CE
2.5
ANCC
Contact
Hours

Interprofessional Implementation of a Pain/Sedation Guideline on a Trauma Intensive Care Unit

Tara L. Sacco, MS, RN, CCRN, AGCNS-BC, ACCNS-AG ■ Brenton LaRiccia, PA-C, MS, MBA

ABSTRACT

Trauma patients experience pain and agitation during their hospitalization. Many complications have been noted both in the absence of symptom management and the in presence of oversedation/narcotization. To combat noted untoward effects of pain and sedation management, an interprofessional team convened to develop a pain and sedation guideline for use in a trauma intensive care unit. Guideline development began with a comprehensive review of the literature. With the input of unit stakeholders, a nurse-driven analgosedation guideline was implemented for a 6-month trial. During this time, unit champions were integral to successful trial execution. Outcome measurement included patient and unit outcomes, nursing satisfaction, and a pre- and postimplementation patient comparison. Following implementation, unit length of stay decreased by 4.16% and there was a 17.81% decrease in average time on the ventilator following the initiation of weaning. Patient reports of nurse sensitivity and responsiveness to pain increased from 93.7 to 94.9. Nurses reported satisfaction with the practice change and improvements in care. In comparing pre- and postimplementation patient data, there was a significant decrease in mean analgesic treatment duration and an increase in the use of antipsychotics for delirium management. Following the trial period, this guideline was permanently adopted across the adult critical care service. The development of a nurse-driven analgosedation guideline was noted to be both feasible and successful.

Key Words

Interprofessional teams, Nurse-driven protocols, Pain and sedation management

Author Affiliations: St. John Fisher College Wegmans School of Nursing, Rochester, New York (Ms Sacco); Villanova University, College of Nursing, Villanova, Pennsylvania (Ms Sacco); Adult Critical Care Nursing, University of Rochester Medical Center, Rochester, New York (Ms Sacco and Mr LaRiccia); and Kessler Family Burn/Trauma ICU, Rochester, New York (Mr LaRiccia).

The authors declare no conflicts of interest.

Correspondence: Tara L. Sacco, MS, RN, CCRN, AGCNS-BC, ACCNS-AG, Visiting Assistant Professor, St. John Fisher College Wegmans School of Nursing, 3690 East Ave, Rochester, NY 14618 (tsacco@sjfc.edu or tara_sacco@urmc.rochester.edu).

DOI: 10.1097/JTN.0000000000000205

In the critical care environment, careful pain and agitation management is required to simultaneously provide adequate comfort and the best possible patient outcomes. Generally, critically ill patients experience pain from routine care and necessary medical procedures (Brush & Kress, 2009; Vogt & Frankel, 2014). However, the pain experienced by traumatically injured patients is a consequence of surgical management, the systemic inflammatory response, and the injury itself (Glowacki, 2015; Malchow & Black, 2008; Porhomayon et al., 2013). Complications of inadequate pain management include venous thrombotic events, pulmonary complications, exacerbated stress response, posttraumatic stress disorder, and an increase in agitation, length of stay, and mortality rates (Malchow & Black, 2008). The mainstay of pain management historically has been the utilization of analgesics (Vogt & Frankel, 2014), often via continuous infusion; however, many patients experience adverse effects including neurologic and respiratory depression, hypotension, delayed ventilator weaning, and increased intensive care unit (ICU) length of stay (Malchow & Black, 2008). Currently, an analgesia first methodology (analgosedation) has been recommended because uncontrolled pain often leads to agitation (Davidson, Winkleman, Gelinas, & Dermenchyan, 2015; Sessler & Varney, 2008; Vogt & Frankel, 2014).

After adequate pain relief has been attained, many patients will still require anxiolysis. Of patients admitted to a critical care unit, 42%–71% will experience agitation (Burk, Grap, Munro, Schubert, & Sessler, 2014). In the trauma population, agitation may be related to anxiety, delirium, and polysubstance abuse/withdrawal (Mehta, McCullaugh, & Burry, 2009). Agitation has also been reported to result from the use of restraints, history of psychiatric diagnosis, untreated pain, and neurologic or respiratory dysfunction and may be linked to severity of illness (Burk et al., 2014). Agitation management ideally provides patient comfort, anxiolysis, and possibly amnesia, while facilitating mechanical ventilation and necessary bedside procedures (Pun & Dunn, 2007). As with analgesia, sedative agents can be given via intermittent dosing or continuous infusion. The adverse effects of continuous sedative infusions include prolonged mechanical ventilation, ventilator-associated pneumonia (VAP), and prolonged length of stay (Bec & Johnson, 2008; Brush

& Kress, 2009; Hughes, Girard, & Pandharipande, 2013; Porhomayon et al., 2013; Robinson, Berube, Barr, Riker, & Gelinas, 2013; Robinson et al., 2008).

To combat the deleterious effects of continuous analgesic and anxiolytic infusions, sedation interruption guidelines with spontaneous awakening trials have been implemented (Fry, Edelman, & Cochran, 2009). As goal-directed therapy, these guidelines have been shown to decrease the incidence of pain, agitation, delirium, posttraumatic stress disorder, drug costs, the duration of mechanical ventilation, sedation days, length of stay, tracheostomy rates, ventilator complications, and risk of death (Balas et al., 2012). The balance between adequate pain and agitation management and complication prevention in the critical care environment has been an evolving, ongoing concern for the interprofessional team as it can impact patient comfort, satisfaction, and outcomes.

LITERATURE REVIEW

Continuous Versus Intermittent Sedation

Daily sedation interruption has been a well-accepted practice in the critical care environment to decrease the duration of mechanical ventilation and ICU length of stay compared with the historical practice of continuous infusions that were infrequently weaned or discontinued in a timely manner (Kress, Pohlman, O'Connor, & Hall, 2000). In addition, daily sedation interruption has been shown to decrease the incidence of complications associated with mechanical ventilation and prolonged intubation (Schweickert, Gehlbach, Pohlman, Hall, & Kress, 2004). The effect of reduction in ventilator days may be partially attributed to the reduction in accumulation of active metabolites of the continuous infusions (Porhomayon et al., 2013; Shafer, 1998) and a reduction in ICU delirium (Ouimet, Kavanaugh, Gottfried, & Skrobik, 2007).

Many of the sedation interruption studies have been completed within medical ICU populations. These samples include critically ill patients with older median ages compared with surgical and trauma patient populations (Porhomayon et al., 2013; Robinson et al., 2008); thus, the findings may not be generalizable to these groups. In orthopedic, general surgery, and cardiac surgery patients, an analgosedation methodology has been noted to reduce agitation when analgesia needs are addressed upfront (Vogt & Frankel, 2014). Optimizing the analgosedative needs in postoperative or critically injured patients can be challenging because of concurrent polysubstance abuse/withdrawal (Robinson et al., 2008), the requirement of multiple surgical procedures, and altered mental status (Porhomayon et al., 2013). In surgical and trauma populations, utilization of a regimented analgesia–delirium–sedation protocol has been shown to decrease ventilator days and hospital length of stay, without incorporating sedation interruption (Robinson et al., 2008). The analgesia–delirium–sedation approach uses validated assessment tools to evaluate and treat pain, agitation, and delirium. It employs an analgosedation methodology to remove pain as a cause for agitation, and differentiates agitation due to anxiety, and also agitation due to delirium (Robinson et al., 2008).

There is evidence that suggests using analgosedation has improved outcomes compared with standard sedative regimens. Analgosedation regimens using morphine and remifentanil have been implemented successfully to decrease weaning time from mechanical ventilation and reducing ICU length of stay (Devabhakthuni, Armahizer, Dasta, & Kane-Gill, 2012; Hughes et al., 2013). In addition to analgosedation, light sedation, which allows the patient to remain arousable and follow commands, may be a preferred method of patient management (Robinson et al., 2013; Vogt & Frankel, 2014). It has been reported that patients in light sedation protocols experience fewer ventilator days, fewer ICU days, and fewer adverse psychological effects from their ICU admission (Hughes et al., 2013).

Nurse-Driven Protocols

Multiple authors have demonstrated that the implementation of interprofessionally developed, nursing-driven protocols for pain, agitation, and delirium is feasible. Pun et al. (2005) described the implementation of the Richmond Agitation-Sedation Scale (RASS; Sessler, Grap, & Brophy, 2001) and Confusion Assessment Method (CAM-ICU; Ely et al., 2001) at two medical centers. In this study, documentation compliance for the RASS was 94.4% and 99.7%, and for the CAM-ICU was 90% and 84%, respectively. The nursing education prior to implementation included a 20-min in-service with bedside demonstration and informational materials. The high compliance rates were achieved without automatic prompts to record either scale (Pun et al., 2005). This, and other studies, has shown that when properly implemented, pain, sedation, and delirium protocols can effectively allow critical care nurses to make decisions to improve the quality of care with regard to sedation and analgesia in the ICU (Bec & Johnson, 2008; Hughes, et al., 2013; Porhomayon et al., 2013; Quenot et al., 2007; Rose et al., 2015; Vogt & Frankel, 2014).

BACKGROUND AND OBJECTIVE

Despite the strong evidence supporting the interruption of continuous infusions, many units struggle with adherence to the guidelines (Hughes et al., 2013; Pun & Dunn, 2007; Rose et al., 2015). Reported barriers include fear of ventilator compromise, concern for self-extubation, clinical instability, and increased nursing workload (Hughes et al., 2013; Mehta et al., 2012; Rose et al., 2015). These barriers were anecdotally noted on a trauma ICU in a Magnet-designated academic medical center in Western

New York. Traditional practice had included the utilization of a VAP bundle with daily sedation/analgesia interruption and spontaneous breathing trials. The continuous drips utilized on this unit included fentanyl and remifentanil for analgesia and midazolam and propofol for sedation. An informal unit assessment revealed that infusion interruption occurred in fewer than 50% of eligible patients. This was concerning as this may have been a contributing factor to negative patient events and outcomes. With this in mind, an interprofessional team sought to implement a new pain and sedation guideline utilizing an analgosedation, bolus load methodology. The ultimate goal was to decrease the use of continuous drips in the ICU while achieving patient comfort and the prevention of negative patient outcomes while maintaining or decreasing nursing and provider workload.

METHODS

Development

Implementation of the pain and sedation guideline occurred over a 9-month period in 2010–2011. In the summer of 2010, an interprofessional team convened to plan, develop, and implement this new guideline for trial in an adult trauma ICU. The patient population served by this unit includes trauma, burn, neurosurgical, orthopedic, and plastic surgery patients older than 18 years requiring intensive monitoring and interventions. The initial team members included the unit-based physician assistant (PA), clinical nurse specialist (CNS), and pharmacist (PharmD), with consultation from the medical director. The team completed a comprehensive review of the literature focusing on pain and agitation assessment and management utilizing guidelines and nurse-driven protocols. A guideline was drafted and revised after receiving the input of registered nurse (RN) leadership, staff, and the unit-based advanced practice provider group (including PAs and nurse practitioners). After vetting the guideline in the appropriate committees, a 6-month trial with a performance improvement evaluation plan was approved.

Overview

The guideline (Figure 1) was designed for intubated patients admitted to a trauma ICU and focuses on prioritizing pain control through analgosedation. The assessment tools utilized are the Adult Non-Verbal Pain Score (NVPS;

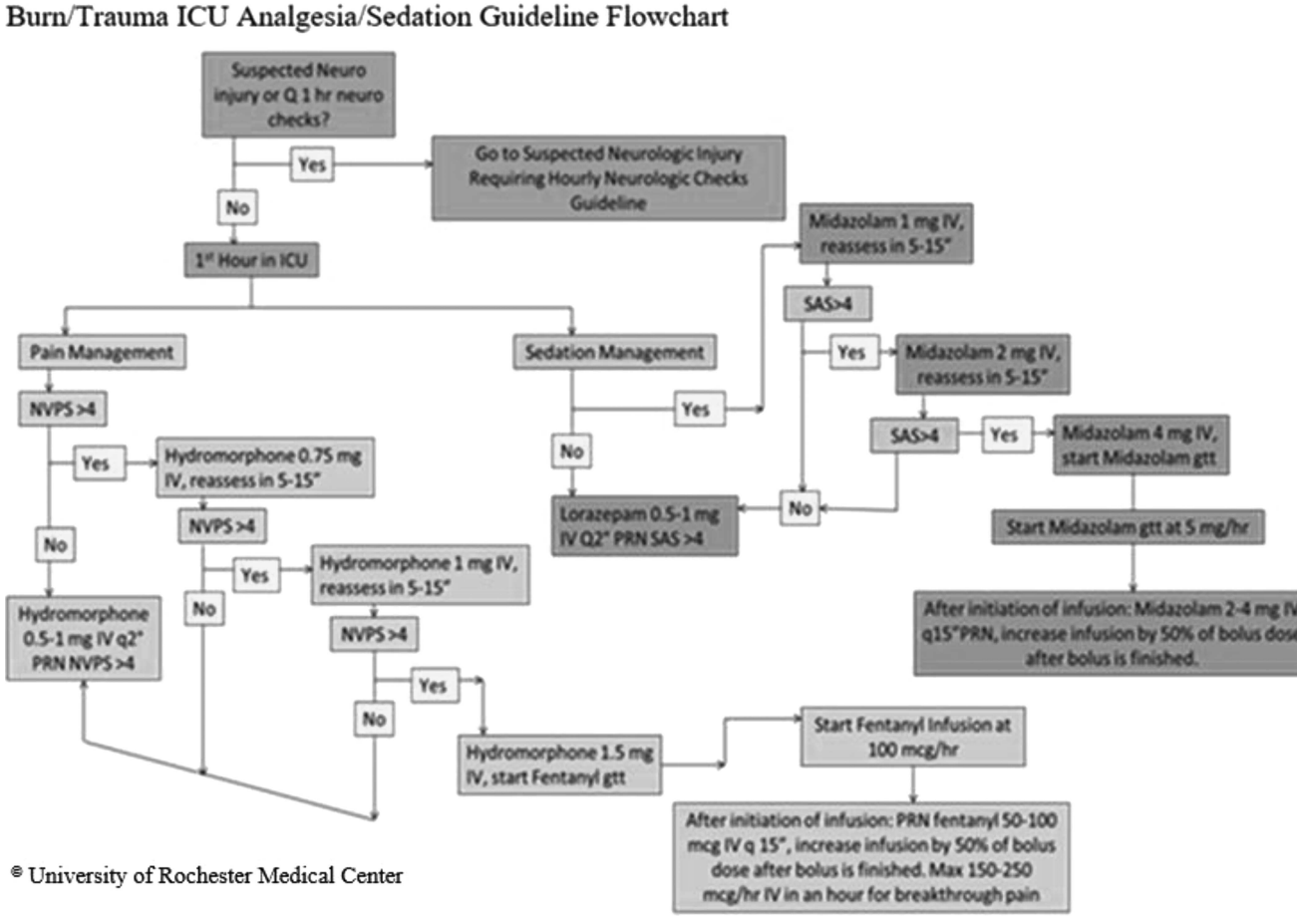

Figure 1. Pain and sedation guideline.

Odhner, Wegman, Freeland, Steinmetz, & Ingersoll, 2003; Kabes, Graves, & Norris, 2009) and the Sedation-Agitation Score (SAS; Riker, Ricard, & Fraser, 1999). The NVPS is rating on a scale of 0 to 10, with 0 being no pain and 10 being the highest pain score (Odhner et al., 2003). The SAS is rated on a scale of 0 to 7, with 0 being unarousable and 7 being dangerously agitated (Riker et al., 1999). Patients requiring neuromuscular blockade for any reason, burns, those withdrawing from alcohol, or those who required deep sedation are excluded.

The guideline splits patients into two groups: those requiring frequent (hourly) neurologic assessments and those who do not. Patients without neurologic injuries are evaluated using the NVPS and SAS. For an NVPS of four or more, the patient receives hydromorphone IV in escalating boluses, doses every 5–15 min. After each dose, the NVPS is reassessed, and if four or more, the next dose is administered. If the patient receives all three doses within the first hour of admission, a fentanyl infusion is initiated; those who do not require all three doses remain on hydromorphone as needed. For agitation, if the SAS is four or more, patients receive escalating midazolam bolus doses. As with the analgesia arm of the guideline, if three doses are required within the first hour, a midazolam infusion is initiated; those who do not require all three doses are transitioned to lorazepam as needed. After the first hour, pain and agitation assessment occurs hourly with vital sign assessment and more frequently as needed. Following the first 12–24 hr of guideline initiation, the analgesic and anxiolytic needs of the patient are reevaluated. In patients who receive fentanyl and/or midazolam infusions, the infusion is weaned by 25%–50% every 12 hr with the goal of transitioning to intermittent dosing.

Delirium is evaluated using the Intensive Care Delirium Screening Checklist (ICD-SC; Bergeron, Dubois, Dumont, Dial, & Skrobik, 2001) every 12 hr. At the time of implementation, the ICD-SC tool had been selected as the assessment tool for use at this institution. The sensitivity and specificity of this tool has been noted to be 99% and 64%, respectively (Bergeron et al., 2001). Patients who are identified as having delirium are treated with haloperidol or an atypical antipsychotic (e.g., quetiapine, risperidone, ziprasidone, and olanzapine). If the patient develops delirium and has been requiring anxiolysis with a benzodiazepine, the benzodiazepine dose is reduced, or discontinued if possible. Ongoing delirium despite treatment with antipsychotic medications is managed with a dexmedetomidine infusion.

Patients with neurologic injuries requiring hourly assessments are placed on the second arm of the guideline. As described earlier, pain and agitation are assessed using the NVPS and SAS, respectively. If they score an NVPS of four or more and an SAS of four or more, they are placed on remifentanil and propofol infusions. Preferentially, remifentanil is started first as this medication possesses both analgesic and sedative properties (Riggi & Glass, 2013) and aligns with an analgosedation methodology. If both drips are started, the guideline directs staff to first wean propofol, with the goal of narrowing to remifentanil alone for analgosedation. Patients are reassessed by the provider team daily for continued need of hourly neurologic assessments and are transitioned to fentanyl infusions they are no longer needed. Weaning of continuous drips occurs in the same manner for both patient populations.

Implementation

Following guideline development, in the fall of 2010, a team of unit champions was assembled to become guideline experts, to develop education, and to participate in outcome data collection. The purpose of the unit champion group was to provide a grassroots implementation effort and a resource to staff on all shifts throughout the process. All RN staff members, except for those actively on orientation, were invited to participate in this process; team membership could also count toward clinical ladder advancement. Seven RNs of various experience levels joined the original team for implementation. At that time, all unit-based providers were involved, including the nurse practitioners (NPs) and PAs. In the initial champion meeting, the need for practice change was presented by the lead facilitators (PA, CNS, and PharmD). A concise, comprehensive review of the literature was presented to the team so that they could directly speak to the need for practice change. The guideline was introduced, and each team member had the opportunity to raise concerns, offer feedback, and ask questions. It was established at this initial meeting that it was the expectation that the RNs, CNS, NPs, PA, and PharmD would drive the utilization of the guideline across all shifts.

Within 2 months, the unit champion team developed mandatory staff education to be deployed before implementation. The PA, NPs, and medical director were responsible for educating all attending physicians and residents. Nursing education occurred through an online educational platform and included a module and posttest to measure competency. In addition, live presentations occurred as optional education, including "red eye" lectures for the night shift. Each unit champion was considered an expert available to answer questions from staff and provide just-in-time education after implementation. Full staff education was completed in 1 month's time.

In the month following the completion of unit education, the guideline was fully implemented on all newly admitted patients; all preexisting patients remained on traditional pain/sedation management. Patients remained on the guideline until they met exclusion criteria, progressed to full intermittent dosing, or were extubated. For the 6 months following implementation, patient outcome and staff satisfaction data were collected. In addition, quarterly outcome data were available for comparison to prior years.

Evaluation

Assessment of this performance improvement project included a review of annual unit performance data and a nursing satisfaction survey. A pre- and postimplementation patient group comparison was completed via a retrospective review of our quality improvement database. Human subjects protection was ensured by the following means: unit performance data are collected on an ongoing basis and were not uniquely collected for this project; nursing satisfaction data were collected anonymously as performance improvement evaluative data with the permission of the nursing manager and associated director for critical care; and the patient group comparison data collection was approved by the institutional review board, completed retrospectively, and without the inclusion of identifying patient information.

Unit performance data are collected on an annual basis; thus, data from 2010 and 2011 were examined during implementation (Table 1). Although average RN care hours increased by 13.08%, improvements were made in average ICU length of stay (4.16% decrease) and average time on the ventilator following the initiation of weaning (17.81% decrease). Press Ganey survey data also indicated that the metric "ICU nurse sensitive and responsive to pain" improved, with a 1.28% increase.

During the 6-month guideline trial period, all RN staff were invited to voluntarily and anonymously complete surveys on a monthly basis to assess their satisfaction with guideline implementation, ease of guideline use, and the impact on RN workflow and patient care. Data were analyzed by the CNS on the implementation team. Participants were asked to rate 14 questions on a five-point Likert scale (1 = disagree to 5 = agree), with an option to rate an item as not applicable. Of the approximately 65 RNs on the unit, only 27 surveys were returned, yielding a 42% response rate over the 6-month period. However, overall RN feedback related to guideline implementation was positive. The average score for all questions was 3.25 or better, indicating that in general staff slightly agreed or agreed with each item (Table 2). Staff reported that the guideline was user friendly, their patient's pain and sedation needs were better met following implementation, that the guideline allowed for around-the-clock pain and sedation management in this population, that they were supported throughout implementation, and that the guideline had improved patient care (Figure 2). The lowest-rated items, "I feel this guideline is used consistently among providers," "I have not had any problems obtaining orders for bolus loading doses of hydromorphone or midazolam," and "My time for documentation has not increased since implementing this guideline," though still rated above neutral, were likely related to changes that occurred during the implementation period. In March 2011, 2 months after guideline implementation, the organization launched a comprehensive electronic medical record (EMR). As the guideline was still in the trial period, order sets had not yet been built and this may have impacted consistent use among providers and the RN's ability to obtain orders. The implementation of the EMR also likely influenced the nursing perception of time spent on documentation. Despite these concerns, overall nursing staff satisfaction with the use of this guideline was positive.

For the pre- and postimplementation patient comparison, 400 charts of patients admitted to this unit (PRE March to July 2009, and POST March to July 2011) were reviewed. Exclusion criteria included patients under chemical paralysis, those with burns, and those who required sedation for medical indications (i.e., for airway protection), those with open abdominal incisions, and any incomplete medical record information. After reviewing the medical records, 145 patients in the postimplementation group (POST), and 95 patients in the preimplementation group (PRE) were selected for review. Records were reviewed concurrently and retrospectively for demographics, Acute Physiology and Chronic Health Evaluation (APACHE) II score, ICU length of stay, hospital length of stay, ventilator days, sedation use, analgesic use, complications, and outcomes. The admitting service distribution did not change significantly during this period. Patients were alike in average age, APACHE II score, presence of pulmonary contusions,

TABLE 1 Aggregate Performance Improvement Data: Pain and Sedation Guideline

Metric	2010[a]	2011[b]	Change 2010–2011
RN care hours (average)	16.4	18.54	13.08%
Average ICU LOS (for LOS <30 days)[c]	5.08	4.87	−4.16%
Average time on ventilator[d]	7.49	6.15	−17.81%
ICU nurse sensitive/responsive to pain[e]	93.7	94.9	1.28%

Note. ICU = intensive care unit; LOS = length of stay; RN = registered nurse.

[a]Baseline; [b]year of implementation; [c]days; [d]tracked from the time of implementation of ventilator weaning and measured per 1,000 ventilator days; [e]% always.

TABLE 2 RN Satisfaction Data ($N = 27$)[a]

Question	Average
1. I feel the guideline is user friendly	4.22
2. I feel the guideline is used consistently among providers	3.50
3. As compared to my previous practice, I feel my patient's pain is better controlled with this guideline	4.04
4. As compared to my previous practice, I feel that may patient's sedation is better controlled with this guideline	3.95
5. I have not had any problems obtaining orders for bolus loading doses of hydromorphone or midazolam	3.25
6. I have not had any problems obtaining orders for PRN hydromorphone or lorazepam if my patient only required PRN management	3.74
7. I have not had any problems obtaining orders for fentanyl or midazolam infusions that include titration parameters	3.79
8. I have not had any problems obtaining one-time orders for boluses given as I am titrating fentanyl or midazolam infusions	3.63
9. I have not had any problems obtaining PRN orders for breakthrough pain/agitation with appropriate parameters	3.96
10. I am able to titrate fentanyl and midazolam infusions easier with this guideline	3.63
11. This protocol allows for around-the-clock pain and sedation management for our patient population	4.24
12. My time for documentation has not increased since implementing this guideline[b]	3.52
13. I have felt supported through this transition	4.39
14. Overall, I believe this protocol has improved care[b]	4.32

[a]Responses on a five-point Likert scale: 1 = disagree; 2 = slightly disagree; 3 = neutral; 4 = slightly agree; and 5 = agree, with an option for not applicable.

[b]n = 25.

and diagnosis of acute respiratory distress syndrome or acute lung injury, or spinal cord injury. The only statistically significant difference noted between groups was an increase in the diagnosis of a neurologic injury (71% vs. 81%, $p < .05$) and a decrease in the presence of chest wall trauma (48% vs. 41%, $p < .05$).

The postimplementation group had a significant decrease ($p = .007$) in average sedation days. In addition, there was a significant decrease in mean analgesic treatment duration ($p = .016$). There was also a trend toward a significant decrease in ventilator days in the postimplementation group; however, this did not reach statistical significance. In addition, the use of antipsychotics for delirium management significantly increased (34.5% vs. 10.5%, $p = .01$).

The improvement in patient and unit outcomes, coupled with the demonstration of nursing satisfaction,

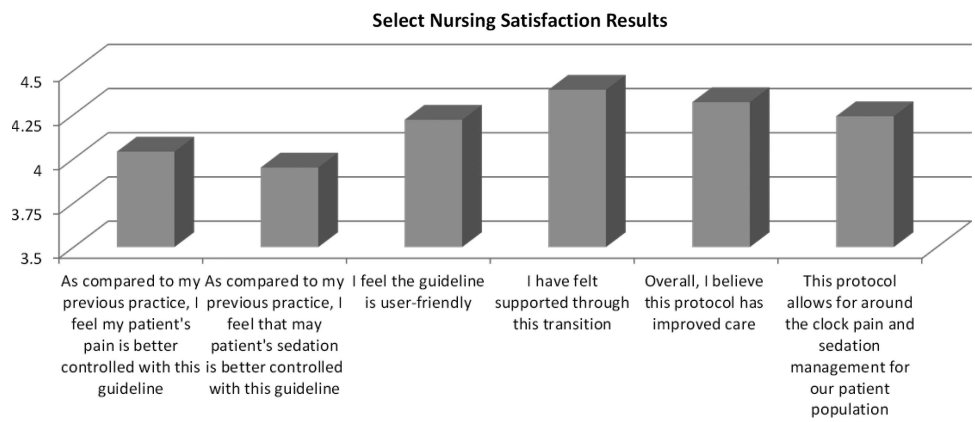

Figure 2. Select nursing satisfaction results.

indicated to the implementation team and administrators that the trial of the pain and sedation guideline was successful. Thus, in July 2011, the protocol was approved for ongoing use in this patient population.

DISCUSSION

Current State

Since the development and implementation of this guideline, the Society of Critical Care Medicine updated the clinical practice guideline for the management of pain, agitation, and delirium (PAD guideline) for intubated and nonintubated, adult medical, surgical, and trauma ICU patients. According to the PAD guideline, pain should be routinely assessed in adult ICU patients utilizing a reliable and valid tool. Although the Behavioral Pain Scale and the Critical-Care Pain Observation Tool are specifically recommended (Barr et al., 2013), the pain and sedation guideline described here utilized the NVPS for pain assessment. The reason for this is multifaceted. First, the NVPS was developed and vetted at this organization and the nurses are astute in pain assessment utilizing this tool. Furthermore, to change scales in addition to trialing a new guideline and implementation of a comprehensive EMR was not feasible. Despite the PAD guideline recommendation, internal consistency, as measured by the Cronbach α, of the NVPS has been noted to be 0.71–0.89. Although interrater reliability measures have varied, this is still considered a valid and reliable tool. Furthermore, it has been identified that more research is needed to identify the gold standard observation pain scale for use in all adult critically ill patients (Stites, 2013). In addition to patient assessment, the PAD guideline recommends the use of intravenous narcotics in this patient population, though no one medication is recommended over another (Barr et al., 2013).

In the agitation arm of the PAD guideline, it is recommended that assessment occur utilizing either the RASS or SAS as these are currently the most valid and reliable tools (Barr et al., 2013). At the time of implementation, the SAS was utilized in this institution. This guideline also recommends the selection of a nonbenzodiazepine sedation strategy when possible, using either propofol or dexmedetomidine. Benzodiazepines are γ-aminobutyric acid-α (GABA-α) agonists and possess amnestic, sedative, and anticonvulsive effects. GABA-α has been implicated as a precipitating cause of delirium in the critical care population. All benzodiazepines are metabolized by the liver, and clearance can be inhibited by a number of conditions. The active metabolites of benzodiazepines accumulate with prolonged administration, which may result in delayed emergence from sedation. Propofol also affects GABA-α receptors, but also has nicotinic, glycine, and M1 muscarinic activity, leading to sedative, anxiolytic, and amnesic effects, among others. Dexmedetomidine is a α_2 receptor agonist that produces an interactive, yet sedated, state in the absence of respiratory depression. Regardless of the medication selected, the PAD guideline points to the need for either daily sedation interruptions or light levels of sedation in mechanically ventilated patients (Barr et al., 2013).

The recommendation regarding delirium focuses on prevention, diagnosis, and treatment. As with pain and agitation assessment, it is recommended that delirium monitoring occur with a reliable and valid tool, noted to be either the CAM-ICU or the ICD-SC (Barr et al., 2013). At the time of implementation, the ICD-SC had already been the standard delirium assessment in this institution. Delirium prevention efforts should include early patient mobilization when feasible and restoration of sleep/wake cycles. It is noted that treatment of delirium unrelated to alcohol or benzodiazepine withdrawal with dexmedetomidine may reduce delirium duration. Atypical antipsychotics may reduce delirium in ICU patients; however, there is no current evidence that haloperidol reduces duration of ICU delirium (Quenot et al., 2007). At the time of development and implementation of the guideline described here, the focus was to optimize pain and agitation management; thus, the immediate effort was not directed toward delirium. Since implementation, a stronger emphasis on the prevention and management of delirium has occurred across the critical care service.

The implementation of a pain and sedation guideline on this unit resulted in improved patient outcomes. In addition, statistically significant differences in patient groups pre- and postimplementation were realized, including a reduction in average sedation days ($p = .007$), mean analgesic treatment duration ($p = .016$), and an increase in delirium management ($p = .01$). Although the pain/sedation guideline described here was implemented before the publication of the PAD guideline, it is the opinion of the writers that the evidenced-based standard has been met as the focus is analgosedation, utilizing the recommended medications and reliable and valid assessment tools, with the goal of light sedation.

After successfully piloting the protocol in this patient population, this guideline was implemented across the other adult critical care units in this institution, including use in surgical, neurologic, medical, and cardiovascular patients. Based on feedback from nursing staff, ongoing interprofessional discussions, and following review of the PAD guideline, minor changes to the service-wide guideline were made. The NVPS threshold for medication administration to treat pain was reduced to more than three, whereas the SAS threshold remained four. Decreasing the NVPS threshold still allows for pain management at a level of four as in the original guidelines and is considered a minor change. For ease of dosing, both the initial hydromorphone and midazolam doses were adjusted to

1 mg times three doses and 2 mg times three doses, respectively. If the patient requires a continuous drip for anxiolysis, propofol is considered the first-line agent in patients who are hemodynamically stable and/or with neurologic injuries. Midazolam may be started in those whose hemodynamic stability is in question (systolic blood pressure <90 mm Hg, mean arterial pressure <65 mm Hg, or heart rate <55 beats per minute). Dexmedetomidine may be considered as a short-term sedative in lieu of propofol and midazolam. Clinicians have the option to perform a sedation interruption and/or a sedation reduction of 25% to effectively wean patients off continuous infusions. This guideline has now been built into the EMR, allowing for ease in provider ordering. Finally, in early 2016, the CAM-ICU tool has been adopted as the delirium screening tool in this institution. The change in delirium assessment was related to an examination of tool psychometrics and that the SAS may now be used to determine whether a delirium assessment with the CAM-ICU is warranted (Robinson et al., 2013).

Pitfalls and Successes

During the implementation period, the institution transitioned from paper documentation to a comprehensive EMR. Thus, nurses and providers working on this unit simultaneously adjusted to two culture changes: the implementation of this guideline and the transition to full electronic charting. Although these transitions occurred concurrently, staff satisfaction with most aspects of care remained high. As noted previously, time for documentation and nursing care hours both increased during the implementation period. This was an expected finding given the practice change and EMR implementation. As with all major practice changes, adherence waxes and wanes; in the time since implementation, ongoing education of incumbent and new staff members has been necessary to sustain the positive impacts on outcomes realized.

One of the significant contributing factors to the success of guideline implementation was thoughtful project management and the use of unit champions. The lead team of clinicians, which included the unit-based PA, CNS, and PharmD, allowed for stable project leadership and support to the unit champion group. According to Carrothers et al. (2013), stability in project leadership when implementing new guidelines is a predictor of project success. The use of unit champions is a process that was recently advocated for by Davidson et al. (2015). This group states that knowledgeable RN staff should become champions who can bolster the change effort. The use of champions is effective "… because of their role in validating that proposed changes are feasible at the bedside, and as such, they serve as opinion leaders." (pp. 27). In essence, RN champion teams can influence their peers to adopt changes, even in times of doubt (Quenot et al., 2007). It has also been noted that project implementation is expedited with the use and support of champions (Carrothers et al., 2013). Without the efforts of the RN unit champions, the implementation of this guideline would not have been a success.

CONCLUSION

Successful implementation of a nurse-driven pain and sedation guideline is not only feasible but necessary. The guideline described here, as well as others (Bec & Johnson, 2008; Fry et al., 2009; Mehta et al., 2012; Porhomayon et al., 2013; Robinson et al., 2008), has been noted to positively impact nurse and unit outcomes, but most importantly patient outcomes. These outcomes include, but are not limited to a reduction in ventilator days, ICU length of stay, and VAP rate and increases in patient and nursing satisfaction. An interprofessional approach, with thoughtful project management and the use of RN champions, is recommended to increase the likelihood of success (Carrothers et al., 2013; Davidson et al., 2015).

KEY POINTS

- There are many untoward complications of pain and sedation management and mismanagement. The Society of Critical Care Medicine recommends the utilization of a guideline for pain, agitation, and delirium management in critically ill patients.
- The trauma population is unique in that these patients have pain from their injuries and surgical management as well as systemic inflammatory response syndrome. The agitation experienced may be related to pain, anxiety, delirium, and often polysubstance abuse/withdrawal. An analgesia first methodology is recommended for the management of pain and agitation in this population.
- Nurse-driven guidelines for the management of pain, agitation, and delirium are necessary. Ideally developed by an interprofessional team, nurse-driven guidelines have the potential to improve nurse, unit, and most importantly patient outcomes. The success of the guideline described here was augmented with the use of unit champions during implementation. The development of such a guideline, by an interprofessional team with unit champions, is both feasible and recommended.

Acknowledgments

We acknowledge the following persons for their assistance during this project: BTICU Pain/Sedation Guideline Committee and Unit Champions and Mary G. Carey, PhD, RN, FAHA, FAAN.

REFERENCES

Balas, M. C., Vasilevskis, E. E., Burke, W. J., Boehm, L., Pun, B. T., Olsen, K. M., ... Ely, E. W. (2012). Critical care nurses' role in implementing the "ABCDE Bundle" into practice. *Critical Care Nurse, 32*, 35–47. doi:10.4037/ccn2012229

Barr, J., Fraser, G. L., Puntillo, K., Ely, E. W., Gelinas, C., Dastas, J. F., … Jaeschke R. (2013). Clinical practice guidelines for the

management of pain, agitation, and delirium in adult patients in the intensive care unit. *Critical Care Medicine*, *41*, 263–306. doi:10.1097/CCM.0b013e3182783b72

Bec, L., & Johnson, C. (2008). Implementation of a nurse-driven sedation protocol in the ICU. *Dynamics*, *19*(4), 25–28.

Bergeron, N., Dubois, M.-J., Dumont, M., Dial, S., & Skrobik, Y. (2001). Intensive care delirium screening checklist: Evaluation of a new screening tool. *Intensive Care Medicine*, *27*, 859–864. doi:10.1007/x001340100909

Brush, D., & Kress, J. P. (2009). Sedation and analgesia for the mechanically ventilated patient. *Clinical Chest Medicine*, *30*, 131–141. doi:10.1016j.ccm.2008.09.001

Burk, R. S., Grap, M. J., Munro, C. L., Schubert, C. M., & Sessler, C. N. (2014). Predictors of agitation in critically ill adults. *American Journal of Critical Care*, *23*, 414–423. doi:10.4037/ajcc2014714

Carrothers, K. M., Barr, J., Spurlock, B., Ridgely, M. S., Damberg, C. L., & Ely, E. W. (2013). Contextual issues influencing implementation and outcomes associated with an integrated approach to managing pain, agitation, and delirium in adult ICUs. *Critical Care Medicine*, *41*, S128–S135. doi:10.1097/CCM.0b013e3182a2c2b1

Davidson, J. E., Winkleman, C., Gelinas, C., & Dermenchyan, A. (2015). Pain, agitation, and delirium guidelines: nurses' involvement in development and implementation. *Critical Care Nurse*, *35*, 33–43. doi:10.4037/ccn20115824

Devabhakthuni, S., Armahizer, M. J., Dasta, J. F., & Kane-Gill, S. L. (2012) Analgosedation: A paradigm shift in intensive care unit sedation practice. *Annals of Pharmacotherapy*, *46*, 530–540. doi:10.1345/aph.1Q525

Ely, E. W., Margolin, R., Francis, J., May, L., Truman, B., Dittus, R, ... Inouye, S. K. (2001). Evaluation of delirium in critically ill patients: Validation of the Confusion Assessment Method for the Intensive Care Unit (CAM-ICU). *Critical Care Medicine*, *29*, 1370–1379.

Fry, C., Edelman, L. S., & Cochran, A. (2009). Response to a nursing-driven protocol for sedation and analgesia in a burn-trauma ICU. *Journal of Burn Care & Research*, *30*, 112–118. doi:10.1097/BCR.0b013e3181921f7e

Glowacki, D. (2015). Effective pain management and improvements in patients' outcomes and satisfaction. *Critical Care Nurse*, *35*, 33–43. doi:10.4037/ccn2015440

Hughes, C. G., Girard, T. D., & Pandharipande, P. P. (2013). Daily sedation interruption versus targeted light sedation strategies in ICU patients. *Critical Care Medicine*, *41*, S39–S45. doi:10.1097/CCM.0b013e3182a168c5

Kabes, A. M., Graves, J. K., & Norris, J. (2009). Further validation of the nonverbal pain scale in intensive care patients. *Critical Care Nurse*, *29*, 59–66. doi:10.4037/ccn2009992

Kress, J. P., Pohlman, A. S., O'Connor, M. F., & Hall, J. B. (2000). Daily interruption of sedative infusions in critically ill patients undergoing mechanical ventilation. *New England Journal of Medicine*, *342*, 1471–1477.

Malchow, R. J., & Black, I. H. (2008) The evolution of pain management in the critically ill trauma patient: Emerging concepts from the global war on terrorism. *Critical Care Medicine*, *36*, S346–S357. doi:10.1097/CCM/0.b013e21817e2fc9

Mehta, S., Burry, L., Cook, D., Fergusson, D., Steinberg, M., Granton, J., ... Meade, M. (2012). Daily sedation interruption in mechanically ventilated critically ill patients cared for with a sedation protocol: a randomized controlled trial. *JAMA*, *208*, 1985–1992.

Mehta, S., McCullaugh, I., & Burry, L. (2009). Current sedation practices: Lessons learned from international surveys. *Critical Care Clinics*, *25*, 471–488. doi:10.1016/j.ccc2009.04.001

Odhner, M., Wegman, D., Freeland, N., Steinmetz, A., & Ingersoll, G. L. (2003). Assessing pain control in nonverbal critically ill adults. *Dimensions of Critical Care Nursing*, *22*, 260–267.

Ouimet, S., Kavanagh, B. P., Gottfried, S. B., & Skrobik, Y. (2007). Incidence, risk factors and consequences of ICU delirium. *Intensive Care Medicine*, *33*, 66–73.

Porhomayon, J., Nader, N. D., El-Sohl, A. A., Hite, M., Scott, J., & Silinskie, K. (2013). Pre- and post-intervention study to assess the impact of a sedation protocol in critically ill surgical patients. *Journal of Surgical Research*, *184*, 966–972. doi:10.1016/j.jss.2013.03.065

Pun, B. T., & Dunn, J. (2007). The sedation of critically ill adults. Part 2: Management. *American Journal of Nursing*, *107*, 40–49.

Pun, B. T., Gordon, S. M., Peterson, J. F., Sintani, A. K., Jackson, J. C., Foss, J, ... Ely, E. W. (2005). Large-scale implementation of sedation and delirium monitoring in the intensive care unit: a report from two medical centers. *Critical Care Medicine, 33*, 1199–1205. doi:10.1097/01.CCM.0000166867.78320.AC

Quenot, J. P., Ladoire, S., Devoucoux, F., Doise, J., Cailliod, R., Cunin, N, ... Charles, P. E. (2007). Effect of a nurse-implemented sedation protocol on the incidence of ventilator-associated pneumonia. *Critical Care Medicine*, *35*, 2031–2036. doi:10.1097/01.ccm.0000282733.83089.4d

Riggi, G., & Glass, M. (2013). Update on the management and monitoring of deep analgesia and sedation in the intensive care unit. *AACN Advanced Critical Care*, *24*, 101–107. doi:10.1097/NCI.0b013e318288d44d

Riker, R., Picard, J. T., & Fraser, G. L. (1999). Prospective evaluation of the Sedation-Agitation Scale for adult critically ill patients. *Critical Care Medicine*, *27*, 1325–1329.

Robinson, B. R. H., Berube, M., Barr, J., Riker, R., & Gelinas, C. (2013). Psychometric analysis of subjective sedation scales in critically ill adults. *Critical Care Medicine*, *41*, S16–S29. doi:10.1097/CCM.0b013e3182a16879

Robinson, B. R. H., Mueller, E. W., Henson, K., Branson, R. D., Barsum, S. B., & Tsuie, B. J. (2008). An analgesia-delirium-sedation protocol for critically ill trauma patients reduces ventilator days and hospital length of stay. *Journal of Trauma: Injury, Infection, and Critical Care*, *65*, 517–526. doi:10.1097/TA.0b013e318181b8f6

Rose, L., Fitzgerald, E., Cook, C., Kim, S., Steinberg, M., Delvin, J. W,... Mehta, S. (2015). Clinician perspectives on protocols designed to minimize sedation. *Journal of Critical Care*, *30*, 348–352. doi:10.1016/j.jcr.2014.10.1021

Schweickert, W. D., Gehlbach, B. K., Pohlman, A. S., Hall, J. B., & Kress, J. P. (2004). Daily interruption of sedative infusions and complications of critical illness in mechanically ventilated patients. *Critical Care Medicine*, *32*, 1272–1276. doi:10.1097/01.CCM.0000127263.54807.79

Sessler, C. N., Grap, M. J., & Brophy, G. M. (2001). Multidisciplinary management of sedation and analgesia in critical care. *Seminars in Respiratory and Critical Care Medicine*, *22*(2), 211–225.

Sessler, C. N., & Varney, K. (2008) Patient-focused sedation and analgesia in the ICU. *Chest*, *133*, 552–565. doi:10.1378/chest.07-2026

Shafer, A. (1998). Complications of sedation with midazolam in the intensive care unit and a comparison with other sedative regimens. *Critical Care Medicine*, *26*, 947–956.

Stites, M. (2013). Observational pain scales in critically ill adults. *Critical Care Nurse*, *33*, 68–79. doi:10.4037/ccn2013804

Vogt, K. N., & Frankel, H. (2014). Maintaining comfort, cognitive function, and mobility in surgical intensive care unit patients. *Journal of Trauma and Acute Care Surgery*, *77*, 364–375. doi:10.1097/TA.0000000000000282