DNP Projects   College of Nursing

2018

Evaluation of a Critical-Care Pain Observation Tool Quality Initiative

Caissy A. Goe
University of Kentucky, caissy18@gmail.com

DNP Final Project Report

Evaluation of a Critical-Care Pain Observation Tool Quality Initiative

Caissy A. Goe

University of Kentucky

College of Nursing

Spring 2018

Martha Biddle, PhD, RN, APRN, CCNS, FAHA – Committee Chair

Melanie Hardin-Pierce, DNP, RN, APRN, ACNP-BC – Committee Member

Jennifer Drumm, MSN, RN – Committee Member, Clinical Mentor

Acknowledgements

While this project is an individual work, its depth, significant clinical impact, and fruition was achieved in conjunction with the support and guidance of a number of wonderful individuals that I immensely respect, depended on, and greatly appreciate. First and foremost, I would like to express my immense gratefulness for my Mom, Cindy Schapson, and my Husband, Barry Goe. It is because of their support and encouragement that I have been able to achieve these academic and professional accomplishments. Next, I would like to express my gratitude to my committee members, Jennifer Drumm, Dr. Martha Biddle, and Dr. Melanie Hardin-Pierce. Their mentorship, professional devotion, and clinical insight greatly enriched this project and significantly contributed to my professional development as a clinical nurse specialist. In addition, I would like to give a special thanks to Julie Duffy for her peer mentorship. Furthermore, I am very appreciative of the Lexington, VA, critical care staff. I could not have asked for a better organization and clinical support team to work with and prepare me for my future endeavors.

I would also like to thank the U.S. Army Nurse Corps for providing me the opportunity to obtain my Doctorate of Nursing Practice and acknowledge the significant impact that each and every professor, with the University of Kentucky College of Nursing, had on my professional and personal growth. Thank you, may your efforts not be wasted and your lessons applied.

Table of Contents

List of Tables

List of Figures

Abstract

Background: Patients unable to self-report pain are at increased risk for inadequate pain management and less than optimal outcomes. The implementation of behavioral pain scales, such as the Critical-Care Pain Observation Tool (CPOT), have demonstrated an improvement in pain management and patient outcomes.

Local Problem: A lack of the routine use of behavioral pain scales for mechanically ventilated patients unable to self-report pain was identified as a significant barrier to optimal pain and agitation management.

Methods: A retrospective pre and post design was used to evaluate the effectiveness and impact of a CPOT quality initiative on the management of pain, agitation and patient outcomes. Descriptive data for analysis were extracted from 60 electronic medical records, 30 for both the pre- and post-implementation groups.

Interventions: The quality initiative included training sessions, unit champions, clinical support tools and the incorporation of the CPOT into unit pain management guidelines and several analgesic order sets.

Results: CPOT pain assessments ($p<.001$) were more frequent in the post-implementation group. There number of PRN analgesics were found to be greater in the post-implementation group, while the tendency for the total morphine equivalent dosage was lower. No differences were found between the pre- and post-implementation groups with regard to sedation and agitation management and patient outcomes.

Conclusions: The quality initiative was successful in increasing the routine use of the CPOT. Pain management of mechanically ventilated patients in this critical setting improved. Multidisciplinary participation and unit champions were vital to the success of this quality initiative.

Keywords: pain, critical care, critical-care pain observation tool, CPOT, pain management

Evaluation of a Critical-Care Pain Observation Tool Quality Initiative

Introduction

Pain is an unpleasant sensory and emotional experience that is a major source of stress for critical care patients[1-6]. Over 75% of intensive care patients will experience pain during their intensive care admissions, with 50-74% of these patients experiencing moderate to severe pain[4,7,8]. Contributing factors to pain have been identified as the sequelae of acute illness, traumatic injury, surgery, cancer, invasive equipment, nursing and medical interventions and procedures, and immobility[9,10].

The inappropriate management of pain accelerates the stress response that can lead to a cascade of deleterious psychological and physiologic consequences[9]. Psychologically, uncontrolled pain can lead to sleep deprivation, exacerbation of agitation and delirium, and post-traumatic stress disorder[9,11]. Physiological pain results in an endogenous catecholamine stress response that may result in multiple organ dysfunction[11,12]. Negative outcomes associated with inadequate pain management include prolonged mechanical ventilation, longer lengths of stay in intensive care units (ICU), an increased risk of morbidity and mortality, a decrease in quality of life, and an increased risk of developing a chronic pain syndrome[12-16].

Barriers to pain management include the patient's inability to communicate verbally, life-threatening illness or injury, concerns about opioid addiction or abuse, lack of pain management education for nurses and providers, validity and inconsistency in pain management protocols, and other individual and system-related barriers[17,18]. These barriers and the sequel of results have contributed to the more than $300 billion U.S. health care dollars spent on pain management annually and approximately $335 billion dollars associated with lost productivity directly attributed to the presence of pain[19].

Background

The rationale for providing appropriate pain relief is to decrease the severity and frequency of the physical and emotional effects of pain and to minimize the adverse effects of pain management[10,18]. In 2011, the International Association for the Study of Pain (IASP) issued a statement acknowledging pain management as a fundamental human right[20]. The first step in pain management is the appropriate and

routine assessment of the presence and severity of pain[9,21,22]. The best patient outcomes are achieved when pain management strategies are tailored to the individual patient's needs[21,22]. The most vulnerable population for inadequate pain management are individuals that are unable to self-report the presence of pain.

Within adult ICUs, more than one-third of critically ill patients are unable to self-report the presence of pain[23]. In addition, 40% of the adult intensive care patients who are able to self-report the presence of pain find it somewhat to extremely difficult to do so when utilizing a self-rating scale such as the Numeric Rating Scale (NRS)[23]. Therefore, nearly 60% of adult intensive care patients may benefit from a behavioral pain scale, such as the Critical-Care Pain Observation Tool (CPOT).

Behavioral pain scales, such as the CPOT, are recommended instruments for pain assessment and management in adult patients who are unable to self-report pain[9,24-26]. Benefits of implementing behavioral pain scales include an increase in pain assessments, an increase in documentation, a decrease in episodes of severe pain, and an increase in patient satisfaction with pain management[15,27-30]. The implementation of the CPOT has also demonstrated an improvement in the effectiveness of pain management strategies, a decrease in the number of patient complications, and a consistent relationship in decreasing the duration of mechanical ventilation and ICU length of stay[17,24,27,29].

Local Problem

A lack of routine pain assessments and documentation was identified as a significant barrier to adequate patient care coordination and consistency of pain and agitation management in a small, 13 bed, medical-surgical ICU. It was observed that current management practices for agitation and anxiety focused largely on the administration of sedatives with limited attention being placed on causative factors, such as pain.

To address the identified gaps, the clinical care team chose an "address pain first" approach, in line with the PAD and Sedation and Analgesia by Non-Anesthesiologists guidelines [1,9,26]. A multidisciplinary quality initiative committee was formed and charged with the task of developing and implementing unit pain management guidelines. After conducting a historical review of patient clinical

3

characteristics and pain assessment practices, a gap in the application of reliable and valid behavioral pain scales was identified. The CPOT was selected as the recommended behavioral pain scale and a quality initiative workgroup was established.

Purpose

The purpose of this project was to evaluate the effectiveness of the CPOT quality initiative among adult, mechanically ventilated patients in the medical-surgical ICU.

The specific aims of this project were to:

1. Assess the use of the CPOT among the ICU staff nurses pre- and post-implementation of the CPOT quality initiative.

2. Examine the effects of using the CPOT to guide the use of PRN opioid medications for pain management.

3. Examine the effects of using the CPOT to guide the use of analgesics and the resulting effect on the total daily average morphine equivalent dosage.

4. Examine patient outcomes (i.e., length of mechanical ventilation, ICU length of stay, episodes of severe pain, and all-cause mortality) and clinical measures (i.e., average level of sedation, incidences of moderate to deep levels of sedation, and incidences of agitation as assessed by the Richmond Agitation and Sedation Scale [RASS]) pre- and post-implementation of the CPOT quality initiative.

<center>Methods</center>

Context

The CPOT quality initiative evaluation was conducted at a small academic medical center serving more than 83,000 patients, located in the southeastern United States. The ICU is a combined medical-surgical unit comprised of 13 beds, with an average annual census of nearly 2000 patients. The historical monthly census for mechanically ventilated patients is 33 patients. The unit care team consists of 36 registered nurses and a combined medical-surgical specialty provider group made up of medical doctors, advanced practice registered nurses, and pharmacists serving approximately 54 medical patients and 36

<center>4</center>

surgical patients per month. All patients admitted to the ICU are over the age of 18 and the unit includes both male and female patients.

Intervention

The practice change model used to guide the quality initiative was the model for evidence-based practice change developed by J. H. Larrabee[31]. A multidisciplinary clinical care team was established and a comprehensive literature review was conducted. The multidisciplinary clinical care team members chose to follow the ICU Liberation: Assess, Prevent, and Manage Pain recommendations, a component of the ABCDEF care bundle, to develop unit practice pain assessment and management guidelines. Based on historical clinical characteristics of the patients served and feasibility of use by nurses, the CPOT was chosen as the recommended behavioral pain scale for patients who are unable to self-report pain.

Previous studies have demonstrated the reliability and validity of the CPOT for identifying behaviors associated with pain in the mechanically ventilated adult without a brain injury who is unable to self-report pain[25,32-35]. The instrument was derived from a compilation of previously established pain assessment instruments, chart reviews of critically ill patients, and focus groups involving critical care nurses and physicians[25]. The CPOT is comprised of four behavioral categories: facial expression, body movements, muscle tension, and compliance with the ventilator for intubated patients or vocalization for extubated patients[25]. Each category is scored from 0 to 2 with a total possible score ranging from 0, equaling no pain, to 8, being the highest level of pain[25].

The CPOT quality initiative included the incorporation of the CPOT into unit practice pain management guidelines (See Figure 1) and several analgesic order sets, such as a fentanyl PRN and infusion order set for mechanically ventilated patients (See Figure 2). The unit practice pain management guideline design was modeled after the Pain Intervention Algorithm developed by Dr. Gélinas[36]. Prior to the unit wide implementation of the CPOT, the intensive care staff nurses, providers, and nursing leadership team attended a 60-minute instruction and application session on CPOT driven pain assessments and management. The education initiative included videos provided by Dr. Gélinas, the developer of the CPOT, introduction and discussion on the newly developed unit practice pain

management guidelines and analgesic order-sets, and a hands-on simulated clinical experience designed to improve competency of CPOT pain assessments[37,38]. Enlarged versions of the CPOT and a visually enlarged horizontal numeric rating scale (NRS), obtained from the Society of Critical Care Medicine, was placed in unit reference binders in each patient care room[37]. Unit champions were available to the clinical care team throughout the implementation period. The role of the unit champions was to ensure clinical competency of CPOT pain assessments and pain management expectations as outlined in unit practice guidelines. The education initiative occurred over a one-month period.

The visually enlarged horizontal NRS was determined to be the most appropriate self-reporting pain scale for the patient population served. Its validity and feasibility for ICU patients was demonstrated by Chanques and colleagues[39]. The NRS has a range of 0 to 10 with word anchors of "no pain" at the zero end of the scale and "extreme pain" at the opposite end of the scale, designated as a score of 10[37]. The unit multidisciplinary care team was already in the practice of utilizing the NRS for assessing pain in patients able to self-report. Therefore, only a limited amount of emphasis was placed on the use of the visually enlarged horizontal NRS during the education initiative.

Study of the Intervention

A retrospective pre and post descriptive design was used to evaluate the effectiveness and impact on patient outcomes and clinical measures for pain management, sedation, and agitation of the CPOT quality initiative. Descriptive data for analysis were extracted from electronic medical records (EMRs). Based on historical census data and patient clinical characteristics (i.e., ICU length of stay, length of mechanical ventilation, and primary diagnoses) a total of 60 EMRs were included for analysis of the CPOT quality initiative, 30 pre-implementation and 30 post-implementation. The pre-implementation review period was six months prior to the development of the CPOT quality initiative workgroup. The post-implementation review period was the six month period following the completion of the CPOT education initiative.

Medical record inclusion for the project consisted of patients meeting the following criteria: ICU length of stay (LOS) $\geq$ 72 hours and length of mechanical ventilation $\geq$ 24 hours. Patient medical records

were excluded from the project if the patient had a spinal injury or a Glasgow Coma Scale (GCS) score < 4 prior to sedation, or if they received neuromuscular blocking agents (NMBA) prior to or during the first 72 hours post-intubation. Patients were excluded for these reasons due to few reliability and validity studies related to the use of the CPOT in these patient populations[25].

EMRs were randomly selected from the list of patients admitted to the medical-surgical ICU within the designated review periods, until the investigators reached a total of 60 eligible EMRs. Each ICU admission for a patient was considered a discrete event. Therefore, a patient's comprehensive EMR may have been selected for review multiple times. The first 30 EMRs from each of the designated review periods that met the inclusion and exclusion criteria were included in the project for a sample total of 60 EMRs.

Measures

Demographic data were collected from the EMR from the time of admission. Clinical data used to characterize the sample and to identify any potential confounding variables are related to the patient's condition from ICU admission until the end of the mechanical ventilation observation period, with the exception of the Acute Physiology and Chronic Health Evaluation (APACHE) II Score. Clinical data used to calculate APACHE II Scores were related to the patient's condition within the first 24 hours of the ICU admission. The APACHE II Score calculator at www.medscape.com was utilized to calculate the APACHE II Score[40].

Clinical pain assessments and their effects on pain management, clinical measures, and patient outcomes were based on the first full intubation day (midnight to midnight) during the patient's first intubation period. An intubation period was calculated in total hours from the time of intubation until extubation. Re-intubations within one hour of an extubation were not considered new intubations and were counted as part of the total time for the first intubation period. The patient's length of mechanical ventilation is based on the patient's first intubation period for that ICU admission. The patient's ICU length of stay was calculated from the recorded date and time of admission to the ICU until the recorded date and time of discharge or transfer from the ICU or death of the patient.

Variables related to patient demographics, pain assessments and management, clinical measures, and patient outcomes were documented utilizing a chart audit tool developed by the authors. The chart audit tool was designed to follow the flow and output of data inquiries of the patient EMRs. To ensure a comprehensive review of the patient's EMR, data were collected from each of the two electronic health information record systems used to capture various aspects of the patients medical care. Variable data in each of the electronic health information record systems were treated as discrete data.

Pain assessment variables included the frequency of pain assessments, frequency of CPOT assessments, and frequency of patient's inability to self-report pain. Glasgow Coma Scale (GCS) verbal response subscale scores of 3 or less were used as a surrogate marker for the patient's inability to self-report the presence of pain. Pain management variables included the frequency of PRN, scheduled intermittent, and continuous infusion analgesics, type and route of administration, and total opioid analgesic dosages. The opioid analgesic dosages were collected and then converted into the morphine equivalent dosage for comparative purposes.

To identify confounding variables for pain management practices and patient outcomes (i.e., length of mechanical ventilation, ICU length of stay, episodes of severe pain, and all-cause mortality), patient demographic data, ICU diagnoses, APACHE II scores, and sedation and agitation variables were extracted from each patient's EMR. The type and frequency of sedatives were collected along with related clinical measures (i.e., average levels of sedation for manipulations of time and incidences of moderate to deep sedation). CPOT pain scores of 6 or greater and NRS scores of 7 or greater were considered clinical indicators of severe pain. RASS scores of -3 or less were captured as incidences of moderate to deep sedation. Incidences of agitation were identified by documented RASS scores of +2 or greater. Documented positive CAM-ICU scores were used to evaluate the frequency of delirious episodes.

Analysis

All data analyses were conducted using SPSS version 23.0 (SPSS Inc., Chicago, Illinois). A *p* value of < .05 was considered statistically significant. Frequency distributions were conducted for all

variables to detect and correct erroneous data. Descriptive statistics were conducted, such as frequencies

and means ± standard deviations for all variables in the both the pre- and post-implementation group, as

appropriate to the level of measurement of the variable. Independent sample t-tests were used to compare

parametric data (i.e. age, APACHE II scores, frequency of pain assessments, patient's ability to self-

report pain, administrations of PRN analgesics, and levels of sedation). Chi-square (x^2) statistics were

used for nonparametric nominal variables (i.e., gender, race, clinical demographic characteristics, and

number of pain assessments, administrations of analgesics and sedatives, and episodes of moderate-deep

sedation, agitation, severe pain, and all-cause mortality). The Mann-Whitney U test was used for

nonparametric continuous variables (i.e., total morphine equivalent dosage, length of mechanical

ventilation, and ICU length of stay).

Significant differences for pain assessment and management variables and patient outcomes were

expected between the pre- and post-implementation groups. Specifically, it was hypothesized that the

frequency of pain assessments and PRN administrations of analgesics would be higher in the post-

implementation group, but the morphine equivalent dosages would be lower. It was also hypothesized

that patients would experience fewer episodes of moderate to deep levels of sedation, agitation, and

severe pain, and improved patient outcomes (i.e., decreases in length of mechanical ventilation, ICU

length of stay, and all-cause mortality).

Ethical Considerations

Data retrieved were de-identified through the assignment of unique patient project numbers and

recorded using a chart audit tool. A waiver for the documentation of informed consent was obtained

along with the approval for the project from the medical center's institutional review board.

Results

Characteristics of the Sample

A total of 204 EMRs (91 for the pre-implementation group and 113 for the post-implementation

group) were screened for inclusion and exclusion criteria. The final project sample size included 60

EMRs (30 EMRs for each of the designated review periods). The sociodemographic characteristics of the

patients in both groups are described in Table 1. Patients included in the project were mostly male (96.7%), Caucasian (90.0%), and an average age of 69 years. Clinical demographics of the patients are described in Table 2. Patients included in the project were largely medical patients (85.0%), had an average APACHE II score of 19.78, and were generally conscious at the time of their ICU admission (62.0%). The top three ICU diagnoses included respiratory compromise (61.7%), cardiovascular compromise (41.7%), and sepsis (35.0%). Greater than 50% of the patients had a medical history of diabetes and chronic pain, with nearly 50% experiencing chronic neuropathy. No significant differences were identified between the two groups in regards to patient sociodemographic or clinical demographic variables. In addition, there was no statistical difference in the discharge status between the two groups. Overall, the pre- and post-implementation groups were similar.

Frequency of Pain Assessments

Each of the patients included in the project received at least one pain assessment during the observation period (See Table 3). Patients in the post-implementation group were assessed 1.5 times more frequently (M = 7.10, SD = 5.09) than the patients in the pre-implementation group (M = 4.5, SD = 2.00). The difference between the two groups was found to be statistically significant (t (37.70) = -2.60, p = .013, two-tailed) with a moderate to large (eta squared = .104) magnitude of differences in the means (mean difference = -2.60, 95% CI: -4.62 to -.58). In addition, the patients in the post-implementation group received 7.6 times more CPOT pain assessments (M = 4.03, SD = 2.80) than the patients in the pre-implementation group (M = .53, SD = 1.01). The difference between the mean frequency of CPOT pain assessments between the two groups was found to be statistically significant (t (36.41) = -6.45, p = .000, two-tailed) with a large (eta squared = .418) magnitude of differences in the means (mean difference = -3.5, 95% CI: -4.60 to -2.40), while the frequency of self-reported pain assessments was found to be similar. In addition, the percent of time the patients were determined to be unable to self-report their pain was not found to be comparable, as no difference was detected between the pre- and post-implementation groups.

Effects on Pain Management (Administration of Pharmacological Interventions)

The number of patients that received analgesics in both the pre- and post-implementation groups was comparable (See Table 4). The patients in the post-implementation group received twice as many PRN analgesics (M = 1.03, SD = 2.17) as those in the pre-implementation group (M = .53, SD = 1.41). However, no statistical difference was detected between the two groups (t (49.69) = -1.06, p = .295, two-tailed). The number of patients that were administered either scheduled or continuous analgesics were also comparable (x^2 (1, n = 60) = .65, p = .422, phi = .14), with the most common analgesic administered in both groups being fentanyl (IV). The mean total morphine equivalent dosage in the post-implementation group (M = 61.80, SD = 68.64) was less than the pre-implementation group (M = 84.63, SD = 164.25). However, the Mann-Whitney U Test revealed no significant difference (U = 497, z = .708, p = .479, r = .09).

Effects on Sedation and Agitation

The number of patients who received sedatives in both the pre- and post-implementation groups was comparable, as was the average percent of time patients were sedated (See Table 5). There was no significant difference identified for the mean RASS scores of patients while intubated during the review period between the two groups. Twice as many episodes of moderate to deep sedation (n = 14) and agitation (n = 8) were identified in the post-implementation group as opposed to the pre-implementation group (n = 6, moderate to deep sedation; n = 3, agitation). However, these results were not significantly different.

Patient Outcomes

Patient outcomes, in regards to length of mechanical ventilation, length of ICU stay, and all-cause mortality, were comparable between the pre- and post-implementation groups (See Table 6). Five times as many episodes of severe pain were identified in the post-implementation group (5 vs 36). However, this difference did not yield a statistical difference (x^2 (6, n = 60) = 8.05, p = .234, phi = .37).

Discussion

The implementation of valid behavioral pain scales such as the CPOT, designed for patients unable to self-report pain, has been associated with an improvement in pain management and the efficiency of pharmacological interventions[15,17,27,29,41,42]. In addition, the routine use of behavioral pain scales has been associated with shorter lengths of mechanical ventilation and ICU lengths of stay[15,27,29,41,43]. The purpose of this quality initiative evaluation was to assess the impact of implementing the CPOT on pain assessments and management, clinical measures for sedation and agitation, and patient outcomes. As hypothesized, there was a significant increase in the frequency of pain assessments and a tendency towards the improvement in pain management practices between the pre- and post-implementation groups. In contrast, the expected improvements in clinical measures for sedation and agitation were not realized. In addition, there was no significant difference identified between the two groups for the assessed patient outcomes.

The implementation of the CPOT quality initiative created an increase in the frequency of pain assessments documented by nursing staff in this critical care environment, with an explicit increase in the frequency of CPOT assessments. There was no difference between the pre- and post-implementation groups for the number of patient self-reported pain assessments and the percentage of time the patients were determined to be unable to self-report their pain. Because there were no differences identified between the two groups, we believe the nursing staff was using the CPOT for pain assessment in the appropriate patient scenarios. These results are consistent with those of Arbour et al., who reported an increase in the mean frequency of pain assessments from 4.33 to 12.33 ($p < .001$) and an increase in the mean number of painful episodes from 1.13 to 4.27 ($p < .001$), six months after a CPOT implementation project[27]. Similar findings were reported by Rose et al. in a multi-ICU, single academic hospital. They reported an increase in the documentation of pain assessments from 180 to 341 ($p < .001$) in a cardiovascular ICU patient group and from 213 to 516 ($p < .001$) in a mixed medical-surgical ICU[29]. In addition, these investigators identified a specific increase in the documentation of behavioral pain assessments from 130 to 147 ($p < .001$) in the cardiovascular ICU patient group[29].

12

The EMR evaluation for analgesic interventions revealed a tendency towards an increase in the utilization of PRN analgesics and a decrease in the mean morphine equivalent dosage. While these results were not found to be significantly different in our project evaluation, they are similar to the findings reported by Arbour et al. and Rose et al. In addition, Wibbenmeyers et al. reported an increase in opioid administration with higher CPOT scores[42]. An increase in the use of PRN analgesics with an increase in the identification of episodes of severe pain appears to be a similar result of implementation of CPOT for pain management in the critical care setting. These findings, in combination with an increase in the frequency of documented CPOT assessments, suggest that the clinical team are utilizing the CPOT instrument appropriately.

Our project's results from the use of the CPOT as a tool for improvement in sedation and agitation management are incongruent with those reported by Luckey et al. and Chanques et. al.. Luckey et al. reported a decreasing tendency in the average daily sedative doses for propofol, lorazepam, midazolam, and dexmedetomidine after transitioning from the use of the Face, Legs, Activity, Cry, and Consolability (FLACC) scale to the use of the CPOT instrument[43]. However, the effects of lower dosages of sedatives on the patient's level of sedation or episodes of agitation were not assessed. Chanques et al. reported a decrease in the incidences of agitation, 29 vs. 12% ($p = .002$) with the implementation of the Behavioral Pain Scale (BPS) in mechanically ventilated ICU patients. However, there are relevant psychometric differences between the BPS and the CPOT that may account for the differences in effects on episodes of agitation. Our project is the first to provide results on the implementation of the CPOT and its effects on levels of sedation and episodes of agitation. Further studies are needed to fully evaluate the full effect of CPOT-driven pain management practices on the management of sedation and agitation.

The CPOT quality initiative did not appear to have an effect on patient outcomes as measured by length of mechanical ventilation, ICU length of stay, and all-cause mortality. While Arbour et al. reported a tendency toward lower lengths of mechanical ventilation and ICU lengths of stay, these results have not been repeated nor reported consistently in other studies[27]. Rose et al. found a decrease in ICU length of stay from 2.0 to 1.8 days ($p = .007$) in the cardiovascular ICU group but no differences were

reported between the mixed medical-surgical ICU groups[29]. In addition, Rose et al. found no difference

in the length of mechanical ventilation among either ICU patient groups[29]. Our findings were also

congruent with Luckey et al.'s (2015) findings of no statistical difference in the length of mechanical

ventilation and ICU length of stay following implementation of the CPOT[43]. Our project is the first to

analyze the correlation between implementation of the CPOT and its effects on all-cause mortality. All-

cause mortality is a definitive patient outcome indicative of the total state of the healthcare system and

should therefore be considered as an outcome measure in future studies.

Limitations

The small sample size limits the generalizability of these project results. In addition, limitations

within the project design and confounding clinical factors may have influenced the internal validity of the

project. First, it is possible that clinical data were over represented in the project because of potential for

duplication in the charting within the two electronic health information record systems. This

measurement bias was considered acceptable in order to create a comprehensive clinical picture and avoid

implementing any researcher bias in the data collection process. Second, the time span between the pre-

implementation review period and the post-implementation period was one year. While this design was

intentional to avoid capturing any influence of the CPOT quality initiative workgroup in the pre-

implementation group, the influence of other implemented quality initiatives over the year were not

isolated as confounding variables within the post-implementation group and may have influenced the

internal validity of the project. In addition, a new chief of critical care was on-boarded during the six

month post-implementation review period. The change in patient care management and support for the

CPOT quality initiative may have compromised the external validity of the project.

Conclusions

Patients who are mechanically ventilated and unable to self-report their pain are at high risk for

inadequate pain relief and less than optimal outcomes. Behavioral pain scales, such as the CPOT, have

been shown to be effective in improving pain management strategies. The implementation of our quality

initiative resulted in increased and appropriate use of the CPOT to augment clinical nursing practice for

pain management. Based on our success, we recommend similarly designed projects testing the

utilization and effectiveness of the CPOT in larger samples and in different critical care environments to

further assess the relationships between the use of behavioral pain scales and clinical outcomes.

References

1. American Society of Anesthesiologist Task Force. Practice guidelines for sedation and analgesia by non-anesthesiologists. *Anesthesiology.* 2002;96(4):1004-1017.

2. Cochran J, Ganong LH. A comparison of nurses' and patients' perceptions of intensive care unit stressors. *Journal of Advanced Nursing.* 1989;14(12):1038-1043.

3. de Sa Dias D, Resende MV, Diniz Gdo C. Patient stress in intensive care: comparison between a coronary care unit and a general postoperative unit. *Revista Brasileira de terapia intensiva.* 2015;27(1):18-25.

4. Gélinas C. Management of pain in cardiac surgery ICU patients: Have we improved over time? *Intensive and Critical Care Nursing.* 2007;23(5):298-303.

5. International Association for the Study of Pain Task Force on Taxonomy. *Classification of Chronic Pain (2nd ed). Morskey, H. & Bogdok, N., (pp.209-214).* Seattle: IASP Press; 1994.

6. Novaes MA, Knobel E, Bork AM, Pavao OF, Nogueira-Martins LA, Ferraz MB. Stressors in ICU: perception of the patient, relatives and health care team. *Intensive Care Medicine.* 1999;25(12):1421-1426.

7. Jones J, Hoggart B, Withey J, Donaghue K, Ellis BW. What the patients say: A study of reactions to an intensive care unit. *Intensive Care Medicine.* 1979;5(2):89-92.

8. Puntillo KA. Pain experiences of intensive care unit patients. *Heart Lung: The Journal of Acute and Critical Care.* 1990;19(5 Pt 1):526-533.

9. Barr J, Fraser GL, Puntillo K, et al. Clinical practice guidelines for the management of pain, agitation, and delirium in adult patients in the intensive care unit. *Critical Care Medicine.* 2013;41(1):263-306.

10. Gélinas C, Fortier M, Viens C, Fillion L, Puntillo K. Pain assessment and management in critically ill intubated patients: a retrospective study. *American Journal of Critical Care.* 2004;13(2):126-135.

11. Pandharipande PP, Patel MB, Barr J. Management of pain, agitation, and delirium in critically ill patients. *Polish Archives of Internal Medicine.* 2014;124(3):114-123.

12. Rivara FP, Mackenzie EJ, Jurkovich GJ, Nathens AB, Wang J, Scharfstein DO. Prevalence of pain in patients 1 year after major trauma. *Archives of Surgery.* 2008;143(3):282-287; discussion 288.

13. Dunwoody CJ, Krenzischek DA, Pasero C, Rathmell JP, Polomano RC. Assessment, physiological monitoring, and consequences of inadequately treated acute pain. *Journal of PeriAnesthesia Nursing.* 2008;23(1 Suppl):S15-27.

14. Jenewein J, Moergeli H, Wittmann L, Buchi S, Kraemer B, Schnyder U. Development of chronic pain following severe accidental injury. Results of a 3-year follow-up study. *Journal of Psychosomatic Research.* 2009;66(2):119-126.

15. Payen JF, Bosson JL, Chanques G, Mantz J, Labarere J. Pain assessment is associated with decreased duration of mechanical ventilation in the intensive care unit: a post Hoc analysis of the DOLOREA study. *Anesthesiology.* 2009;111(6):1308-1316.

16. Schelling G, Stoll C, Haller M, et al. Health-related quality of life and posttraumatic stress disorder in survivors of the acute respiratory distress syndrome. *Critical Care Medicine.* 1998;26(4):651-659.

17. Asadi-Noghabi AA, Gholizadeh M, Zolfaghari M, Mehran A, Sohrabi M. Nurses Use of Critical Care Pain Observational Tool in Patients with Low Consciousness. *Oman Medical Journal.* 2015;30(4):276-282.

18. Lin RJ, Reid MC, Liu LL, Chused AE, Evans AT. The Barriers to High-Quality Inpatient Pain Management. *American Journal of Hospice & Palliative Medicine.* 2015;32(6):594-599.

19. Gaskin DJ, Richard P. The economic costs of pain in the United States. *The Journal of Pain.* 2012;13(8):715-724.

20.   International Pain Summit of The International Association For The Study of Pain. Declaration of Montreal: declaration that access to pain management is a fundamental human right. *Journal of Pain & Palliative Care Pharmacotherapy.* 2011;25(1):29-31.

21.   Gordon DB, Dahl JL, Miaskowski C, et al. American pain society recommendations for improving the quality of acute and cancer pain management: American Pain Society Quality of Care Task Force. *Archives of Internal Medicine.* 2005;165(14):1574-1580.

22.   Herr K, Coyne PJ, McCaffery M, Manworren R, Merkel S. Pain assessment in the patient unable to self-report: position statement with clinical practice recommendations. *Pain Management Nursing.* 2011;12(4):230-250.

23.   Happ MB, Garrett K, Thomas DD, et al. Nurse-patient communication interactions in the intensive care unit. *American Journal of Critical Care.* 2011;20(2):e28-40.

24.   Gelinas C, Arbour C, Michaud C, Vaillant F, Desjardins S. Implementation of the critical-care pain observation tool on pain assessment/management nursing practices in an intensive care unit with nonverbal critically ill adults: a before and after study. *International Journal of Nursing Studies.* 2011;48(12):1495-1504.

25.   Gelinas C, Fillion L, Puntillo KA, Viens C, Fortier M. Validation of the critical-care pain observation tool in adult patients. *American Journal of Critical Care.* 2006;15(4):420-427.

26.   Jacobi J, Fraser GL, Coursin DB, et al. Clinical practice guidelines for the sustained use of sedatives and analgesics in the critically ill adult. *Critical Care Medicine.* 2002;30(1):119-141.

27.   Arbour C, Gélinas C, Michaud C. Impact of the Implementation of the Critical-Care Pain Observation Tool (CPOT) on Pain Management and Clinical Outcomes in Mechanically Ventilated Trauma Intensive Care Unit Patients: A Pilot Study. *Journal of Trauma Nursing.* 2011;18(1):52-60.

28.   de Jong A, Molinari N, de Lattre S, et al. Decreasing severe pain and serious adverse events while moving intensive care unit patients: a prospective interventional study (the NURSE-DO project). *Critical Care.* 2013;17(2):R74.

29.   Rose L, Haslam L, Dale C, Knechtel L, McGillion M. Behavioral pain assessment tool for critically ill adults unable to self-report pain. *American Journal of Critical Care.* 2013;22(3):246-255.

30.   Topolovec-Vranic J, Canzian S, Innis J, Pollmann-Mudryj MA, McFarlan AW, Baker AJ. Patient satisfaction and documentation of pain assessments and management after implementing the adult nonverbal pain scale. *American Journal of Critical Care.* 2010;19(4):345-354; quiz 355.

31.   Larrabee JH. *Nurse to nurse: Evidence-based practice.* New York: McGraw-Hill; 2009.

32.   Gelinas C, Fillion L, Puntillo KA. Item selection and content validity of the Critical-Care Pain Observation Tool for non-verbal adults. *Journal of Advanced Nursing.* 2009;65(1):203-216.

33.   Gelinas C, Harel F, Fillion L, Puntillo KA, Johnston CC. Sensitivity and specificity of the critical-care pain observation tool for the detection of pain in intubated adults after cardiac surgery. *Journal of Pain and Symptom Management.* 2009;37(1):58-67.

34.   Kanji S, MacPhee H, Singh A, et al. Validation of the Critical Care Pain Observation Tool in Critically Ill Patients With Delirium: A Prospective Cohort Study. *Critical Care Medicine.* 2016;44(5):943-947.

35.   Linde SM, Badger JM, Machan JT, et al. Reevaluation of the critical-care pain observation tool in intubated adults after cardiac surgery. *American Journal of Critical Care.* 2013;22(6):491-497.

36.   Gelinas C. Pain assessment in the critically ill adult: Recent evidence and new trends. *Intensive and Critical Care Nursing.* 2016;34:1-11.

37.   Society of Critical Care Medicine. ICU Liberation: Assess, Prevent, and Manage Pain. n.d.; http://www.iculiberation.org/Bundles/Pages/Pain.aspx.

38.   Kaiser Permanente Northern California Nursing Research. CPOT. 2011; http://pointers.audiovideoweb.com/stcasx/il83win10115/CPOT2011-WMV.wmv/play.asx.

39.   Chanques G, Viel E, Constantin JM, et al. The measurement of pain in intensive care unit: comparison of 5 self-report intensity scales. *Pain.* 2010;151(3):711-721.

40.   MedCal 3000. APACHE II Scoring System. 2011;

https://reference.medscape.com/calaculator/apache-ii-scoring-system.

41.   Chanques G, Jaber S, Barbotte E, et al. Impact of systematic evaluation of pain and agitation in

an intensive care unit. *Critical Care Medicine.* 2006;34(6):1691-1699.

42.   Wibbenmeyer L, Sevier A, Liao J, et al. Evaluation of the usefulness of two established pain

assessment tools in a burn population. *Journal of Burn Care & Research.* 2011;32(1):52-60.

43.   Luckey A, Taylor J, Buckley A. 924: MEDICATION UTILIZATION AND OUTCOMES WITH

IMPLEMENTATION OF THE CRITICAL-CARE PAIN OBSERVATION TOOL. *Critical Care

Medicine.* 2015;43(12 Suppl 1):232.

Table 1. Sociodemographic Characteristics of the Sample (N = 60)					
Variable	**Pre-implementation Group (n = 30)**	**Post-implementation Group (n = 30)**	**Total (N = 60)**	**Statistical Test** x^2	t
Gender, n				**1.000**[*]	
Male	29 (96.7%)	29 (96.7%)	58 (96.7%)		
Female	1 (3.3%)	1 (3.3%)	2 (3.3%)		
Race, n				**.304**	
Caucasian	29 (96.7%)	25 (83.3%)	54 (90.0%)		
African American	0	2 (6.7%)	2 (3.3%)		
Hispanic	0	0	0		
Non-Hispanic	0	1 (3.3%)	1 (1.7%)		
Not Specified	1 (3.3%)	2 (6.7%)	3 (5.0%)		
Age, mean (SD)	69.03 (±7.41)	70.67 (±9.74)	69.85 (±8.62)		**.468**

Legend: x^2 = Chi-square statistics, t = Independent sample t-tests

[*] Fisher Exact Test

[a] $p < 0.5$, statistically significant difference between the pre- and post-implementation groups

Table 2. Clinical Characteristics of the Sample (N = 60)					
Variable	**Pre-implementation Group (n = 30)**	**Post-implementation Group (n = 30)**	**Total (N = 60)**	**Statistical Test** x^2	**t**
Provider Service, n				**1.000**[*]	
Medical	25 (83.3%)	26 (86.7%)	51 (85.0%)		
Surgical	5 (16.7%)	4 (13.3%)	9 (15.0%)		
APACHE II Score, mean (SD)	18.47 (±5.77)	21.10 (±7.27)	19.78 (±6.64)		**.125**
ICU Admission Dx(s)					
Resp. Comp., n	20 (66.7%)	17 (56.7%)	37 (61.7%)	**.595**	
Cardio/Vasc Comp., n	13 (43.3%)	12 (40.0%)	25 (41.7%)	**1.000**	
Sepsis, n	12 (40.0%)	9 (30.0%)	21 (35.0%)	**.588**	
Encephalopathy/ Stroke, n	4 (13.3%)	8 (26.7%)	12 (20.0%)	**.333**	
Acute Kidney Failure, n	4 (13.3%)	3 (10.0%)	7 (11.7%)	**1.000**[*]	
Gastrointestinal Comp., n	4 (13.3%)	4 (13.3%)	8 (13.3%)	**1.000**[*]	
Pancreatic Comp., n	1 (3.3%)	2 (6.7%)	3 (5.0%)	**1.000**[*]	
Liver Failure , n	1 (3.3%)	1 (3.3%)	2 (3.3%)	**1.000**[*]	
Medical Hx of:					
Diabetes				**.139**	
(Type II), n	13 (43.3%)	19 (63.3%)	32 (53.3%)		
(Type I), n	0	1 (3.3%)	1 (1.7%)		
Chronic Neuropathy, n	13 (43.3%)	15 (50.0%)	28 (46.7%)	**.796**	
Chronic Pain, n	19 (63.3%)	21 (70.0%)	40 (66.7%)	**.784**	
Depression Disorder, n	12 (40.0%)	12 (40.0%)	24 (40.0%)	**1.000**	
Anxiety Disorder, n	13 (43.3%)	14 (46.7%)	27 (45.0%)	**1.000**	
Sleeping Disorder, n	13 (43.3%)	14 (46.7%)	27 (45.0%)	**1.000**	
Chronic Opioid Use, n	3 (10.0%)	2 (6.7%)	5 (8.3%)	**1.000**[*]	
Chronic Benzodiazepine Use, n	1 (3.3%)	0	1 (1.7%)	**1.000**[*]	

Legend: x^2 = Chi-square statistics, t = Independent sample t-tests

[*] Fisher Exact Test

[a] $p < 0.5$, statistically significant difference between the pre- and post-implementation groups
        Independent sample t-tests

Variable	Pre-implementation Group (n = 30)	Post-implementation Group (n = 30)	Total (N = 60)	Statistical Test x^2	t
Table 2. Clinical Characteristics of the Sample (N = 60) (Continued)					
Illicit Drug Use, n	2 (6.7%)	1 (3.3%)	3 (5.0%)	**.000***	
Tobacco Use, n	19 (63.3%)	15 (50.0%)	34 (56.7%)	**.434**	
ETOH Abuse, n	5 (16.7%)	6 (20.0%)	11 (18.3%)	**.000**	
Level of Consciousness at the time of ICU admission, n				**.104**	
Unconscious (Glasgow $\leq$ 8)	7 (23.3%)	14 (46.7%)	21 (35.0%)	X	
Conscious (Glasgow $\geq$ 9)	23 (76.6%)	16 (53.3%)	39 (65.0%)		
Discharge Status, n					
Transferred	20 (66.7%)	19 (63.3%)	39 (65.0%)	**.581**	
Home	1 (3.3%)	3 (10.0%)	4 (6.7%)		
Deceased	9 (30.0%)	8 (26.7%)	17 (28.3%)		

Legend: x^2 = Chi-square statistics, t = Independent sample t-tests

* Fisher Exact Test

[a] $p < 0.5$, statistically significant difference between the pre- and post-implementation groups

Table 3. Pain Assessment (N = 60)				
Variable	**Pre-implementation Group (n = 30)**	**Post-implementation Group (n = 30)**	**Statistical test** x^2	t
Patients with Pain Assessments, n	30 (100%)	30 (100%)	**1.000**	
Pain Assessments, n	135	213	**.599**	
CPOT Pain Assessments, n	16 (11.9%)	121 (56.8%)	**.001[a]**	
Other Pain Assessments, n	119 (88.1%)	91 (42.7%)	**.002[a]**	
Frequency of any Pain Assessments, mean (SD)	4.50 (±2.00)	7.10 (±5.09)		**.013[a]**
Frequency of CPOT Pain Assessments, mean (SD)	.53 (±1.01)	4.03 (±2.80)		**.000[a]**
Frequency of Other Pain Assessments, mean (SD)	3.97 (±2.14)	3.03 (±4.46)		**.307**
% Time Patients unable to self-report pain, mean (SD)	81.67% (±30.75)	75.83% (±37.99)		**.516**

Legend: x^2 = Chi-square statistics, t = Independent sample t-tests

[*] Fisher Exact Test
[a] $p < 0.5$, statistically significant difference between the pre- and post-implementation groups

Table 4. Pain Management (Administration of Pharmacological Interventions), (N = 60)					
Variable	**Pre-implementation Group (n = 30)**	**Post-implementation Group (n = 30)**	**U**	**Statistical Test x^2**	**t**
Patients Administered Analgesics, n					
Any Analgesics, n	19 (63.3%)	23 (76.7%)		**.398**	
PRN Analgesics, n	7 (23.3%)	8 (26.7%)		**1.000**	
Continuous Infusion, n	15 (50.0%)	19 (63.3%)		**.434**	
Scheduled Analgesic,n	3 (10.0%)	5 (16.7%)		**.704**	
Administrations of PRN analgesics, n	16	31		**.815**	
Fentanyl (IV), n	14 (87.5%)	24 (77.4%)		**.625**	
Hydromorphone (IV), n	0	2 (6.5%)		**.492***	
Morphine (IV), n	0	5 (16.1%)		**.355**	
Hydrocodone/ Acetaminophen (PO), n	1 (6.3%)	0		**1.000***	
Acetaminophen (PO), n	1 (6.3%)	0		**1.000***	
Administrations of PRN analgesics, mean (SD)	.53 (±1.41)	1.03 (±2.17)			**.295**
Patients Administered Scheduled/Continuous Analgesics, n	17	21		**.422**	
Fentanyl (Continuous IV Infusion), n	15 (93.8%)	19 (90.5%)		**.434**	
Hydrocodone/ Acetaminophen (PO), n	1 (6.3%)	2 (9.5%)		**1.000**	
Oxycodone (PO), n	0	1 (4.8%)		**1.000**	
Acetaminophen (PO), n	0	0		**1.000**	
Gabapentin (PO), n	2 (12.5%)	2 (9.5%)		**1.000**	
Morphine Equivalent Dosage, mean (SD)	84.63 (±164.25)	61.80 (±68.64)	**.479**		

Legend: U = Mann-Whitney U test, x^2 = Chi-square statistics, t = Independent sample t-tests

* Fisher Exact Test

[a] $p < 0.5$, statistically significant difference between the pre- and post-implementation groups

Table 5. Sedation and Agitation, (N = 60)				
Variable	**Pre-implementation Group (n = 30)**	**Post-implementation Group (n = 30)**	**Statistical Test** x^2	t
Patients Administered Sedatives, n	27 (90.0%)	25 (83.3%)	**.706**[*]	
Propofol, n	21 (77.8%)	21 (84.0%)	**1.000**	
Midazolam, n	8 (29.6%)	6 (24.0%)	**.760**	
Haldoperidol, n	1 (3.7%)	1 (4.0%)	**1.000**	
Dexmedetomidine, n	1 (3.7%)	2 (8.0%)	**1.000**[*]	
% Time Patients were Sedated, mean (SD)	80.0% (±33.09)	72.5% (±39.58)		**.429**
RASS while intubated, mean (SD)	(n = 29) -1.35 (±0.99)	(n = 28) -1.16 (±0.88)		**.434**
Episodes of moderate-deep sedation (RASS ≤ -3), n	(n = 29) 6	(n = 28) 14	**.394**	
GCS while intubated, mean (SD)	(n = 28) 9.71 (±2.25)	(n = 29) 10.09 (±2.92)		**.584**
Episodes of Agitation (RASS ≥ +2), n	(n = 29) 3	(n = 28) 8	**.520**	

Legend: x^2 = Chi-square statistics, t = Independent sample t-tests

[*] Fisher Exact Test

[a] $p < 0.5$, statistically significant difference between the pre- and post-implementation groups

Table 6. Patient Outcomes, (N = 60)				
Variable	**Pre-implementation Group (n = 30)**	**Post-implementation Group (n = 30)**	**Statistical Test** **U**	**x^2**
Length of Mechanical Ventilation (days), mean (SD)	9.38 (±9.35)	9.54 (±7.13)	**.615**	
ICU Length of stay (days), mean (SD)	10.91 (±9.49)	10.66 (±8.12)	**.935**	
Episodes of severe pain, n	5 (3.7%)	36 (16.9%)		**.234**
All-Cause Mortality, n	9 (30.0%)	8 (26.7%)		**.581**

Legend: U = Mann-Whitney *U* test, x^2 = Chi-square statistics

[*] Fisher Exact Test

[a] *p* < 0.5, statistically significant difference between the pre- and post-implementation groups

Unit Pain Management Guideline Algorithms

Pain Assessment Standards of Care

- Comprehensive pain assessment Q 4 hours (with every physical assessment)
- Regular Pain Assessment (NRS or CPOT) with every 2 hrs and PRN
- Reassessment within 15 to 30 mins of IV/IM pain medication intervention
- Reassessment within 1 hour of oral pain medication intervention
- Pre, Intra & Post procedure pain assessments

Document all pain assessments

Comprehensive Pain Assessment
(Q 4 hrs and PRN)

- Pain Location
- Acceptable Goal
- Functional Goal
- Scale Used
- Severity Number
- Pain: Character, Onset Date/Time, & Timing
- Pain Factors: Aggravate Factor & Relieving Factor

Regular Pain Assessment
(Q 2 hrs and PRN)

- Scale Used
- Pain Observations as needed (i.e. CPOT)
- Severity Number

Pain Management

- Type of Intervention

Pain Reassessment

- Scale used
- Severity Number
- Response to Med

Pain Scale Decision Tree

Able to Self-Report

YES → **NRS: 0-10**

NO → **Paralytics**

NO → **CPOT: 0-8**

YES → **Unable to Assess**

Figure 1.

Pain Management Algorithm

NRS = 0 **CPOT = 0**	**NRS = 1-3** **CPOT = 1-2**	**NRS > 3** **CPOT > 2**

Continue to assess Q 2 hours and PRN

Intervention? **NO**

Pain Management

- Non-pharmacological strategies
- Discuss Non-opioid analgesics with provider

Intervention? **YES**

Moderate
NRS: 4-6
CPOT: 3-5

Severe
NRS: 7-10
CPOT: 6-8

Pain Management

- Opioid and/or non-opioid analgesic
- Non-pharmacological strategies

Pain Reassessment
(within)

- IV/IM: 15 to 30 minutes

- PO: 1 hour

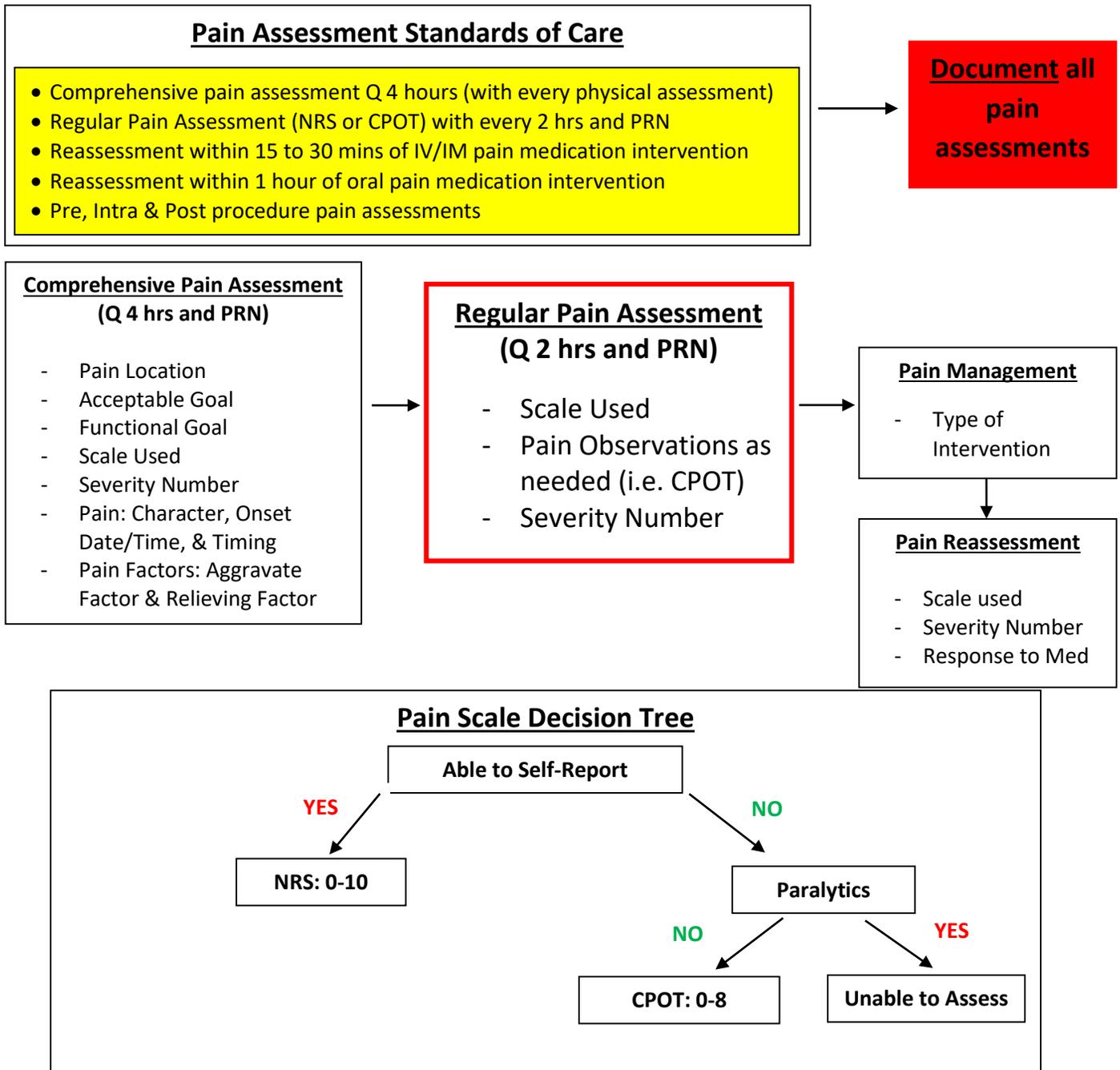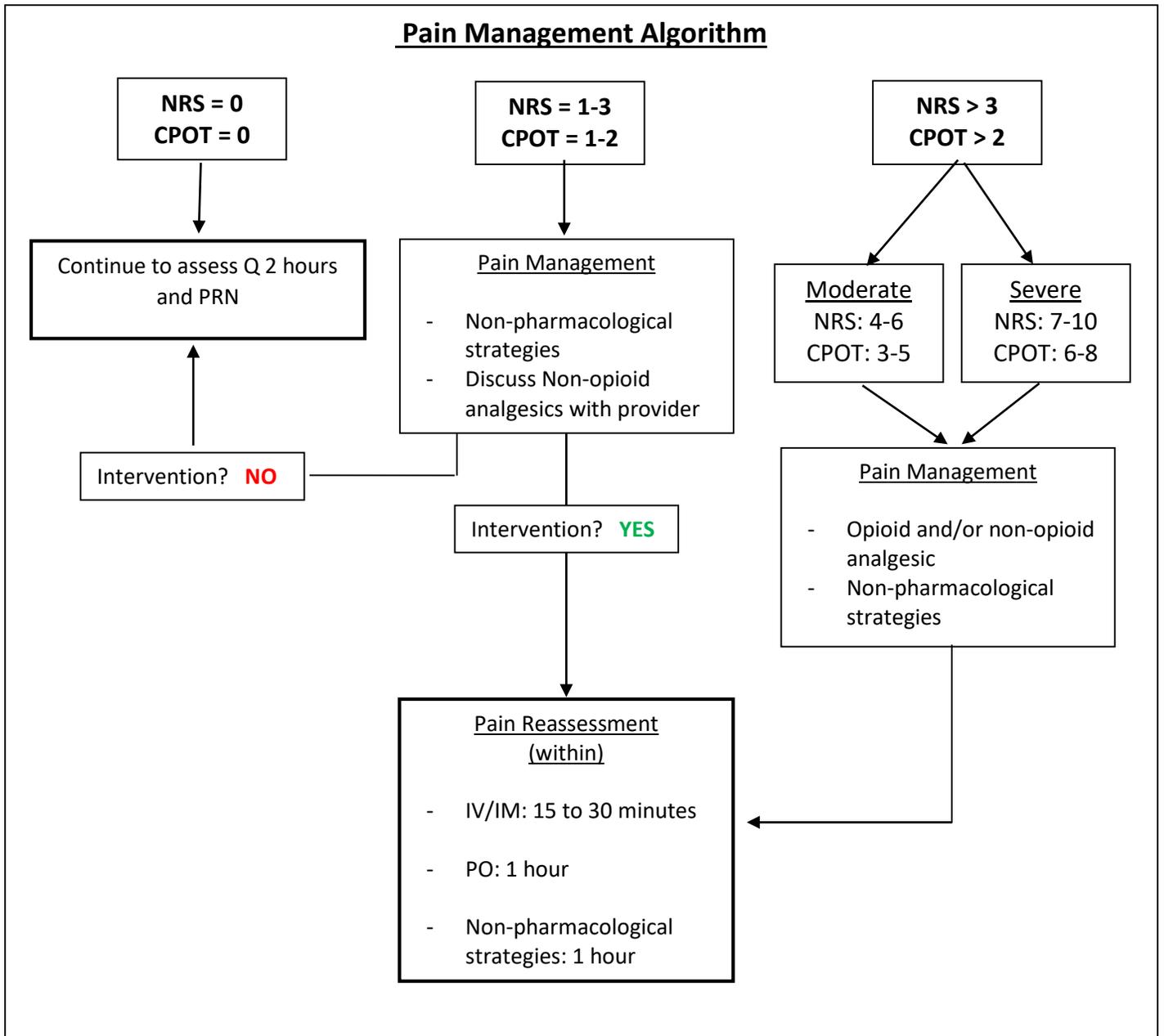- Non-pharmacological strategies: 1 hour

Figure 1 (continued).

Analgesic Order Sets

Fentanyl Infusion & PRN Bolus Order Set

Start Fentanyl drip at:
- ❑ Low dose regiment = 25 mcg/hr
- ❑ High dose regiment = 50 mcg/hr
- ❑ Provider determined dose

Comments:

1) PRN bolus for break through pain CPOT > 2
  - ➢ CPOT 3-5 (moderate pain) = Fentanyl IV 25 mcg Q 10 min
  - ➢ CPOT 6-8 (severe pain) = Fentanyl IV 50 mcg Q 10 min
  - ➢ *** 3 maximum total boluses within 1 hour (regardless of dose)

2) Titration:
  - ➢ Increase infusion rate by 50 mcg/hr if ≥ 3 boluses are required for break through pain within 1 hour.
  - ➢ Notify provider for all infusion rate increases.
  - ➢ Reduce infusion rate daily per sedation wake-up protocol.

PRN Hydromorphone Order Set

1. CPOT > 2: give 0.2 mg x 1 hydromorphone IV

2. Wait 5 mins

3. CPOT > 2: give 0.4 mg x 1 hydromorphone IV

4. Wait 5 mins

5. CPOT > 2: give 0.8 mg x 1 hydromorphone IV

6. *If patient required(received) 3 consecutive doses (total 1.4 mg) with in 1 hour (consider)scheduled oxycodone

---

Figure 2.