Evidence Based Pain Assessment Protocol for Non-Verbal Patients

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Abstract

Purpose: Pain assessment practice in the nonverbal patient is incredibly challenging for the nurse and as such, evidence has shown that a protocolized approach to pain assessments has shown to be effective. Therefore, the purpose of this project was the education, implementation, and evaluation of an evidence based pain assessment protocol for the comprehensive assessment of pain in the nonverbal patient.

Methodology: This Quality Improvement project included the Critical Care Pain Observation Tool (CPOT) as part of an evidence based pain assessment protocol. A three-month implementation phase utilizing the evidence based protocol was initiated following nursing education with a post implementation nursing survey to evaluate its effectiveness.

Results: It was discovered that the majority of nurses rated the CPOT components as positive in pain assessment in the nonverbal patient, however, additional feedback showed that not all nurses understood how to utilize the tool.

Implications for Practice: Effective pain assessment and management has been shown to decrease ICU length of stay, mechanical ventilation days, immobility, and negative hospital outcomes, however, based on nursing feedback, additional education and expert training may be beneficial for practice.

Key words: Critical Care Pain Observation Tool, evidence based practice, nonverbal pain scales, pain assessment

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Patients often experience pain, whether it is the reason for seeking treatment, or from routine care that healthcare providers give them. It is often the provider's responsibility to assess pain and treat it. Unrelieved pain can lead to cardiac instability, immunosuppression, and a decline in respiratory function, all of which are risk factors for ICU patients (Devlin et al., 2018). Furthermore, patients who recalled untreated pain were more likely to develop post-traumatic stress disorder, chronic pain, and a lower health related quality of life (Barr et al., 2013). At times it is difficult to treat pain in a patient who is able to self report it, all the more so in nonverbal patients unable to do so. Nonverbal patients are common in the ICU. This patient population can include those suffering from altered mental status related to encephalopathy, sepsis, drug induced, and most commonly mechanical ventilation (MV). According to the American Association for the Surgery of Trauma (AAST) (2011), more than half of patients in the ICU are ventilated within the first twenty-four hours of admission. Furthermore, transitioning off of MV continues to be challenging with 40% of time spent on MV dedicated to weaning (AAST, 2011). While nonverbal patients are unable to verbalize pain they may or may not be experiencing, a provider cannot exclude it from happening. Because of the communication barrier, there have been multiple nonverbal pain scales established. Examples of nonverbal pain scales published include the Behavioral Pain Scale, Critical Care Pain Observation tool (CPOT), Nonverbal Pain Scale, and the *F*ace, *L*egs, *A*rms, *C*ry, *C*onsolability (FLACC) scale. Each scale is comprised of its own numeric rating scale based on behavioral cues. However, it is critical for the nonverbal pain scales to be effective and evidence-based. According to the Society of Critical Care Medicine

(SCCM) in the clinical practice guidelines proposed by Devlin et al. (2018), the Critical Care Pain Observation Tool (CPOT) is a valid tool to assess patients who are unable to communicate in the adult ICU. However, if pain assessments are executed incorrectly by use of a wrong scale, patients may remain in undiagnosed pain for prolonged periods of time. The purpose of this project was to implement the evidence-based CPOT pain assessment protocol.

Background and Significance

According to the SCCM (n.d.), there are nearly 6 million annual admissions to an intensive care unit. There can be multiple reasons for admissions with examples including airway, breathing, circulation monitoring, life threatening emergencies, personal injuries, and palliative care. However, the most common admission diagnosis for the ICU is a respiratory system diagnosis, with 20-30% of those requiring mechanical ventilation. ICU patients, including those requiring mechanical ventilation, need adequate pain control through continuous or intermittent dose analgesia in order to maintain comfort and safety while undergoing their numerous treatments. Stites (2013) found that pain is a crucial topic in the ICU and inadequate assessment and interventions are connected to increased morbidity and mortality. The practice in an ICU in a teaching hospital in northern New Jersey found the nursing staff assessed pain in nonverbal patients using a scale that lacked supportive evidence called the Behavioral Scale (see Appendix A). The CPOT, unlike the scale previously in practice, provides a more comprehensive assessment of a patient's facial expressions, muscle rigidity, and ventilator compliance. And in the event the patient is not intubated but still nonverbal, providers can substitute the "ventilator compliance" portion of the CPOT with

"vocalization" and score the patient the same way. While the previous behavioral scale may have provided a level of assessment of the nonverbal patient, the SCCM supports the use of the CPOT (Devlin et al., 2018). Furthermore, when comparing the CPOT to other nonverbal pain scales in practice including the BPS and Pain Assessment in Advanced Dementia, the CPOT is most reliable and valid, with sensitivity and specificity higher than other scales (Varndell, Fry, & Elliot, 2016). This provides a unique and complete pain assessment and offers a correct opportunity for analgesic intervention. For patients not receiving continuous analgesia, but rather pro re nata (PRN) boluses to treat a nonverbal pain scale value indicating pain, incorrect behavioral assessments by the registered nurse (RN) may prolong the acute or chronic pain this nonverbal patient is experiencing. Patients often require analgesia during their ICU stay for various treatment interventions such as mechanical ventilation, venipuncture, invasive procedures, as well as nurse driven actions such as turning and positioning. Furthermore, according to Gélinas et al. (2014) clinicians face many barriers in assessing pain in ICU patients with altered mental status, decreased level of consciousness, and mechanical ventilation. Inadequate or underassessment of pain is associated with negative outcomes such as increased total dose of narcotics, prolonged mechanical ventilation, and longer length of intensive care unit stay. As with any hospital course, prolongation of treatment can increase total cost. In fact, according to Kramer, Dasta, and Kane-Gill (2017), when comparing survivors of ICU stays to non-survivors on day 2 of admission versus day 5, surviving patients receiving mechanical ventilation had a predicted cost of $10,317 on day 2 and $19,627 on day 5. On the other hand, survivors who did not receive mechanical ventilation had a predicted cost of $6,709 on day 2 and $13,816 on day 5 (Kramer et al.,

2017). Prolonged mechanical ventilation increases the risk of ventilator-associated events (Kobayashi, Uchino, Takinami, & Uezono, 2017). Furthermore, longer duration of opioid use places a patient at risk for a medication related adverse event. Urman et al. (2019) found that post-operative opioid use, including the use of hydromorphone, is a strong predictor of an adverse event. Patients suffering such an event had a 32% higher healthcare expenditure as well could accumulate $36,842 in total cost of hospitalization (Urman et al., 2019).

The SCCM's clinical practice guidelines for Pain, Agitation, Delirium, Immobility, and Sleep (PADIS) outline the need for adult ICU patients to have routine pain assessments (Devlin et al., 2018). Additionally, pain and sedation practice should be stepwise and protocol based. ICU patients can experience considerable pain on a daily basis and are in an incredibly unique situation based on their clinical needs. Being nonverbal, on mechanical ventilation, immobile, having exposure to procedures and invasive instrumentation, and during routine standard nursing care can propagate or prolong pain (Devlin et al., 2018). A protocolized approach to pain assessments and management is associated with decreased MV days, ICU infections, LOS, cost, as well as 30-day hospital mortality (Skrobik and Chanques, 2013). In the event of assessed pain, analgesia should be used prior to a sedative (Devlin et al., 2018). By having both a protocolized approach to pain assessment and clear, specific orders on which analgesic dose to use in the event of pain, a more effective patient care regimen may lead to positive patient outcomes. Along with the PADIS guidelines, the SCCM released the ICU Liberation Initiative that uses the "ABCDEF" bundle to manage ICU patients (SCCM, 2017). The bundle, which stands for *a*ssess, prevent, and manage pain; *b*oth spontaneous

awakening and breathing trials; *c*hoice of sedation and analgesia; *d*elirium assessment and prevention; *e*arly mobility and exercise; and *f*amily engagement and empowerment, aids the healthcare team in treatment that is patient centered. In this initiative, pain assessments, much like in the PADIS guidelines, should be based upon an established scale such as the CPOT, with analgesic intervention following the correct pain assessment. Most importantly, procedural pain should be treated prior to the procedure. The guideline illustrates analgesia first, then sedation.

Needs Assessment

In the Medical ICU within an academic hospital in northern New Jersey, pain assessment practice utilized a behavioral scale for the nonverbal patient that was not evidence based (see Appendix A). For example, this scale did not include an assessment of ventilator compliance. Hospital practice was also to utilize daily interdisciplinary rounds which included the MICU physician, resident physicians, and nurses to discuss, among other issues, the patients' daily analgesia or sedation goals and readiness to wean which often times was based on the nurses' pain assessments reflected in the behavioral scale. A brief discussion between physicians and nurses about how often a patient registered a pain score on the behavioral scale determined if analgesia doses needed to be addressed. Outside of this ICU, and in a study by Rose, Haslam, Dale, Knetchel, and McGillion (2013), ICU nurses used the CPOT to administer the appropriate analgesic or benzodiazepine and saw their responsiveness to the CPOT with increases in the doses of analgesics to maintain patient comfort. Nurses at this current institution, while they appropriately used their nonverbal pain scale to administer analgesia still utilized a scale that not only lacked evidence, but also failed to assess crucial behavioral aspects of the

non-verbal patient as stated earlier. By continuing to utilize this scale, the pain assessment protocol formerly in practice was clearly not evidence based. Because of this identified gap, a strengths, weaknesses, opportunities, and threats (SWOT) analysis was conducted (see Appendix B). A strength was that this facility acknowledged the use of nonverbal pain scale and pain assessment protocol that needed to be substituted for one that was evidence based. As well, by discussing daily goals for patients, which was the current practice, a more comprehensive treatment plan was developed. There was also an already established nonverbal pain scale in practice for nurses to follow as well as the Richmond Agitation-Sedation Scale to assess the level of sedation. Another strength was that this academic center was Joint Commission and American Nurses Association recognized which signified its commitment to maintaining certain standards and nursing excellence. This hospital also employed a shared governance model that promoted a joint responsibility in decisions that effected daily nursing practice. It was also a level-1 trauma center that had most medical services available 24 hours a day, seven days a week. Pain in trauma patients is an important indicator injury severity and patients often report low satisfaction with their pain control (Ahmadi et al., 2016). Furthermore, the MICU leadership fully supported quality improvement projects, specifically the implementation of an evidence based pain assessment scale such as the CPOT that aid in the care of ICU patients.

On the other hand, weaknesses included protocolized pain assessments that used a nonverbal pain scale, which was not as comprehensive to this patient population as the CPOT and was not evidence based. Another weakness was that often times MICU nurses were incredibly busy that even a simple pain assessment, none-the-less the substitution of

the CPOT added to nurses' tasks and responsibilities and could have been perceived as timely and tedious. Nurses also used sedative medications for ventilator synchrony and comfort. With deeper sedation, pain assessments could have been inaccurate. Lastly, until this previous summer, this organization did not have access to an online library. Nurses were still acclimating to the use of their Clinical Key in Elsevier® for best practice information.

An opportunity this project employed was that by implementing a comprehensive, evidence based pain assessment protocol using the CPOT, the MICU was heavily involved in the prevention of the other risks illustrated in the Society of Critical Care Medicine's 2017 ABCDEF Bundle guidelines as they had already expressed interest in. For example, patients who were not in pain were more likely to be mobilized which according to the guidelines, improved patient outcomes (Devlin et al., 2018). Furthermore, by utilizing this pain assessment protocol, nurses were effectively able to assess pain in the nonverbal population, which could have possibly led to a long-term accomplishment of increased HCAHPS scores. Importantly, Joint Commission standards provided expectations for healthcare organizations, and by extension nurses, to provide the highest level of quality care (The Joint Commission, 2018).

A threat to this project was that patient acuity and volume hindered quality pain assessments. Another threat was that MICU attending physicians had weekly rotations, and critical care fellows and internal medicine residents rotated monthly. With the continuous change in the MICU and the varying focuses of physicians, there were diverse objective assessments of patient pain which impacted nursing assessments and analgesic

orders. Lastly, inadequate pain assessments may have negatively affected HCAHP scores.

Problem Statement

The identified problem is that by having utilized a nonverbal pain scale that did not assess the entire patient, including for example, body movements and muscle tension, nurses could have left a patient in untreated pain. Will an evidence based pain assessment protocol support a comprehensive assessment of pain in the critically ill nonverbal patients'?

Clinical Question

The clinical question guiding this project is "In the adult medical ICU patients, will the evidence based CPOT scale be perceived to be more effective in pain assessment compared to the currently existing pain assessment method in practice?"

Aim and Objectives

The aim of this quality improvement project was to develop, implement and evaluate a nonverbal pain assessment protocol using the CPOT in order to more efficiently measure pain in the nonverbal patient.

The objectives of this project were to:

- Develop an evidence-based pain assessment protocol using CPOT.
- Implement the CPOT pain assessment protocol.
- Evaluate the CPOT pain assessment protocol through user feedback.

Review of the Literature

A literature review was conducted using the following databases: PubMed, CINAHL, and Google Scholar. The articles searched were limited to English only, adult

and human patients, and published since 2011. Several search keywords were used including *CPOT, Behavioral pain scales, pain assessments, non-verbal pain scales, intensive care patients, evidence based practice, evidence based nursing, NURSING* AND *EVIDENCE BASED PRACTICE, CPOT* AND *ICU, CPOT* AND *analgesia, CPOT* AND *mechanical ventilation, CPOT* AND *nursing assessment, CPOT* AND *nursing intervention*. Similar articles were also found using snowballing technique. After a comprehensive review of the search results, 13 studies were retained for appraisal using the John Hopkins Research Appraisal Tools for research and non-research, and included in the literature review (see Appendix C).

Evidence-Based Nursing Assessment

Practice change, whether it is unit specific, or organizational, requires evidence to support the change. The same concept is true for nursing practice. Street, Phillips, Haesler, and Kent (2017), after the introduction of an evidence based nursing postanesthesia care unit (PACU) discharge tool, there were significant increases in nursing assessment and responsiveness to pain (p <.oo1), increased analgesic administration and documentation of continuous analgesic regimens, and provision of a warming blanket for hypothermia ($p < .001$). There were also significant increases in nursing requests for medical consults on their patients in the post-implementation phase (18.9% vs. 30.4%, $p < .001$). Importantly, there was also a significant increase in nursing recognition of adverse events in the PACU period ($p < .001$) (Street et al., 2017).

Gélinas, Arbour, Michaud, Vaillant, and Desjardins (2011) issued a practice change involving the CPOT in an ICU in Canada. After implementation, nursing assessments using the CPOT resulted in pain assessments being three to four times more

frequent and were maintained at the 12-month post-implementation mark. The use of a validated, evidence based assessment tool provided guidance for pain management decisions by the nursing staff (Gélinas et al., 2011).

Similarly, in the practice guidelines proposed by Devlin et al. (2018), a validated assessment tool, specifically in their recommendations, for pain, leads to better patient outcomes. These guidelines, totaling 37 recommendations, and 34 practice statements, are based on strong supporting evidence. Clearly, evidence based practice strongly influences nursing actions and by extension impacts patient outcomes.

Protocolized Pain Regimens

Due to the inability of the vast majority ICU patients to report their own pain, protocoled pain assessments and regimens have been employed in the ICU setting as well as researched in various studies. Georgiou, Hadjibalassi, Lambrinou, Andreou, and Papathanassoglou (2015), in their systematic review of the impact of pain assessments on the critically ill found that routine assessments lead to various positive patient outcomes. Eight studies researched the value of assessments on mechanical ventilation (MV). Of those eight, two reported significant decreases in duration of MV with the odds of weaning from the ventilator increased (OR: 1.40) and a decreased incidence of ventilator associated pneumonia (OR: 0.75). Another study, while not having significant results, reported a trend of decreased duration of MV between two groups by approximately three days (Georgiou et al., 2015). In regard to measuring pain assessments and adverse events or complications, four studies showed the significant impact pain assessments have on preventable adverse events. In one study there was a decreased rate of nosocomial infections, and a decreased incidence of ventilator associated pneumonia, central line

infections, urinary tract infections, and bacteremia. One other study only found an association with a decrease amount of ventilator-associated pneumonia (Georgiou et al., 2015). Two studies measured patient satisfaction in which one showed that almost all patients expressed satisfaction with pain control after implementation of a protocol, and another one in which patients expressed satisfaction when providers explained the pain control regimen to them. However, in another study, after implementation of the nonverbal pain scale (NVPS), patients reported a delay of at least five minutes when requesting pain medications (Georgiou et al., 2015).

The clinical practice guidelines proposed by Devlin et al. (2018) illustrate the need for a protocol based pain assessment and that management of ICU pain should be guided by routine pain assessments and that pain should be treated first prior to sedation. The recommendation Devlin et al. (2018) have is to use a protocol based, step-wise approach to pain as well as employing a validated tool and that use of these tools compared to regular therapy have been shown to reduce sedative needs, duration of MV, ICU LOS, and pain intensity. These outcomes are very similar to those measured in the systematic review by Georgiou et al. (2015).

In their examination of the ABCDEF guidelines on 15,000 adult ICU patients, Pun et al. (2018) found that implantation of the complete bundle had a higher likelihood of ICU discharge (AHR, 1.17; CI, 1.05-1.30) and hospital discharge (AHR, 1.19; CI, 1.01-1.40) and lower likelihood of death (AHR, 0.32; CI 0.17-0.62). Furthermore, an increased dose of the bundle showed an association with more significant pain episodes ($p < .0001$) (Pun et al., 2018). In their discussion, Pun et al. (2018) examine why there were significant increases in pain episodes and considered that once healthcare sites

implemented the bundle, pain that would have otherwise been undetectable became observable and identified more frequently. Furthermore, it is also possible that patients with significant pain could have more bundle requirements fulfilled (Pun et al., 2018). It is evident that a systematic and protocolized approach to pain management through guidelines can have an impact on ICU patients.

Comparison of CPOT to other Behavioral Pain Scales

There are multiple scales used in critical care to assess pain. The reference standard measure is the patient self-report (Devlin et al., 2018). However, ICU patients are often nonverbal to which a behavioral scale must be used to assess pain. Varndell et al. (2016) employed a systematic review to compare the nonverbal pain scales and found a significant moderate to high association ($r = .71$; $p < .05$) between the CPOT score and the patient self-report of pain at rest ($n = 55$). This pain scale has also been employed for use on the verbal and nonverbal patient including those with delirium (Varndell et al., 2016).

Kanji et al. (2016) tested associations between the CPOT, nursing judgment, and physiologic variables such as vital signs and found that the percentage of agreement between the CPOT and nurses objective assessment on 40 adult ICU patients was 80.5% compared to the association of CPOT and physiologic variables of only 67.5%. Furthermore, Kiavar et al. (2015) when comparing the CPOT to the “Facial Expression” (FE) tool over certain time periods following painful stimuli, found that at minute 90 the CPOT was able to identify pain whereas the FE tool could not. When trying to identify relationships between these two behavioral pain tools and physiologic variables, Kiavar et al. (2015) found a significant correlation between systolic blood pressure and the

CPOT but not with the FE tool. While these scales were able to detect moderate to high levels of pain, the CPOT was able to identify moderate to low levels (Kiavar et al., 2015). This conclusion obviously supports the use of a behavioral pain scale on a nonverbal patient rather than observing physiologic variable, which according to Kanji et al. (2016) is supported in the literature.

Validity of the CPOT

The validity of the CPOT was also examined in multiple articles. Echegaray-Benites, Kapoustina, and Gélinas (2014) examined the validity against patient self-report. In their study, 40 brain surgery participants in the neurological ICU who self-reported pain during turning also showed a significantly higher CPOT score; there was a positive correlation between these two variables ($r = 0.571$, $p < .05$) during the turning procedure. Echegaray-Benites et al. (2014) continue to examine the ability of the CPOT to distinguish between patients who reported pain during the turning procedure, and those that did not. The area under the curve (AUC) for this measurement was 0.864 with a $p<.001$, indicating good discriminative relationship. Additionally, Varndell et al. (2016) also examined the CPOT and its validity compared to other behavioral pain scale and found that only three scales, the CPOT, Behavioral Pain Scale (BPS), and Pain Assessment in Advanced Dementia had an item to subject ratio of 1:10, and of these three, the CPOT was most valid, reliable, and feasible with sensitivity and specificity higher than the other scales.

Boiter, Fiola, and Gélinas (2016) also studied vital signs of 125 surgical ICU patients at the time of a noxious stimuli and the use of the CPOT compared to a patients self-report of pain. The CPOT significantly correlated with self-report during painful

procedures (r = 0.419, $p < .01$) whereas there was no significant relationship between self- report and fluctuations in physiologic variables such as heart rate and mean arterial pressure. Fluctuations in vital signs are very common in the ICU due to medications, disease process, and volume status which makes pain assessment using physiologic variables difficult to interpret as pain (Boiter et al., 2016). The CPOT, according to Boiter et al. (2016), assesses pain both on emotional level and a physiologic.

Varndell et al. (2016) also examined the various aspects of validity of the CPOT. Ten studies identified expert review of the CPOT involving four physicians and 13 ICU nurses using a four-point Likert scale. These professionals rated the CPOT scale as high on the Likert scale (0.88-1.0). Furthermore, as mentioned, in a sample of 55 patients, there was a significant moderate to high correlation (r = 0.71, $p < .05$) between CPOT scores and patient self-report of rest pain illustrating concurrent validity (Vardell et al., 2016). The review continues to show a discriminant validity in two studies showing a significant change in CPOT score from baseline compared to a painful procedure (mean difference, 3.13 +/- 1.56, $p < .0001$; Cohen D, 2.0). There were also escalations of CPOT scores of two to three points from rest (Wilk's $\lambda = 0.75$, F4, 34 = 2.91, $p < .05$) to painful procedures (Wilk's $\lambda = 0.60$, F8, 34 = 5.14, $p < .05$) and interaction (Wilk's $\lambda = 0.60$, F8, 34 = 5.18, $p < .05$) (Varndell et al., 2016). Finally, convergent validity was examined in the review of three studies illustrating statistically significant increases between rest and usage of noxious stimuli when comparing the CPOT to the BPS and the Pain Assessment in Advanced Dementia (Vardell et al., 2016). Clearly, when comparing the validity of the CPOT to other pain scales or pain variables, the CPOT is proven to be better overall at detecting pain in the nonverbal patient.

CPOT and ICU Procedure

ICU patients often undergo painful procedures that can go unmeasured if not assessed using the correct pain scale. Examples of procedures can be as simple as turning and positioning by the nursing staff or invasive such as insertion of a central venous catheter, chest tube, or lumbar puncture. Linde et al. (2013) compared the CPOT score of 35 ICU patients during nursing turning (painful) and changing of a central venous catheter dressing (non-painful). These authors found that CPOT scores did not increase significantly during dressing changes (p = .12) but did increase significantly during turning and positioning (increase, +3.04, 95% CI, 2.11-3.98, p <.001). Echegaray-Benites et al. (2014) also measured the use of the CPOT with nociceptive and non-nociceptive ICU based procedures. Participants in this study were observed for one minute during two different procedures, inflation of the noninvasive blood pressure (NIBP) cuff (non-nociceptive) and during turning and positioning (nociceptive). Not surprisingly, there were no significant increases in CPOT scores during or after NIBP inflation. However, significant CPOT scores were observed during the different stages of turning and positioning (p < .001) (Echegaray-Benites et al., 2014). In their post hoc Wilcoxon signed rank test, Echegaray-Benites et al. (2014) calculated significant changes in CPOT scores before and during turning procedures (Z = 5.14, p < .001). There were also significant differences during and after turning and positioning (Z = 5.25, p < .001) but there were not any significant variations between before and after the procedure. Additionally, there was a significant increase in overall CPOT score from 0 during the NIBP cuff inflation to a 2 during positioning (Z = 4.40, p < .001) (Echegaray-Benites et al., 2014).

Boiter et al. (2016) also examined the CPOT in relation to ICU based procedures in their study of 125 ICU patients after cardiac surgery. Pain assessments, during both painful and nonpainful procedures were completed at rest before, during, and 15 minutes after the procedures. There were significantly higher CPOT scores correlated with a painful procedure (chest tube removal) compared to a non-painful procedure (NIBP) ($p <$ .001). Pairwise comparisons comparing assessments during rest periods before and after nociceptive procedure showed a significant increase in CPOT scores ($p < .001$) (Boiter et al., 2016).

Echegaray-Benites et al. (2014) video recorded and documented the CPOT scores during and after NIBP cuff inflation (non-nociceptive) and a nurse led turning procedure (nociceptive). It was determined that there were no statistically significant differences in CPOT scores during the inflation of the NIBP ($\chi 2$ (2)= 2.67, $p = .264$). However, there were significant increases in CPOT score during the turning and positioning ($\chi 2$ (2)= 57.17, $p < .001$) (Echegaray-Benites et al., 2014).

Vazquez et al. (2011) utilized the CPOT scale to evaluate 96 patients on mechanical ventilation being turned. Measurements were obtained one minute before, during, and ten minutes after this action. When analyzing the scores, Vazquez et al. (2011) found statistically significant increases during the turning process. Furthermore, the CPOT score decreased 10 minutes after the turning procedure which was also statistically significant. For example, when looking at comparative data of the facial expression aspect of the CPOT, the before-during score was 0.10-0.80 with $p < .001$. The before-after score of the same indicator was 0.10-0.05 with $p < .001$ (Vazquez et al., 2011). The facial expressions on the CPOT that are associated with pain are frowning,

brow lowering, orbit tightening, levitator contraction, and eyelid tightening (Vazquez et al., 2011). The next, more marked increase was body movement with before-during scores of 0.04-0.43 with $p < .001$ with movements such as protection and restlessness (Vazquez et al., 2011). A common theme throughout all studies involved is that the CPOT can detect pain during painful, routine ICU based procedures, as well as show its remarkability in returning to normal, non-painful values when the patient is at rest.

CPOT and Analgesia

Utilization of the CPOT has been shown to have various impacts on the dosages of analgesics given. Gélinas et al. (2011) implemented the CPOT in a Canadian hospital ICU and measured the nurse's pain management practices. These authors found the number of analgesic boluses was higher in the pre-implementation group ($H = 11.82$, $p < .001$) compared to post-implementation. There was also a trend of smaller equianalgesic doses at 12 months even though it was no at a significant level (Gélinas et al., 2011). Furthermore, there was also a lower amount of propofol boluses ($H = 10.06$, $p < .05$) and dose (mg) ($H = 10.29$, $p < .05$) given in the post implementation group (Gélinas et al., 2011). This decrease of both sedative and analgesic, according to Gélinas et al. (2011) could be due to guidance of a behavioral pain scale (CPOT), which also appeared to assess the response of the analgesic administration. Phillips, Kuruvilla, and Bailey (2018) observed the opposite in their post-implementation group. In the 441 adult ICU charts these authors retrospectively examined, there were significant increases in the amount of analgesics given with the exception of morphine ($p = .001$). Medication dosages such as paracetamol ($p < .01$), fentanyl ($p < .05$), and oxycodone ($p < .001$) increased significantly. There was also a significant increase in the patient controlled analgesia

pumps, modified-release opiates, and neuropathic pain agents (Phillips et al., 2018). These results, which were the opposite of those reported by Gélinas et al. (2011), could be due to pain being more routinely assessed and treated (Phillips et al., 2018).

Vazquez et al. (2011) found that prior to the patient turning procedure in the ICU (painful stimuli), analgesia and sedation were administered in 97.88% an hour before the positioning procedure. Mean doses of Remifentanil were 383.09 µg (SD = 282.84; minimum 20- maximum 1600), of propofol, 155.93 mg (SD = 115.52; minimum 20- maximum 400), and that of Midazolam, 6.01 mg (SD = 2.25; minimum 1- maximum 12). Additionally, additional analgesic boluses were administered prior to turning in 12.7% of the cases demonstrating the need for analgesia for ICU based procedures (Vazquez et al., 2011). Linde et al. (2013) saw similar findings when assessing the CPOT and painful versus non-painful ICU procedures. In their study, 73 patients received analgesia prior to turning as opposed to 40 who received it for dressing changes. Analgesics given include morphine 2 mg (13% of patients) and 4 mg (27%), meperidine 12.5 mg (3%) and 25 mg (3%), and hydromorphone 1 mg (7%) (Linde et al., 2013).

Rose et al. (2013) studied the CPOT on 184 patients divided between two ICUs. In the cardiovascular ICU (CVICU), the median total opioid equivalent hourly doses decreased by 1 mg ($p < .001$) and in the mixed medical/surgical/ trauma ICU (CRCU) it increased 48 mg ($p < .001$). In regard to benzodiazepines, the administered hourly amount in the CVICU decreased 10 mg and remained unchanged in the CRCU (Rose et al., 2013). Interestingly, higher doses of analgesics were given post implementation to those with higher sequential organ failure assessment score (SOFA) and to patients admitted for medical reasons. When comparing total opioid doses in the CRCU post

CPOT implementation, patients admitted for medical reasons received fewer total opioids compared to patients admitted for surgery or trauma (p = .001) (Rose et al., 2013).

Georgiou et al. (2015) found multiple studies reporting better pain management with more efficient use of analgesics and/or sedatives after the implementation of routine pain assessments in the ICU. One study found no reported difference in opioids or amount of morphine equivalents given while another study showed less analgesic and morphine equianalgesic dosages in the post-implementation group compared to the pre-implementation (Georgiou et al., 2015). Furthermore, there were significant increases and decreases in dosage of analgesia and psychoactive drug dosages respectively, but no significant change in continuous infusions of sedatives (Georgiou et al., 2015). Lastly, two studies found that patients who were assessed were more likely to have an active treatment plan for procedural pain events (Georgiou et al., 2015). While all studies mentioned discovered various outcomes regarding analgesic dosages after implementation of the CPOT or protocolized pain assessments, it is clear that pain assessments are crucial to the ICU or nonverbal patient.

CPOT and Pain Documentation

Pain assessments are of extreme importance in the ICU especially as it pertains to the nonverbal patient. Nurses also need to be diligent in documenting their assessment results in order to carry out the appropriate intervention. Often, the documentation does not occur. However, Gélinas et al. (2011), in their implementation of the CPOT in an ICU in a Canadian hospital found that nurses reported their pain assessments three to four times more in the post-implementation group compared to pre-implementation. The pain assessment frequencies as well as reassessments post analgesic interventions were

maintained from three to twelve months post-implementation (Gélinas et al., 2011). Phillips et al. (2018) found similar results in their audit of 441 patient charts. In this study the mean total pain assessments in a 24-hour period significantly increased from 3.0 to 8.9 in the non-communicative patient and from 5.1 to 9.1 in patients transitioning between communicative and non-communicative. There was also a significant increase in the appropriate use of the CPOT and a decreased inappropriate use of the patient self-report in the nonverbal patient (Phillips et al., 2018). Georgiou et al. (2015) in their systematic review of multiple studies found that pain assessment documentation was more frequent after implementation of the appropriate tools. Furthermore, in one study, patients with regular pain assessments were more likely to be assessed for the appropriate sedation and procedural pain (Georgiou et al., 2015).

Interrater Reliability and Interclass Correlation of the CPOT

Interrater reliability of behavioral pain scales can be troublesome as objective assessments between two providers can differ, thus changing whether a patient can receive an intervention. Echegaray-Benites et al. (2014) examined the interrater reliability of the CPOT between two providers by recording the original CPOT assessment via video camera and showing it one month after the original assessment in order to prevent participants from remembering original assessments. The CPOT assessments were completed during NIBP cuff inflation and a turning procedure. The interclass correlation coefficient (ICC) of the NIBP and turning for the first participant were 0.85, $p < .001$ (CI 95% = .73-.91) and 0.82, $p < .001$ (CI 95% = .69- .90) respectively. For the other rater, the ICC for NIBP was 0.92, $p < .001$ (CI 95% = .87- .96) and for turning was 0.90, $p < .001$ (CI 95% = .82- .95) (Echegaray-Benites et al., 2014). Gélinas et al. (2011) also

examined interrater reliability during noxious stimuli in the ICU and found that pre-implementation, the agreement between nurses during a turning procedure was low (73-91%) compared to post implementation which increased to 86-100% (Gélinas et al., 2011). Interrater reliability was further established in the study by Kanji et al. (2016) who not only found a high internal consistency with a Cronbach α of 0.778 but also interrater agreement between each item in the CPOT. For example, facial expression had an ICC of 0.910, $p < .001$ (95% CI = 0.871- 0.937) and ventilator compliance 0.936, $p < .001$ (95% CI = 0.908- 0.955) (Kanji et al., 2016). Additionally, further interrater reliability was supported by a high κ of greater than 0.6 for each individual CPOT criteria (Kanji et al., 2016).

Theoretical Framework

The theoretical framework for this project was the Knowledge to Action (KTA) Framework. Straus, Tetroe, Graham (2009) explained that KTA is a conceptual framework that was originally developed by Graham et al. (2006) and adapted by the Canadian Institute of Health Research. The KTA framework proposes that the translation of knowledge is an intuitive and complex process where the researcher includes stakeholders to ensure the knowledge being implemented is tailored to their needs (Straus et al., 2009). Knowledge to Action has three major components within a triangle: knowledge inquiry, which is a form of primary research where a researcher would inquire with prospective stakeholders about their needs. This can be accomplished through inquiring with unit managers and hospital leadership on areas of concern for various units. Second, synthesis of knowledge, is when the researcher identifies patterns within the existing research by utilizing search strategies to discover evidence. This aspect can

be accomplished by critical appraisal of research and selection of the strongest evidence. Lastly, production tools, where the best quality of research is synthesized into clinical practice guidelines and evidence based practice (Straus et al., 2009). Surrounding the three main phases within the triangle is a seven-phase action cycle that depicts the stages of knowledge implementation. These phases are identifying the problem and the knowledge to implement; adapt the knowledge to the local context; assess barriers to knowledge use; select, tailor, and implement interventions; monitor knowledge use; evaluate outcomes; and sustain knowledge use (Straus et al., 2009).

In the context of this current project, primary research was conducted by inquiring with the nursing research department, the ICU nurse manager, and medical director about the needs of the unit. In this setting, it was discovered that a behavioral pain scale currently in use was not within the standards created by the SCCM. Synthesis of knowledge was then completed through rigorous searches through research databases to establish what has research has been successful already. Data from research process was compiled into a table of evidence (see Appendix C). Production tools are the research and clinical practice guidelines included in this current project.

The seven-phase action cycle also applies to this project. Identification of the problem and the knowledge to implement was completed based on interviews with the nursing research department and knowledge of the current nonverbal pain assessment practices on the unit. Adapting the knowledge to local context was accomplished through the selection process of the various successful research projects. Assessment of the barriers to knowledge use was evaluated through interviews of the nurses on the unit as well as conversations with the nurse manager and ICU director. Selection, tailoring, and

implementation based on the needs of the unit was the action to which the project was implemented as well as through feedback from the nursing staff. Monitoring of knowledge was achieved through availability of the DNP student investigator to answer inquiries by the nursing staff. Evaluating outcomes was the use of a post implementation survey. Lastly, sustaining of knowledge was completed after the implementation and evaluation phases and ensured the knowledge acquired is sustained by sharing of project data as well as implementation into daily practice on the unit (see Appendix D).

Methodology

This quality improvement project was the development, implementation, and evaluation of an evidence-based pain assessment protocol using CPOT. Evaluation was completed through the use of a post implementation feedback survey of the nursing staff who utilized the CPOT.

Setting

The setting for this project was a 13 bed medical ICU which was part of a 519-bed Joint Commission accredited teaching hospital located in northern New Jersey. The hospital is a comprehensive stroke, liver transplant, heart failure designation and level 1 trauma center that reported a total of 16,522 annual admissions.

Study Population

This project involved implementing a practice change, which utilized a change in the pain assessment process through an evidence, based nonverbal pain scale. Educational modules were provided to all RN’s who worked on that unit. After the change of process, the new pain assessment process was evaluated through voluntary user

feedback. The population for feedback was the RN's who utilized the new process as they were the ones who assessed pain in the nonverbal patients. Excluded were nurses employed in other hospital units.

Subject Recruitment

CPOT education modules were distributed to all MICU RN's via Healthstream, with notice of education modules emailed to nurses one week before education was to begin and three weeks before and a reminder one week prior to the implementation of the pain assessment protocol. (see Appendix E). Included in the context of the email was a brief introduction to the project, and the unit which was included in the project. The online educational module was completed by all staff RNs via Healthstream. The nurse manager also alerted staff to the post-implementation anonymous survey, giving them a two-week period to complete it.

Consent Procedure

Implementation of the evidence-based protocol did not require any in person contact. As well, a waiver of consent was requested for the nurses for the post-implementation feedback as it involved no more than minimal risk and did not alter their rights and welfare. Nurses were not identified on the post implementation survey, which had implied consent, nor was there any demographic data collected on them. Data were only maintained for duration of the project and were destroyed as per Rutgers University guidelines at the conclusion of the study. Furthermore, there was no concealment or deception utilized in this project.

Risks and Harms

There were no risks to nursing staff as the project included an implementation of a new pain assessment method, which replaced the current pain assessment tool. The CPOT, much like the current behavioral scale assesses muscle tension and body movements, but unlike the CPOT, it did not assess for ventilator synchrony. Furthermore, the CPOT was the expected standard for assessing this patient population.

Benefits of inclusion in this project was a pain assessment protocol in the nonverbal patient that has proven to impact ICU practice that possibly led to a full inclusion into hospital practice and more accurate pain assessments, accurate analgesic practices, and less sedatives required by patients much like the findings of Gélinas et al., (2011). The CPOT was a standard of care set by the SCCM with supportive evidence to have capability to assess pain in the non-verbal patient. Benefits to nursing staff included a more up-to-date knowledge based on SCCM guidelines including experience and comfort in assessing the nonverbal patient.

Subject Cost and Compensation

There was no cost or compensation for patient participation in this study. No nurses were compensated, as educational sessions were held via online module.

Study Interventions

Development of the institutional CPOT protocol

Endorsement. Upon receiving IRB approval from both the project site and Rutgers University, the DNP student investigator met with the medical director, MICU nurse manager, and education department, who had already verbally approved of developing the evidence based CPOT protocol authored by the DNP student investigator,

endorsed that the new pain assessment protocol was to be implemented into daily practice in the MICU and fit into institutional policy at the study site.

Development of Flowsheet. The DNP student investigator then met with the Information technology (IT) department and produced the CPOT flow-sheet which appeared in patient charts in the EPIC® software as well as developed the online CPOT education modules via Elsevier® which nurses completed (see Appendix F). The flow-sheet included both the numeric value to compute the score as well as a description of what the value represented. For example, under "facial expression," if a "0" is selected, the description read "no muscular tension observed." The online CPOT educational modules which were authored and developed by the DNP student investigator, included pain assessment guidelines proposed by Devlin et al. (2018), reasoning behind the practice change, the SCCMs in-service video on how to perform the CPOT (SCCM, 2011) (see Appendix G), and documentation of the CPOT in EPIC.

Implementation

Nursing Communication. The nurse manager notified staff via professional email of the upcoming project as well as informed them of the DNP student investigator developed online education modules (see Appendix E). The email included contact information of the DNP student investigator, including phone number and personal email address. ICU nurse education continued for three weeks.

Learning Modules. The pain assessment protocol information was delivered via Healthstream online educational modules and included information on the PADIS guidelines (Devlin et al., 2018), an introduction to pain, barriers and outcomes of pain assessments, common nonverbal pain scales, reasoning behind utilizing the CPOT (see

Appendix F), as well as the SCCMs CPOT education video (see Appendix G). The modules were available to nursing staff for the duration of the implementation phase for quick reference.

Initiation. Once the new pain assessment practice utilizing the CPOT had been finalized, and after all nurses had completed their education, the CPOT protocol was initiated. The CPOT pain assessment protocol replaced the behavioral scale in practice within the nurse's charting requirements in EPIC®. For the duration of the implementation phase, the MICU pain assessment policy was modified to include the CPOT. Nurses assessed patients using the CPOT every hour, which was the current standard and policy, and after a PRN analgesic intervention. CPOT scoring cards were printed by the DNP student investigator and supplied to nursing staff for quick reference (see Appendix H). The CPOT value that resulted from their assessments was then documented in EPIC®. Nurses assessed patients using the CPOT until the patient was deceased, transferred out of the MICU, or could self-report pain. The nurse manager arranged times over the implementation period for the DNP student investigator to meet with RNs for audit and feedback.

Evaluation

Post-Implementation Survey. After the 3-month implementation period, a post implementation survey using a 5-point Likert type scale was delivered to the nurses to evaluate their use of the CPOT (see Appendix I). The survey was a DNP student investigator developed tool, which asked questions on the usability of the protocol, and was a web-based anonymous survey via SurveyMonkey®. The link to the survey was emailed to the nurse manager's organizational email address who then distributed it to the

staff nurses organizational email addresses. Data from the survey, which did not include any nursing identifiers or demographics was entered into the DNP student investigator's personal computer which was password protected and stored in a locked safe in the DNP student investigator locked office.

Outcomes Measured

The CPOT pain assessment protocol was successfully implemented and integrated in the hospital EHR. User feedback was collected as the short-term evaluation of the protocol were the nurses' responses to the survey that included, comprehensiveness of the CPOT, how quick the CPOT is to use, and effectiveness of each component of the scale (see Appendix I). Nursing pain assessment in the nonverbal patient is crucial because according to Devlin et al. (2018) improvements in "ABCDEF" bundle compliance, mainly *a*ssessment of pain was associated with ICU days without coma or delirium.

Project Timeline

Initial research of the CPOT began in January 2019. Development of a comprehensive proposal occurred between February and April 2019. Presentation of the proposal to DNP chair and team members took place in May 2019. Submission to site IRB was in June. The start date for the project was September 2019 with the email distributed by the nurse manager that alerted nursing staff of the project and the scheduling of education sessions. Initiation of the study commenced mid-September after all nurses have received the education. The project continued for the duration of 2019 with the collection of data starting in December 2019 and analysis starting January 2020. Final writing started January 2020, presentation of results is anticipated to be April 2020 with anticipated graduation May 2020 (see Appendix J).

Resources Utilized

Nurses required a computer with sound capability to watch the Healthstream. A printer and laminator were also needed to print CPOT scorecards distributed to nursing staff after they completed the online education. The printer, cost of paper for printing the necessary documents, and lamination of the documents, was the sole responsibility of the DNP Student Investigator. The project budget is located in Appendix K.

Evaluation

Evaluation of this project entailed an analysis of the Likert type scores documented in the post implementation survey (see Appendix I). The project was labeled as effective if the majority of nurses selected “very effective,” “effective,” or “somewhat effective” with all the statements of the scale. The reason for this method was that as the Likert-type scale uses numeric values for various statements with equal positive and negative survey options. Analysis of the values illustrated the utility of the CPOT scale. There was also a section on the survey where nurses included qualitative feedback.

Data Analysis

Data analysis was completed through Microsoft Excel®. Ordinal data from each survey question and qualitative survey comments by nurses were tabulated. Survey responses were quantified into percentages. Data were then organized into bar graphs and pie charts which depict the Likert-type scale responses per choice of the nursing staff. The bar graphs illustrating the survey responses are located in Appendix L while the pie charts depicting the percentages are located in Appendix M.

Maintenance and Security

The link to the SurveyMonkey was distributed via the nurse's professional email addresses. The nurse manager then distributed the link to the survey via the nurse's organizational email addresses which were also password protected. Viewing of the original survey on SurveyMonkey as well as the data retrieved from the survey were only accessed by the DNP student investigator and remained password protected. The DNP student investigator then input the survey results into a password protected personal computer and stored in a locked safe within the DNP student investigator's personal apartment in which the door also remain locked. No personal or demographic information was collected on the nurses, nor any link to their responses.

Upon completion of the project, closure of the IRB, and final writing of the manuscript, all data will destroyed on the basis of Rutgers University guidelines including shredding and discarding of surveys. After input, surveys were permanently deleted as per HIPAA requirements. Computer data will be kept for one year and then wiped clean using a data wiping software. Email correspondence between the DNP student investigator and nurses will be permanently deleted and purged. The use of a data wiping software for the DNP student investigator's hard drive will completed after one year post-completion. Hard copies of aggregate data was housed at the project chairs office at Rutgers University 65 Bergen Street, Room 1138, Newark New Jersey, 07107.

Results

CPOT pain assessment scale was implemented and incorporated in the EHR. User feedback was gathered to evaluate the new pain assessment protocol. The DNP student investigator developed Likert-type scale was distributed to nursing staff as indicated

above at the beginning of the evaluation period. Of the 36 nurses who received the survey via their professional email accounts, 14 responded within the allotted two week evaluation period which made a response rate of 39%. The results of the post implementation survey are presented in the following paragraphs, in bar graph format (Appendix L) and pie chart in Appendix M.

Comprehensiveness of the CPOT

As seen in Appendix M, when asked if the CPOT provided a comprehensive assessment of pain in the nonverbal patient, 79% (11) of participants found the scale to be positive labeling it as "very effective," "effective," or "somewhat effective," while 21% (3) were neutral and saw no difference. However, "Not at all effective" was not selected.

Is the CPOT Quick to Use

In regard to quickness of use, Appendix M shows that 86% (12) found the scale to be useful, selecting "effective," "very effective," or "somewhat effective." "No difference" was selected 14% (2) of the time," and "not effective at all" was not chosen.

Effectiveness at Identifying Pain by Facial Expression

When provided the question of the CPOT's ability to assess pain by facial expression, 79% (11) saw it as positive, choosing either "very effective" "effective," or "somewhat effective," and 21% (3) were neutral and selected "no difference" as illustrated in by graph (appendix L) and pie chart (appendix M). Again, "not effective at all" was not selected.

Effectiveness at Identifying Pain by Body Movement

When given the question of the capability of the CPOT to identify pain by body movement such as pulling at tubes of sitting up, 64% (9) saw positive utility selecting

"very effective," "effective," or "somewhat effective." Another 36% (5) claimed it was "no difference," and "not effective at all" was not selected. This is shown in Appendix L.

Effectiveness at Identifying Pain by Muscle Tension

When considering CPOTs ability to assess pain by muscle tension such as resistance of passive movement, Appendix L shows that 79% (11) indicated positivity as they "very effective," "effective," or "somewhat effective." Another 21% (3) were neutral as they saw it as "no difference." None of the nurses claimed it was "not effective at all."

Effectiveness at Identifying Pain by Ventilator Compliance

Nurses were also asked on the CPOTs effectiveness at identifying pain by ventilator compliance such as blocking of ventilation and synchrony and 71% (10) selected "very effective," "effective," or "somewhat effective," and 29% (4) selected "no difference." Yet, there were no nurses that selected "not effective at all." These survey results are depicted in Appendix L.

Effectiveness of Education Modules

The CI developed CPOT education modules were also asked to be evaluated by the participants and presented in Appendix L. "Very effective," "effective," and "somewhat effective" were selected 93% (13) of the time, and 7% (1) indicated "no difference." "Not effective at all" was not selected.

Cumulative Answers

14 participants completed the survey. There were 7 Likert-type survey questions, which if multiplied by the number of participants who completed the survey totals 98 responses. Of those responses, 79% (77) were positive with answers of either "somewhat

effective," "effective," or "very effective," while 21% (21) of the selections were "no difference" indicating a neutral evaluation. Furthermore, there were no responses that selected "not effective at all." This is clearly depicted in Appendix N.

Additional Feedback

Of the 14 survey participants, three provided additional comments in the feedback section of the post-implementation survey. One participant indicated that the CPOT is "easy to use" while another participant wrote that pain itself is subjective data and that experienced caregivers or medical professionals in of itself can identify pain in the critically ill or intubated patient. The third participant recommended an assessment technique for patients pharmaceutically paralyzed, declared brain dead, super combative/agitated, or with deeper RASS.

Discussion

The nursing feedback delivered in the survey, while only 39%(14), provided the DNP student investigator with knowledge and trends towards the utility of the CPOT. The survey itself encompassed eight questions, with six of them directed toward the CPOT itself (the remaining two inquiring about the education modules and additional feedback section). Each of those six questions had the top answer as "somewhat effective," "effective" or "very effective." This finding is the similar to that of the research findings of Varndell et al. (2016) who found that the strongest evidence to support the CPOTs reliability, validity, and feasibility in the critically ill patient with sensitivity and specificity higher than other scales. These authors also found that medical professionals rated the CPOT as high when using a four point Likert type scale.

Furthermore, “not at all effective” was not selected for any of the responses indicating that all respondents found some utility in the scale.

When approached with the question of quickness of use, 86% of participants saw positive utility as participants selected “very effective,” “effective,” or “somewhat effective.” Varndell et al. (2016) who in their systematic review found that even though the CPOT directions were clear, it did not translate into quick use. However, in a study by Gélinas et al. (2014), the majority of nurses did find the CPOT quick to use as 92% of nurses rated it as positive on their post implementation survey. The fact that vast majority of participants were able to manage the scale appropriately could be because they had experience in a behavioral scale prior to implementation.

The following four questions on the survey inquired on the various components of the CPOT scale such as facial expression and body mechanics and how they translate into quality pain assessment. In regard to facial expression such as orbit tightening, 79% of participants selected “somewhat effective,” “effective” or “very effective” with very low negative ratings. A high amount of participants (64%) were positive on the CPOTs ability to assess pain by body movement such as pulling at tubing or sitting up. This is compared to the minority of participants (36%) who responded negatively toward the scale. The previous scale in practice did include “restlessness” and “muscle tone” which may have positively impacted nursing knowledge while utilizing the CPOT. Furthermore, most of the participants (79%) indicated “somewhat effective,” “effective,” or “very effective” when addressing the CPOTs ability to assess pain by muscle tension and resistance to passive movement compared to 21% who responded neutrally. This could partly be due to the previous scale which considered muscle tension but perhaps not as in depth as the

CPOT. However, much like “restlessness” and “muscle tone,” the participants being positive in these aspects of the CPOT validates this pain scale. Furthermore, Vazquez et al. (2011) found similar results seeing significant changes in facial expression and body movements in the mechanically ventilated patient being turned. The majority of participants (71%) saw utility in the CPOT when assessing pain by blocking of mechanical ventilation or ventilator asynchrony. This can be explained simply by the fact that the previous scale in practice did not consider MV when assessing pain and how comprehensive the CPOT is in the critically ill nonverbal patient.

The last survey question, which inquired about the DNP student investigator developed education modules, 93% of participants saw it as positive or helpful and only 7% did not see it as helpful. This result is also seen in the research by Gélinas et al. (2011) who found that CPOT education aided nurses in identifying pain. Furthermore, Gélinas et al. (2014), after a post implementation survey revealed more extensive training was necessary, performed an experimental cohort study that extended training with support teams of nurses and physicians. This led to high symptom monitoring and was sustained 12 months later.

When examining the total amount of response selection per survey question, the majority of participants (79%) responded positively toward the scale, compared to 21% who did not find any difference. This finding is also similar to the study by Gélinas et al. (2014) who saw the majority of nurses (73%) rating the CPOT as a positive impact to their practice and an even larger portion (82%) satisfied with the use of the scale in the ICU. In the context of this project, it is clear that participants found utility in the CPOT

even though aspects of the scale were different and more complex than the previous one in practice.

As mentioned, participants were also given the opportunity for additional feedback. One nurse wrote that pain is subjective and that experienced caregivers can identify pain in the critically ill or intubated patient. Devlin et al. (2018) found that standardized pain assessment protocols improve ICU outcomes while Georgiou et al. (2015), established that systematic pain assessments decrease the amount of reported severe pain events, number of complications, nosocomial infections, VAP, and that documentation of pain increased with implementation of the appropriate tool. Furthermore, physiologic variables used to identify pain in an ICU patient are affected by analgesics and sedatives (Kiavar et al., 2016). Similar to the comment by this participant, respondents on the survey presented by Gélinas et al. (2014) saw some nurses that, in a feedback comment, saw they were already accustomed to behavioral pain indicators and did not need the scale. From the feedback presented and that of Gélinas et al. (2014), it is possible that nursing preference may hinder evidence-based practice. Another nurse wrote the CPOT needs options for pharmaceutically paralyzed patients, brain dead patients, combative, and those with deeper RASS. Regarding patients with neurological deficits, Varndell et al. (2016) mentions the CPOT needs further testing in patients with delirium, dementia, intellectual deficits, and especially when it comes to brain injured patients. Devlin et al. (2018) also found that studies involving the CPOT and brain injured patients are small indicating further need to research this patient population. However, patient declared “brain dead” would not require a pain scale as they do not feel painful stimulus. Even though this project did not take place in a neurological ICU,

delirium is very common in intensive care units (Devlin et al., 2018). In regard the sedation, Gélinas et al. (2011) concluded that analgesics and sedatives were administered less frequently after implementing the CPOT possibly indicating accurate pain assessments impact sedation requirements. While the survey results are similar to the literature associated with the CPOT tool, based on the feedback comments by the participants, it is clear that further education in conjunction with expert demonstration should be utilized in order to clarify how to correctly execute the CPOT.

Facilitators and Barriers

In summary, the CPOT was implemented over the course of a 3-month period and the survey results indicated that the majority of nurses found use in the scale. It is clear that the aims and objectives were completed. Participants were educated on the evidence based pain scale which was then fully implemented and evaluated as planned. Facilitators of the project included ICU management, whom the DNP student investigator had direct contact with over the course of the implementation period, the IT department who constructed the CPOT within the charting software, and the ICU staff who were educated and assessed patients using the CPOT. One barrier encountered in this project was nurses having to utilize a new scale which required a more complex pain assessment than the previous one in practice including the assessment of ventilator synchrony which was not included on the previous scale. Another barrier was educating the nursing staff on who was considered a nonverbal patient. On one occasion the DNP student investigator was asked if intubated patients required the CPOT, and in another instance a nurse inquired if a patient was intubated yet awake and oriented, if the CPOT should be used over the

numeric rating scale. In both cases nursing staff was educated and questions were resolved.

Limitations

Limitations of the project were that there was only a 3-month implementation period after a short educational period. MICU nurses only had a short time to implement a new pain scale on top of their very busy shifts. Furthermore, the DNP student investigator was only able to arrange three site visits. It is possible that more visits could have answered questions and led to higher quality survey results. In regard to the post implementation survey, there were only 14 respondents as there was only a two week period for the staff to send feedback. This could also be the reason why there were only three additional feedback comments in addition to the survey questions. Lastly, the nursing documentation column for the CPOT did not include an option for pharmaceutically paralyzed patients which was an error by the DNP student investigator in developing the flowsheet. However, as mentioned, the IT department was made aware of the error and correction feedback was given to them.

Unintended Consequences

Unintended consequences of the project were both positive and negative. A positive consequence was that some nurses verbalized they were able to separate sedation practice from analgesics and more effectively understand the goals of their ICU. Gélinas et al. (2011) found that nurses were able to distinguish pain from anxiety more easily after implementation of the CPOT. A negative consequence was that nurses were charting CPOT scores on pharmaceutically paralyzed patients who are by definition, nonverbal, however behavioral pain scales are ineffective in paralyzed patients who are

unable to have a pain behavior evoked. During a site visit this question was addressed and answered by the DNP student investigator . At the conclusion of the project, the DNP student investigator made the IT department aware that CPOT should not be utilized in this patient population and that a documentation option was added to the flowsheet indicating a patient is paralyzed, thus negating the CPOT documentation requirements of the nurse.

Impact on Clinical Practice

The scope to which accurate pain assessment using a correct and evidence based scale impacts clinical practice is incredibly vast. Within the scope of this project however, the impact is related to the unit adherence to the ABCDEF bundle proposed by the SCCM (2017). This first aspect of the bundle is *a*ccurate pain assessments. Without an evidence based pain assessment, the remainder of the bundle is affected. This is supported by Devlin et al. (2018) who stated that patients who are without pain are more likely to be mobilized which leads to better outcomes. However, based on survey results bundle compliance may be impacted by inexperience of the nursing staff in utilizing the CPOT.

Economic Impact

The short term economic impact on routine and more appropriate pain assessments especially the nonverbal population could lead to decreased hospital and ICU LOS, decreased healthcare utilization, and decreased duration of continuous or PRN analgesia, all of which will total lower economic healthcare burden but are outside the context of this pain assessment protocol. These implications will support the findings by Gélinas et al. (2014) who stated that incomplete or underassessment of pain is associated

with negative outcomes such as increased total dose of analgesia, prolonged mechanical ventilation, and longer ICU stay. Prolonged duration of mechanical ventilation increases the risk of ventilator-associated events (Kobayashi et al., 2017). The effects of short term pain assessment protocols can be translated into long term by the decreased accumulation of healthcare utilization as expressed above. This can include a shorter LOS, decreased MV days, and decreased total analgesia. In regard to total analgesia, Urman (2019) found that patients suffering from an opioid induced event had a 32% higher healthcare expenditure as well as accumulate $36,842 in total cost of hospitalization. If effective, CPOT utilization could impact the above economic burdens but measurement of economic outcomes is outside the scope of this project.

Impact on Quality Healthcare/Safety

By including the CPOT into protocol, there will be more accurate pain assessments in the nonverbal patient which could improve the quality of healthcare in the ICU settings. Patients previously experiencing continuous unassessed and untreated pain can rate their healthcare experience as low on their HCAHPS survey. Providing appropriate care will endorse the opposite. Furthermore, as mentioned earlier, inadequate pain assessment can increase morbidity and mortality (Stites, 2013). Protocolized pain assessments can decrease negative patient outcomes including VAP (Georgiou et al., 2015). CPOT can address pain, and could impact narcotic and analgesic administration, patient safety practices, and the amount of sedative given.

Impact on Health Policy

The impact on health policy could be that as more units that care for nonverbal patients such as those mechanically ventilated, policy could be endorsed mandating the

CPOT as the nonverbal pain scale of choice due to its wholesome assessment technique. While endorsement could lead to positive patient outcomes, it is outside the scope of this pain assessment protocol. At a local level, an evidence based pain assessment protocol is crucial for the trauma population. As mentioned, trauma patients often experience high levels of pain. This policy could also include further training for nursing and other healthcare professionals on the full PADIS guidelines proposed by the SCCM (Devlin et al., 2018).

Impact on Education

Pain is extremely common in the ICU patient, both at rest and during routine procedures. Often times it is discovered that professionals are not up to date with current evidence which can place patients at risk for unrecognized and untreated pain. Being up to date with evidence based pain practices would decrease these chances. It may be beneficial for a conjoined RN and provider education session on the CPOT and benefits of correct analgesic practice. This is exceptionally important when there is constant attending, critical care fellow, and medical resident turnover.

Organizational Impact

The organizational impact of this project is that upon completion and sharing of survey data, full inclusion into daily practice across all ICUs and units with nonverbal patients will be initiated. The outcomes of such an implementation could lead to the positive outcomes associated with accurate pain assessments, full implementation of the ABCDEF Bundle, and higher HCAHPS scores.

Plans for Sustainability and Future Research

In order to sustain the project on the unit, the results will be posted in the ICU for the nurses and other team members to view, along with the CPOT scorecards. If MICU leadership finds the results of the survey are favorable toward the CPOT, full implementation of this nonverbal pain scale should be included into the daily practice of all ICUs and units with nonverbal patients within this hospital. To evaluate the effectiveness of full inclusion into practice, a nurse educator could redistribute the survey and evaluate responses across multiple ICUs. Furthermore, HCAHPS data should also be tracked regarding nonverbal ICU patients' satisfaction with their pain management.

Future Scholarship

Potential future projects involving the CPOT could involve how adherence to this pain assessment protocol could impact nurse and provider relationships, nurse and family relationships, and nurse burnout or retention. As indicated, the CPOT is essential to the ABCDEF Bundle, which this unit is in the process of implementing. A project measuring how full inclusion of those guidelines into practice effects the variables presented above could also be beneficial. Furthermore, if a nonverbal patient is discharged to a long-term acute care facility, a project measuring CPOT and readmission rates could be warranted. One long terms project is how accurate CPOT assessments along with analgesic practice guidelines proposed by the SCCM (Devlin et al., 2018) impact chronic pain, outpatient opioid consumption, and ICU post-traumatic stress disorder.

Dissemination/Professional Reporting

Dissemination of project findings includes the healthcare site in which this project took place in northeast New Jersey both on the unit as well as the organizations poster

day**.** Results of this project will also be shared with Rutgers University School of Nursing during a final DNP presentation and at the annual DNP poster day. Results will further be disseminated to other small, nonacademic or community hospitals yet to utilize the CPOT. Other professional organizations to be included in the dissemination are the SCCM's annual critical care conference and the *Journal of Critical Care Nursing*.

Summary

This project involved the implementation of an evidence based nonverbal pain scale to replace the behavioral scale that was in use in a Medical ICU. The data collected from the post implementation survey revealed that even though feedback was positive, a larger sample of respondents could show the full utility of the scale. Current literature supports the validity, reliability, and user agreement for the scale. While positive results are portrayed in the results of the current project, feedback by the nursing staff confirm that further education should be utilized. Research also reinforces protocolized pain assessments using evidence-based scales based on the data suggesting its effects of MV days, ICU LOS, and mobility.

It is important to note that the acuity of the MICU population and the implementation of the SCCM's ABCDEF Bundle which included a new pain scale, may have impacted the survey results. More time, and as mentioned, further nursing education may be required to observe the full effect of the CPOT.

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Appendix A

Nonverbal Pain Scale Currently in Practice

Behavioral Scale (Pain)						
Face						0
Restlessness						0
Muscle Tone						0
Vocalization						0
Consolability						0
Behavioral Scale - Pain Total						0 (calculated)

BPS.docx Microsoft Word

Appendix B

SWOT Analysis

Strengths • Acknowledged need to change practice. • Interdisciplinary rounds. • Nurses experienced in a nonverbal pain scale and RASS. • Joint Commision and ANA recognized. • Level 1 trauma center. • Supportive leadership.	**Weaknesses** • Non-evidence based pain scale. • Busy nurses. • Sedation use impairs pain assessments. • Nurses new to Clinical Key.
Opportunities • Involvement in ABCDEF Bundle. • Joint Commision standards of nursing excellence.	**Threats** • Patient acuity and volume. • Physician/resident physician rotations. • Negative effect on HCAHPS survey.

Appendix C

Table of Evidence

EBP Question: In the adult medical ICU patients, will the evidence based CPOT scale be more effective in pain assessment compared to the currently existing pain assessment method in practice?

Date: May 20, 2019

Article #	**Author & Date**	**Evidence type**	**Sample, Size, and Setting**	**Study findings that help me answer my EBP Question**	**Limitations**	**Evidence level and Quality**
1	Georgiou, E., Et. al, (2015)	Systematic review	10 research articles included	Routine pain assessments lead to better pain management and more protocolized pain regimens.	Variations of pain assessments among studies, and lack of RCTs, Methodological limitations, include preexperimental designs, limited control of confounders and small sample sizes burden this body of evidence,	Level 3, High quality
2	Varndell, W., Fry, M., Elliot, D. (2017)	Systematic review	26 studies included.	CPOT, as opposed to the 4 others assessment tools identified, was shown to have the most reliability and validity when assessing the nonverbal,	Only 1 author extracted the data and made initial critical appraisal, Descriptions of the development and testing of the	Level 3, high quality

				critically ill patient.	observational pain assessment instruments vary in terms of quality and detail, Other relevant instruments may have been subjected to rigorous unreported testing that has not yet been published, not included in review.	
3	Devlin, J.W. et. al (2018)	Clinical practice guidelines	N/A	There should be a stepwise approach to pain assessment and sedation management in the ICU patient	Not Mentioned	Level 4, High quality
4	Phillips, M.L., Kuruvilla, V., Bailey, M. (2018)	Before and after study with a retrospective chart review.	441 adult ICU charts over 49 days: ICU was was mixed tertiary unit that included communicative and noncommunicative patients. There were 344 charts analyzed over 43 days.	After education, implementation of the CPOT led to increased frequency of pain assessments in the noncommunicative patient as well as increased use of analgesia	Patient identifying information not collected, researchers unable to account for repeated measures, One patient had GBS requiring heavy analgesia which could have introduced bias, It was not possible to directly compare patients actual	Level 3, Good quality

					pain levels between audits, Interrater reliability was not examined, There was nurse turnover during the study.	
5	Vazquez, M., Pardavila, M.I., Lucia, M., Aguado, Y., Margall, M.A., Asiain, M.C. (2011)	Prospective descriptive study	12 bed general ICU in a university hospital of Spain: Convenience sample of 96 patients. There were 330 observations made on those 96 patients. Excluded were: Patients on muscle relaxants, motor/sensitive disorders, patients on PCA pumps, hemodynamically unstable patients, and those with respiratory failure at time of study.	There is an increase in CPOT scores during turning and positioning. Behavioral indicators of pain include facial expression, body movements, and compliance with ventilator, all of which the CPOT can detect.	Practice change was carried out in only one ICU, Most patients enrolled in study were receiving opioid analgesia and sedation which could skew the real impact turning and positioning has on pain.	Level 3, Good Quality
6	Pun, B.T. et. al (2018)	Prospective multicenter cohort quality improvement initiative	15,226 adults with at least one ICU day across 68 academic, community, and federal ICUs in a 20-month period. Patients included were on or off MV, and those in MICU, SICU, CCU, and NSICU.	Bundle compliance is associated with decreased MV days, ICU LOS, hospital LOS, and readmission rates. Furthermore, pain was more routinely reported as bundle compliance	Not randomized, variety of ICU types, patient level outcomes not dependent on one another, no data accuracy auditing, data collected within the scope of a	Level 5, Good quality

				increased.	large QI,no uniform severity of illness collection	
7	Boitor, M., Fiola, J.L., Gelinas, C. (2016)	Prospective repeated measure, within-subject design	125 ICU patients from a 20 bed surgical ICU of a university hospital in Canada. Inclusion criteria were 18 years and older, French or English speaking, and able to self report.	CPOT use is associated with accurate pain assessments especially during chest tube removal.	Raters were not blinded to the MTR and may have perceived behavioral reactions as known painful to the patients, Assessing muscle tension by viewing videos alone is challenging, Intrarater reliability is calculated based on the CPOT scores and viewed 1 month apart and removes the context of real time observation.	Level 3, Good quality
8	Kiavar, M., Azarfarin, R., Totonchi, Z., Tavakoli, F., Alizadehasl, A., Teymouri, M. (2016)	Prospective study	91 ICU patients who had undergone cardaic surgery. Inclusion criteria were CABG, heart valve surgery, tracheal intubations, lack of extreme facial damage, movement of at least one body part, 18 years of age, at least 3 hours post sedative, analgesic, or muscle relaxant	CPOT proved to be more valid in detecting pain in the intubated patient compared to "facial expression."	Single center and only intubated cardiac surgery patients included, Stress was considered as pain and unpredictable changes in patient condition resulted in samples being less than what originally was	Level 3, Good Quality

			administrations.		intended.	
9	Gelinas, C., Arbour, C., Michaud, C., Vaillant, F., Desjardins, S. (2011)	Before and after study design	The ICU of a university affiliated healthcare center in Canada. 60 full time ICU nurses and 90 retrospective chart reviews.	CPOT education was proven to be effective at increasing nurses knowledge and skill in nonverbal patient pain assessments as well as decreased the total amount of analgesia given.	Restricted to a retrospective chart review of medical files, Methods of pain assessments were not the same in the pre and post-Implementation groups which did not allow inferential comparison, Nurses pain assessment practices may have differeed from those who are usually encountered in other ICUs whcih can affect external validity, Competence of the CPOT could only be evaluated in 50% of those initially trained due to high turnover.	Level 3, Good Quality
10	Kanji, S., MacPhee, H., Singh, A., Johanson, C., Fairnairn, J., Lloyd, T., MacLean, R.,	Prospective Cohort Design	40 delirious ICU patients from two ICUs of a Canadian tertiary healthcare center. Inclusion criteria: English or French speaking, 18 years of age, admitted	CPOT is a validated tool that can assess pain in the nonverbal, non comatose, delirious adult patient.	Pain is complex and subjective, self report is the gold standard, No other tool has been validated to assess pain in the delirious	Level 3, Good Quality

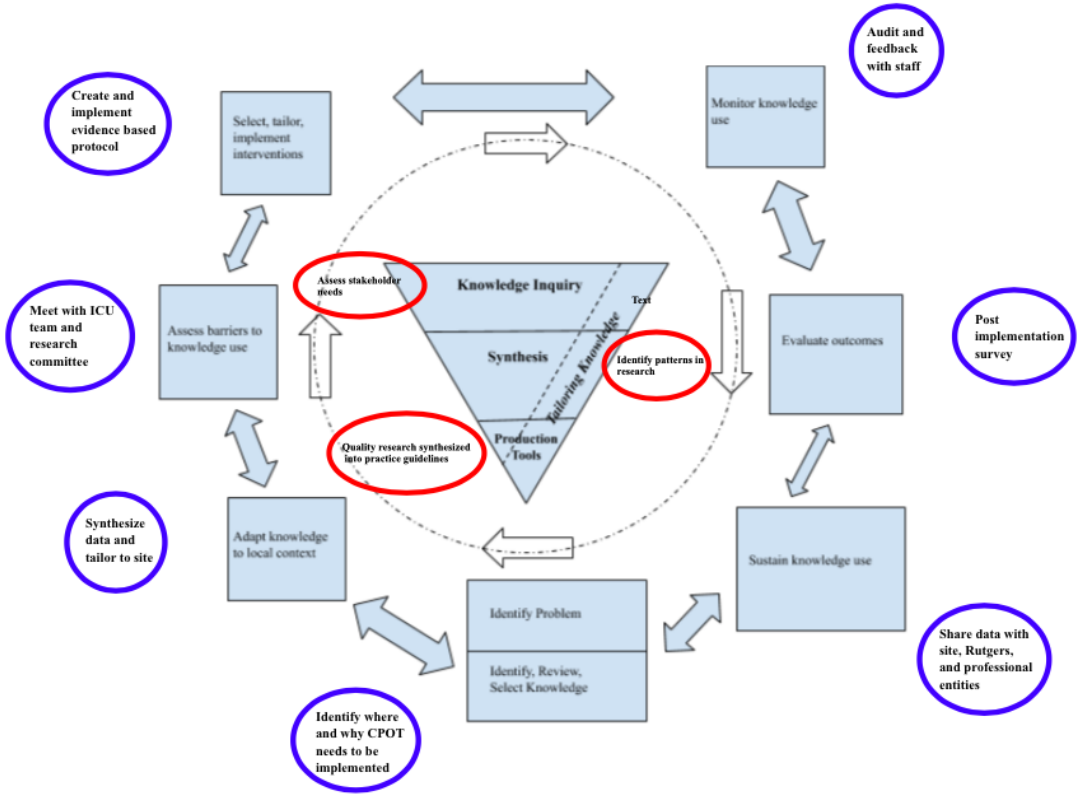
	Rosenberg , E. (2016)		between March 2014- June 2014, and CAM-ICU positive.		patient, therefore nothing to compare the CPOT to, Painful and nonpainful stimuli are not standardized between patients, Delirium often fluctuates and this cohort consisted of untreated and treated	
11	Echegaray -Benites, C., Kapoustin a, O., Gelinas, C. (2014)	Methodological study within subject prospective design	43 elective brain surgery patients in a Canadian university affiliated neurological hospital. Inclusion criteria: elective craniotomy/ craniectomy surgery, over 18 years old, able to self report.	In a population where pain assessments can be challenging, the CPOT was validated to assess pain in brain surgery patients.	Specific patient subpopulation and cannot be generalized to all neurological patients, Nocicpetion could have been altered in this patient population, Impossibility of blinding the raters to the type of procedure the participants underwent.	Level 3, Good Quality
12	Rose, L., Haslam, L., Dale, C., Knetchel, L., McGillion, M. (2013)	Before and after design	184 ICU patients in [redacted] in Toronto, Ontario from 2 ICUs: A 20 bed mixed med/surg/trauma that admits 1100 annually and a 14 bed CVICU	The proportion of pain assessment intervals for both units increased after the implementation of the CPOT with various increases of	Influence of confounders- there was an ongoing quality initiatives such as an algorithm targeting low levels of sedation	

			that admits 1150 annually. Patients included were those with a GCS less than 5, unable to communicate or follow commands.	medications given after the assessment with each unit having different total administrations. This shows that protocolized pain assessments positively impact nonverbal patients.	introduced at the same time, There was turnover of physicians and nurses, Subject to performance and ascertainment bias, A retrospective design made it impossible to do an assessment of response to analgesia, Time of assessment was not well documented, 5 PAIs short of target sample size in the CVICU, Unable to present data on PAIs with documented pain assessment per day of ICU stay.	
13	Street, M., Phillips, N.M., Haesler, E., Kent, B. (2017)	Quasiexperimental, multicenter nonrandomized study	Nurses providing care in 3 PACUs in Australia	Evidence based discharge tool was associated with increased responsiveness to patient pain, nausea, vomitting, and hypothermia, Frequency of assessment increased,	Only 1 local health network involved in the study, Cultural attitudes may contribute to findings	Level 3, Good Quality

				Frequency of documentation increased, Handoffs to wards increased in clarity.		

Appendix D

Conceptual Framework



Adapted from Graham, I., Logan, J., Harrison, M., Straus, S., Tetroe, J., Craswell, W., Robinson, N. (2006). Lost in knowledge translation: Time for a map. *Journal of Continuing Education in the Health Professions, 26.* 13-24.

Appendix E

Email to staff

Dear nursing staff,

[redacted] and the MICU, has been chosen to host a DNP quality improvement (QI) project. This project title is "In the adult medical ICU patients, will the evidence based CPOT scale be more effective in pain assessment compared to the currently existing pain assessment method in practice?" This research project is a QI project which purpose is to implement the CPOT, which is an evidence based nonverbal pain scale, and part of the ABCDEF Bundle. The DNP student investigator of this project will Juda Zurndorfer who is an ICU nurse and DNP student at Rutgers University School of Nursing 65 Bergen Street Newark, NJ 07107. His contact information will be supplied at the conclusion of this email. The first aspect of this QI is educating our nursing staff on how to perform the CPOT. MICU staff RNs will be included in the project. Please note that this is a voluntary project. Not participating in this QI project will not effect employment status in any capacity. With that being said, online CPOT educational sessions starting in 1 week. Benefits of inclusion in this research project are a more vast knowledge base of nonverbal patient pain, and the skills to complete a comprehensive adult nonverbal pain scale. Please await further details and instruction.

PI contact information: [redacted]

Sincerely,

XXXXXXXXXX

Nurse Manager

Appendix F

PowerPoint Presentation

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Evidence Based Pain Assessment Protocol for Non-Verbal Patients

Juda Zurndorfer RN BSN CCRN
Rutgers University
Fall 2019

RUTGERS

PADIS Guidelines

- Guidelines proposed by the SCCM (2018) on the prevention and management of *P*ain, *A*gitation/Sedation, *D*elirium, *I*mmobility, and *S*leep disruption in the adult ICU patient.
- Builds on the *PAD* guidelines of 2013 endorsed by the SCCM by including immobility and sleep disruption.
- Conditional recommendations applying to most, not all critically ill adults.
- Five sections should be considered in its entirety rather than individual.

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Barriers to Pain Assessments & Potential Outcome

- According to Gélinas et al. (2014) clinicians face many barriers in assessing pain in ICU patients with altered mental statuses, decreased level of consciousness, and even mechanical ventilation.
- Incomplete or underassessment of pain is associated with negative outcomes such as increased total dose of narcotics, prolonged mechanical ventilation, and longer length of intensive care unit stay.
- Kramer, Dasta, and Kane-Gill (2017), when comparing survivors of ICU stays to non-survivors on day 2 of admission versus day 5, surviving patients receiving mechanical ventilation had a predicted cost of $10,317 on day 2 and $19,627 on day 5. On the other hand, survivors who did not receive mechanical ventilation had a predicted cost of $6,709 on day 2 and $13,816 on day 5.

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Pain

- Reference standard is the self-report, but inability to communicate does not negate a painful experience.
- Pain assessment and management guidelines improve patient outcomes.
- Unrelieved pain can lead to cardiac instability, immunosuppression, and a decline in respiratory function, all of which are risk factors for ICU patients (Devlin et al., 2018).
- Stites (2013) found that pain is a crucial topic in the ICU and inadequate assessment and interventions are connected to increased morbidity and mortality.

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Nonverbal Pain Scales

- Critical Care Pain Observation Tool (CPOT)
- Behavioral Pain Scale (BPS)
- Face, Legs, Arms, Cry, Consolability Scale (FLACC)
- Pain Assessment in Advanced Dementia
- Nonverbal Pain Scale (NVPS)

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Why the CPOT

- In their systematic review of 26 studies of various nonverbal pain scales, Varndell, Fry, and Elliot (2016) found the CPOT:
  - Content validity was established through expert review of physicians and nurses using a four-point Likert scale with a rating .88-1.0.
  - Concurrent validity established with sig. moderate to high correlations between CPOT score and patient self report of pain intensity at rest (r 0.71, $p < .05$).
  - Discriminant validity established in 2 studies which demonstrated a significant change in mean score from baseline compared to painful procedure.
  - Convergent validity examined in 3 studies with significant increases between pain scores from rest to application of noxious stimuli compared to the BPS.
  - Survey of 24 ICU nurses: 73% recommended the CPOT as helpful to practice.

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CPOT Score Card

Indicator	Description	Score	
Facial expression	No muscular tension observed	Relaxed, neutral	0
	Presence of frowning, brow lowering, orbit tightening, and levator contraction	Tense	1
	All of the above facial movements plus eyelid tightly closed	Grimacing	2
Body movements	Does not move at all (does not necessarily mean absence of pain)	Absence of movements	0
	Slow, cautious movements, touching or rubbing the pain site, seeking attention through movements	Protection	1
	Pulling tube, attempting to sit up, moving limbs/ thrashing, not following commands, striking at staff, trying to climb out of bed	Restlessness	2
Muscle tension Evaluation by passive flexion and extension of upper extremities	No resistance to passive movements	Relaxed	0
	Resistance to passive movements	Tense, rigid	1
	Strong resistance to passive movements, inability to complete them	Very tense or rigid	2
Compliance with the ventilator (intubated patients)	Alarms not activated, easy ventilation	Tolerating ventilator or movement	0
	Alarms stop spontaneously	Coughing but tolerating	1
OR	Asynchrony: blocking ventilation, alarms frequently activated	Fighting ventilator	2
Vocalization (extubated patients)	Talking in normal tone or no sound	Talking in normal tone or no sound	0
	Sighing, moaning	Sighing, moaning	1
	Crying out, sobbing	Crying out, sobbing	2

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Adapted from Gélinas, C., Fillion L., Puntillo, K.A., Viens, C., Fortier, M. (2006). Validation of the critical care pain observation tool in adult patients. *American Journal of Critical Care, 15(4)*. 420-427.

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Behavioral Scale (current practice)

Behavioral Scale (Pain)						
Face						0
Restlessness			BPS.docx Microsoft Word			0
Muscle Tone						0
Vocalization						0
Consolability						0
Behavioral Scale - Pain Total						0 (calculated)

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Comparing the two scales

- CPOT provides a more comprehensive assessment of the nonverbal patient.
  - Facial expression.
  - Body movements.
  - Muscle tension.
  - Ventilator compliance/vocalization.
- CPOT is evidence based and is included in the ABCDEF Bundle.
- CPOT has been proven to have a positive effect on analgesic practice which leads to better patient outcomes.
- By providing a an evidence based pain assessment protocol, not only will pain and analgesic practices improve but patient satisfaction will be impacted as well.

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Reference

Devlin, J. W., Skrobik, Y., Gélinas, C., Needham, D. M., Slooter, A. J. C., Pandharipande, P. P., . . . Kho, M. E. (2018). Executive summary: Clinical practice guidelines for the prevention and management of pain, agitation/sedation, delirium, immobility, and sleep disruption in adult patients in the ICU. *Critical Care Medicine, 46*(9), 1532-1548.

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Appendix G

SCCM CPOT Video

Adapted from Society of Critical Care Medicine. (2011). The Critical Care Pain Observation Tool; CPOT: How to use it in your ICU. Retrieved from http://sccmmedia.sccm.org/video/Webcast/Pain-Critical-Care-Observation-Tool.mp4

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Appendix H

CPOT Scorecard

Critical-Care Pain Observation Tool

Indicator	Description	Score	
Facial expression	No muscular tension observed	Relaxed, neutral	0
	Presence of frowning, brow lowering, orbit tightening, and levator contraction	Tense	1
	All of the above facial movements plus eyelid tightly closed	Grimacing	2
Body movements	Does not move at all (does not necessarily mean absence of pain)	Absence of movements	0
	Slow, cautious movements, touching or rubbing the pain site, seeking attention through movements	Protection	1
	Pulling tube, attempting to sit up, moving limbs/ thrashing, not following commands, striking at staff, trying to climb out of bed	Restlessness	2
Muscle tension Evaluation by passive flexion and extension of upper extremities	No resistance to passive movements	Relaxed	0
	Resistance to passive movements	Tense, rigid	1
	Strong resistance to passive movements, inability to complete them	Very tense or rigid	2
Compliance with the ventilator (intubated patients)	Alarms not activated, easy ventilation	Tolerating ventilator or movement	0
	Alarms stop spontaneously	Coughing but tolerating	1
OR	Asynchrony: blocking ventilation, alarms frequently activated	Fighting ventilator	2
Vocalization (extubated patients)	Talking in normal tone or no sound	Talking in normal tone or no sound	0
	Sighing, moaning	Sighing, moaning	1
	Crying out, sobbing	Crying out, sobbing	2
Total, range			0-8

Adapted from Gélinas, C., Fillion L., Puntillo, K.A., Viens, C., Fortier, M. (2006). Validation of the critical care pain observation tool in adult patients. *American Journal of Critical Care, 15(4).* 420-427.

Revised June 25, 2019

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Appendix I

Nurses Survey

1. Does the CPOT give a comprehensive assessment of pain in the nonverbal patient?

   a. Very effective b. Effective c. No difference d. Somewhat effective e. Not at all effective

2. Is the CPOT quick to use?

   a. Very effective b. Effective c. No difference d. Somewhat effective e. Not at all effective

3. Is the CPOT effective at identifying pain by facial expression such as frowning or orbit tightening?

   a. Very effective b. effective c. No difference d. Somewhat effective e. Not at all effective

4. Is the CPOT effective at identifying pain by body movement such as pulling or tubes or sitting up?

   a. Very effective b. effective c. No difference d. Somewhat effective e. Not at all effective

5. Is the CPOT effective at identifying pain by muscle tension such as resistance of passive movements?

   a. Very effective b. effective c. No difference d. Somewhat effective e. Not at all effective

6. Is the CPOT effective at identifying pain by ventilator compliance such as assessing blocking of ventilation or asynchrony?

   a. Very effective b. effective c. No difference d. Somewhat effective e. Not at all effective

7. Were the educational modules effective at preparing for the use of the CPOT?

   a. Very effective b. effective c. No difference d. Somewhat effective e. Not at all effective

Any Additional feedback:

Revised June 25, 2019

Appendix J

Project Timeline

	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20	Apr-20	May-20
Initial Research																	
Writing of Proposal																	
Presentaiotn of proposal to DNP team and Stakeholders																	
Submission to UH IRB																	
Initiation of the Project																	
Duration of Project																	
Data Collection/Final Writing																	
Presentation of Final Results																	
Anticipated Graduation																	

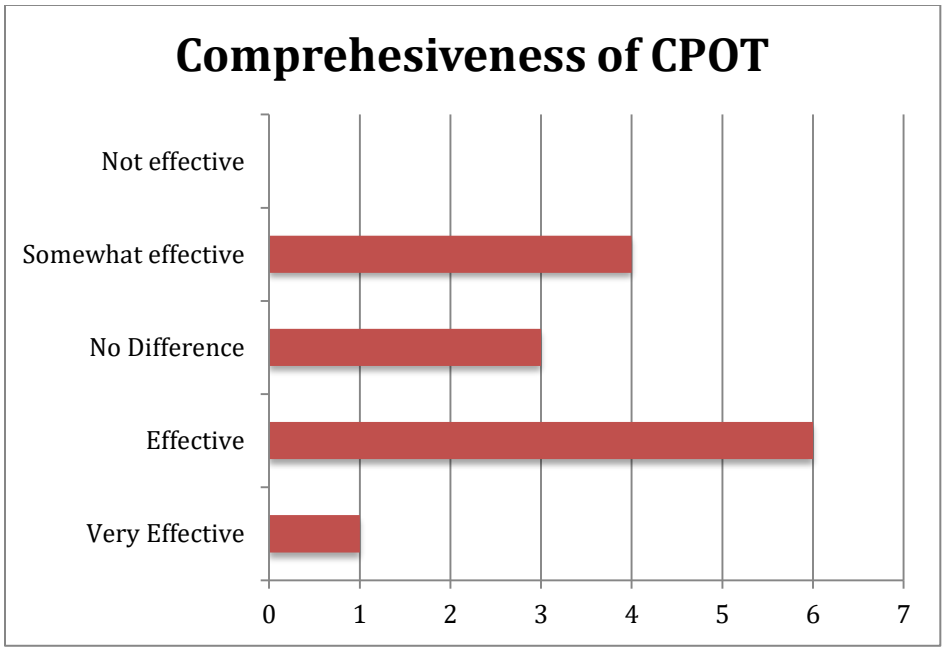
Appendix K

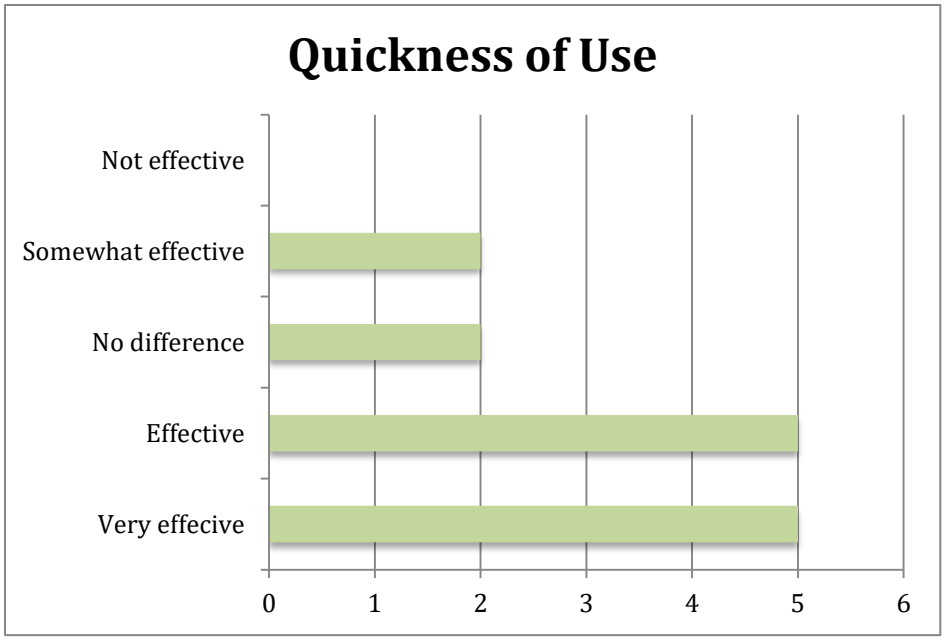
Project Budget

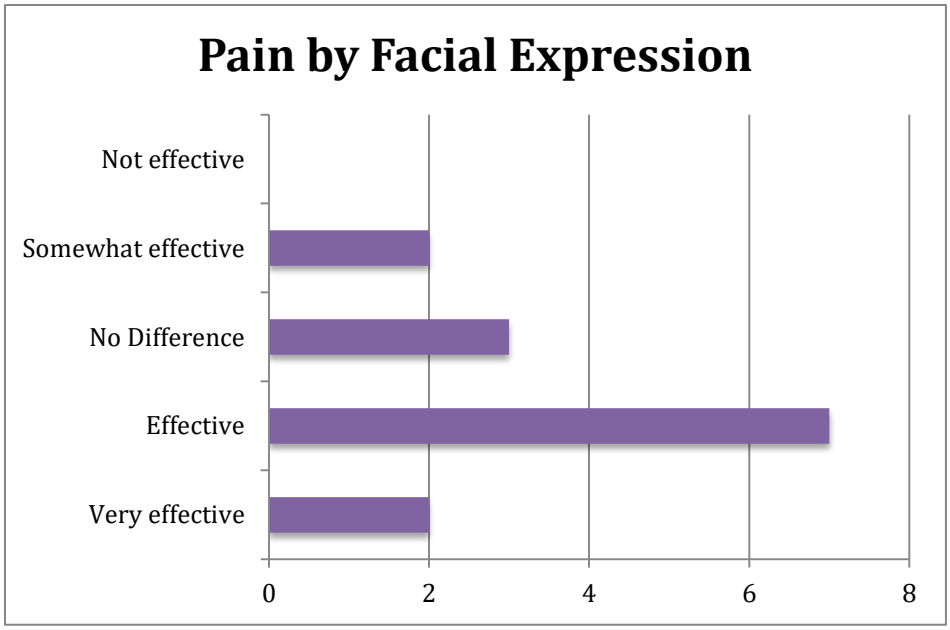
Product	Cost
8.5” x 11” copy paper 500 count	$7.49
Custom lamination	$11.71
Clasp and moistenable glue catalog envelopes: 100 count	$21.09
Digital safe- electronic, extra large, steel, keypad, 2 manual override key and safe	$69.99
Refreshments	$19.99
Total	$147.06

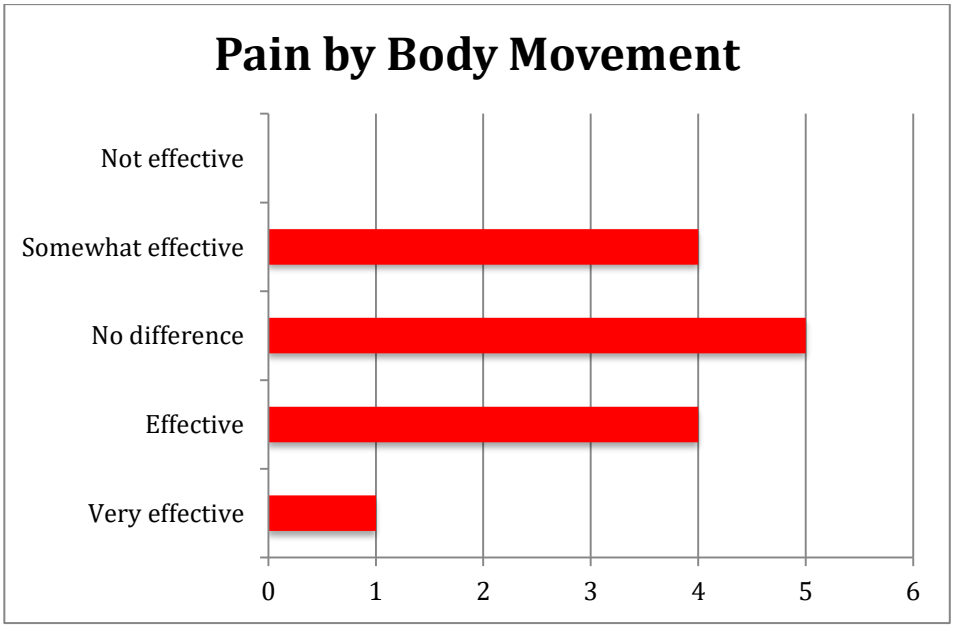
Appendix L

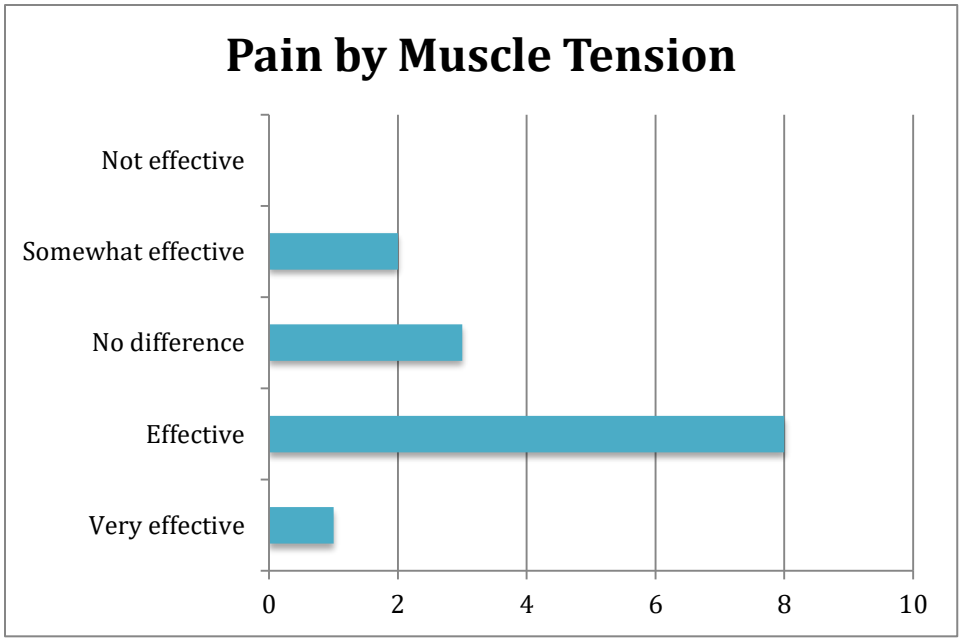
Bar Graphs

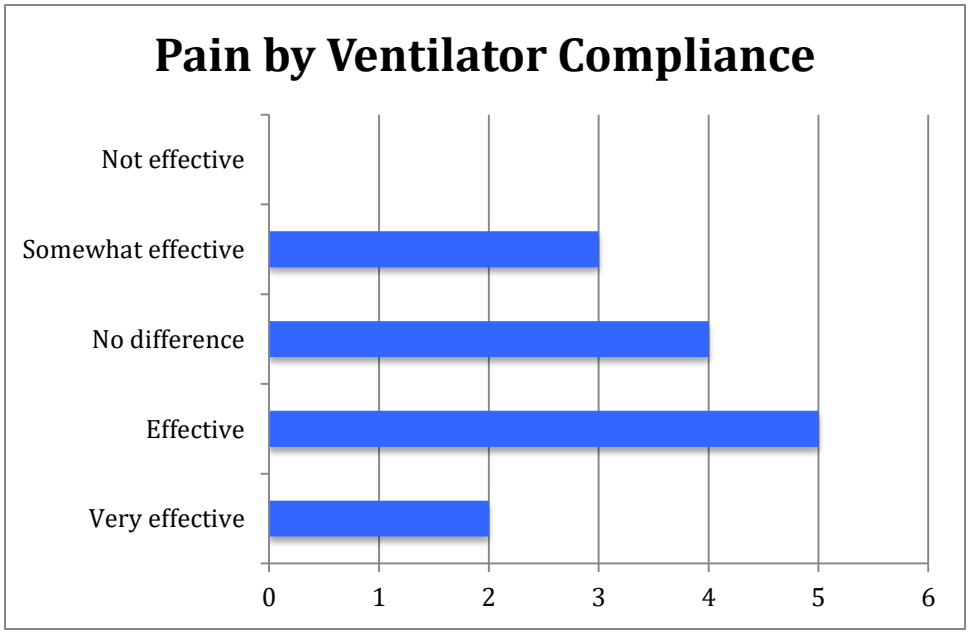


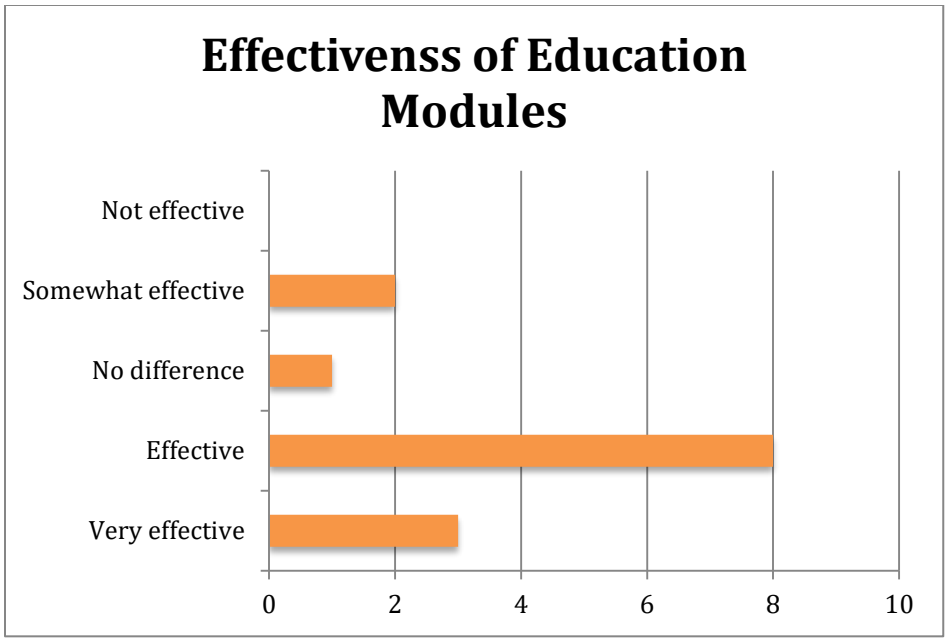



Pain by Facial Expression
Not effective
Somewhat effective
No Difference
Effective
Very effective
0
2
4
6
8


Pain by Body Movement
Not effective
Somewhat effective
No difference
Effective
Very effective
0
1
2
3
4
5
6

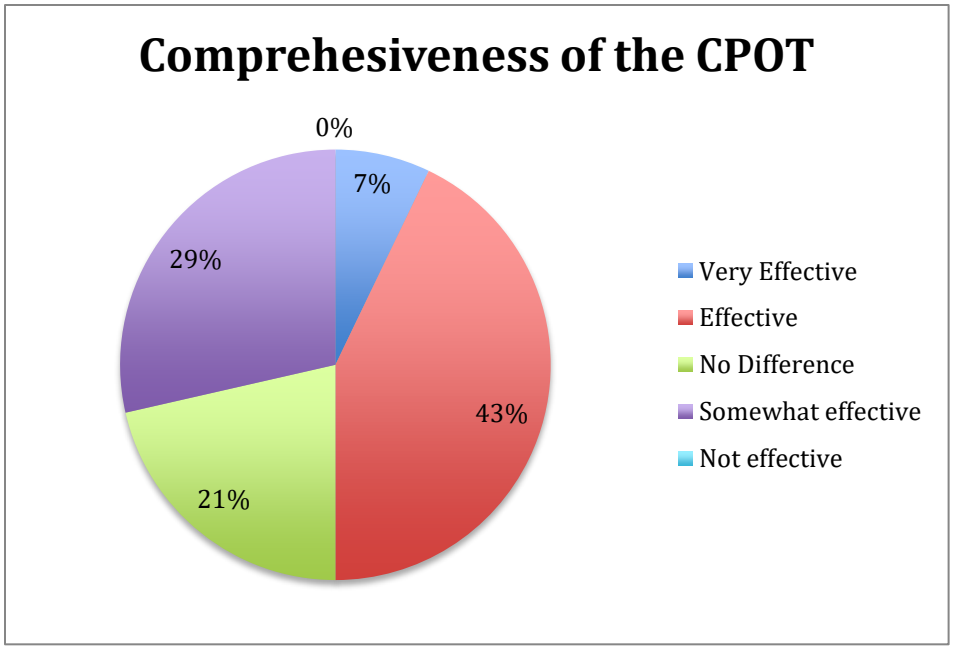

Pain by Muscle Tension
Not effective
Somewhat effective
No difference
Effective
Very effective
0
2
4
6
8
10

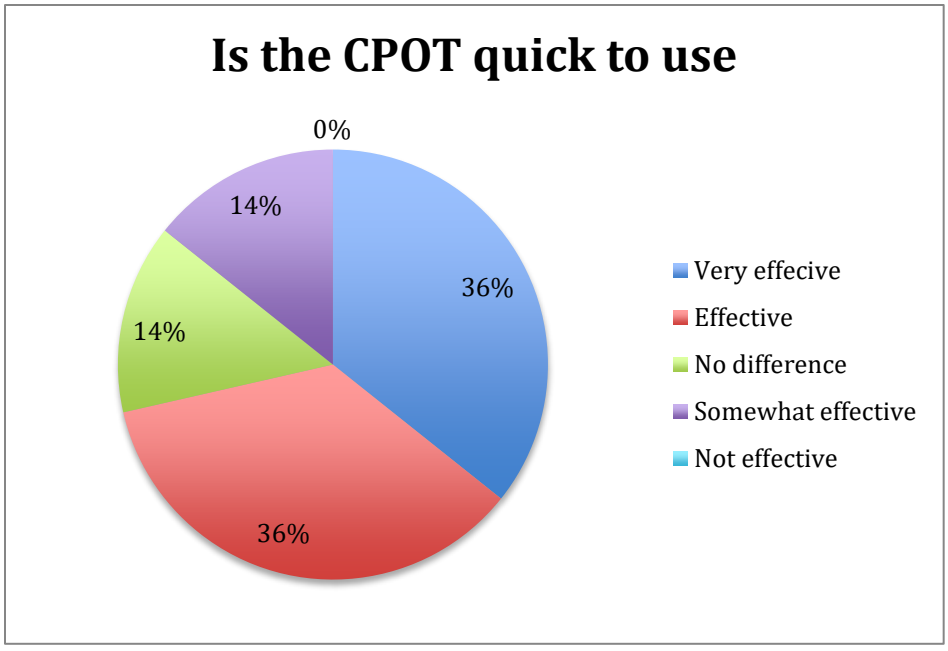

Pain by Ventilator Compliance
Not effective
Somewhat effective
No difference
Effective
Very effective
0
1
2
3
4
5
6

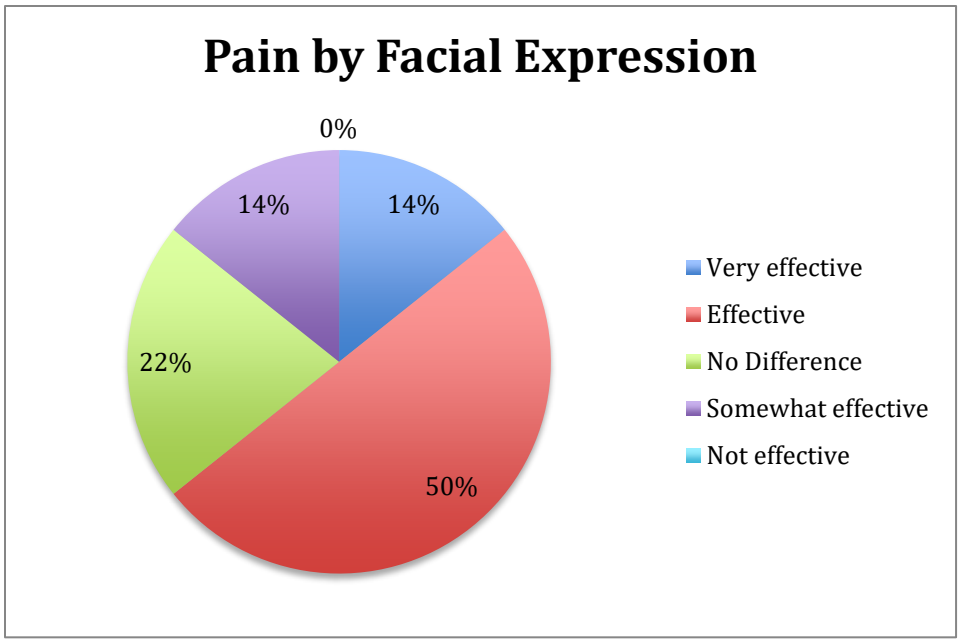

Effectivenss of Education Modules
Not effective
Somewhat effective
No difference
Effective
Very effective
0
2
4
6
8
10

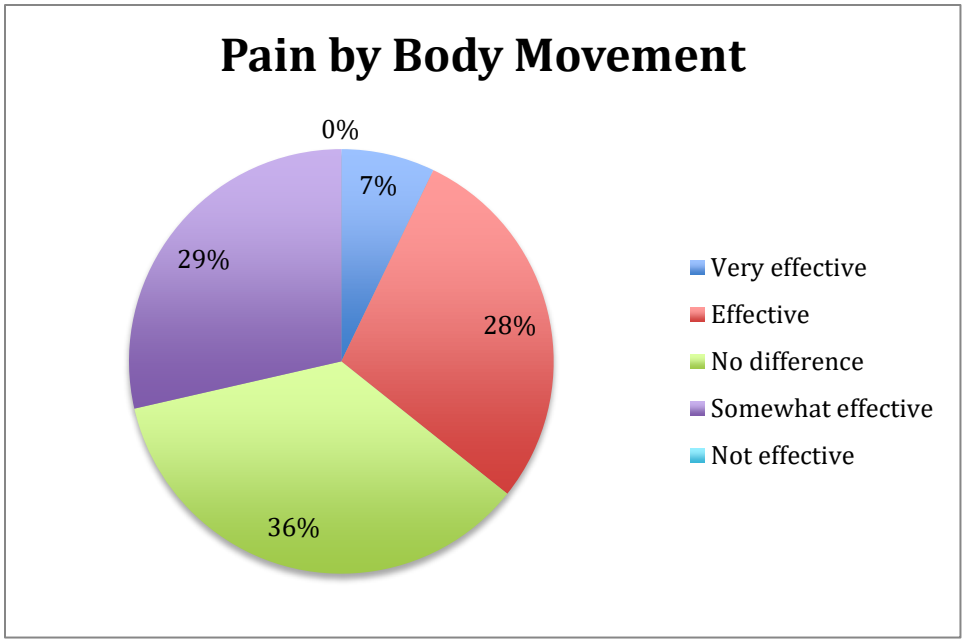
Appendix M

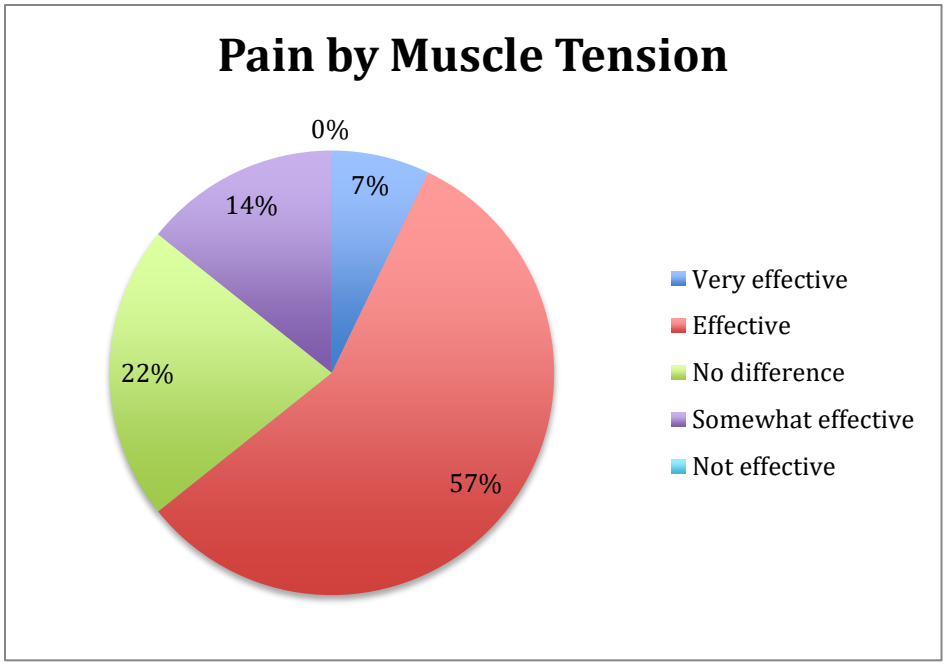
Pie Charts

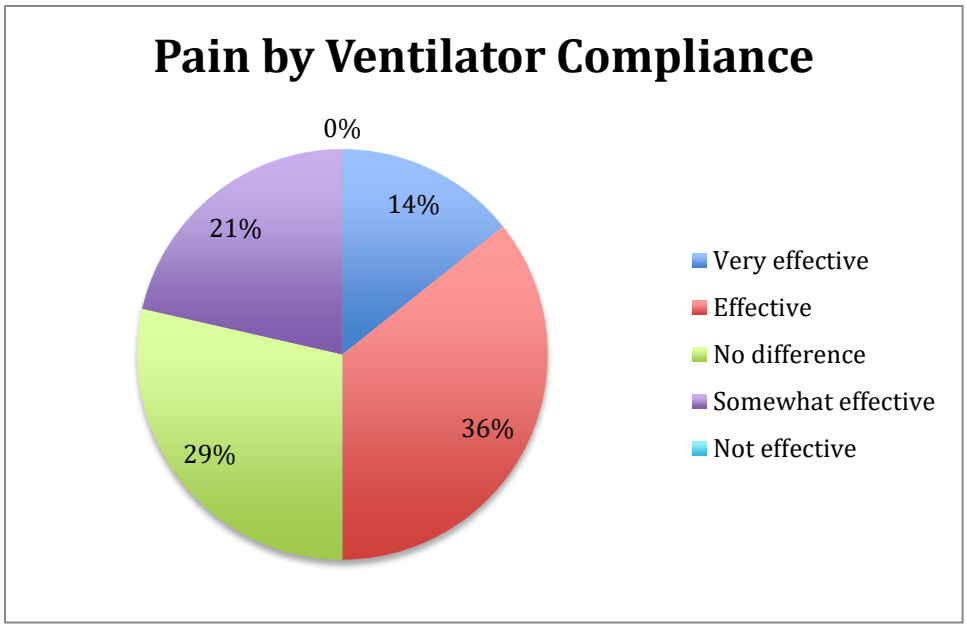


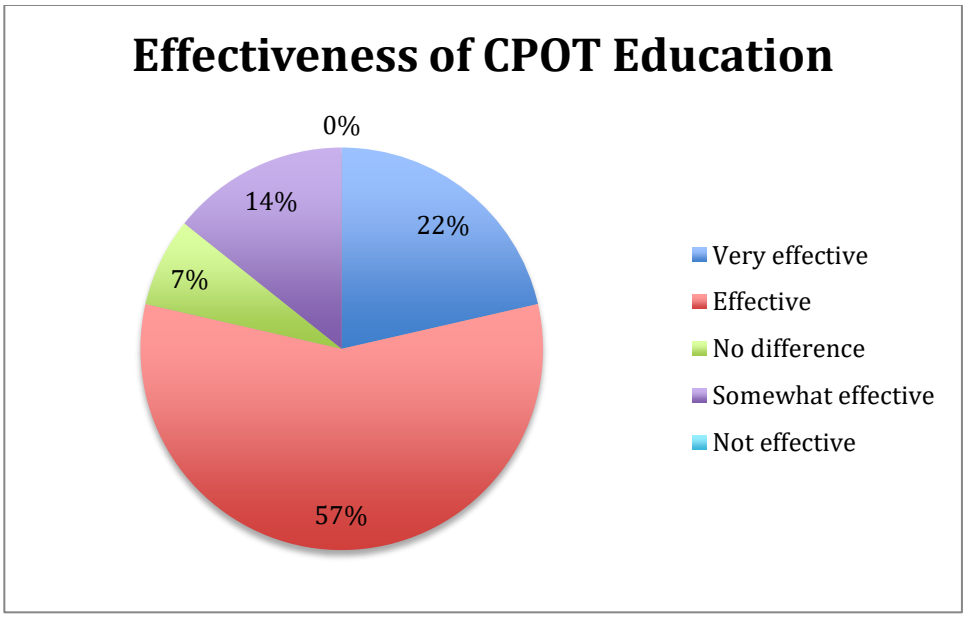



Pain by Facial Expression
0%
14%
14%
22%
50%
Very effective
Effective
No Difference
Somewhat effective
Not effective


Pain by Body Movement
0%
7%
29%
28%
36%
Very effective
Effective
No difference
Somewhat effective
Not effective


Pain by Muscle Tension
0%
7%
14%
22%
57%
Very effective
Effective
No difference
Somewhat effective
Not effective


Pain by Ventilator Compliance
0%
14%
21%
36%
29%
Very effective
Effective
No difference
Somewhat effective
Not effective


Effectiveness of CPOT Education
0%
14%
22%
7%
57%
Very effective
Effective
No difference
Somewhat effective
Not effective

Appendix N

Cumulative Responses