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Determination of Behavioral Pain Responses During Invasive Nursing Interventions in Unconscious Patients

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Abstract

Background: Pain assessment is the first and the most important step in nursing management and has a direct effect on patient's outcomes. Unconscious patients are often unable to communicate, which make difficulties in pain assessment and management. This study aims to investigate the effect of selected invasive nursing interventions on behavioral pain responses in unconscious patients. A cross-sectional observational study was carried out from 26th September 2024, to 28th May 2025, in the intensive care units at Imam Al-Hussein Medical City and Imam Al-Hassan Al-Mujtaba Teaching Hospital in Holy Kerbala City. A purposive sample consist of 80 unconscious intubated critically ill patients .The data were analyzed using the IBM Statistical Package of Social Sciences Version 26.

Results: The results revealed sever to moderate degree of pain during procedures, mainly endotracheal suctioning (the mean BPS score: 8.7 ± 1.7), with more than one-half (52.5%) of patients suffering from moderate pain and 37.5% from severe pain.

Conclusion: During their stay in the intensive care unit, the unconscious patients on mechanical ventilation were silently experiencing a comparatively high amount of discomfort (p-value= 0.000) during all three procedures.

Keywords: Invasive nursing interventions, Unconscious patients, Behavioral pain responses.

1. Introduction

Pain was determined as a common patient's concerns in the intensive care units (ICUs), with more than seventy-five percent of patients in the ICUs suffering from pain for many reasons e.g., wound managements, chronic illnesses, and invasive nursing care interventions (Emad Bachi & AL-Fayyadh, 2022) . Conscious patients express pain in several ways, however, unable to express pain does not merely that they do not experience pain, such as in unconscious patients (Booker & Haedtke, 2016) . According to the International Society for the Study of Pain (IASP), pain is a prevalent symptom in ICUs and is characterized as a negative, emotional, and sensory experience based on actual or anticipated tissue damage (Pudas-Tähkä et al., 2009) . Patients in the ICUs frequently endure a number of invasive and painful interventions, and because pain is difficult to assess and manage, this has a negative impact on both the time patients stay in the ICUs and how quickly they recover (Booker & Haedtke, 2016) . Approximately 75% of patients admitted to the ICUs experience sever pain, 30% of them have pain even while they are at rest, and 50% of them experience pain during intvasive nursing interventions (Pinheiro & Marques, 2019) .Pain is experienced by intensive care patients for various reasons, including endotracheal suctioning. Critically ill patients experienced mild to moderate pain during various nursing interventions such as change position, and respiratory physiotherapy, and oral care (Gomarverdi et al., 2019) . Among unconscious patients, pain is often ignored because it is difficult to assess and control (do Nascimento & Silva, 2014) , affecting the recovery and health of the patient (Pinheiro & Marques, 2019) . Assessment of pain in unconscious patients is recognized as significant challenge in clinical practices, mainly during invasive nursing procedures. Several studies evaluate pain during the routine patient's care, however fewer investigate high-intensity nursing interventions e.g., removing of chest tube,or insertions of tracheal catheter (Puntillo et al., 2014) . Unlike the conscious patients who can report pain, unconscious patients rely on physiological and behavioral parameters for pain assessment (Gélinas et al., 2006) . Accurate pain assessments help to reduce the durations of mechanical ventilation and lengths of stay in the ICUs, increase adequacy of therapeutic interventions, such as the use of sedatives and analgesics, and facilitate effective care management (Arbour et al., 2011) . Invasive interventions such as endotracheal suctioning affect the perception of pain, hemodynamic parameters, mechanical ventilator values. Pain that is not prevented or addressed causes psychological and physical stress for patients in critical care and is one of the factors that delays their rate of recovery (Azevedo-Santos & DeSantana, 2018) .Various behavioral responses might serve as useful objective indicators for assessing pain. Expressions on the face that may indicate pain include crying, frowning, forehead wrinkles, and grimacing. Pain is also correlated with the movements of patients, particularly during procedures (Raja et al., 2020) . Proper evaluation of pain helps ensure optimal pain control by increasing the therapeutic measures adequacy such as sedation and analgesics use, as well as decreasing patient's hospitalization. Nurses have a responsibility to assist patients controlling their pain, and it is unethical and a failure of professional practice to minimize pain, nurses need to use standardized pain assessment tools, such as the Behavioral Pain Scale (BPS) when patients have no ability to self-report their pain. The BPS examine signs such facial expressions, movements of the upper limbs, and breathing compliance (Pinheiro & Marques, 2019) .

2. Methodology

A cross-sectional observational study design was conducted to investigate the effect of selected invasive nursing interventions on behavioral pain responses in unconscious patients. This study was initiated from 26th September 2024, to 29th May 2025.The study took place in the ICU at Imam Al-Hussein Medical City and Imam Al-Hassan Al-Mujtaba Teaching Hospital in Kerbala, Iraq. Unconscious e.g., mechanically ventilated patients, patients under sedation or in coma are usually found in ICUs, where invasive nursing interventions commonly done. A purposive non-probability sampling method was used in the current study, which involved the adults (≥18 years) unconscious patients (Glasgow Coma Scale ≤ 8, or mechanically ventilated), and those who needing invasive nursing procedures as part of usual care. The sample consisted of 80 patients, the sample size was calculated according to A-priori sample sizes for t-tests. The exclusion criteria of this study included patients who were <18 years old, patients who have had neuropathic conditions such as Myasthenia Gravis, patients with upper limb neuropathy were excluded because these conditions may interfere with behavioral responsivity when using the BPS. Patients with upper limb fractures, those on a heavy anesthetic regimen were also excluded because they may be unable to show any behavioral response which may interfere with the research tool usability and measurement accuracy and study purposes. This study utilized the Behavioral Pain Scale (BPS) created by (Payen et al., 2001) . The BPS is both reliable and valid for evaluating pain in mechanically ventilated and sedated patients in the ICU who are unable to articulate their suffering. The Cronbach's alpha coefficient for the scale demonstrated strong reliability, with a reliability coefficient of 0.79 for the BPS (Payen et al., 2001) . The BPS has three primary domains: facial expression, adherence to mechanical ventilation, and upper limb motions. In each domain, behavioral reactions are rated from (1), signifying the absence of pain, to (4), the highest score indicating the existence of pain. Patients' answers will be evaluated on a scale from 1 to 4 across each domain, yielding a maximum total score of 12, which signifies the highest level of pain (Payen et al., 2001) .The data were gathered via observational methods from November 26, 2024, to January 12, 2025. The intensity of pain was assessed objectively by observing the patient's response utilizing the BPS. Initially, consciousness levels were evaluated using the Glasgow Coma Scale, with patients in the current study exhibiting consciousness levels ranging from 5 to 10. Subsequently, the presence and intensity of pain were assessed in three phases: the first phase involved evaluating patients' pain immediately prior to nursing procedures (without any invasive or therapeutic interventions); the second phase occurred during nursing procedures, which included endotracheal suctioning, arterial blood sampling, and daily oral care. The final part was to assess the patient's pain five minutes following nursing procedures.The data were analyzed utilizing IBM Statistical Package for Social Sciences (SPSS) version 26, encompassing both descriptive and inferential statistical measures.

3. Results

Table 1. Distribution of socio-demographic and medical characteristics (n-80):

Variables	Mean ± SD	Minimum-Maximum
Age (years)	48.4±14.8	18-77 years
Duration unconsciousness	6.0±4.6	1-26 days

Duration of ICU admission		6.1±4.6	1-26 days
Socio-demographic Characteristics		f	%
Sex	Male	42	52.5
	Female	38	47.5
	Total	80	100
Reason of ICU admission	Traumatic	15	18.8
	Non-traumatic	65	81.3
	Total	80	100.0
Preexisting chronic diseases	None	12	15
	DM	17	21.2
	HTN	44	55
	Respiratory Diseases	5	6.2
	Cancers	2	2.5
	Total	80	100.0

In this study, table (1) showes a total of 80 patients were observed during three separated different

invasive procedures include endotracheal suctioning, arterial blood sampling and oral care. The

mean age of the patients was 48.4 ± 14.8 years, ranging from 18 to 77 years, 52.5% of the patients

were males and 47.5% were females, regarding to the duration unconsciousness and duration of ICU

admission was reng from 1 to 26 days. In terms of the reason for ICU admission, the majority (81.3%) of patients were admitted as a results of non-traumatic causes, such as chronic illnesses or acute medical conditions, whereas 18.8% were admitted due to traumatic causes, with respect to the preexisting chronic diseases, 55% of the patients had a history of hypertension, followed by diabetes mellitus at 21.25%, 15% was without underlying disease

The results in table (2) exposed a significant change in behavioral pain indicators occurred during all procedures for facial expression, body movements, and ventilation compliance (P-value 0.00). Endotracheal suctioning caused the most pronounced behavioral changess. After the procedures, most behaviors returned to baseline, with no significant differences observed in the post-procedure phase except in facial expression (P-value 0.01)

Table 2. Comparing the behavioral pain indicators across selected nursing interventions (N=80):

		Interventions	

Indicators	Time	Endotracheal suctioning (Mean ± SD)	Arterial blood sampling (Mean ± SD)	Oral care (Mean ± SD)	p-value
Facial expression	Immediately before the procedure	1.4±0.59	1.4±0.56	1.3±0.51	0.33 NS
	During the procedure	3.4±0.72	2.6±0.73	2.7±0.61	0.00 HS
	Five minutes after the procedure	1.4±0.58	1.3±0.47	1.3±0.50	0.01 S
Body movements	Immediately before the procedure	1.3±0.56	1.3±0.51	1.3±0.48	0.92 NS
	During the procedure	3.1±0.88	2.8±0.93	2.5±0.84	0.00 HS
	Five minutes after the procedure	1.2±0.51	1.3±0.51	1.2±0.47	0.73 NS
Compliance with ventilation	Immediately before the procedure	1.0±0.15	1.0±0.00	1.0±0.11	0.36 NS
	During the procedure	2.2±0.42	1.0±0.28	1.7±0.43	0.00 HS
	Five minutes after the procedure	1.0±0.15	1.0±0.00	1.0±0.00	0.13 NS
Note :Friedman Test; NS: Non significant p-value > 0.05; HS: Highly significant p-value < 0.0.5.					

Table 3. Distributions of pain levels using the behavioral pain scale for the patients before, during, and after selected invasive procedures:

Pain levels	Endotracheal suctioning						Arterial blood sampling						Oral care					
	Before		During		After		Before		During		After		Before		During		After	
	f.	%	f.	%	f.	%	f.	%	f.	%	f.	%	f.	%	f.	%	f.	%
Painless (BPS=3)	42	52.5	0	0.0	46	57.5	42	52.5	3	3.8	48	60.0	45	56.3	3	3.8	48	60.0

Mild (BPS=4-6)	33	41.3	8	10.0	31	38.8	38	47.5	34	42.5	32	40.0	34	42.5	27	33.8	31	38.8
Moderate (BPS=7-9)	5	6.3	42	52.5	3	3.8	0	0.0	41	51.2	0	0.0	1	1.3	50	62.5	1	1.3
Sever (BPS=10-12)	0	0.0	30	37.5	0	0.0	0	0.0	2	2.5	0	0.0	0	0.0	0	0.0	0	0.0
Total	80	100	80	100	80	100	80	100	80	100	80	100	80	100	80	100	80	100

Note: the f: frequency; %: percentage; Before: Immediately before the procedure; During: During the procedure; After: Five minutes after procedure.

Table (3) displayed the patients' pain distributions prior to, during, and following several invasive procedures using the behavioral pain scale. Prior to the procedures, most patients reported either no pain or rather mild pain. A greater proportion of patients experienced moderate to severe pain during the procedures, especially during endotracheal suctioning (52.5%), and (37.5%), have severe pain. Following the interventions, the majority of patients reported either no or mild pain.

The results in table (4) showed the overall behavioral pain responses by type of invasive procedure and include before, during and after the procedure. There were no significant differences at p-value 0.35 and 0.36 in behavioral pain responses before and after the procedures across all three types of invasive procedures. During the procedure there was a highly significant difference in overall behavioral pain responses, with endotracheal suctioning causing the highest level of pain responses at p-value 0.00.

Table 4. Comparing the overall behavioral pain responses by type of invasive procedure

Time	Endotracheal suctioning	Arterial blood sampling	Oral care	*p-value
	Mean ± SD	Mean ± SD	Mean ± SD	
Immediately before the procedure	3.7±1.1	3.6±0.8	3.6±0.8	0.35 (NS)
During the procedure	8.7±1.7	6.6±1.4	6.9±1.5	0.000 (HS)
Five minutes after the procedure	3.6±1.0	3.6±0.8	3.6±0.8	0.36 (NS)

Note:Friedman Test; NS: Non significant p-value > 0.05; HS: Highly significant p-value < 0.0.5.

Table 5. Association between the effect of endotracheal suctioning on behavioral pain responses with patients' socio-demographic and clinical data:

Behavioral responses	Age		Sex		Reason of ICU admission		Duration of unconsciousness	
	p-value	Level	p-value	Level	p-value	Level	p-value	Level
Endotracheal suctioning	0.51	NS	0.47	NS	0.13	NS	0.82	NS
Arterial blood sampling	0.17	NS	0.19	NS	0.07	NS	0.81	NS
Oral care	0.83	NS	0.10	NS	0.43	NS	0.33	NS

The result in table (5) showed a non-significant association between behavioral pain responses and any of the socio-demographic or clinical variables (age, sex, reason of ICU admission, duration of unconsciousness) .

4. Discussion

The majority of patients in ICUs are unable to self-report pain due to their compromised health status. For instance, intubation and sedation. Conversely, behaviors have demonstrated reliability as a means of conveying the presence of discomfort. Indicators of pain in intensive care units are essential elements of nursing evaluation proficiency. Numerous behavioral responses characterize the pain and its intensity. Examples include facial expressions, body movements, and vital sign markers (*Pain in Intensive Care: Assessments and Patients' Experience,* 2021) . The mean age of the patients enrolled in this study was 48.4 ± 14.8 years, ranging from 18 to 77 years, Regarding the patients' gender, more than half (52.5%) of the study sample were males and 47.5% were females. The researcher attributed this results due to the fact that male's individuals are more at risk of the occurrence of cerebrovascular accidents and males' individuals are more susceptible to road traffic accidents than females (Hinksman et al., 2022) . With respect to preexisting chronic diseases, the most of patients (55%)had hypertension, this is supported by the results of a meta-analysis study that was conducting by (Khairy et al., 2022) , to calculate the prevalence and risk involved of hypertension among COVID-19 patients in ICU, which reflect that the majority of patients admitted to ICU were hypertensive. In addition to that, 81.3% of the subjects classified medically as non-traumatic patients. (Oliveira et al., 2019) presented a cross-sectional study with quantitative design to assess pain and the utilization of analgesia in critically ill hospitalized patients admitted in the emergency and intensive care services of a government institution where there were more than two-thirds (73.1%) of patients classified as having clinical non-traumatic conditions. There were significant increase in BPS scores during procedures (endotracheal suctioning, arterial blood sampling, and mouth care) in ICUs patients, mainly for endotracheal suction, where more than one-half (52.5%) of patients have moderate level of pain and 37.5% have severe level of pain. These results arrange in a line with earlier study that was conducting by (Gélinas et al., 2006) indicates that invasive nursing procedures like endotracheal suctioning usually result in discomfort and pain even in unconscious or sedated patients. The pain scores by using

Behavioral Pain Scale (BPS) exposed a highest pain levels during the endotracheal suctioning procedures eliciting the most noticeable responses. Most notable change was observed during endotracheal suctioning, the most significant behavioral alterations during the procedure, with facial expression, mean ± SD was (3.4±0.72) and movement of the body (3.1±0.88) and compliance with ventilation (2.2±0.42). (Ayasrah, 2016) conducted a study of 247 mechanically ventilated patients found the most painful procedure to witness was during endotracheal suctioning . (Rijkenberg et al., 2017) conducting a cross-sectional study to compare pain severity evaluated by two scales (CPOT and BPS) among patients admitted to the ICUs, revealed that the endotracheal suction produces major pain responses in ICUs patients as a result of mechanical stimulus of the tracheal mucosa, even in sedated patients. Furthermore, the results in the table (3) presented the distribution of pain before, during, and after selected invasive nursing procedures using the behavioral pain scale. Overall, most of patients felt no or few degree of pain before the procedures, more patients felt moderate to severe type of pain during the procedures, particularly during endotracheal suctioning (52.5%), and arterial blood sampling (37.5%). Additionally, most patients felt very slight pain or no pain after the procedure, and their pain reduced significantly. (Emad Bachi & AL-Fayyadh, 2022) conducted a study to measure the determinations of pain after nursing procedures and found that the pain score is raised during procedures especially during endotracheal suction and arterial blood sampling. (Gélinas et al., 2006) reported that's comparing to oral care and arterial blood sampling procedures, the endotracheal suction produced higher pain responses, as showed by the higher mean scores (8.7±1.7) using BPS. Oral care and arterial blood sampling, still produced notable concern, highlighting the necessity for pain interventions even during seemingly minor procedures.There were no significant differences at p-value 0.35 and 0.36 in behavioral pain responses before or after the procedures across all three types of invasive procedures as presented in table (4). There was a highly significant differences in overall behavioral pain responses during the procedures, with endotracheal suction causing the highest level of pain responses at p-value (0,00). (Emad Bachi & AL-Fayyadh, 2022) conducted a study to measure the determinations of pain after nursing procedures and found that the pain level was at peak level during nursing interventions. There is no significant association was found between behavioral pain responses and any of the socio-demographic or clinical variables with endotracheal suctioning, arterial blood sampling and oral care as mentioned in table (5). (Puntillo et al., 2014) conducted a study to Determining factor effecting pain severity during nursing procedures in the ICUs, found a non-significant association between socio-demographic and clinical variables such as sex, age, causes of admission to the ICU, duration of loss of consciousness and pain responses. This differences with some studies signifying that's patients with traumatic injuries or younger patients may exhibit heightened pain responses. These findings emphasize the need of routine pain evaluation and preventive pain management for patients undergoing invasive procedures in ICUs. The used of authorized tools similar to the BPS is critical for recognizing pain in patients unable to communicate (Gélinas et al., 2006) . Moreover, interventions such as sedation protocols for endotracheal suction or topical anesthetics for arterial blood sampling punctures or may possibly alleviate pain during procedure (Alves et al., 2023) .

5. Acknowledgements:

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6. Conclusions:

The unconscious, mechanically ventilated patients, who were enrolled in this study, were silently suffering from a relatively high level of pain during their hospitalization period in the intensive care unit and there is clear change in behavioral responses during invasive nursing interventions. The patient's increased pain, particularly during nursing procedures, had altered the behavioral characteristics. It is a condition that should not be ignored because it prolongs patients' recuperation. All three nursing procedures had a significant statistical difference in pain level, indicating that endotracheal suctioning, blood sampling, and oral care each had a large pain score. As a result, the nurses should pay close attention to any changes in the patient's vital signs and overall health, and they should try to alleviate any pain that might be contributing to the patient's decline, reducing patient pain and discomfort in order to prevent conditions from being disturbed.

7. Limitations:

The primary constraints are the comparatively small sample size and the duration of the investigation and data collecting was short .

8. Recommendations:

Further research with large sample sizes explicitly targeting patients is essential to evaluate pain and physiological indicators in critical care environments. Utilize behavioral pain assessment instruments, such as the Behavioral Pain Scale (BPS) and other scales reliant on behavioral responses, for non-communicative or comatose patients. It is highly advisable for intensive care units to utilize current protocols for assessing pain and its responses. Equally significant is the utilization of proven behavioral pain assessment instruments, particularly in Iraqi ICUs, notably in Holy Kerbala city, as objectively validated pain assessment methods have yet to be implemented. Executing randomized controlled clinical trials centered on pain evaluation and behavioral reactions during nursing interventions to identify the most effective strategies for improving pain management, particularly for non-communicative patients in intensive care units.

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