine, over benzodiazepines due to increased ventilator-free days and decreased mortality.[3,5,6] Benzodiazepine use may remain appropriate in select populations, such as refractory epilepsy and alcohol or benzodiazepine withdrawal.[7]

The need for ongoing sedation should be assessed through daily spontaneous awakening trials (SAT) in appropriate patients. Such trials should not be performed on patients in status epilepticus, enduring alcohol withdrawal, receiving concomitant paralytic agents, have an elevated intracranial pressure, or are in a moribund state.[8] Daily spontaneous awakening trials have shown multiple benefits, such as more ventilator-free days, reduced ICU length of stay, shorter hospital length of stay, and decreased one-year mortality.[8–10]

Abbreviations: BPS, Behavioral Pain Scale; CAM-ICU, Confusion Assessment Method for the Intensive Care Unit; CHS NE, Carolinas HealthCare System NorthEast; CPOT, Critical Care Pain Observation Tool; ICDSC, Intensive Care Delirium Screening Checklist; ICU, Intensive Care Unit; RASS, Richmond Agitation-Sedation Scale; REDCap™, Research Electronic Data Capture; SAS, Sedation-Agitation Scale; SAT, Spontaneous Awakening Trial; SCCM, Society of Critical Care Medicine.

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The 2013 Clinical Practice Guidelines for the Management of Pain, Agitation, and Delirium in Adult Patients in the ICU[11] recommend using the following scales: the Critical Care Pain Observation Tool (CPOT) or Behavioral Pain Scale (BPS) for pain, the Richmond Agitation-Sedation Scale (RASS) or Sedation-Agitation Scale (SAS) for sedation and agitation, and the Confusion Assessment Method for the ICU (CAM-ICU) or the Intensive Care Delirium Screening Checklist (ICDSC) for monitoring of delirium.[12–17]

The primary objective of this study was to evaluate demographic and clinical data, including percentage of time spent within target sedation range, as defined by physician order, during initial intubation at the study site, and to determine its influence on attainment of target sedation. The secondary objective was to assess the relationship between attainment of target sedation (yes/no) and the following variables: length of mechanical ventilation, occurrence of reintubation, occurrence of unplanned extubation, and documentation of pain and delirium monitoring per BPS and ICDSC, respectively.

Methods

Study setting and subjects

This IRB-approved, single-center, retrospective study was conducted at Carolinas HealthCare System NorthEast (CHS NE), a 457-bed, tertiary referral center and community teaching hospital in Concord, North Carolina. Daily, the 35-bed medical/surgical ICU is staffed with approximately 32 nurses, 4 intensivists, and 2 pharmacists. The average daily census is 31 patients, with approximately 2,400 patients admitted annually. Mechanically ventilated adult patients on continuous sedation were identified using an automated dispensing cabinet report from January 1, 2016, through March 31, 2016 and screened for inclusion in the study. Exclusion criteria were age less than 18 years, pregnancy, receipt of sedatives for status epilepticus or solely as part of comfort care measures, concomitant orders for neuromuscular blockade (NMB) infusions, RASS score target missing within the initial physician order, or immediate transfer of the patient to another facility [Figure 1].

Charts were chronologically reviewed and screened for inclusion until at least 40 patients that failed to achieve target sedation were included, with a total desired target of 100 patients. Following the guidelines of Peduzzi et al. – i.e., the number of events per independent variable in a logistic regression analysis should be at least 10 – this sample size (100) and estimated number of failures (40) allow for a logistic regression model with target sedation (yes/no) as the dependent variable and four independent variables.[18] Applying the results from the DEXCOM, MIDEX, and PRODEX trials, a target of 60% time spent at goal RASS was chosen to determine whether a patient achieved target sedation.[2,5] To further support this target, a separate, internal retrospective analysis conducted between January 1, 2016, and June 30, 2016, found that 62% of RASS scores were within the target range defined by physician order.

Definitions

The following definitions were utilized for this study. RASS scores between -2 to +1 were classified as "light-to-moderate sedation" while scores between -3 to -5 were "moderate-to-heavy sedation." The "light-to-moderate" sedation range of -2 to +1 was chosen to include both definitions of a health system standard that underwent active change during the timeframe of this study (-2 to 0; -1 to +1). "Target sedation" was defined as having at least 60% of RASS scores within the previously discussed ranges of "light-to-moderate" or "moderate-to-heavy" sedation based on the original physician order. "Multiple comorbidities" was defined as having at least 2 chronic medical conditions upon admission. "Reintubation" was intubation within 24 hours of initial extubation, while "unplanned extubation" was defined as unintentional or self-extubation.

Measures and data collection

Data was collected retrospectively from the electronic medical record per proposed criteria and managed within a secure Research Electronic Data Capture (REDCap™) database.[19] As no previous studies have evaluated the correlation between demographic and clinical characteristics and attainment of target sedation, the authors determined a broad scope was needed and utilized the delirium risk factors listed in the 2013 clinical practice guidelines, as well as various patient characteristics that may affect the pharmacokinetics and pharmacodynamics of sedatives.[11] Characteristics that were assessed include: age, gender, total body weight, degree of renal dysfunction, choice of sedative [benzodiazepine, non-benzodiazepine (propofol, dexmedetomidine, and fentanyl), or combination], risk factors for delirium as documented in the electronic medical record

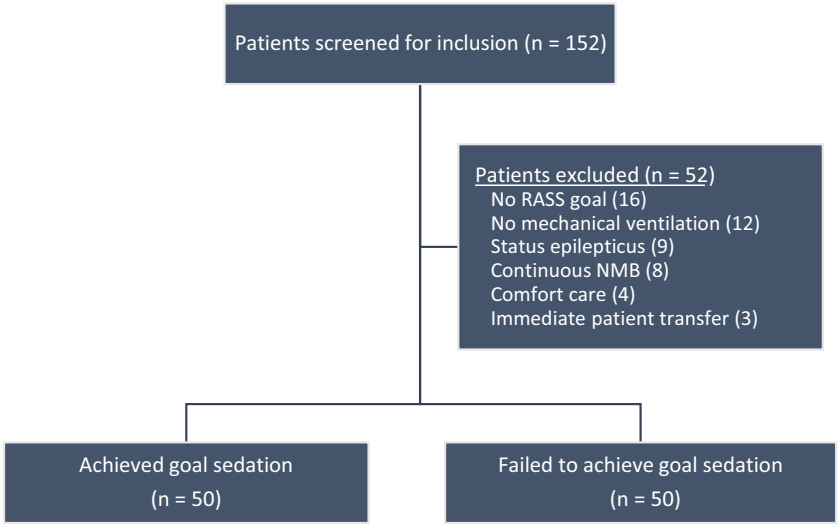

Fig. 1. Patient screening and exclusion flow diagram.