Implementation of ICU bundles and the impact on pain, agitation, and delirium in critically ill patients in the ICU

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Background

Historically, ventilated patients were heavily sedated due to poor ventilator control, limited understanding of pain and delirium in patients in the ICU, and the perception of improved comfort. Deep sedation is no longer routinely indicated with advances in ventilator technology, updates in literature regarding optimal pain and sedative use, and better understanding of pain assessment and treatment in sedated patients. Uncontrolled pain and over-sedation can lead to delirium, increased length of ICU stay, and increased mortality[1,2].

The 2018 Update to the Clinical Practice Guidelines for the Management of Pain, Agitation, and Delirium in Adult Patients in the ICU recommends using an interdisciplinary team approach when managing ventilated patients[3]. These guidelines advocate for education to pharmacists, physicians, and nurses regarding best practices, implementation of electronic order sets, and application of checklists to encourage standardized pain, agitation, and delirium assessment tools. This is all done with the goal of minimizing the use of benzodiazepines, optimizing pain management, and using appropriate symptom-based scoring tools to guide treatment[4].

Pharmacy driven policies and protocols are often used to decrease medication and healthcare related cost, and improve patient outcomes[5]. St. Peter's Health presents a quality opportunity to implement a pharmacist-directed sedation protocol, as it is a rural community hospital with an non-intensivist managed ICU. Pharmacists at St. Peter's Health will collaborate with nurses and hospitalists to develop and implement evidence-based protocols and order sets for pain control and sedation in mechanically ventilated ICU patients.

Changing current culture for management of critically ill patients at St. Peter's Health will be a large hurdle. Barriers to implementation include added workload for nursing staff due to routine assessments and daily awakening trials, engaging physical and occupational therapy, and pharmacy staff engagement with ongoing adherence to the proposed bundle to ensure that newly implemented procedures are being consistently followed.

	Pain	Agitation	Delirium
Assess	Assess pain 4 times per shift and as needed Use Critical Care Pain Observation Tool (CPOT) • CPOT ≤ 2: pain well controlled • CPOT > 2: pain uncontrolled	Assess agitation 4 times per shift and as needed Richmond Agitation-Sedation Scale (RASS) • RASS -5 to -3: deeply sedated • RASS -2 to -1: lightly sedated • RASS 0: awake and calm • RASS 1 to 4: agitated	Assess delirium every shift and as needed Use Confusion Assessment Method for the ICU (CAM-ICU) • Delirium present if CAM-ICU positive
Treat	Maximize pain control using appropriate pharmacologic treatment • Nociceptive pain: IV opioids and non-opioid analgesics • Neuropathic pain: gabapentin or carbamazepine • Muscle spasms: cyclobenzaprine	Titrate sedation to a goal RASS of -1 to 1 • Under sedated: use bolus sedatives as needed or titrate sedation per protocol • Over sedated: hold sedative until RASS at goal, re-start at 50% of previous dose	Treat pain as needed Minimize sedation • Avoid benzodiazepines when possible • Maximize time at target sedation
Prevent	Treat pain prior to initiation of sedatives Administer pre-procedural anesthesia and/or non-pharmacological interventions	Daily spontaneous breathing trial Early mobilization and exercise when patient at goal RASS, unless contraindicated	Identify delirium risk factors • Alcohol abuse • Severity of illness • Benzodiazepine administration Early mobilization Promote sleep

Objectives

The objective of this study is to improve patient outcomes in ventilated patients by developing a standard ventilator bundle modeled after the 2018 PADIS guidelines.

Primary outcome

A retrospective data review of intubated patients from November 1, 2016 to October 31, 2017 was performed to determine focus points for improving practice. These focus points were used to build a scoring tool, used to objectively measure adherence to guideline recommended practice. This is done with the aim of correlating higher scores with improved secondary outcomes.

Guideline Recommendation	Intervention	Points
"Management of pain for adult ICU patients should be guided by routine pain assessment and pain should be treated before a sedative agent is considered. We suggest using an assessment-driven, protocol based, stepwise approach for pain and sedation management in critically ill adults."	Analgesia-first sedation	1
	Pain assessment with goal CPOT ≤ 2 or documentation of subjective pain assessment if CPOT not applicable	1
	Change in dose using protocol titration algorithm	1
	Multimodal pain approach used	0
	Lowest effective opioid dose used to achieve pain score	0
"We suggest using light sedation (vs deep sedation) in critically ill, mechanically ventilated adults. We suggest using either propofol or dexmedetomidine over benzodiazepines for sedation in critically ill, mechanically ventilated adults."	Sedation titrated to a RASS score of -1 to 1 after maximization of pain control	1
	Propofol or intermittent benzodiazepines used over continuous infusion benzodiazepines	1
	Daily sedation interruption, with sedation restarted at 50% of dose as appropriate	2
"Critically ill adults should be regularly assessed for delirium using a valid tool."	Daily delirium assessment using CAM-ICU, including proper documentation	1
"We suggest using a multicomponent, non-pharmacologic intervention that is focused on reducing… delirium, improving cognition, and optimizing sleep, mobility, hearing, and vision in critically ill adults."	Documentation indicating limited noise and light pollution during nighttime hours	1
	Early mobilization through physical therapy consult	1
	Total	**10**

Secondary Outcomes

Benzodiazepine use, time on ventilator, length of ICU stay, and length of hospital stay

Methods

This project will look to implement policies and protocols at St. Peter's Health to become compliant with updated clinical practice guidelines. Standardized assessment tools will be used to measure pain, sedation, and delirium. Patient length of time on ventilator, length of ICU stay, length of hospital stay, and benzodiazepine use will be tracked throughout patient stay. This data will be compared to similar data collected on patients admitted to St. Peter's Health prior to implementation of the new protocols to show improved outcomes.

Inclusion Criteria	Exclusion Criteria
Intubated > 24 hours	Indication for deep sedation
Age > 18	Intubated <24 hours or anticipated transfer to another facility
Ability to tolerate light sedation	Exclusion by provider's professional opinion

A new protocol and updated policies will standardize choice of analgesic and sedative, titration, and documentation. Explicit starting doses and titration regimens for analgesics and sedatives will be outlined.

Updated ventilator bundles will encourage analgesia first sedation and a multidisciplinary team approach. Continuous infusion benzodiazepines will be added to the high alert medication policy and removed from ventilator bundle order sets to discourage use.

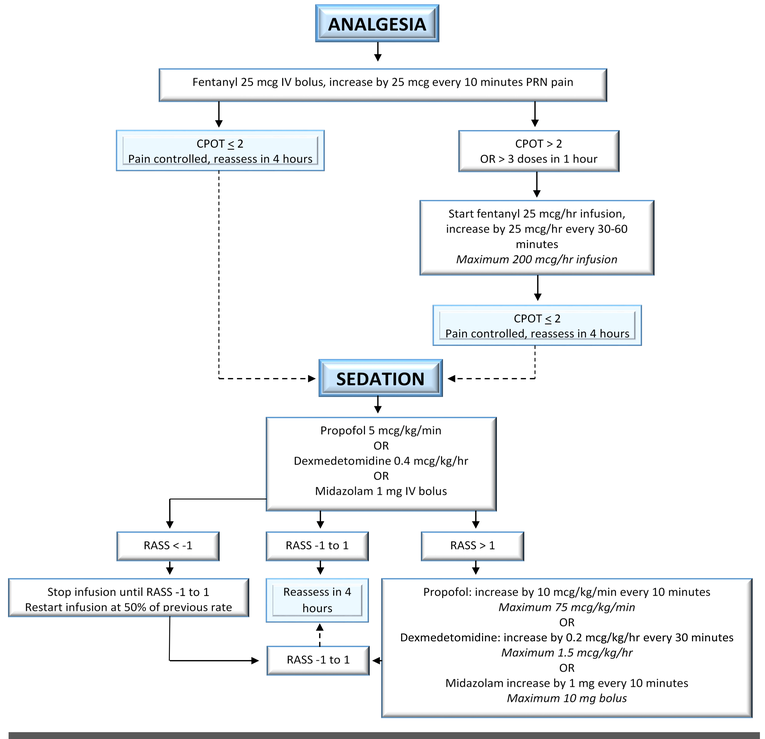
Routine nursing assessment will be enforced by requiring documentation of assessment four times per shift, as well as assessment with titration changes. This includes documentation of associated scores using standardized tools, including RASS for sedation, CPOT for pain, and CAM-ICU for delirium assessment.

Retrospective Data

Average Hospital Length of Stay, in days	**9.26**
Average ICU Length of Stay, in days	**7**
Average Time on Ventilation, in hours	**29.7**
Analgesia First Sedation, number of patients	**1**
CPOT Documented, number of patients	**2**
RASS Documented, number of patients	**9**
CAM-ICU Documented, number of patients	**0**
Continuous Infusion Benzodiazepines Administered, number of patients	**30**
Sedation Vacation Documented, number of patients	**5**
Multimodal Pain Approach, number of patients	**1**

41 patients included in retrospective data collection
RASS scores were not associated with change in sedative rate in any patients
No patients had documented sleep hygiene or early mobilization

Titration Protocol



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