E-ISSN: 2583-9667
Indexed Journal
Peer Reviewed Journal
https://multiresearchjournal.theviews.in

Received: 18-05-2025
Accepted: 25-06-2025

INTERNATIONAL JOURNAL OF ADVANCE RESEARCH IN MULTIDISCIPLINARY

Volume 3; Issue 3; 2025; Page No. 182-185

Pain Evaluation in Critical Care: CPOT and Bps - A comparative study

[1]Yogalakshmi S and [2]Sasikala Dakshinamoorthy

[1]Associate Professor, Medical Surgical Nursing, Anurag University, Hyderabad, Telangana, India
[2]Professor Cum HOD, Fundamentals of Nursing, Apollo College of Nursing, Chennai, Tamil Nadu, India

DOI: https://doi.org/10.5281/zenodo.16785583

Corresponding Author: Yogalakshmi S

Abstract

Background: The assessment of prognosis in critically ill patients is crucial for the intensive care units (ICU) ability to provide high-quality care. Many patients in the ICU experience pain, leading to considerable suffering and potentially resulting in long-term consequences such as chronic pain and post-traumatic stress disorder. Instruments such as the Critical Care Pain Observation Tool and the Behavioral Pain Scale play a vital role in assessing pain in patients who are unable to express their discomfort verbally. The study's objective was to compare the scales and find which scale helps to measure pain accurately.
Methods: This study was conducted using the comparative research design among 100 ICU patients, who were selected by consecutive sampling technique at intensive care unit of selected hospitals, Chennai. Pain assessment was done using critical care pain observation tool and behavioral pain scale simultaneously to identify the severity of pain from the patients on mechanical ventilation admitted in ICUs.
Results: Pain Assessment showed significant difference in perceived pain at rest based (2 ±3.34 & 4.3±0.7), during invasive procedure (5.01±2.34 & 6.4±2.1) using CPOT and BPS respectively. But there was no significant difference in perceived pain during non-invasive procedures based on CPOT (3.5±2.3) and BPS (5.28 ±2.05). There was a moderate to strong correlation between the CPOT and BPS pain assessment scale $p<0.01$ during rest, invasive procedure and non-invasive procedure. The ROC curve depicts that there is more area under the curve is observed in the CPOT (0.25) than in BPS (0.209).
Conclusion: The findings indicate that the CPOT scale demonstrates greater efficacy than the BPS in evaluating pain levels in critically ill patients who are receiving mechanical ventilation.

Keywords: CPOT, BPS, Mechanical Ventilator, Invasive Procedure, Non-invasive procedure, ICUs

Introduction

Pain, an unpleasant sensory and emotional experience, can vary in intensity from merely bothersome to severely incapacitating, often manifesting as a sharp stab or a dull ache. It is frequently characterized by sensations such as throbbing, pinching, stinging, burning, or soreness. In critically ill patients, the experience of pain presents a significant challenge, with estimates indicating that around 30% to 50% of individuals in intensive care units (ICUs) endure moderate to severe pain. If pain is not adequately managed, it can result in negative consequences, including multisystem complications and the development of chronic pain, which can be severely debilitating. The first step toward effective pain management involves a comprehensive assessment. To aid in this process, a variety of objective pain measurement tools have been developed specifically for assessing pain in nonverbal adult patients in ICUs. Prominent examples of these assessment tools include the evaluation of facial expressions (FE), the Critical-Care Pain Observation Tool (CPOT), the nonverbal pain scale, as well as the Faces, Legs, Activity, Cry, and Consolability scale (FLACC), and the Behavioral Pain Scale (BPS) [1]. Evaluating pain in patients within the Intensive Care Unit (ICU) presents a significant challenge for healthcare teams, particularly for those who are intubated, receiving mechanical ventilation, or under sedation. This complexity is further compounded by the presence of neurological and psychiatric conditions, including aphasia, dementia, delirium associated with critical illness, and various psychoses [2, 3]. It is essential that pain assessment and management in ICU settings be prioritized, necessitating routine monitoring, thorough assessment, ongoing reassessment, and meticulous documentation to enhance treatment efficacy and facilitate communication among healthcare professionals [4]. Accurately assessing pain in patients who cannot verbally express their discomfort is

particularly challenging, and numerous studies indicate that pain levels are often underestimated in critically ill patients who are unable to communicate [5]. There is a notable absence of standardized protocols for pain assessment and management in clinical practice. Limited research conducted in India has demonstrated that implementing pain control protocols can effectively manage pain in ICU patients. Consequently, this study aims to compare existing pain assessment tools, specifically the Critical-Care Pain Observation Tool (CPOT) and the Behavioral Pain Scale (BPS), to evaluate their suitability and effectiveness for patients on mechanical ventilation.

Statement of the Problem

A Comparative Study Between Critical Care Pain Observation Tool and Behavioral Pain Scale for Pain Assessment among Patients on Mechanical Ventilation at Selected Tertiary Care Centre, Chennai.

Objectives of the study

1. To assess and compare the level of pain using critical care pain observation tool and behavioral pain scale among patients on mechanical ventilation.
2. To determine the correlation between critical care pain observation tool score and behavioral pain scale score at rest, during selected invasive procedure and non-invasive procedure among patients on mechanical ventilation.

Materials and Methods

An observational analytical cross-sectional study was conducted involving patients aged 18 to 65 years who were admitted to the ICU and unable to self-report their pain, with an expected ICU stay of more than 12 hours. Patients with progressive neuromuscular disorders, those who were paralyzed, and individuals who were conscious were excluded from participation. The sample size was calculated based on parameters of $\alpha = 0.05$, a power of 80%, and an effect size of 0.05, leading to a total sample size of 100, which included a 10% allowance for attrition to improve the study's generalizability. After obtaining approval from the institutional ethics committee and securing written consent from the patients' relatives, a trained nurse employed two assessment scales to evaluate all eligible patients at their bedside over the course of the one-month study period.

Demographic and clinical information of the patients was gathered for analysis. Pain levels were assessed using a checklist aligned with the BPS [6] and CPOT [7] pain assessment scales during various conditions, including noninvasive procedures (such as changes in body position), invasive procedures (like secretion suctioning), and while the patients were at rest (without any therapeutic interventions). The BPS scale evaluates three primary components: facial expression, upper limb movement, and vocalizations in both non-intubated patients and those on mechanical ventilation. Pain is categorized on this scale from 3 to 12, with classifications indicating no pain (3), mild pain (4–6), moderate pain (7–9), or severe pain (10–12). Scores of 6 or higher suggest moderate to severe pain, necessitating intervention. The CPOT scale incorporates four key components, which, in addition to the BPS elements, also assesses muscle tone. Pain levels are classified as painless (0), mild (0–3), moderate (3–6), or severe (6–8), with both minimum and maximum pain levels determined by the scores obtained. The pain scores derived from both scales were compared and analyzed for correlation. The data collected was processed using SPSS version 20, employing both descriptive and inferential statistical methods.

Results and Discussion

This study comprised of 58% male patients and 42% female patients, 55% admitted for medical management, 31% had neurologic disorder and 55% were intubated for low GCS, with the mean scores for age (53 ±15), no of tubes/ catheters (4 ±1.43), no. of ventilator days (1±0.49), SOFA Score (8±3) and GCS (2±0.43). Majority of the patients had mild pain at rest as rated using both pain scales i.e., CPOT (68%) and BPS (53%). During invasive procedures 43% and 48% of the patients reported moderate pain as per CPOT (43%) and BPS (48%) respectively. 35% of the patients perceived no pain in COPS and 58% the patients reported mild pain in BPS.

The findings shows a significant difference in perceived pain at rest (2 ±3.34 & 4.3±0.7), during invasive procedure (5.01±2.34 & 6.4±2.1) using CPOT and BPS respectively as in table 1. But there was no significant difference in perceived pain during non-invasive procedures based on CPOT (3.5±2.3) and BPS (5.28 ±2.05). Similar study revealed BPS score in sedated patients during rest (3.7 ± 0.5) and during painful procedure (5.2±1.1). The BPS facial expression score recorded during painful procedures was 2.4±0.9, whereas during rest, it was 1.0±0.2. The findings of the study indicated that the BPS is an effective scale for detecting variations in pain response and successfully differentiates between painful and non-painful procedures [8].

Table 1: Comparison between CPOT and BPS for Pain Assessment among Patients on Mechanical Ventilator

Observations	CPOT		BPS		t value	p-value
	Mean	SD	Mean	SD		
At rest	2	2.34	4.3	0.7	3.284	0.001
Invasive procedure	5.01	2.34	6.4	2.1	2.689	0.007
Non-Invasive procedure	3.5	2.3	5.28	2.05	0.137	0.89

The present study result (table 2) shows moderate to high levels of correlation ($p<0.01$) and association ($p<0.01$) between CPOT and BPS pain score at rest, during invasive procedure and during non-invasive procedure. Similarly, Gruszka *et al.* conducted a study to evaluate the effectiveness of the BPS and CCPOT scales in measuring pain in patients with varying levels of sedation among 81 mechanically ventilated and sedated individuals in the ICU. A total of 1005 assessments were carried out using the BPS and CPOT scales by three trained observers, who performed evaluations three times daily-during rest, during painful nursing procedures, and following these interventions. The findings revealed a significant increase in pain indicators ($p<0.001$) during the interventions for patients assessed with both scales, and a robust correlation was observed between the results of the two scales at every phase of the study [9]. In a study conducted by Severgini *et al.*, which aimed to compare the CPOT and BPS scales for evaluating pain in critically ill patients, both conscious and unconscious, it was

observed that the scores for CPOT and BPS increased during nursing interventions in the ICU, with a significant correlation between the two. These results align with our own findings, which also demonstrated a strong correlation between the scores of the BPS and CPOT scales. While both scales are applicable for measuring pain intensity, the BPS scale exhibited greater specificity at 91.7% compared to the CPOT's 70.8%. However, the CPOT was found to be more sensitive, with sensitivity rates of 76.5% for CPOT versus 62.7% for BPS [10].

Table 2: Correlation and Association between Pain Perceived based on CPOT and BPS for Pain Assessment among Critically ill Patients.

Observations (CPOT vs BPS)	'r 'value	'p' value
At rest	0.7	(p<0.05)
During invasive procedure	0.7	(p<0.05)
During non-invasive procedure	0.6	(p<0.05)

The figure 1 and table 3 shows that the area under the curve is more in CPOT (0.26) than in BPS (0.21). It shows that the CPOT scale is more effective than the BPS to assess the pain in the critically in patients who all are intubated. So CPOT pain assessment scale discriminates the level of pain perceived better than the BPS. The findings of this study are corroborated by research involving pain assessment through the Critical-Care Pain Observation Tool (CPOT) among 63 critically ill Chinese adults on ventilators. This assessment was conducted by two independent raters at rest and during two specific procedures: a nociceptive procedure (turning) and a non-nociceptive procedure (measuring non-invasive blood pressure). A total of 12 assessments were performed. The results indicated a significantly higher CPOT score during the nociceptive procedure, demonstrating strong discriminant validity. This suggests that the CPOT is a reliable and valid tool for pain assessment in critically ill adults on ventilators [11].

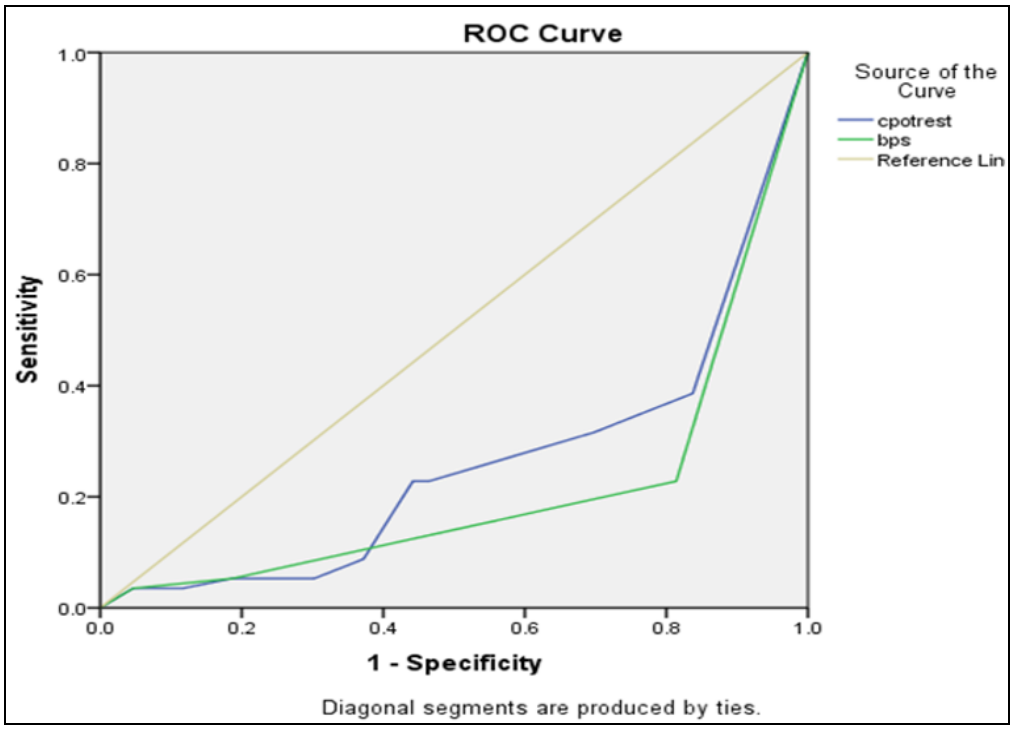

Fig 1: ROC curve to compare CPOT and BPS pain assessment scale

Conclusion

This study results projects that BPS is a sensitive scale for capturing pain response and Critical Pain Observation scale distinguishes pain among patients during painful procedures such as endotracheal intubation better than the Behavioural Pain Scale.

Acknowledgement

I would like all the research participants of this study and all who helped me directly and indirectly in the conduction of the study.

Conflict of Interest: No conflict of interest.

References

1. Gélinas C. Pain assessment in the critically ill adult: Recent evidence and new trends. Intensive and Critical Care Nursing. 2016;34:1–11.
2. Kotfis K, Zegan-Barańska M, Szydłowski Ł, Żukowski M, Ely EW. Methods of pain assessment in adult intensive care unit patients – Polish version of the CPOT (Critical Care Pain Observation Tool) and BPS (Behavioral Pain Scale). Anaesthesiology Intensive Therapy. 2017;49(1):66–72. doi:10.5603/AIT.2017.0010. PMID: 28362033.
3. Kotfis K, Strzelbicka M, Zegan-Barańska M, Safranow K, Brykczyński M, Żukowski M, *et al*. Validation of the Behavioral Pain Scale to assess pain intensity in adult, intubated postcardiac surgery patients: A cohort observational study – POL-BPS. Medicine (Baltimore). 2018;97(38):e12443. doi:10.1097/MD.0000000000012443.
4. Aljumah MI, Aboshoushah EF, Coric D, *et al*. Assessment and management of pain in the intensive

care unit. The Egyptian Journal of Hospital Medicine. 2018;73(4):6439–6445.
5. Marmo L, Fowler S. Pain assessment tool in the critically ill post-open heart surgery patient population. Pain Management Nursing. 2010;11:134–140.
6. Batalha LM, Figueiredo AM, Marques M, Bizarro V. Adaptação cultural e propriedades psicométricas da versão Portuguesa da escala Behavioral Pain Scale - Intubated Patient (BPS-IP/PT). Revista de Enfermagem Referência. 2013;3(9):7–16.
7. Gélinas C, Fillion L, Puntillo KA, Viens C, Fortier M. Validation of the Critical-Care Pain Observation Tool in adult patients. American Journal of Critical Care. 2006;15(4):420–427. PMID: 16823021.
8. Kirankumar DH. Behavioural pain scale to assess pain in sedated and conscious patients. International Journal of Medical and Biomedical Studies. 2019;3:31–34.
9. Wojnar-Gruszka K, Sega A, Płaszewska-Żywko L, Wojtan S, Potocka M, Kózka M. Pain assessment with the BPS and CCPOT behavioral pain scales in mechanically ventilated patients requiring analgesia and sedation. International Journal of Environmental Research and Public Health. 2022;19(17):10894. doi:10.3390/ijerph191710894.
10. Severgnini P, Pelosi P, Contino E, Serafinelli E, Novario R, Chiaranda M. Accuracy of Critical Care Pain Observation Tool and Behavioral Pain Scale to assess pain in critically ill conscious and unconscious patients: Prospective, observational study. Journal of Intensive Care. 2016;4:1–8.
11. Li Q, Wan X, Gu C, Yu Y, Huang W, Li S, Zhang Y. Pain assessment using the Critical-Care Pain Observation Tool in Chinese critically ill ventilated adults. Journal of Pain and Symptom Management. 2014;48(5):975–982. doi:10.1016/j.jpainsymman.2014.01.014.