

IMPLEMENTATION OF ICU BUNDLES AND THE IMPACT ON PAIN, AGITATION, AND DELIRIUM IN CRITICALLY ILL PATIENTS IN THE ICU

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Abstract #223 1

DISCLOSURE STATEMENT

- IRB status: exempt
- Co-investigators:
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 - Julie Petre PharmD, BCPS
- Conflicts of interest: none
- Project sponsorship: none



Abstract #223 2

LEARNING OBJECTIVES

- Using the SPH Ventilator Bundle Scoring tool, assess adherence to guideline recommendations for the management of mechanically ventilated patients in the ICU
- Identify areas of patient care improved by implementing ICU bundles for mechanically ventilated patients



Abstract #223 3

BACKGROUND – ST. PETER'S HEALTH

- Rural, community hospital
 - 123 beds
 - 8 bed ICU
- Service population: 97,000
- Providers
 - Hospitalist-run
 - No intensivist or pulmonologist on site
 - Tele-health with University of Utah



Abstract #223 4

BACKGROUND - 2018 GUIDELINES

- Society of Critical Care Medicine Clinical Practice Guideline Update in 2018 for the Prevention and Management of Pain, Agitation/Sedation, Delirium, Immobility, and Sleep Disruption in Adult Patients in the ICU¹
 - Key recommendations
 - Multidisciplinary team approach: provider education, protocols and order forms, ICU checklists
 - Routine pain assessment; analgesia prior to sedation
 - Routine sedation assessment; light sedation (versus deep sedation)
 - Regular delirium assessment using a valid tool



Abstract #223 5

BACKGROUND - PAIN

- Most common memory for ventilated patients²
- Pain first approach
 - Pain control before initiation of sedative
 - Sedation can mask pain response³
 - Reduced sedative use



Abstract #223 6

BACKGROUND - SEDATION

- Depth of sedation and long-term outcomes⁴
 - Lighter sedation associated with improved patient outcomes
 - Independent of severity of illness or other confounding factors
- Continuous infusion benzodiazepines
 - Increased incidence of delirium⁵
 - Difficult to titrate
 - Unpredictable pharmacokinetics in critically ill

BACKGROUND - DELIRIUM

- Easily assessed with daily awakening
 - Rapidly reversible versus persistent
 - Hypoactive versus hyperactive
- Benzodiazepines associated with increased risk
- No recommended treatment¹
 - Prevention is key

PURPOSE

- Implement ventilator bundles, update provider order sets, and implement hardwired assessment documentation to increase adherence to guideline recommended interventions for mechanically ventilated patients in the ICU

METHODS – STUDY DESIGN

- Single center prospective cohort study
 - St. Peter's Health, Helena, Montana
- Interventional quality improvement project
 - Rural community hospital
 - Non-intensivist managed ICU

METHODS – INCLUSION AND EXCLUSION CRITERIA

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

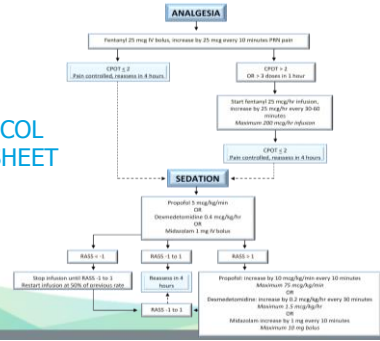
METHODS – STUDY GROUPS

- Control group: Retrospective review of ventilated patients from November 1, 2016 to October 31, 2017
- Interventional group: Ventilated patients from December 1, 2018 to April 10, 2019
 - Following protocol implementation

METHODS - INTERVENTION

- Updated provider order sets
 - Continuous infusion benzodiazepines removed
 - Explicit titration parameters added
 - Analgesia pre-checked
 - Sedation interruption order added
- New protocol for ventilator management
 - Explicit titration parameters
 - Required assessment and documentation of pain and sedation

PROTOCOL FLOWSHEET

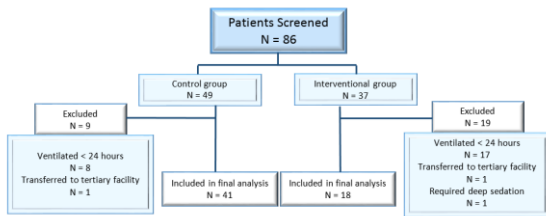


METHODS – OUTCOMES

- Primary outcome
 - Adherence to guideline recommended interventions for mechanically ventilated patients in the ICU following implementation of an updated ventilator protocol
 - Unique scoring tool developed at St. Peter's Health to measure adherence
- Secondary outcomes
 - Length of time on ventilator
 - Length of ICU stay
 - Length of hospital stay
 - Benzodiazepine use

SPH Ventilator Bundle Scoring Tool		
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
"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
"Critically ill adults should be regularly assessed for delirium using a valid tool."	Daily sedation interruption, with sedation restarted at 50% of dose as appropriate	2
	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

STUDY SUBJECTS



BASELINE CHARACTERISTICS

	Control Group (N=41)	Interventional Group (N=18)
Median Age (years)	62	57
Sex (male)	21 (51%)	9 (50%)
Median APACHE-II Score	23	29
Reason for Intubation		
Cardiac Event	6 (15%)	3 (17%)
Infection	8 (19%)	3 (17%)
Respiratory Cause	16 (39%)	7 (39%)
Substance Abuse	6 (15%)	4 (22%)
Trauma	3 (7%)	0 (0%)
Other	2 (5%)	1 (5%)

PRIMARY OUTCOME

	Control Group (N = 41)	Interventional Group (N = 18)
Analgesia first sedation (N)	1	15
CPOT documented (N)	2	11
Dose change documentation (N)	0	11
RASS documented (N)	9	16
Continuous infusion benzodiazepines (N)	30	1
Sedation interruption (N)	5	9
CAM-ICU documented (N)	0	0
Documentation of sleep hygiene (N)	0	0
Early mobilization (N)	0	0
Median Score	1	5

SECONDARY OUTCOMES

	Control Group (N = 41)	Interventional Group (N = 18)
Median hospital length of stay (days)	10	7
Median ICU length of stay (days)	6	5
Median time on ventilator (hours)	25	71
Continuous Infusion Benzodiazepine (N)	30	1

DISCUSSION

- Implementation of a multidisciplinary pain, agitation, and delirium protocol is an effective way to improve adherence to guideline recommendations
 - Protocol adherence to guideline recommendations improved in 6 of 9 categories
 - Decreased ICU and hospital length of stay
 - Ventilator times increased

DISCUSSION

- Similar barriers as previous studies^{7,8}
 - Disruption in workflow, resistance to change
 - Increased pharmacy burden
- Challenges
 - Electronic healthcare record
 - Continuity of care upon transfer to tertiary facility
- Positive process changes
 - Interdisciplinary approach – increased involvement of pharmacist
 - No change in nurse, pharmacist, or physician FTE
 - Administrative rules expedited change

DISCUSSION

- Strengths
 - Baseline characteristics similar between groups
 - Leverage of EHR and administrative functions
 - Multidisciplinary approach
- Limitations
 - Single center study with small sample size
 - Potential confounders
 - No statistical analysis
 - Short duration of study

FUTURE DIRECTION

- Improved assessments and documentation
 - Continued education on the use of standardized assessment tools and appropriate documentation
 - Next step: consistent documentation of daily awakening trials, spontaneous breathing trials, CAM-ICU scores
- Increased collaborative involvement
 - On-site intensivist
 - Early physical therapy consult

CONCLUSIONS

- A uniquely developed scoring tool was an effective way to track adherence to guideline recommended interventions in an effort to improve the care of ventilated patients at St. Peter's Health
- Multidisciplinary driven protocol for pain, agitation, and sedation provides several benefits for institutions:
 - Improves patient outcomes for ventilated patients
 - Improves adherence to guideline recommendations and regulatory agency requirements
 - Can positively impact experience of ventilated patients in the ICU

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QUESTIONS?

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Abstract #223

Supplementary Information

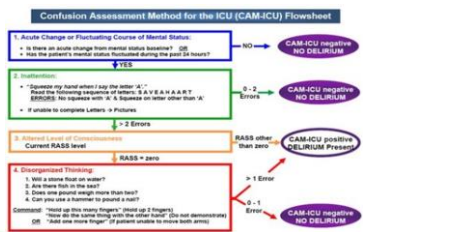
CRITICAL CARE PAIN OBSERVATION TOOL (CPOT)

Item	Description	Score
Facial Expression	Relaxed, neutral	0
	Tense	1
Body Movements	Grimacing	2
	Absence of Movement	0
	Protection	1
Muscle Tension	Relaxed	0
	Tense/rigid	2
Compliance with Ventilator	Tolerating ventilator or movement	0
	Coughing but tolerating	1
Fighting ventilator	Asynchrony, blocking ventilation, alarms frequently activated	2

RICHMOND AGITATION-SEDATION SCALE (RASS)

Score	Term	Description
+4	Combative	Overly combative, violent, immediate danger to staff
+3	Very Agitated	Pulls or removes tubes or catheters; aggressive
+2	Agitated	Frequent, non-purposeful movement, fights ventilator
+1	Restless	Anxious but movements not aggressive or vigorous
0	Alert and Calm	
-1	Drowsy	Not fully alert, but sustained awakening (eye opening to <u>voice</u> and eye contact >10 seconds)
-2	Light Sedation	Briefly awakens with eye contact to <u>voice</u> (<10 seconds)
-3	Moderate Sedation	Movement or eye opening to <u>voice</u> , but no eye contact
-4	Deep Sedation	No response to voice, but movement or eye opening to <u>physical</u> stimulation
-5	Unarousable	No response to <u>voice or physical</u> stimulation

CONFUSION ASSESSMENT METHOD FOR THE ICU (CAM-ICU) Flowchart



COMMON ANALGESICS

Drug	Typical Dose	Pharmacokinetics	Adverse Effects
Fentanyl	20-100 mcg/hr Optional 50-100 mcg load	Half-life: 1.5-6 hr Rapid onset Accumulates with infusion	Nausea, constipation, respiratory depression, skeletal muscle rigidity with high bolus doses
Morphine	1-5 mg/hr Optional 2-5 mg load	Half-life: 3-7 hr Slower onset than fentanyl Less accumulation than fentanyl	Nausea, constipation, respiratory depression, hypotension, itch
Hydromorphone	0.5-2 mg/hr Optional 0.4-1.5 mg load	Half-life: 1.5-3.5 hr Significantly more potent than morphine	Nausea, constipation, respiratory depression

COMMON SEDATIVES

Drug	Typical Dose	Pharmacokinetics	Adverse Effects
Midazolam	Bolus: 1-5 mg Infusion: 1-5 mg/hr	Half-Life: 3-11 hr Active metabolite accumulates Renal excretion of metabolites	Possible high risk of delirium than other sedatives, tolerance
Propofol	50-200 mg/hr OR 1-3 mg/kg/hr	Half-life: 30-60 minutes after infusion Stored in fat, can prolong effects when infusion stopped	Hypotension, bradycardia, propofol infusion syndrome, hypertriglyceridemia, pancreatitis
Dexmedetomidine (Precedex)	0.2-1.5 mcg/kg/hr	Half-life: 2 hr No accumulation, no active metabolites	Hypotension, bradycardia, dry mouth, nausea

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