Trauma Monthly 2022; 27(3): 470-478

10.30491/tm.2022.307508.1378

Trauma Monthly

Original Article

Procedural Pain Management of Trauma Patients in Intensive Care Units

Sorour Mosleh [1], Ghasem Zarei [2], Mohammad sadegh Aboutalebi [3*]

1 Master Science in Preoperative Care, Nursing and Midwifery Care Research Center, School of Nursing and Midwifery, Isfahan university of Medical Sciences, Isfahan, Iran

2 PhD student in physiology, Department of physiology, Isfahan University of Medical Sciences, Isfahan, Iran

3 Master Science in Critical Care Nursing, Nursing and Midwifery Care Research Center, School of Nursing and Midwifery, Isfahan University of Medical Sciences, Isfahan, Iran

*** Corresponding Author**: Mohammad sadegh Aboutalebi, Master Science in Critical Care Nursing, Nursing and Midwifery Care Research Center, School of Nursing and Midwifery, Isfahan university of Medical Sciences, Isfahan, Iran. Tel: +989137155716, Email: ms_aboutalebi@yahoo.com.

Received 2021-12-14; **Accepted** 2021-08-07; **Online Published** 2022-04-27

Abstract

Background: Pain management in diagnostic and therapeutic procedures and their complications is critical. The study aimed to assess procedures type of pain control in patients admitted to Intensive Care Units (ICU).

Methods: This observational study was conducted on 400 trauma patients in ICU. The tool used in this study had three sections: In the first part, demographic variables, information related to trauma, and the type of painful procedures performed on the patient, were recorded. The second part was the measurement of the pain severity with the Critical-Care Pain Observation Tool (CPOT). The third part recorded the time of the pain assessment, methods of controlling pain in local anesthesia, and the pharmacological and non-pharmacological interventions.

Results: There were male (78.2%), with a mean age of 33.1 years. The most common procedure was tracheal suctioning (38.8%). The patients showed mild pain intensity according to CPOT before the processes. Also, according to the Friedman test results, they experienced a significant increase in pain intensity during the procedure for all procedures. A total of 160 patients received pain-relief interventions, of which 157 cases received pharmacy and three received non-pharmacological interventions. Patients who treated their pain with the interventions experienced additional pain according to the CPOT criteria immediately after the procedure.

Conclusion: Health services must be more active in pain management strategies for assessment of the pain intensity by proper tools to manage procedural pain appropriately.

Keywords: Pain, Trauma, Intensive Care Units, Procedure.

Introduction

Pain is an unpleasant experience that suffers many hospitalized patients. All kinds of pains, chronic or acute, impose expenses and inconveniences on society and the individual, impact the workforce and reduce productivity[1]. Pain increases the hospitalization time, immobility, and costs have increased[2] and affects patients' satisfaction with the services provided[3]. The World Health Organization states that 20% of the world's population suffers from unnecessary pain, while 33% of this group cannot live independently[4].

Pain has been introduced as the most common reason patients refer to medical care centers and receive medication. For example, 75% of patients seeking emergency care have experienced some level of pain[5].

Despite the high prevalence of pain among patients referred to medical centers, insufficient analgesia (oligo antigenic), which refers to the inadequate administration of analgesics to reduce patients' pain, is still common among patients, and in fact, it is a global problem[6].

Despite the importance of pain management to prevent complications, only about 30% of patients with acute pain received adequate treatment to relieve pain[5, 7]. Health care professionals must protect the minimum human rights of patients reduce unnecessary suffering[8].

On the other hand, patients have a high level of expectation for pain relief, so a study in the US showed that patients expected an average of 72% of pain relief. From them, 18% expected complete pain

relief. The same results were valid for painless patients, assuming they were in pain[9].

In addition to the patient's pain due to diagnostic and therapeutic procedures such as venous implantation, chest tube insertion, bladder catheterization, lavage, and wound suturing can be painful for patients[3, 10]. Procedural pain in the intensive care unit is very common[12]. Although these procedures are necessary to treat patients, they can cause suffering for the patient, his family, and even health care providers[6].

The lack of tools for pain assessment of procedural pain has created a significant gap in the measurement and control of this type of pain and, consequently, can affect the quality of patient care[13]. The findings of a review study suggest that pain assessment tools are specifically designed to assess the patient's contemporary pain and that there are no appropriate tools for estimating pain from procedural pain[14].

Numerous factors can affect the level of pain resulting from painful procedures. A study by Pantilo et al. in the intensive care unit showed that several independent factors, including the type of procedures, analgesia administration, pain intensity before the processes, the level of fear before the operations, and non-nurse techniques, are effective on the pain intensity associated with painful procedures15. Therefore, the patient's pain and stress in such monotonous conditions should be evaluated and reduced using special measures[12, 16]. Over the years, it has been concluded that pain management of painful diagnostic and therapeutic procedures and their complications, especially when left without relief and treatment, is crucial. Therefore, it is necessary to pay attention to such pains and evaluate and treat them appropriately[14]. Perhaps the most effective way to reduce the pain of procedures is to use subcutaneous Lidocaine injections, which few studies are performed in this field[17]. On the other hand, this action can be accompanied by side effects that need to be considered, and instead, other methods should be used to control such pains. Most of the studies in procedural pain are on the age group of children and infants, and the pain control methods resulting from such procedures have been compared. Therefore, in the field of pain control, a lack of study on procedural pain and the effects of proper pain management on reducing diagnosis and treatment costs and increasing patient satisfaction is essential.

The study aimed to assess the incidence and procedures type of pain control in patients admitted to ICU.

Methods

Design

The present study was a cross-sectional descriptive study performed in three public hospitals from February to August of 2020. After approving the plan and receiving the code of ethics from the Vice Chancellor for Research of Isfahan University of Medical Sciences and obtaining the consent of hospital officials, the researcher and trained colleagues attended eleven intensive care units of these hospitals.

Participants

After completing the informed consent form by the patient family, according to inclusion criteria, patients were sampled. The inclusion criteria were: (1) injured due to trauma, (2) older than 18 years, (3) stabilized condition regarding airway, breathing, and circulation, (4) Glasgow Coma Scale score <8 (on a 3–15-scale where 3 indicates no sign of neurological function and 15 is a full neurological function), (5) patients who were intubated for less than 24 hours, (6) not addicted to any kinds of drugs, (7) no need to cardiopulmonary resuscitation, (8) not brain dead, (9) not receiving sedation or narcotic injection or, if acetate injection, drug half-life expired, and (10) at least one hour before the intended painful procedure, no other painful procedures have been performed on the patients as part of their standard care. The patients who required cardiopulmonary resuscitation or any essential process that caused pain or were transferred to another ward during data collection were excluded from this study[19].

Sample size

Patients with acceptable inclusion criteria are included in the study by a non-randomized continuous sampling method to complete the required sample size. The sample size was determined by the following equation:

$$n = \frac{z2pq}{E2}$$

Due to the lack of accurate statistics on the prevalence of procedural pain in adult intensive care units, the presence or absence of pain related to procedural pain was considered 50% for each, 95% confidence interval, and 5% error. The sample size was 400. Patients were entered sequentially in the study.

Outcomes and survey Instruments

The authors developed the assessment tool used in this study in three parts. In the first part, demographic

variables, including age and sex, and information related to trauma, such as the location of pain, type of injury, cause of injury, and type of painful procedures performed on the patient, were recorded. Painful procedures in this study include chest tube insertion, wound care, urinary tract catheterization, change position, gastric tube removal, catheter removal, tracheal suctioning, chest tube removal, a central venous catheter (CV line) insertion, peripheral intravenous insertion, and blood draw[11].

The second part was the measurement of the pain severity with the Critical-Care Pain Observation Tool (CPOT) from 0 to 8, where 0 shows no pain and 8 indicates the most severe pain one can have. CPOT is documented to be a valid and reliable measure of pain severity in intensive care units[20, 21]. A researcher measured and recorded these three times, including before, immediately after, and 30 minutes after the painful procedures.

The third part recorded the time of the pain assessment, methods of controlling pain in local anesthesia, and the pharmacological and non-pharmacological interventions. The experts confirmed the validity of the assessment tool in intensive care units, and its inter-rater reliability was estimated as 0.88.

Data Collection

The researcher and colleagues were present randomly in different work shifts in the research environments, and by direct observation of painful procedures performed on the patients, they obtained all this information and recorded it in the relevant checklist. Then the next patient was observed in the same way in case of painful procedures performed on that patient by a physician or nurse. Each patient was considered one sample.

Statistical Methods

Data were statistically analyzed using SPSS16 and described by frequencies, means, and standard deviations. The Kolmogorov-Smirnov tests measured the normality of data on pain intensity. The pain intensity was analyzed in different sub-groups using the Mann-Whitney and the Kruskal-Wallis tests. The pain intensity in different time sections was presented by the repeated measure facility and analyzed by the Freidman test. The significance level for all the tests was 0.05.

Ethical Consideration

The investigation involving human subjects conformed to all relevant national regulations and institutional policies and followed principles of the Declaration of Helsinki (as amended in 2013); and was approved by the Research Ethical Committee of the University of Medical Sciences. All the legal patients' attendants signed the written informed consent, and they could withdraw from the study at any time during the research. The patients' attendants were assured that their personal information was kept confidential.

Result

Baseline data

Overall, 400 patients participated in this experiment, of which the majority [N = 313 (78.2%)] were male, and the mean age was 33.16 years. Table 1 lists the main patient characteristics. Among the 400 patients, 241 (60.25%) received invasive mechanical ventilation during the procedure, and the others were in a breathing trial with T piece. The most common approach was tracheal suctioning (n = 155), and the least common was urinary catheter removal (n = 4) (Table 2). Pain intensity varied significantly across procedures. Chest tube insertion, wound care, and tracheal suctioning were the three most painful procedures. CV line removal was the least painful procedure (Table 2).

Pain intensity changes

In general, patients showed mild pain intensity according to CPOT before the procedures, and according to the Friedman test results, they experienced a significant increase in pain intensity during the method for all approaches ($P<0.001$) except urinary catheter removal ($P=0.363$). Of course, in analyzing all techniques except urinary catheter removal, the Bonferroni test showed no significant difference between before and 30 minutes after painful procedures, including chest tube placement ($P=0.854$), gastric tube placement ($P=0.099$), bladder catheterization ($P=1$), chest tube removal ($p=0.312$) and CV line removal ($P=1$). Also, there was no significant difference in pain intensity immediately after the procedure and 30 minutes after the CV line removal ($P=0.098$). Also, the Kruskal-Wallis test showed a significant difference between the groups of

painful procedures in terms of pain intensity based on CPOT criteria in all three periods (Table 2).

Pain Assessment

35 (%8.8) patients of 400 trauma patients underwent pain assessment. There was no pain assessment before painful procedures. The most pain assessment was done during the painful procedures in 30 (%7.5) patients and 30 minutes after painful procedures in 5 (%1.2). All these pain assessments were performed with the personnel's direct observation of the patient face and asking the patient, "Are you in pain?" So there was no use of any tool for pain assessment by personnel. Most of these pain assessments were performed by nurses (n=26) and other examinations by physicians (n=9). Also, there was no secondary pain assessment until 30 minutes after the painful procedures.

Pain management

A total of 160 patients received pain relief interventions, of which 157 cases received pharmacy, and three received non-pharmacological intervention by the ICU treatment team for pain relief. The frequency of type, dose, and time of drug interventions used for the first time by the ICU treatment team to reduce the pain of procedures is presented in Table 3. Notice that in two cases, in addition to local anesthesia with Lidocaine, Morphine was used during the painful method. Also, there was no pain management in change position, NG tube removal, or urinary catheter removal, and there was one intervention as, Midazolam, in procedures of CV line removal, peripheral intravenous insertion, and blood draw separately.

Adequacy of pain management

Patients who were treated by the interventions experienced more pain according to the CPOT criteria immediately after the procedure. Friedman's test showed a significant difference within each group regarding pain intensity. Also, the Bonferroni test showed a significant difference between all three time periods in pairs. The Mann-Whitney U test showed no significant difference between the two pain management groups and non-pain management in pain intensity in the time section before the process. Thirty minutes after the procedure, the pain was significantly reduced in the pain management group (Table 4).

Type of pain treatment

Notice that only three times deep-breathing as non-pharmacological intervention were performed for three out of 400 patients, all of whom underwent airway suction procedures. All three deep breaths are asked to be acted during the approach that was not specified to the researcher that the purpose of this work was to sputum suction or reduce the patient's pain. The status of changes in pain intensity in three groups, including without pain management, non-pharmacological and pharmacological pain management, was shown in Figure 1. In patients who had pain reduction with non-pharmacological pain management (only considering deep breathing in this study), based on CPOT criteria, they experienced more pain immediately after and then 30 minutes after the operation, compared to the other two methods. (Figure 1).

Table 1. Characteristics of patients

Variables		N (%)
Sex	Female	87 (21.8)
	Male	313 (78.2)
Injury site	Upper and lower limbs	21 (5.2)
	Trunk	30 (7.5)
	Head	28 (7)
	Multi-site	321 (80.3)
The kind of Trauma	Contusion and stretching	23 (5.8)
	Laceration and wounds	20 (5)
	Fracture	19 (4.8)
	Multiple	338 (84.5)
The Cause of Trauma	Motor Vehicle Accident	280 (70)
	Fall	84 (21)
	Collision	15 (3.7)
	Other causes	21 (5.2)

Table 2. Kind and frequency of procedures and pain intensity according to CPOT in three time measurements.

Procedure	N (%)	Before procedure (Mean ± Sd)	Immediately after procedure (Mean ± Sd)	30 minute after procedure (Mean ± Sd)	P Value*
CV line insertion	33 (8.2)	0.94 ± 0.60	5.67 ± 1.84	1.55 ± 0.66	<0.001
Chest tube insertion	20 (5)	1.20 ± 1.39	7.35 ± 1.22	1.50 ± 0.76	<0.001
Tracheal suctioning	155 (38.8)	1.12 ± 0.97	6.32 ± 1.53	1.50 ± 0.95	<0.001
Gastric tube insertion	8 (2)	0.25 ± 0.70	6 ± 1.41	1.25 ± 1.03	<0.001
Bladder catheterization	5 (1.2)	2 ± 1.22	6.20 ± 1.09	1.80 ± 0.44	<0.001
Wound care	53 (13.2)	0.74 ± 0.98	6.34 ± 1.53	1.85 ± 1.62	<0.001
Chest tube removal	10 (2.5)	0.40 ± 0.69	2.80 ± 1.68	0.80 ± 0.91	0.002
CV line removal	5 (1.2)	0.80 ± 0.44	2.20 ± 0.44	1 ± 0.77	<0.001
Urinary catheterremoval	4 (1)	2 ± 2	4 ± 1.73	2.33 ± 0.57	0.363
Gastric tube removal	11 (2.8)	0.64 ± 0.92	3.18 ± 1.88	1.73 ± 0.64	<0.001
Change position	39 (9.8)	0.62 ± 0.67	3.56 ± 1.90	1.72 ± 0.72	<0.001
peripheral intravenous insertion and blood draw	57 (14.2)	0.88 ± 1.22	4.89 ± 2.03	2.16 ± 0.90	<0.001
Total		0.94 ± 1.01	5.59 ± 2.03	1.65 ± 1.03	<0.001
P Value**		0.001	<0.001	<0.001	
* Friedman test, ** Kruskal-Wallis test					

Table 3. Frequency of type, dose and time of drug interventions used by treatment team to reduce pain in trauma patients in ICU.

Drugs	N (%)	Average dose used	Pharmacological intervention time	N (%)
Fentanyl	12 (3)	62.5 ± 22.61 (µg)	Before procedure	0
			During procedure	10 (83.3)
			After procedure	2 (16.7)
Morphine	6 (1.5)	2 (mg)	Before procedure	0
			During procedure	5 (83.3)
			After procedure	1 (16.6)
Midazolam	87 (21.8)	2.26± 0.44 (mg)	Before procedure	0
			During procedure	71 (78.9)
			After procedure	16 (17.8)
Subcutaneous Lidocaine	54 (13.5)	100 (mg)	Before procedure	54 (100)
			During procedure	0
			After procedure	0

Table 4. The effectiveness of pain control interventions on pain intensity in trauma patients in ICU

Time sections		N (%)	Before the procedure (Mean ± Sd)	Immediately after the procedure (Mean ± Sd)	30 minutes after the procedure (Mean ± Sd)	P value*
Pain management	Yes	160 (60.8)	0.90 ± 0.96	6.28 ± 1.74	1.54 ± 1.1	<0.001
	No	240 (39.2)	0.96 ± 1.04	5.13 ± 2.08	1.72 ± 0.98	<0.001
	P value**		0.656	<0.001	0.035	<0.001

* Friedman test, ** Mann-Whitney U test

Discussion

This study aimed to evaluate the frequency and type of painful procedures and pain control methods of these procedures in patients admitted to intensive care units. The severity of pain before the process was mild but intensified immediately after it. There was no pain management plan for most of the patients, and only 39.2% of those with significant pain, received analgesics almost during the procedure performance considering almost after the non-verbal expression of pain by patients.

In an international study in Europe, to assess self-reported procedural pain intensity versus baseline pain, all procedures significantly increased pain, although none bof them caused severe pain[15]. Of course, this study was performed on the loss of consciousness patients, and there are differences in pain expression in research by Olsen et al., the proportions of patients who were in pain were significantly higher for patients able to self-report[22].

In this study, 30 minutes after the procedure, the severity of pain was measured and showed a decrease, but its mean did not exactly reach the base of pain severity before it and remained a little high compared to it (pain severity mean score in before the procedure, and 30 minutes after it was 0.94 and 1.65 respectively). Khayer et al. showed that the CPOT mean score was significantly higher in tracheal suctioning during and 10 minutes after suctioning than before suctioning, and the score 30 minutes after suctioning was incredibly lower than that 10 minutes after suctioning. Pain severity mean score before and 30 minutes after suctioning was 1.72 and 1.65, respectively[23]. It shows that the pain caused by this procedure almost disappears up to 30 minutes after the painful procedures, and patients return to their original state of pain.

In this study, demographic data showed that most patients were male, multi-site, multiple trauma with motor vehicle accident cause of trauma. In line with this study, the demographic information of studies conducted on Iran trauma patients shows that men suffer more from trauma and the most common cause was the motor vehicle accident[19]. However, in terms of size and nature of trauma, most trauma patients admitted to intensive care units were complex and multidisciplinary, leading to such patients being admitted to the ICU. Of course, gender and age disparities in oligoanalgesia occur frequently[24], although we did not find such differences in our research.

The most common procedure was tracheal suctioning, but Puntillo et al. showed the most common method was turning[15] and in another study was bladder catheter[25]. This discrepancy may be due to the differences between the study methods and the sample entry criteria. Nevertheless, the most painful procedure in this study was chest tube insertion, which is according to Puntillo et al.'s study[15]. Kalfon et al. in France showed that chest tube insertion, chest tube removal, use of bladder catheter, CV line insertion, complex dressing change, and intra-hospital transport were associated with pain-related discomfort[25]. About tracheal suctioning as a prevalent procedure in ICU was shown that closed suctioning is less painful for the patients in ICU[23]. In this study, tracheal suctioning through an endotracheal tube and tracheostomy was considered other than oral suctioning, referred to as tracheal suctioning.

For two CV line and chest tube insertion procedures, subcutaneous Lidocaine injection was used for all of these two procedures and only for two patients; in addition to subcutaneous Lidocaine, Morphine was used during the chest tube insertion. According to other studies[7, 8, 12, 15, 26], of course, in a different setting, the dose of analgesic drugs has been high and varied compared to this study. Our study demonstrated less administration of analgesics in ICU trauma patients due to the fear of patients' dependence on drugs and getting their condition worse[5, 10, 27-29] or due to insufficient knowledge of physicians and nurses in this field[30]. However, the patients who received pharmacological interventions showed significantly better pain relief.

When the pain was assessed regularly with pain assessment tools, 10% of patients were in pain and resting, and 27% were in pain during turning in a longitudinal study[22]. Robleda et al. showed that pre-emptive fentanyl is more effective and reasonably safe in pain management of turning procedures in critically ill patients. This result may change nursing attitudes about this. Turning is frequently a painful nursing procedure in this setting, and preemptive administration of supplementary analgesia may help decrease this pain[31].

Also, there is a wide range of non-pharmacological methods for pain relief procedures, including transcutaneous electrical nerve stimulation (TENS), message, and cold or heat therapy[32, 33] that nurses can use safely. The uses of these methods in our study were rare in Faigeles's study, and deep breathing was used in 37.9% of intensive care patients[12]. Combining two pharmacological and non-pharmacological methods was shown by Lou et al. that virtual reality is an effective pain reduction measurement added to analgesics for burn patients undergoing dressing changes or physical therapy as too painful procedures in burn patients[1]. There is an emphasis on multimodal analgesia and preventive analgesia to reduce central sensitization[3].

On the other hand, more pain assessments were performed by nurses in this study, and other studies recommend that nurses should be more involved in pain management[19, 34-36]. Nurses should be trained in pain measurement and pain medication, especially opioid administration[19, 36], similar to nursing care and

pediatric procedural pain techniques[37, 38]. Of course, lack of time, workload, doctors' reluctance to prescribe painkillers, the lack of nursing knowledge about prescribing opioids, confusion in the healthcare system, doctors' distrust of pain assessment by nursing personnel, and difficulty in contacting and communicating with doctors for Discussion. The results of patients' pain assessments and complications experienced by patients with completing pain assessment scales were among common barriers to procedural pain management [39, 40]. In this context, the health services must be more active in pain management strategies since procedures potentially produce pain and anxiety, both of which should be assessed and addressed before the process begins to improve quality of care and patient satisfaction; however, there is an appropriate guides[11, 16].

The results of this multiple-site study might not be generalized to other ICU settings. Further studies are required on procedural pain management discrepancies to improve patient care.

Pain management protocols, pain coding, and other suggestions for procedural pain improvement should be reviewed in safety and efficacy.

Conclusion

The current research study demonstrated that procedural pain procedural pain is particularly significant during the process but is commonly overlooked in the intensive care unit because there was no pain assessment before painful procedures. Before any procedures for treatment, an accurate assessment of pain intensity by proper tools is crucial to managing pain appropriately. Patients who were treated with pain relief interventions experienced more pain immediately after the procedure. Also, non-pharmacological analgesic interventions have no place in procedural pain relief, and the variety of drug interventions used was low and sometimes wrong and misplaced.

Acknowledgments

None.

Authors' contributions

All authors have accepted responsibility for the entire content of this manuscript and approved its submission.

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding/support

This study has been funded by the research deputy of the University of Medical Sciences in Isfahan with grant No. 198145.

Ethical Consideration

The Research Ethical Committee of the University of Medical Sciences in Isfahan approved the study protocol under the ethical approval number IR.MUI.RESEARCH.REC.1398.488. The online version of this decree is available at https://ethics.research.ac.ir/IR.MUI.RESEARCH.REC.1398.488, and it is open publicly.

References

1. Luo H, Cao C, Zhong J, Chen J, Cen Y. Adjunctive virtual reality for procedural pain management of burn patients during dressing change or physical therapy: A systematic review and meta-analysis of randomized controlled trials. *Wound Repair Regen* 2019; 27: 90-101.

2. Mitra S, Jain K, Singh J, Saxena P, Niyma T, Selvam S, et al. Clinical utility of the behavioral pain assessment tool in patients admitted in the intensive care unit. *Indian J. Crit. Care Med.*: Peer-reviewed, Official Publication of Indian Society of Critical Care Medicine 2020; 24: 695.

3. Joshi GP, Schug SA, Kehlet H. Procedure-specific pain management and outcome strategies. *Best Pract. Res. Clin. Anaesthesiol* 2014; 28: 191-201.

4. Federici S, Bracalenti M, Meloni F, Luciano J. World Health Organization disability assessment schedule 2.0: An international systematic review. *Disabil Rehabil* 2017; 39: 2347-2380.

5. Bergman CL. Emergency Nurses' Perceived Barriers to Demonstrating Caring When Managing Adult Patients' Pain. *J Emerg Nurs* 2012; 38: 218-225.

6. Masoudi Alavi N, Aboutalebi MS, Sadat Z. Verbal and Non-verbal Rating Scales in the Determination of Pain Severity in Trauma Patients in the Emergency Department. *Trauma Mon* 2017; 22.

7. Ridderikhof ML. Pain management in adult patients with acute traumatic injuries: Improving injury-related pain treatment. *UvA*, 2019.

8. Minick P, Clark PC, Dalton JA, Horne E, Grene D, Brown M, et al. Long-bone fracture pain management in the emergency department. *J Emerg Nurs* 2012; 38: 211-217.

9. Brawley DC. Pain Relief Knowledge, History, and Expectations among Emergency Dental Patients.WVU 2019.

10. Czarnecki ML, Simon K, Thompson JJ, Armus CL, Hanson T, Berg K, et al. Barriers to pediatric pain management: A nursing perspective. *Pain Manag Nurs* 2011; 12: 154-162.

11. Czarnecki ML, Turner HN, Collins PM, Doellmam D, Wrona S, Reynolds J. Procedural pain management: A position statement with clinical practice recommendations. *Pain Manag Nurs* 2011; 12: 95-111.

12. Faigeles B, Howie-Esquivel J, Miaskowski C, Stanik-hutt J, Thompson C, White C, et al. Predictors and use of nonpharmacologic interventions for procedural pain associated with turning among hospitalized adults. *Pain Manag Nurs* 2013; 14: 85-93.

13. Lang EV, Tan G, Amihai I, Jensen M. Analyzing acute procedural pain in clinical trials. *PAIN®* 2014; 155: 1365-1373.

14. Stang AS, Hartling L, Fera C, Johnson D, Ali S. Quality indicators for the assessment and management of pain in the emergency department: a systematic review. *Pain Res. Manag* 2014; 19: e179-e190.

15. Puntillo KA, Max A, Timsit J-F, Vignoud L, Chanques G, Robleda G, et al. Determinants of procedural pain intensity in the intensive care unit. The Europain® study. *Am J Respir Crit Care* Med2014; 189: 39-47.

16. Lee GY, Yamada J, Shorkey A, Stevens B. Pediatric clinical practice guidelines for acute procedural pain: a systematic review. *Pediatrics* 2014: peds. 2013-2744.

17. Shah V, Taddio A, McMurtry CM, Halperin SA, Noel M, Riddell RP, et al. Pharmacological and combined interventions to reduce vaccine injection pain in children and adults: systematic review and meta-analysis. *Clin J Pain* 2015; 31: S38.

18. Farber SJ, Saheb-Al-Zamani M, Zieske L,Laurido O,Bery A,Hunter D, et al. Peripheral nerve injury after local anesthetic injection. *Anesth Analg* 2013; 117: 731-739.

19. Alavi NM, Aboutalebi MS, Sadat Z. Pain management of trauma patients in the emergency department: a study in a public hospital in Iran. *Int Emerg Nurs* 2017; 33: 53-58.

20. Basiri R, Ghelichli M, M Lari S, Vahidi A, Ghelichli M. The Critical-Care Pain Observation Tool: A useful tool for pain assessment in intensive care units. *Journal of Cardio-Thoracic Medicine* 2018; 6: 329-331.

21. Kiesewetter I, Bartels U, Bauer A, Schneider G, Pilge S. The German version of the Critical-Care Pain Observation Tool for critically ill adults. *Der Anaesthesist* 2019; 68: 836-842.

22. Olsen BF, Valeberg BT, Jacobsen M, Smastuen C, Puntillo K, Rustoen T. Pain in intensive care unit patients—A longitudinal study. *Open J Nurs* 2021; 8: 224-231.

23. Khayer F, Ghafari S, Saghaei M,Yazdannik A, Atashi V. Effects of open and closed tracheal suctioning on pain in mechanically ventilated patients. *Iran J Nurs Midwifery Res* 2020; 25: 426.

24. Cullison K, Carpenter CR, Milne WK. Hot Off the Press: Use of Shared Decision-making for Management of Acute Musculoskeletal Pain in Older Adults Discharged from the Emergency Department. *Acad Emerg Med* 2016; 23: 956-958.

25. Kalfon P, Boucekine M, Estagnasie P, Geantot M, Berric A, Simon G, et al. Risk factors and events in the adult intensive care unit associated with pain as self-reported at the end of the intensive care unit stay. *Crit Care Med* 2020; 24: 1-10.

26. Fry M, Bennetts S, Huckson S. An Australian audit of ED pain management patterns. *J Emerg Nurs* 2011; 37: 269-274.

27. Berben SA, Meijs TH, van Grunsven PM, Schoonhoven L, Achterberg Tv. Facilitators and barriers in pain management for trauma patients in the chain of emergency care. *Injury* 2012; 43: 1397-1402.

28. Ghazanfari Z, Forough AG,Mir HM. The nursing staff view about barriers of using pain relief methods. *Iranian journal of critical care nursing* 2011.

29. Zargarzadeh M, Memarian R. Assesing barriers for using of complementary medicine in relieving pain in patients by nurses. *Quarterly Journal of Nursing Management* 2013; 1: 45-53.

30. Dehnoalian A, Mohammadpour A. Barriers to pain management: Comparing the viewpoints between physicians and nurses. *Reg Anesth Pain Med* 2014; 4: 49-56.

31. Robleda G, Roche-Campo F, Urrútia G, Navarro M, Sendra MA, Castillo A, et al. A randomized controlled trial of fentanyl in the pre-emptive treatment of pain associated with turning in patients under mechanical ventilation: research protocol. *J Adv Nurs* 2015; 71: 441-450.

32. Martorella G. Characteristics of Nonpharmacological Interventions for Pain Management in the ICU: A Scoping Review. *AACN Adv Crit Care* 2019; 30: 388-397.

33. Sandvik RK, Olsen BF, Rygh LJ, Moi Al. Pain relief from nonpharmacological interventions in the intensive care unit: A scoping review. *J Clin Nurs* 2020; 29: 1488-1498.

34. Hadorn F, Comte P, Foucault E, Morin D, Hugli O. Task-shifting using a pain management protocol in an emergency care service: Nurses' perception through the eye of the Rogers's diffusion of innovation theory. *Pain Manag Nurs* 2016; 17: 80-87.

35. Taylor DM, Fatovich DM, Finucci DP, Furic J, Jin S, Keijzers G, et al. Best-practice pain management in the emergency department: A cluster-randomised, controlled, intervention trial. *Emerg Med Australas* 2015; 27: 549-557.

36. Ucuzal M, Doğan R. Emergency nurses' knowledge, attitude and clinical decision making skills about pain. *Int Emerg Nurs* 2015; 23: 75-80.

37. Bice AA, Gunther M, Wyatt T. Increasing nursing treatment for pediatric procedural pain. *Pain Manag Nurs* 2014; 15: 365-379.

38. Koller D, Goldman RD. Distraction techniques for children undergoing procedures: a critical review of pediatric research. *Pediatr Nurs* 2012; 27: 652-681.

39. Mędrzycka-Dąbrowska WA, Dąbrowski S, Basiński A, Dubiela M. Identification and Comparison of Barriers to Assessing and Combating Acute and Postoperative Pain in Elderly Patients in Surgical Wards of Polish Hospitals: A Multicenter Study. *Adv Clin Exp Med*: official organ Wroclaw Medical University 2016; 25: 135-144.

40. Pretorius A, Searle J, Marshall B. Barriers and enablers to emergency department nurses' management of patients' pain. *Pain Manag Nurs* 2015; 16: 372-379.