Novelty Journals

ISSN 2394-7330

International Journal of Novel Research in Healthcare and Nursing
Vol. 7, Issue 3, pp: (22-27), Month: September - December 2020, Available at: www.noveltyjournals.com

Comparison between Three Alternative Pain Assessment Methods among Unconscious Patient

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Abstract: **Most of critically ill adult patients experience remarkable pain during hospitalization. In the intensive care unit (ICU), more than 30% of patients had significant pain at rest, and more than 50% have significant pain during daily routine care. Untreated pain affects the patient's organs functions', quality of life, and well-being. The aim of study is to compare between three alternative pain assessment methods among unconscious patients. Non-experimental, correlational comparative design was utilized to achieve the aim of the study and answer research questions.60 patients were included in this study. Data were obtained through two four main tools structural interview questions, behavioral pain scale (BPS), critical pain observation tool (CPOT) and nociception coma scale (NCS). Methods: data were collected over a period of six months from beginning of May 2018 to November 2018. Results: The findings show the behavioral pain scales critical pain observation tool (CPOT) and behavioral pain scale (BPS) are more valid than nociception coma scale (NCS) at pain assessment in mechanically ventilated (non-verbal) critically ill patients. Conclusion: Self-reporting remain the gold standard for the pain perception and assessment in mechanically ventilated patients. The study recommended the utility of behavioral pain scale and critical pain observation as a daily pain assessment scales. The study serves for further research to establish gold standard for pain assessment so pain can be appropriately managed.**

Keywords: **Pain, Unconscious, Assessment methods, scales, critically ill, nonverbal.**

1. INTRODUCTION

The International Association for the Study of Pain "IASP" in 2017 updated the definition of pain as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage". The sensory process of discovering the "actual or potential tissue damage" is called nociception Pain management in critically ill patients is a complicated process, but related to the clinical assessment of pain. Pain is high1y underestimated a1though it seems to be the patients' worst memory in intensive care unit (Kyranou & Puntillo, 2012).

On January 1, 2018, The Joint Commission carry out new and revised pain assessment and management standards for accredited hospitals The new and revised pain assessment and management standards are found in the Leadership; Medical Staff; Provision of Care, Treatment, and Services; and Performance Improvement chapters of The Joint Commission hospital accreditation manual. The standards seek a Joint Commission accredited hospital to establish policies and procedures that ensure clinical assessment of pain and treatment or referral for treatment based on patient's population and scope of services provided by the organization. (Joint Commission International, 2018)

Pain management in critically ill patients is a complex process, but relevant to the clinical Assessment. Pain is highly underestimated although it seems to be the patient's worst memory in intensive care unit (ICU) even after 5 years from ICU discharge. The perception of pain in ICU patients is mainly associated with respiratory therapy, positioning of

nasogastric tube, venous and arterial catheters, and lack of mobilization. However patients are usually unable to self-report their pain due to sedative drugs, intubation and other barriers likely leading to its underestimation. (Gelinas, 2007**)**

Untreated acute pain in adult ICU patients can lead to host of negative outcomes including sleep disturbances, increased anxiety and fear, and disorientation. Furthermore, pain decreases patient cooperation with various care procedures designed to promote healing such as turning and physical therapy. These factors and more may delay patients' recovery time as the physiologic responses to pain inhibit the body's ability to react positively during the healing process Heart rate and blood pressure increase, tissue perfusion is impaired therefore decreasing oxygen delivery, hyperventilation occurs, and other compensatory mechanisms kick in as the body is stressed due to the presence of pain. In addition to this, unmanaged pain patients are at an increased risk for developing chronic pain and post-traumatic stress disorder (PTSD) related to their hospitalization which can have a severe impact on their long-term health and quality of life even after recovering from their initial injury or illness (Asmundson & Katz, 2009).

Several pain scales have been used to document self-reporting of pain in intubated patients. In the absence of a patient's self-report, observable behavioral and physiological indicators become important indices for the assessment of pain. The Behavioral Pain is an observational scale developed by Payen et al in 20001 to assess pain among unconscious, mechanically ventilated patients. The BPS is consists of a sum of scores based on three items, facial expression, upper limb movement and compliance with ventilation. The BPS provides descriptions of different behaviors which may observe and assigns a score to each one.

The Critical Care Pain Observation Tool (CPOT) was developed by Gélinas et al in 2006 written in French and has been developed in Canada. Due to its usefulness, increased interest in using CPOT is also growing in other countries to measure behavioral indicators of pain in critically ill patients; specifically, patients unable to communicate their pain. The tool comprises four behavioral categories: facial expression, body movements, muscle tension, and compliance with the ventilator for mechanically ventilated patients, or vocalization for extubated patients. Each category is scored on a scale of zero to two, with a possible total score ranging from zero to eight.

The Nociception Coma Scale (NCS) is pain observation tool, developed by Schnakers at 2009 for patients with disorders of consciousness. The NCS rates four behavioral responses to pain on a 4-point-scale: motor response (Localization of noxious stimulation, Flexion withdrawal, Abnormal posturing and None/flaccid), verbal response (Verbalization, Vocalization, Groaning and None), visual response (Fixation, Eye movement, Startle and None) and facial expression (Cry, Grimace, startle response and None). The minimum pain score is zero and the maximum pain score is twelve.

SIGNIFIGANCE OF THE STUDY:

Despite great evidence of adverse clinical impact, pain still remains infrequently assessed and poorly managed in the intensive care unit (ICU). Pain has serious physical and psychological effects, and can impair patient recovery and discharge. Pain relief is also an ethical and professional responsibility of doctors and nurses. Unrelieved pain activates the pituitary-adrenal axis, which can suppress the immune system and have negative effects on the cardiovascular, gastrointestinal, and renal systems. Pain may be due to medical and nursing procedures, and the ICU environment. (Chanques, 2006) So that,

AIM OF THE RESEARCH:

Is to compare between three alternative pain assessment scales The Behavioral Pain Scale (BPS) and the Critical Care Pain Observation Tool (CPOT) with a new scale developed to assess nociception in disorders of consciousness Nociception Coma Scale (NCS) searching for the most valid behavioral pain assessment scale.

RESEARCH QUESTIONS:

The research questions were addressed in study are:

1. What is the most valid pain assessment scale for unconscious mechanically ventilated patients?
2. What are the differences between three alternative pain assessment scales?

ETHICAL CONSIDERATION:

Ethical approval obtained from the scientific ethical committee of Helwan University. IN addition written informed consent was obtained from the next of kin or the patient's legal guardian. To maintain anonymity and guarantee confidentiality, all participants were identified by a code number that was maintained throughout the study. During the daily routine procedures (blood pressure measuring and Endotracheal suctioning), the researcher measuring the pain with behavioral assessment scales. These routine nursing procedures would be done despite the research project.

DESIGHN:

This study followed non-experimental, correlational comparative design. The correlational structure for study evaluated the variables of pain scores at non-noxious stimuli (non-invasive blood pressure measuring) and at noxious stimuli (Endotracheal suctioning). Through correlational design the strength and validity of three pain assessment tools in identifying the presence of pain were evaluated. The correlational and comparative methods were utilized and served to explore non-experimental relationship since experimental manipulation of variables not ethically feasible in human subjects.

SETTING:

The study was conducted in General intensive care unit at Alexandria university students' hospital in Egypt which present in the second floor and composed of 10 beds with 5 mechanical ventilators.

PILOT STUDY:

A pilot study carried out on 10% of the patients to test applicability, clarity, relevance and simplicity of the tools, to identify the difficulties that may be faced during the application.

CONTENT VALIDITY:

It ascertained by a jury of expertise from medical and nursing staff (3 expertise), to review the tool for clarity, relevance and comprehensiveness.

2. METHODS

This study followed non-experimental, correlational comparative design. The correlational structure for study evaluated the variables of pain scores at non-noxious stimuli (non-invasive blood pressure measuring) and at noxious stimuli (Endotracheal suctioning). Through correlational design the strength and validity of three pain assessment tools in identifying the presence of pain were evaluated. Including 60 patients from General intensive care unit at Alexandria university students' hospital who fulfilled the following criteria:

Inclusion criteria:

1. Age ≥ 20 years
2. Showing no motor or verbal communication
3. GCS (4-10)
4. Mechanically ventilated patient.

Exclusion criteria:

1. Quadriplegia
2. Severe polyneuropathy
3. Treatment with neuromuscular blocking agents
4. Neurological disease that resulted in a score <4in the motor section of the Glasgow Coma Scale (GCS)
5. All these conditions resulted in study exclusion as they had the potential to alter a patient's behavioral responses to pain.

The study was approved by the scientific ethical committee of Helwan University and written informed consent was obtained from the next of kin or the patient's legal guardian.

PROCEDURE:

The data collected with the three pain observational tools behavioral pain scale (BPS), critical pain observation tool (CPOT) and nociception coma scale (NCS) as well as utilizing structural interview questions that assessed for every patient before pain assessment. The data were collected by the investigator. Pain on the three pain assessment scales were measured during non-painful nursing intervention (non-invasive blood pressure measuring) and during routine nursing intervention known to be painful (endotracheal suctioning). The painful procedure assessment conducted after 5 minutes at least apart from non-painful nursing procedure assessment.

3. RESULTS

The study included 60 patients Majority of them were females and mean age 41 years old. The most frequent past medical history were diabetes mellitus and hypertension and most frequent present medical diagnosis is road traffic accident followed by septic shock. All patients were mechanically ventilated, moderate consciousness (GCS=7) and mildly sedated (Ramsey score=3)

At The critical-care pain observation tool (CPOT), during blood pressure measuring, the percentage of facial expression categories was 70%, 30% and 0% for relaxed, tense and grimacing respectively while during suction the percentage was 0%, 23% and 76.7% respectively. As regards to body movements, the percentage of absent movements, protection and restlessness was 96.7%, 3.3% and 0% during B.p measuring respectively, on the other hand, during suction the percentage was 31%, 55% and 13% respectively. Accordingly, the percentage of Tolerating ventilator, Coughing but tolerating and fighting ventilator was 86.7%, 13.3% and 0% during B.p measuring respectively and during suctioning, the percentage became 8.3%, 78.3% and 13.3% respectively. There were significant differences between the two periods (During B.p measuring and suctioning) as regards to all parameters of CPOT.

At Behavioral pain scale (BPS), the percentage of facial expression components was 66.7%, 30.0% 3.3% and 0.0% for Relaxed, Partially tightened, Fully tightened and Grimacing During blood pressure measuring respectively, while during suction, the percentage was 3.3% 3.3%, 18.3% and 75.0% respectively. With respect to upper limb parameters, the percentage of No movement, partially bent, fully bent with finger flexion and permanently retracted was 86.7%, 13.3%, 0.0% and 0.0% respectively during blood pressure measuring, nevertheless, during suction the percentage was 31.7%, 48.3%, 16.7% and 3.3% respectively.

The percentage of mechanical ventilation compliance parameters were 86.7%, 13.3%, 0.0% and 0.0% for Tolerating movement, Coughing but tolerating ventilation for the most of time, Fighting ventilator and Unable to control ventilation respectively during blood pressure measuring respectively, while during suction, the percentages were 5.0%, 81.7%, 13.3% and 0.0% respectively. There were significant statistical differences between the two periods (During B.p measuring and suctioning) as regards to all components of BPS.

At Protocol of nociception coma scale, during B.p measuring the percentage of motor response category was 90.0%,0.0%,10.0% and 0.0% for None/flaccid, Abnormal posturing, Flexion withdrawal, and Localization of noxious stimulation respectively while during suction the percentage was 28.3%, 0.0%, 20.0 and 51.7% respectively. As regards to Verbal response, the percentage of None, Groaning, Vocalization and Verbalization (intelligible) was 96.7%, 3.3% and 0% during B.P measuring respectively, on the other hand, during suction the percentage was 85%, 13% 1.7% and 0% respectively. Accordingly, the percentage of visual response components namely None, Startle, Eye movement and Fixation was 13%, 21%, 65% and 0% during B.P measuring respectively and during suction, the percentage became 11%, 0% 88% and 0% respectively. Table (5) shows that there were significant differences between the two periods (During B.p measuring and suctioning) as regards to all parameters of Protocol of nociception coma scale, however, significance in vocal response was borderline (p =0.033*).

The higher tool scores change was the behavioral pain scale with mean 242.4±156.8 following with the critical-care pain observation tool with mean 241.7±135.7 then finally Protocol of nociception coma scale 143.1±86.9. Before suction, the

mean CPOT was 9.58 ± 12.47 and the mean BPS was 7.04 ± 9.80 while after suction the mean scors were 55.83 ± 20.52 and 51.67 ± 15.69 respectively. There were significant statistical differences between the two scores before suction, however, significance after suction was borderline.. Also there were significant statistical differences between the scores of the same tool before and after suction.

Before suction, the mean Protocol of nociception coma scale was 22.22 ± 10.48 and the mean BPS was 7.04 ± 9.80 while after suction the mean scores were 52.50 ± 14.17and 51.67 ± 15.69 respectively. There were significant statistical differences between the two scores before suction, but not after suction. Also there were significant statistical differences between the scores of the same tool before and after suction.

4. DISCUSSION

The research results indicate great increase in pain scores at non-painful and painful producer at the behavioral pain scale (BPS) followed by protocol of critical pain observation tool (CPOT) and finally nociception coma scale (NCS).

The behavioral pain scales critical pain observation tool (CPOT) and behavioral pain scale (BPS) are more valid than nociception coma scale (NCS) at pain assessment in mechanically ventilated (non-verbal) critically ill patients. A finding shows that there were significant differences between the two periods (During Blood pressure measuring and during suctioning) as regards to all parameters of Protocol of nociception coma scale, however, significance in vocal response was borderline that decrease validity to the NCS.

The behavioral pain scale (BPS) and critical pain observation tool (CPOT) each has its features and disadvantages. BPS items are simple and easy to use. CPOT items more briefly worded, despite each BPS items having four sub items and CPOT items have three sub items. The difference between these two tools also is that movement's strength in the muscles of the arm and whole body are assessed in the CPOT scale, but only upper limb movements were considered in BPS scale.

5. CONCLUSION

According to the study of patients, Majority of them were females and mean age 41 years old. The most frequent past medical history were diabetes mellitus and hypertension and most frequent present medical diagnosis is road traffic accident followed by septic shock. All patients were mechanically ventilated, moderate consciousness (GCS=7) and mildly sedated (Ramsey score=3). The study conclude that behavioral pain scale and critical pain Observation tool are more valid than nociception coma scale in measuring pain in mechanically ventilated critically ill patients. Self-reporting remain the gold standard for the pain perception and assessment in mechanically ventilated patients.

6. RECOMMENDATION

This study support use of behavioral pain scales in pain perception for mechanically ventilated critically ill patients instead of visual analogue scale. Also support use of behavioral pain scale and critical pain observation tool than nociception coma scale in assessment of pain in mechanically ventilated critically ill patients. This study serves as further research to establish gold standard for pain assessment so pain can be appropriately managed.

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