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ORIGINAL RESEARCH

Evaluating the implementation of pain management templates in adult intensive care units: A systematic review

Ladan Sedighie[1], Fariba Bolourchifard[2], Maryam Rassouli[3], Nadia Sanee[1]

1- PhD Student, Department of Nursing, Student Research Committee, School of Nursing & Midwifery, Shahid Beheshti University of Medical Sciences, Tehran, Iran
2- Assistant Professor, School of Nursing & Midwifery, Shahid Beheshti University of Medical Sciences, Tehran, Iran
3- PhD, RN, Cancer Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran.
4- PhD Student in Medical Librarianship and Information Science, Student Research Committee, School of Health Management and Information Sciences, Iran University of Medical Sciences, Tehran, Iran.

Correspondence:

Fariba Bolourchifard,
School of Nursing & Midwifery, Shahid Beheshti University of Medical Sciences, Tehran, Iran.
E-mail:
bolourchifard@gmail.com
Tel: +98-09121547356

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ABSTRACT

Background & Aim: Pain is one of the common problems in intensive care units (ICUs), and is considered a major clinical challenge due to its high prevalence and unwanted effects on morbidity if left uncontrolled. This study was conducted with the aim to critically appraise pain management templates and their effect on clinical outcomes for patients admitted to adult ICUs.

Methodology: The current integrative systematic review was carried out by searching the databases Web of Knowledge, Scopus, PubMed, Cochrane and Embase from January 1, 1995 to December 31, 2018 and using keywords pain, pain threshold, pain management, analgesia, algorithms, clinical protocols, program, guidelines, and intensive care. Out of 160 retrieved articles, 14 were ultimately selected, which were analyzed based on the specific criteria of pain diagnosis and evaluation, treatment, and pain documentation and prevention.

Results: In all studies, specific tools for pain diagnosis and pharmacological treatment were advised or implemented. Most studies also referred to pain re-assessment or prevention, but no attention to documentation of pain management was done in any of them. NRS (numeric rating scale) and BPS (behavioral pain scale) for pain assessment in conscious and unconscious patients were considered more than any other scales. Additionally, in all studies, injectable opioids were prescribed as the first line of pain medication and there was a lack of non-pharmacological pain relief advice in all.

Conclusion: Disregard for various non-pharmacological pain management methods and lack of precise documentation for the pain management need more attention. Results of this study can be a useful clinical guide to design and implement a standard pain management algorithm effective in ICUs and to improve the quality of pain management in ICUs.

Key words: Pain; Pain management; Adult; Intensive Care Unit; Template

Abbreviations: PAD - pain, agitation, and delirium; J-PAD –Japanese guidelines for the management of pain, agitation, and delirium; FEPIMCTI - Federacion Panamericana e Iberica de Sociedades de Medicina Critica y Terapia Intensiva

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INTRODUCTION

Pain is an unpleasant sensory and emotional experience,[1] and a stressful and common problem in critically ill patients admitted to intensive care units,[2] which can cause agitation and impairments in patients' hemodynamics, cortisol and insulin secretion, immune system, cardiorespiratory function, and mental status.[3,4] In addition to patients' systemic diseases, normal nursing care and procedures are also common causes of pain in ICU patients.[5] More than 70% of patients recall moderate to severe pains during their stay in the ICU, more than

50% of which are related to common nursing care.[6] About 64% of patients are unable to express pain for different reasons such as the inability to communicate due to reduced consciousness, receiving sedatives and mechanical ventilation.[7]

Despite the importance of this issue, and despite recent efforts in the field of pain management, there are standards and validated guidelines,[8,9] such as PAD, J-PAD, FEPIMCTI.[10-13] Weaknesses in pain management are still felt,[13] and remain a major problem in all healthcare centers and especially in intensive care units.[14] The probable reasons may be; patients' inability to express their pain,[14] use of sedation,[15,16] lack of knowledge by nurses and agitated patient.[14,17] Proper evaluation and organization of analgesic interventions is difficult and challenging[17] and more than 75% of the severe patients receive ineffective analgesics during admission and hospitalization in ICUs.[18]

Pain management consists of three main stages including diagnosis, interventions for pain relief, and reassessment of pain.[7,19] A standardized algorithm for pain management need to cover all the three stages and be consistent with the updated guidelines of pain management.[8] However, the factors discussed in the preceding paragraph suggest poor pain management in these patients.[8,18,20] Improper pain management leads to undesirable clinical outcomes such as prolonged hospitalization, re-hospitalization, and patients' dissatisfaction with the provided care, and increased morbidity and mortality.[6, 8]

Pain management in the form of an evidence-based algorithm can be utilized as a standard and uniform instrument in clinical guidelines to provide adequate pain management by the treatment team.[21] In addition, its other benefit is to improve the indicators of quality of care in ICUs, such as the diagnosis of pain by nurses in patients with reduced consciousness, improving the quality of documentation of pain assessment in patients, taking effective pharmacological and non-pharmacological measures to relieve pain, decreasing the rate of ventilator-associated pneumonia (VAP) in patients under mechanical ventilation, reducing the duration of mechanical ventilation in patients, shortening the length of stay for hospitalized patients, reducing medical errors (injectable opioids and analgesics),[2,6,21,22] treatment costs and mortality rates.[23]

Therefore, considering the positive impacts of implementing a coherent pain management program, the need for implementing coherent programs or guidelines that cover all the three main stages of pain management is of particular importance and considered necessary. By using the existing standards associated with all the three stages of pain management and introducing the best algorithms in this regard, the present review also aims to examine the algorithms for pain management in ICUs, in order to appraise the quality of algorithms and methods of pain management in ICUs. It is hoped that the obtained results will allow us to take a small step forward to enhance pain management in ICUs, and further improve the indicators of quality of care in ICUs.

METHODOLOGY

Study Design:

The main pattern of this study was based on a systematic review of published research papers which had investigated pain management algorithms or implemented them in ICUs.

Data Collection Source:

Based on PRISMA 2009 model (Flow chart No.1), a systematic review was performed on the databases, e.g., Web of Knowledge, Scopus, PubMed, Cochrane Library and Embase, among articles published from 01.01.1995 to 12.31.2018, by using keywords *pain, pain threshold, pain management, analgesia, algorithms, clinical protocols, program, guidelines,* and *intensive care*. The search strategy formula was ("pain"[MeSH Terms] OR "pain threshold"[MeSH Terms] OR "pain management"[MeSH Terms] OR

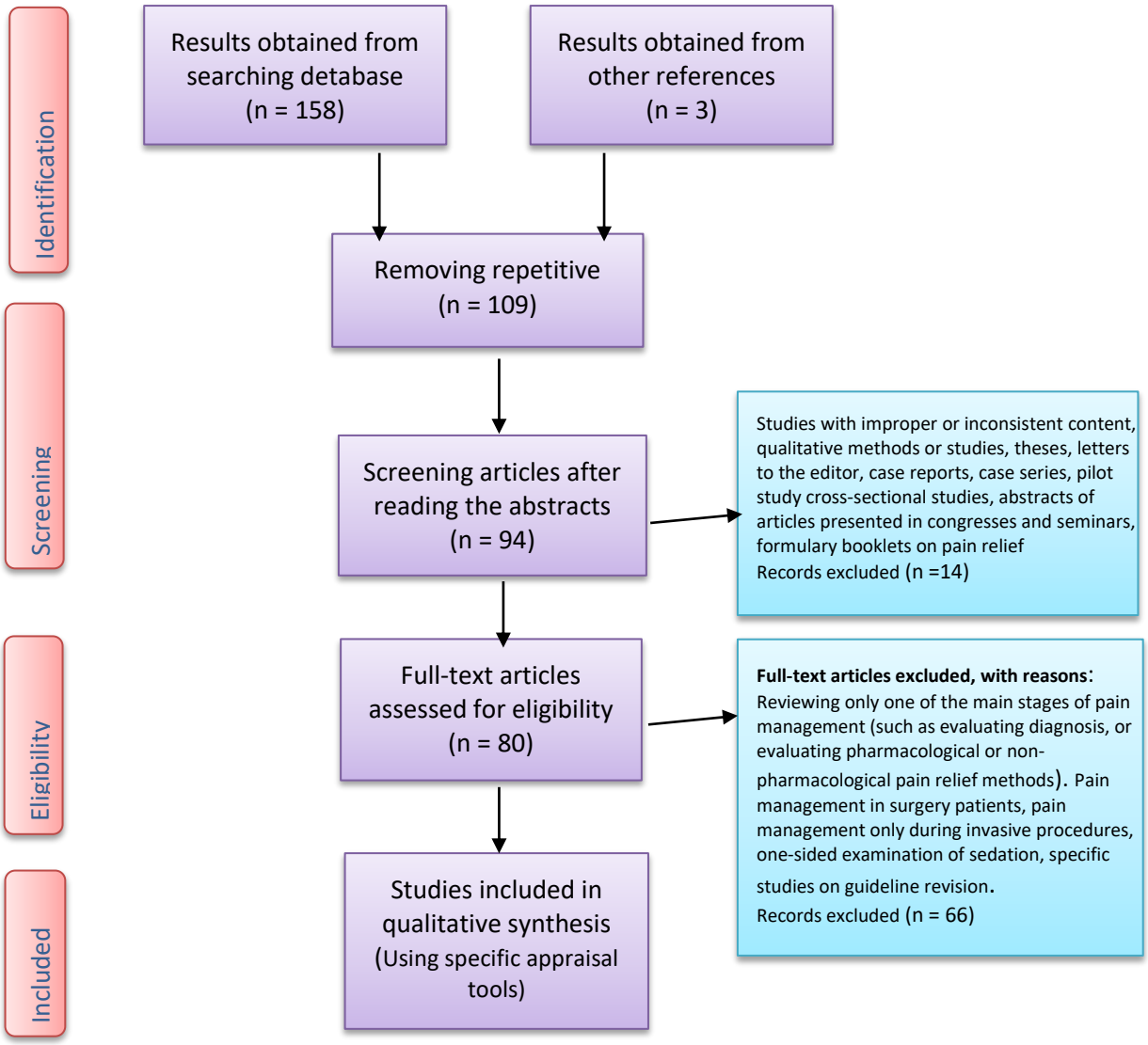

Figure 1: PRISMA 2009 Flow Diagram

"analgesia" [MeSH Terms]) AND ("algorithms"[MeSH Terms] OR "clinical protocols"[MeSH Terms] OR program [All Fields]) OR "guidelines as topic"[MeSH Terms] AND ("intensive care units"[MeSH Terms] OR "icu"[All Fields].

Reference lists were checked to retrieve additional studies. Two reviewers (N.S., and L.S.) collected studies separately and shared the final selected studies. All disagreements were solved by discussion and consensus. The articles published in English were searched by performing advanced search, but due to the lack of access to acceptable results in eligible Iranian sites (SID and Barakat), no Farsi articles were mentioned in the current study.

Inclusion criteria:

all studies referring to at least one pain management algorithm or method, with samples consisting of adult patients (above 18 y of age) hospitalized in ICUs, with reduced consciousness.

Exclusion criteria:

- Studies only focusing on the non-pharmacological aspects of pain

management, and only introducing, explaining or evaluating pain assessment scales
- Studies that addressed pain management algorithms in patients undergoing surgery (such as general orthopedic surgery or coronary artery surgery), and had only examined pain management during treatment procedures
- Qualitative methods, dissertations, letters to the editor, case reports, case series, cross sectional studies, summaries of articles presented at congresses and seminars, and studies that investigated pain-management-related medicines
- Studies that only considered patient sedation

- Studies only referring to agitation or anxiety management in patients
- Formulary booklets on pain relief specifically developed for different countries, without providing any coherent and clinical algorithm for pain management
- A non-review or overview study developed only to introduce or revise the guideline

Appraisal criteria of retrieved studies:

The retrieved 14 studies were appraised. The study of Sigakis et al., which referred to the main indicators of pain management in a practical, coherent and detailed manner, was in line with the PAD guideline (eligible pain management guideline) and chosen as the reference article. This article earned the highest score among other studies containing pain management guidelines and was examined by a specific appraisal instrument.

The remaining 13 studies were reviewed based on this guideline in the three major stages of pain management (diagnosis, treatment, pain relief and reassessment of pain) (Table 2). In addition to the major stages, documentation was also considered as an important factor in the process of pain management, and the fourth stage in the evaluation of studies (Table 2).[15,24]

RESULTS

Out of 160 articles, 14 papers were selected and appraised, according to the year of publication, design and objectives of the study, final results, inclusion and exclusion criteria, the method and the type of pain management algorithm in adult ICUs, in line with PRISMA 2009 Model (Figure 1). Final studies mentioned clinical algorithms, clinical protocols and guidelines for pain management and their impact on clinical outcomes (Table 1).

Out of the 14 obtained studies, 4 systematic or integrative review studies with or without Delphi or expert panel focused on evaluating the implementation of the eligible guideline PAD (Pain, Agitation, Delirium) and evaluated their use in pain management and clinically outcomes.[21,23,25,26] One review study compared the guidelines J-PAD, PAD, and FEPIMCTI guides and effects of them on pain management.[9] Another systematic review study also introduced pain management standards in order to provide the best care, which was also used for appraising other articles, as a reference study or guide.[8] In addition, an interventional study performed an assessment before and after the implementation of pain management protocols.[27]

Six other studies, including a clinical trial, a randomized clinical trial, an interventional study, an action research and a cohort with pilot study introduced and presented the results of implementing clinical pain management algorithms and programs. The reported results regarding implementing pain management programs included shortened hospitalization, reduced length of stay in the ward and in the hospital, enhanced pharmacological and non-pharmacological methods of pain relief, reduced ventilator-dependent pneumonia (VAP), reduced treatment costs and increased cost effectiveness.[10,12,13,28-30] In some studies, pain management algorithm or flowchart was not included in the article, and only explanations about the nature of pain management algorithm were offered. A randomized trial study also compared two strategies in patients' pain management and examined the impact of both strategies on clinical outcomes.[31]

All of the 14 obtained studies were examined with specific appraisal tools. The protocols and guidelines were appraised with AGREE 2 instrument, and other studies with the specific tools PRISMA, CONSORT CASP, NOS, MAK, and QI-MQCS, all of which had an acceptable quality to be included in the assessment studies, based on pain management standards. At this stage, 13 studies were appraised in accordance with the reference article (Sigakis et al.) and with focus on the three main domains of pain management process including pain diagnosis, treatment (pain relief), prevention and improvement, in line with the model presented by Sigakis et al., as well as the documentation of pain management (Table 2).

All 13 studies referred to eligible scales for the assessment and the diagnosis of pain in patients hospitalized in ICUs; out of which 6 studies used NRS pain assessment scale.[9,13,21,26,29] Detail of different studies using different scale is shown in Table 1. In all 13 studies, it was recommended to use pain relief algorithms to relieve and control pain in patients hospitalized in ICUs. Two studies briefly referred to the implementation of pharmacological pain relief methods, but pharmacotherapy details or prioritizing the use of analgesic and sedative drugs was not mentioned.[10,29]

Only two of the extracted studies referred to pain prevention during the process of pain management in the patients hospitalized in ICUs.[9,26] One study noted the complications of narcotics, in addition to pain prevention.[23]

Four studies pointed to the reassessment of pain (post medical interventions), in general terms, with no details on pain assessment methods.[10,25,29,30] However, two studies referred to the reassessment of pain based on the severity of reported pain, from mild to severe, as well as how to assess pain.[21,28] However, in four studies, there was no mention of pain prevention, the reassessment of pain, or narcoticcomplications.[12,13,27,31] In spite of the importance of documenting pain management process, none of the 13 papers under study pointed to the key role it plays in the documentation of pain management

Table 1: Characteristic of Included Studies (sorted the reports by study design, from highest to lowest methodological rigor)

Author / year	Country	Aim	Methodology	Critical Appraisal tool	Sample size	Results (clinical out come)
Sigakis.et al. (2015)	Michigan	describe evidence-based strategies for improving pain management	comprehensive review /review of RCTs	PRISMA	ICU Patients	• Flowchart describing the best practices when managing pain in the ICU. • Reported pain management Challenges in ICU
Walder&Tramer (2004)	Switzerland	Evaluating standards and methods of Implementation of guidelines for analgesia and sedation	Review of RCTs	PRISMA	critically ill patient	• Adequate, systematic and standards of analgesia and sedation facilitate patient care, increase comfort, and are likely to improve outcome.
Tsuruta (2018)	Japan	Compare of tree guide line: PAD, J-PAD, FEPIMCTI	Review OF Guidelines	PRISMA	ICU Patients	• Deep sedation levels are defined as a RASS score of 3to 5 in the PAD guidelines versus 4to 5 in the FEPIMCTI guidelines. The FEPIMCTI guidelines define mild sedation as a RASS score of +1to 3. • The FEPIMCTI guidelines specify which analgesics to use for different patients. • Recommendations are similar between the PAD and J-PAD guidelines. • The composition of the FEPIMCTI guidelines is quite different from those of both PAD guidelines. • The outlines of the three guidelines are similar, and all reinforce The management of PAD to improve patient outcomes .
Barr et al.(2013)	San Francisco (USA)	To revise the(clinical practice guidelines and use of sedatives and analgesics	Review AND Delphi method	AGREE 2	Critically ill patient	• This guideline provides a roadmap for developing integrated, evidence-based, and patient-centered protocols for preventing and treating pain, agitation, and delirium in critically ill patients

Olsen et al. (2015)	Norway	Develop a pain management algorithm AND Evaluate The psychometric the translated tools used in the algorithm.	Literature review, expert panel, pilot testing	PRISMA	285 ICU patients	• The pain management algorithm may be a useful tool to improve pain assessment and management in adult ICU patient • Inter-rater reliability for the BPS varied from moderate (0.46) to very good (1.00). Inter-rater reliability for the BPS-NI varied fromfair (0.21) to good (0.63).
Mansouri et al. (2013)	Iran	designed and used a protocol for pain management	Randomized clinical trial	CONSORT	A total of 201 patients admitted to protocol and control groups	• Duration of mechanical ventilation in the protocol group 19 (9.3-67.8) and control groups was 40 (0-217) hours, respectively (P = .038). • The median (interquartile range) length of ICU stay was 97 (54.5-189) hours in the protocol group vs 170 (80-408) hours in the control group (P= .001). • The mortality rate in the protocol group was significantly reduced from 23.8% to 12.5% (P = .046).
Shahriari et al. (2015)	Iran	determine the effects of the implementation of a pain management program on the length of stay in ICU patients	Clinical trial	CASP	Totally 50 patients Control group:25 case group:25	• Overall mean length of stay of the patients in the ICUs was significantly lower in the case group (3.2 ± 1.4 days in the study group vs. 7.4 ± 4.8 days in the control group ($P < 0.001$). • Pain management program can make the nurses function better • reduction costs of treatment and hospitalization
Heim et al. 2018	USA	Evaluate the impact of implementation of a PAD guideline on clinical outcomes and medication	pre and post guideline implementation	AGREE 2	1147 pre 1270 post critically ill patient	**After guideline implementation:** • Average ventilation days was reduced (3.98vs 3.43 days, P = .0021). • Hospital length of stay (LOS) (4.79 vs. 4.34 days, P = .048 and 13.96 vs. 12.97 days, P= .045, respectively). • Hospital mortality (19 vs. 19%, P = .96) • Acute physiology and chronic health evaluation (APACHE) IV scores (77.28 vs. 78.75, P = .27)

						were similar. • The percentage of patients receiving midazolam Infusions decreased (422/1147 [37%] vs. 363/1270 patients [29%], P = .0001)
De Wit et al. . (2008)	USA	comparing two strategies for sedation	Randomized trial	consort	74 patients (DIS[1] :36) (SAs[2]: 38)	• The DIS group had longer total duration of MV[3] (median 6.7 versus 3.9 days; *P* = 0.0003) • Longer ICU length of stay (15 versus 8 days; P <0.0001) • Longer hospital length of stay (23 versus 12 days; *P* = 0.01).
Olsen et al. (2016)	Norway	Measure the impact of implementing a pain management algorithm	pre-post intervention design	(QI-MQCS)[4]	Totally, 650 Control group: (n = 252) Intervention group:(n = 398)	• The number of pain assessments was higher in the intervention group compared with the control group. • Duration of ventilation in Control group:(hours) 79 (26-205) and Intervention group:46 (17-153) P :0.01 • Length of ICU stay decreased significantly in the intervention group,(day): 2.6 (1.7-5.4) compared with the control group:3.0 (1.7-6.9).p:0. 04 • Length of hospital in the intervention group and control group was similar: (day): 13 (7-24) p:, 0.79
Awissi et al.(2012)	Canada	Implementing a protocol for management of analgesia, sedation, and delirium	prospective pre- and post-protocol design	(QI-MQCS)	Total Patients: 1214 pre protocol group: 604 Post protocol group:610	• The mean (SD[5]) length of ICU stay were shorter among patients of the Post protocol group compared with those of the pre protocol group (5.43 [6.43] and 6.39 [8.05] days, respectively; p = 0.004) • The duration of mechanical ventilation 5.95 [6.80] and 7.27 [9.09] days, respectively; p < 0.009).

[1] *Daily interruption of sedation*
[2] *Sedation algorithms*
[3] *Mechanical ventilation*
[4] *Quality Improvement Minimum Quality Criteria Set*
[5] *Standard deviation*

						• The mean total cost of ICU hospitalization decreased from $6212.64 (7846.86) in the pre protocol group to$5279.90 (6263.91) in the post protocol group (p = 0.022) • Implementing a protocol is a cost-effective (savings of nearly$1000 per hospitalization
Pandharipande. (2014)	Nashville United States	Help to ICU physicians and other healthcare for management of PAD in critically ill patients	Review	PRISMA	Critically ill patient	• Strong evidence indicates that linking PAD management strategies with ventilator weaning, early mobility, and sleep hygiene in ICU patients will result in significant synergistic benefits to patient care and reductions in costs
Louzon et al. (2017)	Florida	Described involvement in management of pain, agitation and delirium (PAD)	Case study And cohort	NOS[6]	-Using the ABCDE bundle approach (*n* = 436) - a standard-care cohort (*n* = 499)	**APACHE Methodology**: • overall 46% reduction in continuous infusions of sedatives and reductions in both ICU and total hospital LOS • resulting in estimated savings of $1.2 million in direct hospital costs and $183,216 in drug costs • decrease mean ventilator days per patient
Blenkharn et al. (2002)	London, (UK)	Development of pain assessment tool and use of pain management flowchart	Action Research.	[7]M.A.K	13-bedded general intensive care unit.	**pain management flowchart**: • Aid to nurses in identifying(**more visible and explicit)** the severity of pain in the unconscious critically ill improve the quality of patient care

[6] Newcastle - Ottawa Quality Assessment Scale

[7] Mehdi Mohammad Aghaee,Mohammadreza Ahanchian,Hossein Kareshki
Evaluating of action research reports: re-Recognizing the categories and indicators

DISCUSSION

In this study, the quality of pain management algorithms was evaluated based on standard indicators and in accordance with the reference article. Most of the studies focused on all three stages of pain management consisting of diagnosis, treatment (pain relief), and reassessment and prevention of pain. However, there were deficiencies, such as not using the non-pharmacological pain relief algorithms, not highlighting the need of reassessment and prevention of pain, and the lack of attention to the restrictions and complications of pharmacological pain relief. In most studies, NRS scale was considered as the specific tool for pain assessment in conscious patients, and BPS scale, for pain assessment in unconscious patients. Based on the eligible PAD guideline, these scales were also considered as valid and specific scales for pain assessment in conscious patients, and those with reduced awareness.

In other studies on the appraisal of pain assessment tools, BPS with the highest score, 12/20, and COPT and NVPS with a score of 11/20, had the highest validity, reliability, and pain assessment quality, respectively, for the clinical judgment of the treatment team. In fact, these three scales have the best or the most appropriate score for pain assessment quality.[32]

In addition to the above measures, some studies referred to eligible delirium and agitation measurement scales as well as behavioral pain scales, which indicate a strong attention to the analgesia and sedation of patients hospitalized in ICUs.

In the field of pain relief, most studies have referred to injectable narcotics as the first line of treatment and main strategy for effective pain control. Additionally, according to other references, using narcotics was considered as the first line of pharmacological pain relief for the critical patients hospitalized in ICUs.[1,33] However, according to WHO's guideline and based on the severity of the reported pain, at the first step, it is recommended to use drug classes such as acetaminophen or non-steroidal anti-inflammatory drugs alone to relieve mild pains; but these can be used in combination with a reduced dose of narcotics to relieve moderate to severe pains.[34] What is important is not only the selection of type of injectable sedatives or analgesics, but also a need to consider their complications and limitations of use in critical patients with various underlying diseases. A practical pain management algorithms must address all of these problems, so that the treatment team focuses on pain relief with full awareness and attention. The non-pharmacological pain relief has been mentioned as complementary and even alternative therapies in controlling some mild to moderate pains. The recommended methods include hypnotism, massage, physiotherapy, touch, changing patients' positions, music therapy, using ice bags, and reducing environmental stressors in patients hospitalized in ICUs.[1,35,36,37.38] Moreover, applying non-pharmacological pain relief methods by nurses has been suggested to be safe and cost effective compared to pharmacological pain relief methods, as an analgesic practice.[39]

Most studies referred to pain prevention and reassessment in general terms, without any details. In addition, recommendations have been made regarding the complications of opioids and the need for readjusting them according to the patient's condition. Paying attention to all the above items, particularly the reassessment of pain, plays a key role in the process of optimal pain management in ICUs. Gélinas et al. also confirmed the deficiency in the reassessment of pain after the provision of therapeutic interventions. The results of the study showed that in 40% of cases, nurses did not reassess pain for investigating the the effects of palliative interventions.[40]

The documentation of pain management includes recording the pain score or intensity, pain relieving or pain aggravating factors, pain interventions and many other items.[38,39,40] Despite the importance of it, no study has pointed out the role of pain management documentation. In a study by Gélinas et al., it has been mentioned that in more than 60% of cases, documentation is not performed by nurses.[40]

Table 2: Comparing best methods in pain management studies (Based on Sigakis et al. -2015 and sorted by year)

Author/ Year	Pain management Templates	Pain assessment scale used	Treatment (listed treatments/limitations)	Prevention Reported /not reported	Documentation (pain management)
		1	2	3	4
łeim et al. (2018)[30]	PAD guideline on clinical outcomes	- CAM-ICU and RASS scales in the assessment of agitation and delirium	Mentioning the pharmacological pain relief -Not pointing to non-pharmacological pain relief	-Not mentioning the methods of assessment or reassessment of pain	-
Tsuruta (2018)[9]	j-pad guide program Algorithm for administering sedation and analgesia	- NRS scale in conscious patients - BPS scales in patients with reduced consciousness - RASS scale for the assessment of sedation level	-Not referring to pharmacological pain relief (analgesic/sedative) - Not mentioning non-pharmacological pain relief	-Pointing to the pain prevention plan	-
Louzon et al. (2017)[12]	ABCDE Bundle PROGRAM/PATHWAY PAD guide	RASS and CAM-ICU scales in the assessment of agitation and delirium - CPOT scale in patients with reduced consciousness	-Not referring to pharmacological pain relief (analgesic/sedative) - Not mentioning non-pharmacological pain relief	-	-
Olsen et al. (2016)(29)	pain management algorithm in adult ICU Patients.	- NRS scale in conscious patients - BPS scales in patients with reduced consciousness - MASS and RASS scales for the assessment of sedation level	-Only referring to therapeutic interventions without mentioning the details -Not mentioning non-pharmacological pain relief	Mentioning pain reassessment plan	-

Shahriari et al. (2015)(28)	Clinical algorithms for pain management in ICUs	NVPS scale for the assessment of pain intensity in critically ill patients	Referring to pharmacological methods of pain relief (emphasis on narcotics as the medicine of choice for pain relief in critical patients)	Mentioning pain reassessment plan, based on pain intensity (mild to severe)	-
Olsen et al.(2015)(21)	pain management algorithm is consistent with the latest clinical practice guideline recommendations	- NRS scale in conscious patients - BPS scales in patients with reduced consciousness	-Only referring to the stage pharmacological pain relief -Not mentioning non-pharmacological pain relief	-Mentioning pain reassessment plan, based on pain intensity (mild to severe)	
Pandharipande . (2014) (26)	PAD care bundle in ICU	- NRS in conscious patients -Using BPS and CPOT scales in patients with reduced consciousness	-Mentioning the pharmacological pain relief -Not pointing to non-pharmacological pain relief	-Referring to the pain prevention plan	-
Barr et al.(2013)(23)	Clinical practice guide	- BPS and CPOT in critical patients hospitalized in ICUs	-Referring to pharmacological pain relief and opioid analgesics as the first line of treatment. Mentioning other pharmacological methods of pain relief.	Referring to the pain prevention, and considering narcotics complications	-
Mansouri et al.(2013). (13)	protocol for integrated management of pain, agitation, and delirium	NRS scale in conscious patients - BPS scale in patients with reduced consciousness - RASS and CAM-ICU scales for the assessment of agitation and delirium	Referring to pharmacological pain relief (narcotics as analgesic of choice, and midazolam as the first line of treatment agitation in patients hospitalized in ICUs - Not mentioning non-pharmacological pain relief	-	-
Awissi et al.(2012)(27)	Sedation, Analgesia and Delirium Protocols	NRS for pain assessment and RASS in sedation assessment	Mentioning the pharmacological pain relief method: Analgesic, Sedative, Antipsychotic -Not pointing to non-pharmacological pain relief	-	-

De Wit et al. (2008)(31)	Sedation algorithm	RASS scale	-Mentioning the pharmacological pain relief -Not pointing to non-pharmacological pain relief	-	-
Walder&Tramer(2004)(25)	guidelines for rational analgesia and sedation Decision tree for analgesia and sedation in critically ill patients	- VAS and NRS scales in conscious patients - BPS and RASS scales in order to assess pain intensity and agitation in unconscious patients - Glasgow scale to evaluate the level of consciousness	-Mentioning the pharmacological pain relief -Not pointing to non-pharmacological pain relief	-Mentioning the methods of assessment or reassessment of pain	-
Blenkharn et al. (2002)(10)	Pain flow chart	VGS scale - vital signs	-Lack of explanation for pharmacological pain relief -Not referring to non-pharmacological pain relief	Not referring to the methods of assessment or reassessment of pain	-

In some studies, the use of BPA tool has been introduced as an positive factor in pain documentation process carried out by nurses,[15,42] while other studies have reported contradictory results.[24] Despite the fact that in most studies (as seen in Table 1), the desired clinical outcomes and results are reported as a consequence of implementing a pain management algorithm or program, it seems that in addition to observing the main stages of pain management and its proper documentation, a better evidence-based care can be provided for patients, by identifying the existing clinical barriers to effective pain control, prioritizing measures to provide proper basis for effective pain control, and revising the system, resources, and in particular, guidelines.[8]

The results of the appraisal of papers indicated that the studies focused on three main stages of pain management, e.g., pain diagnosis, relief and reassessment. Additionally, favorable clinical outcomes such as shortened hospitalization, reduced ventilation time, increased cost effectiveness, etc. were reported along with the implementation of pain management process. All of the studies referred to specific pain diagnosis scales, and in most of them, agitation and delirium assessment scales were also introduced along with the aforementioned scale, which indicates particular attention to pain diagnosis, the maintaining sedation, and meeting the comfort of those hospitalized in ICUs. In the field of pain relief or treatment, all the studies focused on pharmacological interventions, recommending the use of opioid narcotic analgesics in particular. However, despite scientific evidences, non-pharmacological pain relief is not considered as a complementary and sometimes independent medicine yet. Most studies focused on pain assessment or reassessment after the provision of therapeutic interventions, but in many of them, no attention was paid to the details and how to assess pain. Furthermore, in most studies, not enough attention has been paid to pain prevention, and the complications of drugs, especially narcotics. In addition, despite the importance of documentation in pain management process, not even one study pointed to the necessity of its implementation in pain management process or clinical algorithms of pain management.

CONCLUSION

On the basis of this study, we can conclude that there is an overall good stress on the pharmacological pain management, but non-pharmacological methods are ignored. Due emphasis needs to be laid on proper documentation of pain management protocols to be followed in each pain patient with suggested measures to prevent recurrence. There is still a need to have a comprehensive clinical algorithms of pain management to be followed in the wards.

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Appendix: Search methodology

PubMed
("pain"[MeSH Terms] OR "pain"[All Fields]) OR "pain threshold"[MeSH Terms] OR "pain management"[MeSH Terms]) AND ("algorithms"[MeSH Terms] OR "clinical protocols"[MeSH Terms] OR (clinical[All Fields] AND program[All Fields]) OR "guidelines as topic"[MeSH Terms]) AND "intensive care units"[MeSH Terms] (308 results) ("pain"[MeSH Terms] OR "pain threshold"[MeSH Terms] OR "pain management"[MeSH Terms] OR "analgesia"[MeSH Terms]) AND ("algorithms"[MeSH Terms] OR "clinical protocols"[MeSH Terms] OR program[All Fields]) OR "guidelines as topic"[MeSH Terms] AND ("intensive care units"[MeSH Terms] OR "icu"[All Fields]) AND ("1995/01/01"[PDAT] : "2018/12/31"[PDAT])
Embase
'pain'/exp OR 'pain threshold'/exp OR 'pain assessment'/exp OR 'pain management') AND ('algorithm'/exp OR 'clinical protocol'/exp OR 'practice guideline'/exp OR program) AND ('intensive care unit'/exp OR icu) AND [1-1-1995]/sd NOT [31-12-2018]/sd (1200 results) ('pain'/exp OR 'pain' OR 'pain threshold'/exp OR 'pain threshold' OR 'pain assessment'/exp OR 'pain assessment' OR 'pain management'/exp OR 'pain management' OR 'analgesia'/exp OR 'analgesia') AND ('algorithm'/exp OR 'algorithm' OR 'clinical protocol'/exp OR 'clinical protocol' OR 'practice guideline'/exp OR 'practice guideline' OR 'program'/exp OR program) AND ('intensive care unit'/exp OR 'intensive care unit' OR icu) AND [1-1-1995]/sd NOT [31-12-2018]/sd (2444 results)
Scopus
(pain OR "pain threshold" OR "pain management" OR analgesia) AND (algorithm* OR "clinical protocols" OR program OR guideline*) AND ("intensive care unit*" OR ICU) (1559 results)
Web of science
(pain OR "pain threshold" OR "pain management" OR analgesia) AND (algorithm* OR "clinical protocols" OR program OR guideline*) AND ("intensive care unit*" OR icu) Timespan: 1995-2018. Indexes: SCI-EXPANDED, SSCI, CPCI-S, CPCI-SSH, ESCI.
Cochrane
(pain OR "pain threshold" OR "pain management" OR analgesia) AND (algorithm* OR "clinical protocols" OR program OR guideline*) AND ("intensive care units" OR ICU) in Title Abstract Keyword - (Word variations have been searched)' time limitation: 1995-2018