Original
ISSN 2413-0516

Determination of Procedural Pain Intensity among Critically-Ill Patients: Using Behavioral Pain Scale (BPS)

Ghufran Emad Bachi[1*], Sadeq AL-Fayyadh[2]

[1]Al-Muthanah Health Directorate, Ministry of Health, Al-Muthanah, Iraq.
[2]Adult Nursing Department, College of Nursing, University of Baghdad, Baghdad, Iraq.
*Correspondence to: Ghufran Emad Bachi (E-mail: ghofran.emad1202a@conursing.uobaghdad.edu.iq)
(Submitted: 28 May 2022 – Revised version received: 12 June 2022 – Accepted: 27 July 2022 – Published Online: 26 August 2022)

Abstract
Objective: To assess pain severity for routine nursing procedures. As well as to compare pain severity during three measurement phases. And to find out the differences among routine nursing procedures pain severity.
Methods: An observational method for data collection and sample of 135 subjects who had met the study's inclusion criteria were targeted. The data collection started from January 18th to April 7th, 2022.
Results: Patients were silently suffering pain during all three assessment phases: pre-during, and 20 minutes' post-routine nursing procedures. Of equal importance, there is a statistically significant difference between all nursing procedures in terms of pain intensity.
Conclusion: The critically ill, mechanically ventilated patients who were recruited in this study, were silently suffering from a relatively high level of pain during their hospitalization period in the Intensive Care Unit. The highlighted case of silent suffering is a serious gap in both medical and nursing care quality that must be addressed both urgently and effectively.
Keywords: Pain, critically-ill, behavioral pain scale, intensive care unit

Introduction

Patients who are admitted to the Intensive Care Unit (ICU) often suffer from one vital organ failure or several organ failures and need intensive care for their survival.[1] Therefore, most patients in the ICU are intubated and sedated due to their need for advanced care to support their vital organs; such as the heart, lungs, and kidneys. For example, if the patient needs critical care after surgery, trauma, or cardiac arrest, intensive care has been indicated for the patient's survival. One of the problems within the ICU is patients' pain reporting, both at rest and during the procedure. Also, in studies that include memories of patients after an ICU, pain is commonly reported as a major problem.[2]

Pain is a common problem in the ICU, with more than 75% of ICU patients experiencing pain at rest and 50% or higher in both medical and surgical ICUs experiencing pain for a variety of reasons such as the patient's chief complaint(s), chronic conditions, wound care, and invasive nursing care procedures. Pain is one of the chief discomfort problems that patients experience in the ICU. Lack of effective pain evaluation has been associated with serious complications, including chronic pain, delayed mechanical ventilation duration, longer ICU hospitalization, and an increased death rate.[3,4]

Careful pain assessment contributes to effective pain management by increasing the sufficiency of therapeutic measures such as analgesics and sedation use, as well as decreasing patient stays in the ICU.[5] Approximately 75% of ICU hospitalized patients have severe pain. About 50% of them are having pain during invasive nursing procedures and about 30% are having pain even at rest.[6] Several factors that may contribute to acute pain in the ICU, such as the type of patient's condition, such as surgery or trauma, diagnostic, extended immobilization, therapeutic procedures, underlying chronic diseases, or other medical conditions, may also contribute to persistent pain.[7] Nursing interventions can cause pain in ICU hospitalized patients. Endotracheal suctioning has been recognized as the most painful procedure in mechanically ventilated patients. Pain produces damaging physical effects.[8]

Pain stimulates sympathetic activity throughout the body, resulting in immunological suppression, hyperglycemia, changes in hemodynamic state, and an increased release of catecholamine, cortisol, and anti-diuretic hormones. Untreated pain can also lead to respiratory disorders like airway obstruction and pneumonia, as well as limited mobility, deep vein thrombosis, chronic pain syndromes, and psychological issues including anxiety, depression, disorientation, and post-traumatic stress disorder.[9]

Mechanically ventilated patients and critically ill patients are unable to verbalize their pain because of altered consciousness, being sedated, and being unable to communicate to express their pain, which may be agonizing. As a result, quantifying pain caused by altered awareness, anesthesia, invasive procedures, and artificial ventilation is both a difficult and underappreciated topic.[10] There are many challenges that may contribute to decreasing effective pain assessment and management, including lack of evidence and lack of collaboration between physicians and nurses, were identified as barriers to effective pain assessment and management. In addition, the physical and cognitive impairments of many critically ill patients and communication impediments are factors that should not be overlooked when practicing pain management.[11]

When patients are unable to report their pain, especially those hospitalized in the critical care setting, the nurses use pain-related behaviors such as facial expression, limb movements, and muscle rigidity as pain landmark indicators. Patients who experience pain during invasive and nursing care procedures are more likely to develop behavioral responses than those without pain.[12]

In medical, surgical, and trauma patients who were unable to describe their pain, the Behavioral Pain Scale (BPS) was approved to be the most reliable and valid pain evaluation

instrument. The BPS can be used for sedated patients and depends on the three behavioral categories, including facial expression, upper-limb movements, and mechanical ventilation compliance.[13]

Ongoing reassessment of a patient's pain is required to provide effective pain management for patients. Pain should be assessed before the administration of any analgesic agents, as well as before and during therapeutic interventional procedures to understand the pain severity caused by the patient's health status or due to the therapeutic procedures. Also, pain assessment is one of the major responsibilities every member of the health care team should master, particularly nurses.[14]

The main question of this study was: what is the pain severity for routine nursing procedures? Therefore, this study aims to assess the pain severity associated with routine nursing procedures. As well as to compare pain severity during three measurement phases. And to find out the differences among routine nursing procedures' pain severity.

Materials and Methods

Study design: Cross-sectional study design.

Participants and Study Design

The purposive non-probability sampling method was used for the current study method which is selected depending on population characteristics, eligibility criteria and the study's aims. The exclusion criteria of this study included patients who were < 18 years old. Patients who can report pain were excluded because the research tool was designed for patients who are unable to report the presence and intensity of pain, as well as patients who have had neuropathic conditions such as Myasthenia Gravis and Guillain-Barre Syndrome (GBS), patients with upper limb neuropathy and patients with upper limb fractures because these conditions may interfere with behavioral responsivity when using the BPS. 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.

The Sample consisted of 135 patients. The sample size was calculated according to A-priori sample sizes for student *t*-tests.

Settings: The study was conducted by using observational methods, targeting hospitalized adult patients in the ICUs in Baghdad teaching hospitals; Martyr Ghazi Al-Hariri Hospital for Surgical Specialties; and the Private Nursing Home Hospital of the Medical City Directorate; Al-Hussein Teaching Hospital of Al-Muthanah Health Directorate**.**

Study Instrument: The Behavioral Pain Scale (BPS) was used in this study after obtaining official permission from the primary author Dr. Jean F Payen. The BPS is both reliable and valid for use in assessing pain for mechanically ventilated-sedated patients who are hospitalized in the ICUs and the patients who are unable to communicate and expressing their distress. Cronbach's alpha coefficients of the scale was highly reliable; the reliability coefficient for the BPS was 0.79.[15,16] The BPS contain three main domains Facial expression, compliance with mechanical ventilation and upper limb movement. Within each domain, behavioral responses are scored from (1) that indicate no pain to (4), which is the worst score that indicates the presence of pain. The health care professional uses BPS to assess the presence and severity of the pain and decide what the best behavioral response will be within each domain. Patients' responses are to be scored from 1 to 4 in each domain, with a total score of 12 that indicates maximum pain.[15]

Data Collection Method: The data was collected through observational methods from January 18th, 2022, to April 7th, 2022. The severity of pain was measured objectively through observation of the patient's response using BPS and vital signs measured from patient's monitoring machine. The study sample include 135 patients who were selected purposively among critically ill patients with a diminished level of consciousness. The pain and vital signs were determined through three phases: the first was assessing patients' pain during rest (without any invasive or therapeutic procedures); the second was during routine nursing procedures, including: (Position change, endotracheal suctioning, dressing change, and blood sampling). Finally, the third phase, which was done to determine patient's pain within 20 minutes post-nursing procedures. SpO_2% levels were also assessed during all three assessment phases. The mean arterial pressure, was measured and categorized according to the following formula: (MAP= [2 × diastolic + systolic]/3).[16,17]

Data Analysis Procedures: Data were analyzed using IBM-Statistical Package for Social Sciences (SPSS) version 24, which included descriptive and inferential statistical measures. Descriptive statistics are used to describe the demographic data and health-related variables. Repeated measurement analysis of variance (ANOVA) used to measure the difference among pain severity during all routine nursing procedures (Position change, endotracheal suctioning, dressing change, and blood sampling).

Ethical Considerations and Official Agreements: With the submission of the study protocol, ethical approval was sought from the Scientific Committee of the Nursing Faculty, University of Baghdad. The researcher submitted a detailed description of the study, including problem statement, objectives, and questionnaire, to the Ministry of Planning (Central Statistical Organization) and to the Medical City Directorate, and Al-Muthanah Health Directorate, in order to obtain official permission to carry out the study. To verify that the rights, welfare, and well-being of human participants are completely protected while they are participating in a study; the researcher has completed the Human Research Protection Fundamental Training offered by the Office for Human Research Protection.

Results

The results represent the highest percentages and the dominant percentage of gender distribution for the targeted sample was males, representing more the half (58.5%) of the study sample and the age groups included (18– < 32 years old), more than one quarter with percentage (28.9%).

The results represent the majority of the collected samples were as follow: patient's length of staying days, more than half (55.6%) of the subjects were hospitalized for 5 days or less. Additionally, more than half (61.5%) of the participants were medically classified as non-traumatic patients. Regarding consciousness level for the patients according to GCS was (5–8), representing more than half (58.5%) of the study subjects. Finally, narcotics was approximately used by about two-fifths (42.2%) of study subject.

The descriptive statistics for pain intensity demonstrate the first phase was pre-routine nursing procedures. That represents approximately more than half (61.5%) of the total collected samples experiencing mild pain. The second phase of measurement, conducted during routine nursing procedures, showed the highest percentage (100%) of patients having a severe unacceptable amount of pain. Regarding the third phase, which was conducted within 20 minutes post-routine nursing procedures, showed that the vast majority of patients (95.6%) had suffered mild pain level. Finally, the overall pain intensity was presented, which showed that more than two thirds of patients (71.1%) had a severe unacceptable pain level.

Overall Pain Score

The mean plot demonstrates the higher overall pain score during routine nursing procedures as an expected response to increased pain stimulation than pre and post-nursing procedures within 20 minutes.

The results represent the highest percentages of the vital signs. As noticed, the vital signs increased during routine nursing care procedures and, conversely, the SpO_2 decreased below normal during the procedural phase compared to pre and post-nursing procedures.

These procedures include blood sample, endotracheal suctioning, and dressing changes. Surprisingly most patients (99.3%) had a severe unacceptable amount of pain (6-11).

Repeated measurement ANOVA test in table (4-18) indicates there is a statistically significant difference between four nursing procedures between the blood sampling (1) and endotracheal suctioning (2) at (M = –.0941, P = 0.000). Also, there is a statistically significant difference between the blood sampling procedures and the dressing change (M = 0.696*, P = 0.000). Additionally, the statistically significant difference between the blood sampling procedures and the position change was represented at (M = 0.911*, P = 0.000) (Figure 1).

Pain Score during Nursing Procedures

The mean plot demonstrates there is a statistically significant difference between all nursing procedures (blood sampling, endotracheal suctioning, dressing change, and position change) with a higher pain score rate during endotracheal suctioning, blood sampling, dressing change, and position change, respectively (Figure 2).

Discussion

Patient pain determination is an important issue in the critical care setting to improve patients' care plans, improve patients' outcomes, and decrease the length of stay and healthcare needs. When the nurses assess patients' pain frequently, they can determine pain intensity and provide management methods according to pain severity and medical report, such as modifying medication doses and adjusting sedation uses that can improve the care plan and enhance the patients' health status.[14,17]

The findings in Table 1 showed that more than one quarter (28.9%) of the study participants' age group was (18 – < 32 years old). The cross-sectional study[18] similar to this result. Regarding the patients' gender, findings of the study indicated that more than half (58.5%) of the study sample were males the study confirmed this result.[19] This may be due to the fact that male individuals are more at risk of the occurrence of cerebrovascular accidents and male individuals are more susceptible to road traffic accidents than females.[20]

The findings in Table 2 revealed more than half (61.5%) of the participants were medically classified as non-traumatic patients. This was confirmed by the study[21] which represent non-traumatic patients more than traumatic. The majority (58.5%) of the patient's consciousness level was (5-8), according to the Glasgow coma scale. These results were not surprising to the researcher since the patients were hospitalized in intensive care units commonly diminished consciousness level. [22]

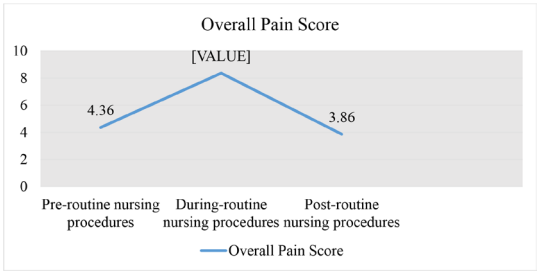

Fig. 1

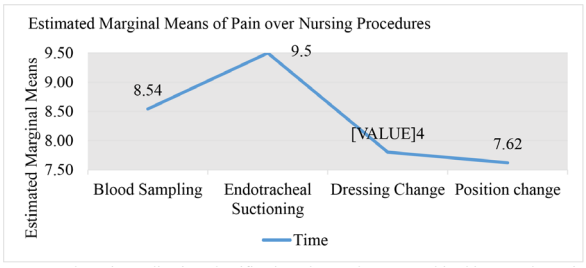

Fig. 2

Table 1. **Minimum sample size determination**

Parameter of calculating the minimum sample size	Selected values
Anticipated effect size (Cohen's *d*):	0.5
Desired statistical power level:	0.8
Probability level:	0.05

Table 1. **Descriptive statistics of sociodemographic data**

	f	%
Age groups		
18 – < 32 years old	39	**28.9**
32.0 – < 45.0 years old	23	17.0
45.0 – < 58.0 years old	26	19.3
58.0 – < 71.0 years old	36	26.7
≥71 years old	11	8.1
Total	135	100.0
Gender		
Male	79	**58.5**
Female	56	41.5
Total	135	100.0

Moreover, the pain medication classification, the results appeared in this way: the majority of the patients' were under mild regimen of narcotics medications was approximately used by about two-fifths (42.2%) of the study subjects. This result was not surprising to the researcher since the patients are hospitalized in ICU, frequently treated with mild, moderate, and even heavy sedative regimens.[14] The study results are supported by a prospective cohort study that reported most patients under mild regimen.[23]

Descriptive statistics represents vital signs and SPO_2 level during all three phases of assessment (pre, during, and post-nursing procedures). It started with respiratory rate. More than half (62.2%) of patients had eupnoea, yet more than half (59.3%) of study participants had a normal heart rate (60–100 beats/min). Of equal importance, nearly two thirds (68.9%) of patients had normal mean arterial pressure (93–99 mmHg). Moreover, the majority (88.9%) of collected study samples had a normal body temperature (36.5–37.5°C). Furthermore, the vast majority of patients (94.1%) had normal SpO_2% levels in the pre-nursing procedures phase. This results supported by AL-Saad et al. (2018).[24]

Concerning the second phase, which was during routine nursing procedures, results showed that a relatively high percentage of patients had tachypnea (100%). Similarly, more than three-quarters (77%) of study participants had tachycardia (> 100 beats/min). Of equal importance, more than one third (37.8%) of patients had normal mean arterial pressure (93–99 mmHg). Surprisingly, the majority (88.1%) of collected study samples had a normal body temperature (36.5–37.5°C). Furthermore, less than two thirds (65.9%) of patients had an SPO_2 level below normal (90–94.4%) this may be due to response of patients to severe pain according to their conditions and several researcher studies supported these findings.[15,24,25]

Continually, overall vital signs post-nursing procedures within 20 minutes. The results were as follows: The respiratory rate was more than half (52.6%) of patients who had eupnoea (12–20 breaths/min). Approximately more than half (57.8%) of study participants had a normal heart rate (60–100 beats/min). Additionally, less than two thirds (65.2%) of patients had normal mean arterial pressure (93–99 mmHg). Of equal importance, the vast majority (93.3%) of collected study samples had a normal body temperature (36.5–37.5°C). Furthermore, more than three-quarters (79.3%) of patients had a normal SPO_2 level of (95–100%). The changes in vital signs during all three measurement phases: pre, during, and post-nursing procedures may be to the body response to decreased pain intensity.[26]

In accordance the descriptive statistics for pain severity during three measurement phases illustrate. In the pre-nursing procedures phase represent approximately more than half (61.5%) of the total collected samples experiencing mild pain. The highest percentage (100%) of patients had a severe, unacceptable amount of pain. Finally, during the third phase. It was shown that almost all patients (95.6%) experienced mild pain in the third phase, which was performed after standard nursing procedures within 20 minutes. Based on the overall level of pain, more than two-thirds of patients (71.1%) showed an unacceptable level of pain. This results supported by Erden et al. (2018).[25]

The descriptive statistics in Table 5 represent the descriptive statistics of pain intensity that were assessed when implementing procedures as part of routine daily nursing care for the most frequent nursing procedures that are conducted in the ICU for hospitalized critically ill patients. These procedures include blood sampling, endotracheal suctioning, and dressing changes. Surprisingly, most patients (99.3%) suffered

Table 2. **Descriptive statistics for health related variables**

	f	%
Length of stay, days		
5 days or less	75	**55.6**
6–10 days	60	44.4
Total	135	100.0
Medical Diagnoses classification		
Non-traumatic	83	**61.5**
Traumatic	52	38.5
Total	135	100.0
Assessment using Glasgow Coma Scale (GCS)		
Severe condition (5–8)	79	**58.5**
Moderate condition (9–13)	56	41.5
Total	135	100.0
Pain Medication(s)		
No Medication	28	20.7
Non-Narcotics	10	7.4
Narcotics	57	**42.2**
Both (Narcotics & Non-narcotics)	40	29.6
Total	135	100.0

Table 3. **Descriptive statistics of pain levels using behavioural pain scale**

Phases of assessment	Pain level categories								Total	
	No pain 3		Mild pain 4–5		Severe unacceptable pain 6–11		Maximum pain 12			
	f	%	*f*	%	*f*	%	*f*	%	*f*	%
Pre-routine nursing procedures	32	23.7	83	**61.5**	20	14.8	0	0	135	100%
During-routine nursing procedures	0	0	0	0	135	**100%**	0	0	135	100%
Post-routine nursing procedures within 20 minutes	5	3.7	129	**95.6**	1	0.7	0	0	135	100%
Overall pain levels	0	0	39	28.9	96	**71.1**	0	0	135	100%

Table 4. **Descriptive statistics of overall vital signs during all three phases of assessment (Pre-routine nursing procedures, during- and post-routine nursing procedures)**

	Vital signs and SpO_2% level during all three measures	*f*	%
Pre-routine nursing procedures	Respiratory rate (Eupnoea 12–20 breath/min)	84	62.2
	Pulse rate (Normal 60–100 beat/min)	80	59.3
	Mean Arterial Pressure (Normal mean Arterial Pressure MAP (93–99 mmHg))	93	68.9
	Temperature (Euthermia 36.5–37.5°C)	120	88.9
	SpO_2% (Normal (95–100%))	127	94.1
During routine nursing procedures	Respiratory rate (Tachypnea >20 breath/min)	135	100.0
	Pulse rate (Tachycardia > 100 beat/min)	104	77.0
	Normal mean Arterial Pressure MAP (93–99 mmHg)	51	37.8
	Temperature (Euthermia 36.5–37.5°C)	119	88.1
	SpO_2% (Below Normal (90–94%)	89	65.9
Post-routine nursing procedures within 20 minutes	Respiratory rate (Eupnoea 12–20 breath/min)	71	52.6
	Normal 60–100 beat/min	78	57.8
	Normal mean Arterial Pressure MAP (93–99 mmHg)	88	65.2
	Temperature Euthermia 36.5–37.5°C	126	93.3
	SpO_2% Normal (95–100%)	107	79.3

Table 5. **Descriptive statistics of pain levels during each nursing procedure**

Nursing procedures	Mild pain 4–5		Severe unacceptable pain 6–11		Maximum pain 12	
	f	%	*f*	%	*f*	%
Blood sampling	1	0.7	134	99.3	0	0
Endotracheal suctioning	0	0	134	99.3	1	0.7
During dressing change	1	0.7	134	99.3	0	0
During position change	4	3.0	131	97.0	0	0

Table 6. **Statistical difference in the pain scale over four procedures (Blood sample, Endotracheal Suctioning, Dressing Change, and Change Position)**

Pain over four nursing procedures						
(I) Time	ANOVA analysis		(J) Time	Mean Difference (I-J)	Std. Error	Sig.[b]
Blood sampling (1)	f	sig	Endotracheal suctioning (2)	-.941*	.071	.000
	204.799	.000	Dressing change (3)	0.696*	.086	.000
			Position change (4)	0.911*	.090	.000

1 = blood sampling; 2 = endotracheal suctioning; 3 = dressing change; 4 = change position.

an unacceptable intensity of pain (6–11). This results supported by Considine et al. (2020).[27]

A repeated measurement According to the ANOVA test in Table 6, there is a statistically significant difference between four nursing procedures between blood sampling (1) and endotracheal suctioning (2), blood sample protocols and the dressing change. The results supported by Akhani (2014) and García-Esquinas et al. (2019).[28,29]

Conclusions

The critically ill, mechanically ventilated patients who were recruited in this study, were silently suffering from a relatively high level of pain during their hospitalization period in the Intensive Care Unit. The highlighted case of silent suffering is a serious gap in both medical and nursing care quality that must be addressed both urgently and effectively. Also pain severity had reached its highest level during nursing procedures, as it showed a severe unacceptable pain score, which is both clinically and ethically unacceptable.

Recommendations

Use up-to-date clinical protocols to measure pain in intensive care units and use of the well-established behavioral pain assessment tools, particularly in Iraqi ICUs particularly in Iraqi ICUs, because the objectively established pain assessment methods have not been applied yet. Likewise further

studies with a larger sample size that specifically target patients to assess pain in critical care settings are mandatory. Conducting double-blinded randomized controlled clinical trials that focused on pain assessment and management during nursing procedures to determine the most effective methods that may enhance pain management, especially for ICUs hospitalized non-communicative patients.

Limitations

The main limitations are the relatively small sample size and the timeframe for the study and data collection. The more relevant method to classify the patient's consciousness and sedation level in the ICUs is the Richmond Agitation Sedation Scale (RASS), which is not used in the current study since it is not applicable in the health situations and the health care providers and the informed consent to use the RASS was not obtained from the primary author.

Funding Information

The budget of this research work was not support by any governmental or non-governmental organization. The authors of this manuscript covered all the research work-related expenses.

Conflicts of Interest

None.

References

1. Hylén M. Pain in intensive care: assessments and patients' experience (Doctoral dissertation, Malmö universitet). 2021.
2. Na'el K A, Mohammed WK. Nurses' Knowledge toward Care of Unconscious Adult Patients at Teaching Hospitals in Al-Hilla City. Iraqi National Journal of Nursing Specialties. 2019; 32(1).
3. Shaikh N, Tahseen S, Haq QZ, Al-Ameri G, Ganaw A, Chanda A, Labathkhan MZ, Kazi T. Acute pain management in intensive care patients: facts and figures. InPain management in special circumstances 2018 Nov 5. London, England: IntechOpen.
4. Shahiri TS, Richard-Lalonde M, Richebé P, Gélinas C. Exploration of the Nociception Level (NOL™) Index for pain assessment during endotracheal suctioning in mechanically ventilated patients in the intensive care unit: An observational and feasibility study. Pain Management Nursing. 2020 Oct 1; 21(5):428–34.
5. Pinheiro AR, Marques RM. Behavioral Pain Scale and Critical Care Pain Observation Tool for pain evaluation in orotracheally tubed critical patients. A systematic review of the literature. Revista Brasileira de terapia intensiva. 2020 Jan 20; 31:571–81.
6. Aktaş YY, Karabulut N. Relief of procedural pain in critically Ill patients by music therapy: a randomized controlled trial. Complementary medicine research. 2019; 26(3):156–65.
7. Arrar A, Mohammed S. Evaluation of Nurses' Knowledge and Practices Concerning Nursing Care Guide in the Intensive Care Unit in Misan Governorate Hospitals. Kufa Journal for nursing sciences. 2020; 10(1):12–22.
8. Gomarverdi S, Sedighie L, Seifrabiei MA, Nikooseresht M. Comparison of two pain scales: Behavioral pain scale and critical-care pain observation tool during invasive and noninvasive procedures in intensive care unit-admitted patients. Iranian journal of nursing and midwifery research. 2019 Mar; 24(2):151.
9. Alnajar MK, Shudifat R, Mosleh SM, Ismaile S, N'erat M, Amro K. Pain Assessment and Management in Intensive Care Unit: Nurses' Practices, Perceived Influencing Factors, and Educational Needs. The Open Nursing Journal. 2021 Oct 5; 15(1).
10. Kadhim H. Evaluation of Nurses' Practices toward the Control of Patients' Complications at the Respiratory Care Unit in Baghdad Teaching Hospitals. Iraqi National Journal of Nursing Specialties. 2014; 1(27):47–58.
11. Damico V, Macchi G, Murano L, Molinari AF. Incidence of pain at rest and during nursing procedures in ICU patients: a longitudinal observational study. Ann Ig. 2020 Jul 1;32(4):407–18.
12. Berman A, Snyder SJ, Levett-Jones T, Dwyer T, Hales M, Harvey N, Moxham L, Langtree T, Parker B, Reid-Searl K, Stanley D. Kozier and Erb's Fundamentals of Nursing [4th Australian edition].
13. Devlin JW, Skrobik Y, Gélinas C, Needham DM, Slooter AJ, Pandharipande PP, Watson PL, Weinhouse GL, Nunnally ME, Rochwerg B, Balas MC. 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. 2018 Sep 1; 46(9):e825–73.
14. Payen JF, Bru O, Bosson JL, Lagrasta A, Novel E, Deschaux I, Lavagne P, Jacquot C. Assessing pain in critically ill sedated patients by using a behavioral pain scale. Critical care medicine. 2001 Dec 1; 29(12):2258–63.
15. Salvadore CA. Implementation of the Critical Care Pain Observation Tool. 2018
16. Honan L, Bautista C, Esposito C. Focus on Adult Health Medical-Surgical Nursing 2nd Ed. 2018.
17. Kundu RN, Biswas S, Das M. Mean arterial pressure classification: a better tool for statistical interpretation of blood pressure related risk covariates. Cardiology and Angiology: An International Journal. 2017; 6(1):1–7.
18. Alikiaie B, Mousavi S, Ebrahimi A, Foroughi Z. Evaluation of pain assessment and management in critically Ill intubated patients in a referral university hospital in Iran. Journal of Research in Pharmacy Practice. 2019 Jul; 8(3):137.
19. Kemp HI, Bantel C, Gordon F, Brett SJ, PLAN, SEARCH, Laycock HC, Bampoe S, Bantel C, Gooneratne M, Highton D. Pain Assessment in INT ensive care (PAINT): an observational study of physician-documented pain assessment in 45 intensive care units in the United Kingdom. Anaesthesia. 2017 Jun; 72(6):737–48.
20. Hinksman CA, Haylock RG, Gillies M. Cerebrovascular disease mortality after occupational radiation exposure among the UK National Registry for Radiation Workers Cohort. Radiation Research. 2022 May; 197(5):459–70.
21. Alogaili AA, Khullof WA. Epidemiological, characteristics and outcomes of Road Traffic accident among patients in emergency units. Journal of MAR case rports. 2021; 3(3):1–3.
22. Oliveira LS, Macedo MP, Silva SA, Oliveira AP, Santos VS. Pain assessment in critical patients using the Behavioral Pain Scale. BrJP. 2019 Jun 19; 2:112–6.
23. Morris JL, Bernard F, Bérubé M, Dubé JN, Houle J, Laporta D, Morin SN, Perreault M, Williamson D, Gélinas C. Determinants of pain assessment documentation in intensive care units. Canadian Journal of Anesthesia/Journal canadien d'anesthésie. 2021 Aug; 68(8):1176–84.
24. AL-Saad SN, Al-Jaafari HA. Comparison between dexmedetomidine and propofol as sedatives for critically ill patients in intensive care units. Journal of the Faculty of Medicine Baghdad. 2018 Apr 1; 60(1):28–31.
25. Erden S, Demir N, Ugras GA, Arslan U, Arslan S. Vital signs: Valid indicators to assess pain in intensive care unit patients? An observational, descriptive study. Nursing & health sciences. 2018 Dec; 20(4):502–8.
26. Klein C, Caumo W, Gélinas C, Patines V, Pilger T, Lopes A, Backes FN, Villas-Boas DF, Vieira SR. Validation of two pain assessment tools using a standardized nociceptive stimulation in critically ill adults. Journal of Pain and Symptom Management. 2018 Oct 1; 56(4):594–601.
27. Considine J, Street M, Hutchinson AM, Mohebbi M, Rawson H, Dunning T, Botti M, Duke MM, Hutchison AF, Bucknall T. Vital sign abnormalities as predictors of clinical deterioration in subacute care patients: A prospective case-time-control study. International Journal of Nursing Studies. 2020 Aug 1; 108:103612.
28. Akhani P, Mendpara S, Palan B, Harsoda J. Gender differences in response to experimental pain among medical students from a western state of India. International journal of medical students. 2014 Jan 27; 2(1):13–7.
29. García-Esquinas E, Rodríguez-Sánchez I, Ortolá R, Lopez-Garcia E, Caballero FF, Rodríguez-Mañas L, Banegas JR, Rodríguez-Artalejo F. Gender differences in pain risk in old age: magnitude and contributors. InMayo Clinic Proceedings 2019 Sep 1 (Vol. 94, No. 9, pp. 1707-1717). Elsevier.