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

Ladan Sedighie¹, Fariba Bolourchifard², Maryam Rassouli³, Nadia Sanee¹

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 reassessment 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

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.\(^5,18,20\)

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
Evaluating the implementation of pain management templates

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 narcotic complications. \(^12,13,27,31\) 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 outcome)                                                                                                                                 |
|---------------|---------------|----------------------------------------------------------------------|----------------------------|-------------------------|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sigakis et al. (2015) | Michigan      | Describe evidence-based strategies for improving pain management     | Comprehensive 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 guideline: PAD, J-PAD, FEPIMCTI                        | Review of Guidelines PRISMA | ICU Patients            |             | • Deep sedation levels are defined as a RASS score of 3 to 5 in the PAD guidelines versus 4 to 5 in the FEPIMCTI guidelines. The FEPIMCTI guidelines define mild sedation as a RASS score of +1 to 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 |
| Study                  | Country  | Intervention                                                                 | Design          | Sample Size | Findings                                                                                                                                                                                                 |
|-----------------------|----------|------------------------------------------------------------------------------|-----------------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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 | 285 ICU patients | - The pain management algorithm may be a useful tool to improve pain assessment and management in adult ICU patients  
- Inter-rater reliability for the BPS varied from moderate (0.46) to very good (1.00). Inter-rater reliability for the BPS-NI varied from fair (0.21) to good (0.63). |
| Mansouri et al. (2013) | Iran     | designed and used a protocol for pain management                             | Randomized clinical trial | 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   | 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  | 1147 pre 1270 post critically ill patient | After guideline implementation:  
- Average ventilation days was reduced (3.98 vs 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) |
## Evaluating the Implementation of Pain Management Templates

| Study Authors | Country | Study Design | Sedation Management | Pain Management | Outcome Measures |
|---------------|---------|--------------|---------------------|-----------------|------------------|
| De Wit et al. (2008) | USA | Randomized trial | Comparing two strategies for sedation | | The percentage of patients receiving midazolam Infusions decreased (422/1147 [37%] vs. 363/1270 patients [29%], P = .0001) |
| Olsen et al. (2016) | Norway | Pre-post intervention design | Measure the impact of implementing a pain management algorithm | (QI-MQCS) | | The DIS group had longer total duration of MV\(^3\) (median 6.7 versus 3.9 days; P = 0.0003) |
| Olsen et al. (2016) | Norway | Pre-post intervention design | Measure the impact of implementing a pain management algorithm | (QI-MQCS) \(^4\) | | Longer ICU length of stay (15 versus 8 days; P <0.0001) |
| Olsen et al. (2016) | Norway | Pre-post intervention design | Measure the impact of implementing a pain management algorithm | (QI-MQCS) \(^4\) | | Longer hospital length of stay (23 versus 12 days; P = 0.01). |
| Awissi et al. (2012) | Canada | Prospective pre- and post-protocol design | Implementing a protocol for management of analgesia, sedation, and delirium | (QI-MQCS) \(^5\) | | The number of pain assessments was higher in the intervention group compared with the control group. |
| Awissi et al. (2012) | Canada | Prospective pre- and post-protocol design | Implementing a protocol for management of analgesia, sedation, and delirium | (QI-MQCS) \(^5\) | | Duration of ventilation in Control group:(hours) 79 (26-205) and Intervention group:46 (17-153) P :0.01 |
| Awissi et al. (2012) | Canada | Prospective pre- and post-protocol design | Implementing a protocol for management of analgesia, sedation, and delirium | (QI-MQCS) \(^5\) | | 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 |
| Awissi et al. (2012) | Canada | Prospective pre- and post-protocol design | Implementing a protocol for management of analgesia, sedation, and delirium | (QI-MQCS) \(^5\) | | Length of hospital in the intervention group and control group was similar: (day): 13 (7-24) p.; 0.79 |

---

\(^1\) 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).

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.

- 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

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. 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. 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. 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.

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. 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 effects of palliative interventions. The documentation of pain management includes recording the pain score or intensity, pain relieving or pain aggravating factors, pain interventions and many other items. 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.
### 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) |
|----------------------------|---------------------------|------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|----------------------------------|
| Heim et al. (2018)<sup>30</sup> | 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)<sup>9</sup>   | 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)<sup>12</sup> | 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)<sup>(29)</sup> | 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                                                               | -                               |
| Reference                | Description                                                                 | Pain Management Methods                      | Pain Reassessment Plan | Pain Prevention Plan |
|-------------------------|------------------------------------------------------------------------------|-----------------------------------------------|------------------------|----------------------|
| Shahriari et al. (2015) | 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)     | 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 | -                     |
| Pandharipande (2014)    | 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)      | 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)  | 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) | -                     |
| Awissi et al. (2012)    | 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 | -                     |
| Authors                  | Title                                                                 | Sedation Algorithm | Assessment Tools | Pain Relief Issues                                                                 |
|-------------------------|-----------------------------------------------------------------------|--------------------|------------------|-------------------------------------------------------------------------------------|
| De Wit et al. (2008)(31)| Sedation algorithm                                                    | RASS scale         | -                | -                                                                                   |
| 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 | -                                                                                   |
| Blenkharn et al. (2002)(10)| Pain flow chart                                                       | VGS scale, vital signs | -                | -                                                                                   |
In some studies, the use of BPA tool has been introduced as a 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.

**Acknowledgements:**

The authors sincerely appreciate all the researchers whose articles have been used in this paper. We also acknowledge Shahid Beheshti University of Medical Sciences for their financial support in this project.
REFERENCES

1. Audrey B. Koziar and Erb’s Fundamentals of nursing: concepts, process, and practice. 8th ed. Pearson Education India; 2014.
2. Campbell GB, Happ MB. Symptom identification in the chronically critically ill. AACN Adv Crit Care. 2010 Jan-Mar;21(1):64-79. [PubMed] DOI: 10.1097/NCI.0b013e3181c932a8
3. Smeltzer S, Bare B, Hinkle J, Cheever K. Brunner & Suddarth’s textbook of medical surgical nursing: pain, electrolyte, shock, cancer and end of life. Shariat E, Namadi Vosough M, Movahedpour A, translators. Tehran: Salemi; 2011. p.14-28.
4. Klein DG, Dumpe M, Katz E, Bena J. Pain assessment in the intensive care unit: development and psychometric testing of the nonverbal pain assessment tool. Heart Lung. 2010;39(6):521-6. [PubMed] DOI: 10.1016/j.hrtlng.2010.05.053
5. Sole ML, Klein DG, Moseley MJ, Brenner ZR, Henderspas J. Introduction to critical care nursing. 5th ed. St. Louis, Mo.: Saunders; 2009. p.748.
6. Subramanian P, Allcock N, James V, Lathlean J. Challenges faced by nurses in managing pain in a critical care setting. J J Clin Nurs. 2012 May;21(9-10):1254-62. [PubMed] DOI: 10.1111/j.1365-2702.2011.03789.x
7. Urden LD, Stacy KM, Lough ME. Critical care nursing. 7th ed. Elsevier Health Sciences; 2013.
8. Sigakis MJ, Bittner EA. Ten myths and misconceptions regarding pain management in the ICU. Crit Care Med. 2015 Nov;43(11):2468-78. [PubMed] DOI: 10.1097/CCM.0000000000003126
9. Tsuruta R, Fujita M. Comparison of clinical practice guidelines for the management of pain, agitation, and delirium in critically ill adults. Acute Med Surg. 2018 Apr 10;5(3):207-12. [PubMed] DOI: 10.1007/ams2.337
10. Blenkharn A, Faughnan S, Morgan A. Developing a pain assessment tool for use by nurses in an adult intensive care unit. Intensive Crit Care Nurs. 2002 Dec;18(6):332-41. [PubMed] DOI: 10.1016/s0964-3397(02)00071-x
11. DeWitt-Weaver D. The experience of Christian student nurses becoming ready to provide spiritual care. Available from: https://studylib.net/doc/8918574/col orado-christian-university
12. Louzon P, Jennings H, Ali M, Kraisinger M. Impact of pharmacist management of pain, agitation, and delirium in the intensive care unit through participation in multidisciplinary bundle rounds. Am J Health Syst Pharm. 2017;74(4):253-62. [PubMed] DOI: 10.2146/ajhp150942
13. Mansouri P, Javadpour S, Zand F, Ghodsbin F, Sabatsian G, Masjedi M, et al. Implementation of a protocol for integrated management of pain, agitation, and delirium can improve clinical outcomes in the intensive care unit: a randomized clinical trial. J Crit Care. 2013;28(6):918-22. [PubMed] DOI: 10.1016/j.jcrc.2013.06.019
14. Lewithwaite BJ, Jabsbusch KM, Wheeler BJ, Schnell-Hoehn KN, Mills J, Estrella-Holder E, et al. Nurses’ knowledge and attitudes regarding pain management in hospitalized adults. J Contin Educ Nurs. 2011 Jun;42(6):251-7; quiz 258-9. [PubMed] DOI: 10.3928/00201247-20110103-03
15. Rose L, Haslam L, Dale C, Knechtel L, Mc Gillion M. Behavioral pain assessment tool for critically ill adults unable to self-report pain. Am J Crit Care. 2013 May;22(3):246-55. [PubMed] DOI: 10.4037/ajcc2013200
16. Rose L, Smith O, Gelinas C, Haslam L, Dale C, Luk E, et al. Critical care nurses’ pain assessment and management practices: a survey in Canada. Am J Crit Care. 2012 Jul;21(4):251-9. [PubMed] DOI: 10.4037/ajcc2012611
17. Carr E. Barriers to effective pain management. J Perioper Pract. 2007 May;17(5):200-3, 206-8. [PubMed] DOI: 10.1177/17504589070170502
18. Kizza I, Mulira J. Nurses’ pain assessment practices with critically ill adult patients. I Int Nurs Rev. 2015 Dec;62(4):573-82. [PubMed] DOI: 10.1111/inr.12218
19. Brunner LS, Brunner & Suddarth’s textbook of medical-surgical nursing. Lippincott Williams & Wilkins; 2010.
20. Boyce BAB, Yee BH. Incidence and severity of phlebitis in patients receiving peripherally infused amiodarone. Crit Care Nurse. 2012 Aug;32(4):27-34. [PubMed] DOI: 10.4037/ccn2012139
21. Olsen BF, Rustaen T, Sandvik L, Miaskowski C, Jacobsen M, Valeberg BT. Implementation of a pain management algorithm in intensive care units and evaluation of nurses’ level of adherence with the algorithm. Heart Lung. 2015 Nov-Dec;44(6):528-33. [PubMed] DOI: 10.1016/j.jhrt.2015.08.001
22. Georgiou E, Hadjibalassi M, Lambrinou E, Andreou P, Papatheodasoglou ED. The impact of pain assessment on critically il patients’ outcomes: a systematic review. Biomed Res Int. 2015;2015:503830. [PubMed] DOI: 10.1155/2015/503830
Evaluating the implementation of pain management templates

23. Barr J, Fraser GL, Puntillo K, Ely EW, Gélinas C, Dasta JF, et al. Clinical practice guidelines for the management of pain, agitation, and delirium in adult patients in the intensive care unit. Crit Care Med. 2013 Jan;41(1):263-306. [PubMed] DOI: 10.1097/CCM.0b013e3182783b72

24. Noghabi AA, Gerdroodbari M, Zolfaghari M, Mehran A. Effect of application of critical-care pain observation tool in patients with decreased level of consciousness on performance of nurses in documentation and reassessment of pain. Hayat. 2012;18 (3):54-65. [Free Full Text]

25. Waldör B, Tramèr MR. Analgesia and sedation in critically ill patients. Swiss Med Wkly. 2004 Jun 12;134(23-24):333-46. [PubMed] DOI: 2004/23/swm-10319

26. Pandharipande PP, Patel MB, Barr J. Management of pain, agitation, and delirium in critically ill patients. Pol Arch Med Wewn. 2014;124(3):114-23. [PubMed] DOI: 10.20452/pamw.2136

27. Awissi DK, Bégin C, Moisan J, Lachaine J, Skrobik Y. I-SAVE study: impact of sedation, analgesia, and delirium protocols evaluated in the intensive care unit: an economic evaluation. Ann Pharmacother. 2012 Jan;46(1):21-8. [PubMed] DOI: 10.1345/aph.1Q284

28. Shahriari M, Golshan A, AliMohammadi N, Abbasi S, Fazel K. Effects of pain management program on the length of stay of patients with decreased level of consciousness: A clinical trial. Iran J Nurs Midwifery Res. 2015 Jul-Aug;20(4):502-7. [PubMed] DOI: 10.4103/1735-9066.160996

29. Olsen BF, Rustøen T, Sandvik L, Jacobsen M, Valeberg BT. Results of implementing a pain management algorithm in intensive care unit patients: The impact on pain assessment, length of stay, and duration of ventilation. J Crit Care. 2016 Dec;36:207-11. [PubMed] DOI: 10.1016/j.jcrc.2016.07.011

30. Heim M, Draheim R, Knupp A, Breihan P, O'Rourke A, Wells J, et al. Evaluation of a Multidisciplinary Pain, Agitation, and Delirium Guideline in Mechanically Ventilated Critically Ill Adults. Hosp Pharm. 2019 Apr;54(2):119-24. [PubMed] DOI: 10.1177/0018578718769570

31. de Wit M, Gennings C, Jenvey WJ, Epstein SK. Randomized trial comparing daily interruption of sedation and nursing-implemented sedation algorithm in medical intensive care unit patients. Crit Care. 2008;12(3):R70. [PubMed] DOI: 10.1186/cc6908

32. Pudas-Tähkä SM, Axelin A, Aantaa R, Lund V, Salanterä S. Pain assessment tools for unconscious or sedated intensive care patients: a systematic review. J Adv Nurs. 2009 May;65(5):946-56. [PubMed] DOI: 10.1111/j.1365-2648.2008.04947.x

33. Hinkle JL, Cheever KH. Brunner & Suddarth's textbook of medical-surgical nursing. Lippincott Williams & Wilkins; 2013.

34. Potter PA, Perry AG, Stockert P, Hall A. Fundamentals of nursing-e-book. Elsevier Health Sciences; 2016.

35. Häuser W, Hagl M, Schmierer A, Hansen E. The efficacy, safety and applications of medical hypnosis: a systematic review of meta-analyses. Dtsch Arztebl Int. 2016 Apr 29;113(17):289-96. [PubMed] DOI: 10.3238/arztebl.2016.0289

36. Boitner M, Martorella G, Maheu C, Laizner AM, Gélinas C. Effects of Massage in Reducing the Pain and Anxiety of the Cardiac Surgery Critically Ill-a Randomized Controlled Trial. Pain Med. 2018 Dec 1;19(12):2556-69. [PubMed] DOI: 10.1093/pm/pny055

37. oman F, Avelar M. Teaching of nursing interventions as non-pharmacological strategy for pain relief. Rev Dor. 2014;15(4):264-6. [PubMed] DOI: 10.5935/1806-0013.20140057

38. Tracy MF, Chan L. Nonpharmacological interventions to manage common symptoms in patients receiving mechanical ventilation. Crit Care Nurse. 2011 Jun;31(3):19-28. [PubMed] DOI: 10.4037/ccn2011653

39. Gélinas C, Arbou C, Michaud C, Robar L, Côté J. Patients and ICU nurses’ perspectives of non-pharmacological interventions for pain management. Nurs Crit Care. 2013 Nov;18(6):307-18. [PubMed] DOI: 10.1111/j.1478-5153.2012.00531.x

40. Gélinas C, Fortier M, Viens C, Fillion L, Puntillo K. Pain assessment and management in critically ill intubated patients: a retrospective study. Am J Crit Care. 2004 Mar;13(2):126-35. [PubMed]

41. Wilkins LW. Nurse's 5-minute clinical consult: procedures. Wolters Kluwer/Lippincott Williams & Wilkins; 2008.

42. Topolovec-Vranic J, Canzian S, Innis J, Pollmann-Mudryj MA, McFarlan AW, Baker AJ. Patient satisfaction and documentation of pain assessments and management after implementing the adult nonverbal pain scale. Am J Crit Care. 2010 Jul;19(4):345-54; quiz 355. [PubMed] DOI: 10.4037/ajcc2010247
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