Nursing care with patient-controlled analgesia: scope review

Cuidados de enfermagem com a analgesia controlada pelo paciente: revisão de escopo

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ABSTRACT

BACKGROUND AND OBJECTIVES: Patient controlled analgesia (PCA) is an effective technology for controlling pain, with relevance to the care offered. The objective of the present work was to describe, through a scoping review, nursing care in PCA intravenous and epidural routes during the postoperative period of adult patients.

CONTENTS: A scoping review was carried out, registered on the Center for Open Science Website (10.17605/OSF.IO/T74DK), with the following question: "What is the nursing care with patient-controlled analgesia in the postoperative period of adults patients?", in the electronic databases Cochrane, Science Direct, Pubmed/Medline, LILACS, MedCarib, PAHO-IRIS, and WHOIRIS in addition to an exploratory search for documents, published from 2013 to 2023. 192 documents were found, of which were included five. The nursing care found occurred in the areas of patient and caregiver education, patient assessment, and nursing team conduct.

CONCLUSION: Nursing has an important role in educating patients and caregivers, preventing errors, and promoting patient safety. Further studies that are more specific in relation to the conduct of the nursing team in this context are needed.

Keywords: Pain, Patient safety, Postoperative nursing.

RESUMO

JUSTIFICATIVA E OBJETIVOS: A analgesia controlada pelo paciente (ACP) é uma tecnologia eficaz no controle da dor, com relevância para o cuidado ofertado. O objetivo do presente trabalho foi descrever, por meio de uma revisão de escopo, os cuidados de enfermagem na ACP em vias intravenosa e peridural durante o pós-operatório de pacientes adultos.

CONTEÚDO: Foi realizada uma revisão de escopo, registrada no *Center for Open Science Website* (10.17605/OSF.IO/T74DK), com a seguinte pergunta: "Quais são os cuidados de enfermagem com a analgesia controlada pelo paciente no pós-operatório de pacientes adultos?", nas bases de dados eletrônicas Cochrane, *Science Direct*, Pubmed/Medline, LILACS, MedCarib, PAHO-IRIS e WHOIRIS, além de busca exploratória de documentos, publicados de 2013 a 2023. Foram encontrados 192 documentos, dos quais foram incluídos cinco. Os cuidados de enfermagem encontrados se deram nas áreas de educação do paciente e cuidador, avaliação do paciente e condutas da equipe de enfermagem.

CONCLUSÃO: A enfermagem possui um importante papel na educação do paciente e cuidadores, prevenção de erros e promoção da segurança do paciente. São necessários futuros estudos que sejam mais específicos em relação às condutas da equipe de enfermagem nesse contexto.

Descritores: Dor pós-operatória, Enfermagem perioperatória; Segurança do paciente.

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HIGHLIGHTS

• Nursing care with patient-controlled analgesia focuses on patient and caregiver education, patient monitoring, optimization of teamwork and quality of care.
• This study highlights nursing actions that promote patient safety when using the device.

INTRODUCTION

Acute pain is a phenomenon related to nociceptive stimulation produced by a real or potential tissue injury, inflammatory process or illness process, and can last from a few hours to weeks[1]. According to the Brazilian Society for the Study of Pain[2], recognizing pain as the fifth vital sign can ensure that patients have access to pain control interventions with the same importance given to immediate treatment for changes in other vital signs.´

Severe postoperative pain (POP) affects the performance of daily activities and contributes to persistent POP[3]. Despite being expected, untreated acute postoperative pain has negative impacts

on the patient experience, clinical outcome and increased administrative burden, making it even more necessary to advance the patient-centered analgesia approach[4].

Patient-controlled analgesia (PCA) is a method with the objective of efficient pain relief, allowing bolus administration of a predetermined dose of drug, on demand, at the press of a button by the patient themselves[5]. The patient-triggered bolus can be administered on its own, or associated with continuous drug infusion[5].

In terms of routes of administration, PCA can be administered intravenously (IV), epidurally, via a peripheral nerve catheter or transdermally[5]. The effectiveness of intravenous and epidural PCA is based on several aspects. When compared to conventional intravenous infusion of analgesics in the postoperative period, epidural PCA leads to a considerable reduction in the consumption of morphine, as well as fewer adverse effects related to opioid consumption, such as nausea and vomiting, and greater patient satisfaction with analgesia[6].

The use of PCA can also minimize gaps in the administration of analgesics, providing more uniform analgesia, avoiding painful waiting periods between the request and receivement of the analgesic[7]. Nurses play a key role in assessing and managing patients' pain. The use of PCA has emerged as a technology to improve the care offered, enabling self-care and reducing the workload of the nursing team[7].

Given the efficacy of using the PCA pump in the treatment of POP and its relevance as a technology for comprehensive nursing care for patients, a literature search was carried out on nursing care when using the PCA. Based on the scant literature found on the subject, the aim of this study was to describe, by means of a scoping review, nursing care in intravenous and epidural PCA during the postoperative period in adult patients.

CONTENTS

This study is a scoping review. According to the Joanna Briggs Institute[8], the objective is to map out the main concepts that underpin a field of research and/or clarify the working definitions and/or conceptual limits of a topic. Based on this premise, the Joanna Briggs Institute Manual for Evidence Synthesis[8] was used to learn about the study method, define the type of review and delimit the research. This work was registered under the OSF (Open Science Framework) protocol number 10.17605/OSF. IO/T74DK.

A preliminary exploratory search of published reviews on nursing care in PCA was carried out in order to recognize what had been published on the subject in the last 10 years and to identify gaps. The research question was then established using the PCC framework (population, concept and context): "What are the nursing care strategies for patient-controlled analgesia in the postoperative period of adult patients?". Therefore, the population studied was adults, the concept was nursing care during the use of PCA and the context was the post operative period. For each of these keywords, a corresponding Decs/Mesh term was associated (Table 1).

Table 1. Selection of descriptors according to the PCC strategy (population, concept and context)

	Keywords	Descriptors (Decs/Mesh)
P (Population)	Adults	Adult
C (Concept)	Nursing care with patient-controlled analgesia	Analgesia, Patient-Controlled Nursing car
C (Context)	Postoperative period	Postoperative period

The search strategy's objective was to locate documents in the databases through structured searches based on descriptors and, later, through exploratory searches. The databases were: Cochrane, Science Direct, Pubmed/Medline, LILACS, Med-Carib, PAHO-IRIS and WHOIRIS. The search was carried out on January 12, 2024. The inclusion criteria were nursing care including PCA in epidural, perineural (local) and/or intravenous (IV) routes; the period of use of PCA could be in the immediate or mediate postoperative period; studies carried out with adult humans; and studies published between January 2013 and December 2023, in Portuguese and English. Exclusion criteria were: studies carried out on children, animal models and clinical trial protocols. The search strategy was adapted for each of the databases used (Table 2).

Table 2. Database search strategy

Databases	Search strategy
VHL	(Nursing Care) AND ("Analgesia, Patient-Controlled") AND NOT (Child). Filter: from 2013 to 2023
Pubmed	((Nursing Care) AND ("Analgesia, Patient-Controlled")) NOT (Child). Filter: from 2013 to 2023
Science Direct	Nursing Care AND "Analgesia, Patient-Controlled" NOT Child. Filter: from 2013 to 2023
Cochrane	Nursing Care AND "Analgesia, Patient-Controlled" NOT Child. Filter: from 2013 to 2023

VHL = Virtual Health Library.

After the search, all the citations identified were grouped together using the EndNote software and then exported to the Rayyan software, a tool that makes it possible to evaluate and select titles and abstracts blindly, or not, in a collaborative effort. Initially, duplicates were removed. Next, the titles and abstracts were selected by two independent reviewers for evaluation against the inclusion and exclusion criteria for the review and the answer to the research question.

The reviewers could choose to blindly include, exclude or mark as "maybe" each of the citations. Conflicts and "maybe" marks were resolved by a third reviewer. After unblinding the sample, an exploratory search was carried out by analyzing the references of the included articles. The exploratory search aimed to include documents that were not found in the initial search, but which could be relevant to this scoping review. Searches were made for the names of authors considered relevant and articles considered related to those selected via Pubmed/Medline.

The complete texts of the selected documents were evaluated in detail using the inclusion criteria by two or more independent

reviewers. Data extraction was carried out by two independent reviewers and conflicts were resolved by a third reviewer. The JBI Manual for Evidence Synthesis[8] data extraction tool was used. The information included: number and characteristics of participants, concept, context, study methods. A table was also constructed on the nursing care found, with the objective of answering the research question.

RESULTS

The search and selection process is described in the flowchart adapted from the Preferred Reporting Items for Systematic reviews and Meta-Analysis (PRISMA) checklist (figure 1). A total of 150 articles were found in the database search and a further 54 in the exploratory search. Forty duplicate articles were removed. The analysis of titles and abstracts removed 117 articles and 30 articles were excluded after full-text reading. The final sample therefore included 5 articles published between 2013 and 2019 in the United States of America (USA)[9,10], South Korea[11,12] and Turkey[13]. These were: a quasi-experimental study[11], a prospective study[13], a retrospective study[12] and thematic dossiers[9,10]. The results obtained are organized in table 3 and summarized in figure 2. The nursing care addressed in the sample was organized into three main topics: health education for patients and companions[9,10,12], patient assessment[9,10,11,13] and team conduct[9,10,12] (Table 3 and Figure 2).

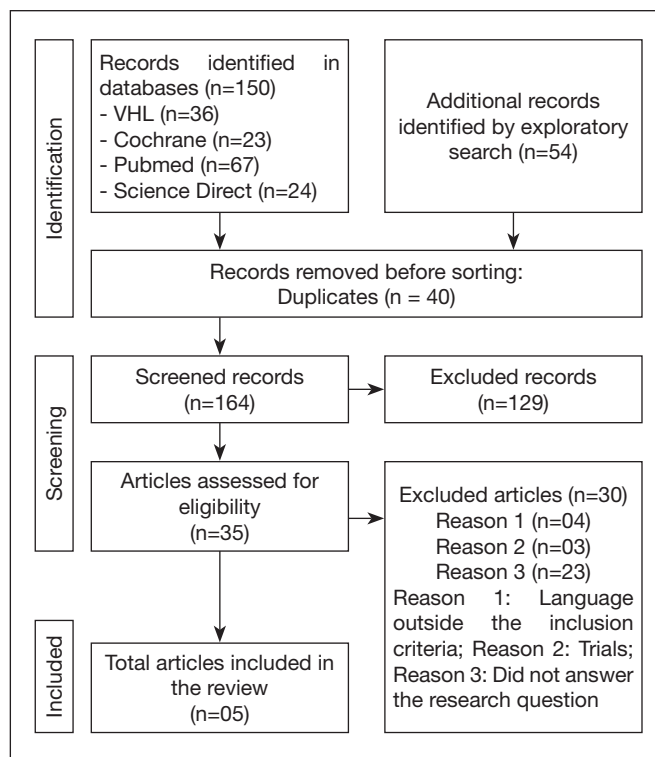**Figure 1**. Article selection flowchart adapted from PRISMA

VHL = Virtual Health Library.

Table 3. Extraction of data from the article's sample

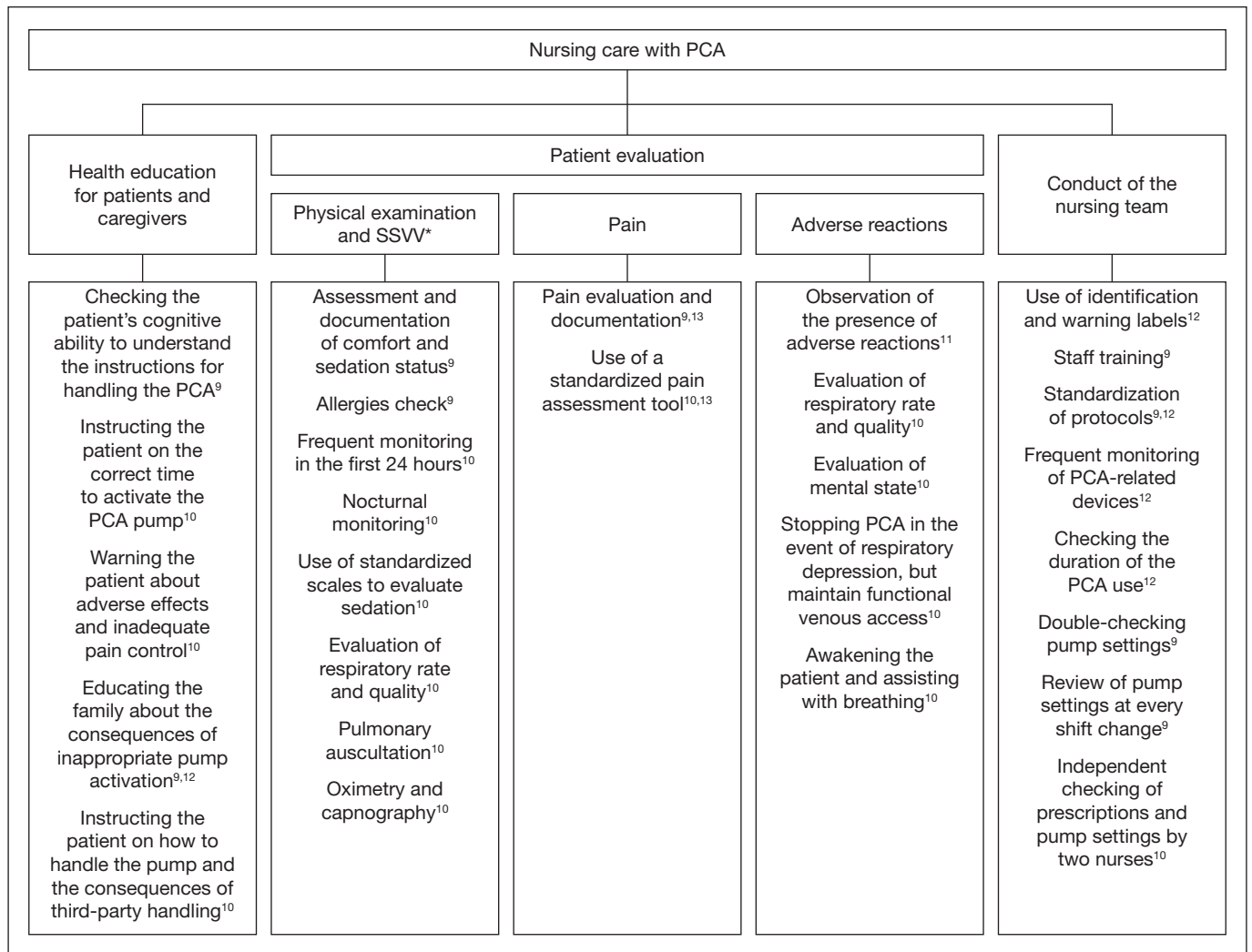| Authors and countries	Objectives	Type of study and sample	Nursing care	Outcome found
Clifford et al.[9] United States	Describe safety measures with PCA.	Thematic dossier, sample not applicable.	Pain documentation and allergy checks. Staff training. Patient and family education.	Does not apply.
Hong and Lee[11] South Korea	Compare the effects of IV PCA administration with conventional methods.	Quasi-experimental comparison study, 140 women who underwent hysterectomy.	Patient observation, communication, documentation and administration of analgesics.	The activity that demands the most time from the nursing team in the PCA context is patient observation, due to the care taken with adverse reactions in this method of analgesia.
Aydogan et al.[13] Turkey	Compare postoperative patients who received intravenous morphine with PCA or epidural morphine.	Prospective, randomized, double-blind study of 42 patients undergoing hepatectomy.	Pain assessment using the Visual Analog Scale.	Using the scale allowed to identify that the use of epidural PCA was associated with lower intensity of postoperative pain and lower consumption of morphine by these patients.
Dobbins[10] United States	Expose complications related to PCA and methods of resolution.	Thematic dossier, sample not applicable.	Assessment of vital signs, pain and sedation Assessment of the respiratory system. Double-checking of all PCA prescriptions. Preoperative patient education. When respiratory depression is identified, stop the PCA infusion immediately.	Does not apply.
Lee, Kim and Kim[12] South Korea	Describe and analyze the errors associated with postoperative IV PCA.	Retrospective study, medical records of 45104 patients.	Installation and programming of the PCA pump. Knowledge of the pump by patients and companions. Identification of pump malfunctions.	Important nursing actions to prevent errors are: Patient and caregiver education; Carrying out rigorous post-operative checks; Monitoring the operational status of intravenous PCA devices; Standardizing procedures.

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Health education for patients and caregivers	Patient evaluation			Conduct of the nursing team
	Physical examination and SSVV*	Pain	Adverse reactions	
Checking the patient's cognitive ability to understand the instructions for handling the PCA[9]

Instructing the patient on the correct time to activate the PCA pump[10]

Warning the patient about adverse effects and inadequate pain control[10]

Educating the family about the consequences of inappropriate pump activation[9,12]

Instructing the patient on how to handle the pump and the consequences of third-party handling[10] | Assessment and documentation of comfort and sedation status[9]

Allergies check[9]

Frequent monitoring in the first 24 hours[10]

Nocturnal monitoring[10]

Use of standardized scales to evaluate sedation[10]

Evaluation of respiratory rate and quality[10]

Pulmonary auscultation[10]

Oximetry and capnography[10] | Pain evaluation and documentation[9,13]

Use of a standardized pain assessment tool[10,13] | Observation of the presence of adverse reactions[11]

Evaluation of respiratory rate and quality[10]

Evaluation of mental state[10]

Stopping PCA in the event of respiratory depression, but maintain functional venous access[10]

Awakening the patient and assisting with breathing[10] | Use of identification and warning labels[12]

Staff training[9]

Standardization of protocols[9,12]

Frequent monitoring of PCA-related devices[12]

Checking the duration of the PCA use[12]

Double-checking pump settings[9]

Review of pump settings at every shift change[9]

Independent checking of prescriptions and pump settings by two nurses[10] |

Figure 2. Flowchart of nursing care with patient controlled analgesia epidural IV and epidural
*SSVV: vital signs.

Health education for patients and caregivers

Health education for patients and caregivers was addressed in three of the five analyzed articles. The retrospective study[12] aimed to describe and analyze the errors associated with postoperative IV PCA. Errors related to misuse of the pump by the patient or third parties were found. The thematic dossier[9] aimed to describe safety measures with PCA. This document mentions educating the family about the consequences of improperly activating the pump and checking the patient's cognitive ability to comprehend how the PCA is handled.

The thematic dossier[10], which aimed to expose PCA-related complications and methods of resolving them, highlighted the importance of educating patients about how to handle the PCA pump in the preoperative period, including instructions on how to handle the pump by third parties. The reference authors[10] argued that the patient should clearly understand the correct time to activate the pump and be warned about adverse drug reactions or inadequate pain control. Patient and caregiver education should be carried out by the nursing team in order to correct the errors found[12].

Patient assessment

The assessment of patients using post-operative PCA was found in four of the articles in the sample. The literature describes assessment mainly in terms of pain, physical examination, vital signs and adverse effects.

Pain assessment and documentation are nursing care[9]. One study[13] in the sample compared donor patients who received IV morphine with patients who received epidural PCA during the immediate postoperative period of liver transplantation. The authors found that the use of post-operative epidural PCA was associated with lower morphine consumption compared to other routes of administration. The thematic dossier[10] recommends pain assessment using a standardized pain intensity classification tool, such as a numerical scale.

In addition to pain care, the assessment and documentation of comfort, the patient's state of sedation and checking for allergies[9] should be observed and recorded. The reference article[10] describes the care taken to monitor patients using post-operative PCA and the frequent assessment of vital signs in the first 24 hours,

paying attention to the night period, as this is when most cases of respiratory depression occur.

They reinforce the assessment of respiratory quality and frequency in terms of the number of breaths, depth, breathing pattern and quality of respiratory effort[10]. Pulmonary auscultation should be assessed for clear sounds, diminished sounds and the presence of adventitious noises[10]. A pulse oximeter is recommended to measure changes in the patient's oxygenation, especially if the patient has risk factors for respiratory depression[10].

The same study[10] also highlights the importance of assessing the level of sedation, as sedation precedes respiratory depression, offering an opportunity for intervention in case it is detected early. They also suggest[10] the use of standardized scales, such as the Ramsay Sedation Scale, the Pasero-McCaffery Opioid-Induced Sedation Scale or the Richmond Agitation and Sedation Scale.

The main signs and symptoms to be identified during respiratory depression are a respiratory rate between 8 and 10 breaths per minute, shallow breathing, insufficient and noisy respiratory effort, a depressed mental state, oxygen desaturation or increasing capnography. In cases where respiratory depression has already set in, the PCA infusion must be stopped immediately, maintaining functional venous access, waking the patient up immediately and reminding them to "take a deep breath", and the use of supplementary oxygen should also be considered[10]. The use of opioid antagonists is not mentioned in this study.

The quasi-experimental study[11] showed that the nursing activity that demanded the most time from professionals during postoperative PCA care was patient observation, due to the high incidence of adverse reactions to this method of analgesia. In addition, they identify10 respiratory depression as a frequent adverse reaction to PCA, as the analgesic of choice for this method is usually opioid.

Team conduct

Another study[12] found that errors (54.7%) on the part of the PCA pump operator were the most common in the use of post--operative IV PCA. The nursing actions needed to remedy these errors are the proper display of identification and warning labels to prevent device tampering, constant monitoring of the PCA devices, strict checks on the length of time the PCA is left in place and standardization of the procedures to be carried out[12]. Another study[9] mentions the importance of training staff on PCA and the use of appropriate identification labels. They also suggest double-checking the pump's settings and passing on the pump's settings at the end of the shift. When installing the pump, other authors[10] suggest that two nurses check independently all PCA prescriptions and pump settings to ensure the programming and pharmacology are correct. Finally, two studies[10,12] highlight the importance of standardizing procedures and patient assessment tools.

DISCUSSION

PCA is a different method of analgesia to be used in the treatment of POP, as it gives adult patients autonomy in terms of analgesia and the supply of drugs (usually opioids) on demand, as well as continuous doses[7]. The efficacy and safety of using this device depends directly on nursing care, both related to the PCA pump and to the patient themselves.

The results obtained in this study show that health education on PCA should take place in order to train and alert patients and caregivers to the use of the pump, identification of adverse effects and consequences of misuse and activation by third parties. This educational process should begin with the patient and family in the preoperative period, with instructions on how to use the pump[9,10,12]. Training is one of the strategies to prevent errors related to misuse of the PCA pump[12]. The literature shows that it is necessary to encourage nurses to carry out educational activities throughout the perioperative period, thus increasing the patient's knowledge and promoting comfort and safety[14].

One of the objectives of the Brazilian National Patient Safety Policy (PNSP - *Política Nacional da Segurança do Paciente*)[15] is to include patients and their families in the care process and in their own safety. The PNSP states that involving patients in their care is a strategy for preventing avoidable errors. On the other hand, patient education is a challenge, as it requires a change in the culture of healthcare establishments[15].

The Implementation Committee of the National Patient Safety Program (CIPNSP - *Comitê de Implementação do Programa Nacional de Segurança do Paciente*)[16], institutionalized by Ministerial Order MS/GM No. 529/2013, provides for the creation of protocols, guides and manuals for some specific areas of care, such as surgical and anesthesiology procedures, prescribing, transcribing, dispensing and administering drugs, patient identification processes and the safe use guidance of equipment and materials. The results found corroborate the need to standardize protocols[9,12], as well as precautions to be included by the nursing team, such as the use of identification tags and labels, double-checking PCA pump settings, passing on PCA pump settings among the team at every shift change and independent checking of prescriptions by two nurses.

Opioids are the main class of drugs used to treat POP, due to their high analgesic efficacy. Among the data found in this study is the recommendation that the use of opioids requires attention to adverse effects, especially nausea, vomiting, respiratory depression and sedation[17]. Patient assessment should include observing adverse reactions associated with the respiratory system, especially respiratory depression and sedation, measuring respiratory rate and quality, oximetry and capnography. Monitoring of the patient's vital signs should also be carried out during the use of the PCA pump. In order to include the patient in their care, they should be instructed on the presence of signs and symptoms of respiratory depression, sedation and nausea, for example, so that they know how to identify them and report them to the nursing team[9,10,11].

Sedation as an adverse effect of opioid use may be associated with their anticholinergic activity[18]. The results highlight the importance of taking into account the assessment of the level of consciousness, mainly due to the fact that sedation precedes respiratory depression in patients using opioids[10]. This should be assessed using standardized scales, such as the Ramsay Sedation

Scale, the Pasero-McCaffery Opioid-Induced Sedation Scale and the Richmond Agitation and Sedation Scale[9,10,12,13].

A validation study of sedation and agitation scales in Portuguese suggested that although the Ramsay Sedation Scale is widely used, it has more limitations when compared to the Richmond Agitation and Sedation Scale[19]. This is because the assessment items adopted in the Ramsay scale can generate doubts during the assessment[19].

On the other hand, the Richmond Agitation and Sedation Scale systematically differentiates the items evaluated, which makes it easier for the evaluator to apply the scale[19]. The existence of a validated translation into Brazilian Portuguese makes it possible to use these scales to assess sedation as an adverse effect of using the PCA pump. No information was found on the validation in Portuguese of the Pasero-McCaffery Opioid-Induced Sedation Scale or more recent validation studies of the Richmond Agitation and Sedation Scale and the Ramsay Sedation Scale.

The use of opioids also has other adverse effects that require attention, such as urinary retention, cardiovascular effects, constipation, pruritus, effects on the immune system, tolerance and hyperalgesia, as well as hormonal changes[18]. As a treatment for the adverse effects of the use of opioids in an PCA pump, the results showed the importance of interrupting the infusion in cases of respiratory depression, as well as waking the patient up and "reminding them to take a deep breath"[10].

In addition, the literature also includes the importance of diagnosing and treating comorbidities that can potentiate sedation, suspending or reducing the dose of other drugs that depress the central nervous system, the use of psychostimulants, and opioid substitution, which consists of changing from one opioid to another as a strategy for better pain control and reducing adverse effects[18]. The use of an opioid antagonist, naloxone, is considered in cases of respiratory depression caused by opioids[20]. The immediate and appropriate administration of naloxone is vital for the care of emergencies associated with the adverse effects of opioids[20].

The nursing staff is also responsible for identifying and caring for these signs and symptoms. The fact that PCA allows opioids to be offered on demand can be an option for reducing the adverse effects caused by the choice of these analgesics, and can become an ally in optimizing nursing care. Despite the importance of antagonists, the results found did not provide information on the use of naloxone in emergencies associated with opioids in the sample of this study.

The limitations of the present review include the small number of articles in the sample. Despite the importance of the nurse's role in this method of postoperative analgesia, there is a lack of recent scientific evidence to support nursing conducts in this scenario.

CONCLUSION

Nursing care with PCA, IV and epidurals found in the literature over the last 10 years focuses on patient and caregiver education, constant assessment of patients using PCA as well as the optimization of teamwork and quality of care. They highlight the importance of strategies aimed at promoting patient safety through patient and caregiver education, actions such as correct pump identification, double-checking of programming by nurses and the importance of standardizing procedures. The evaluation of patients using PCA should include the use of standardized scales to assess pain and adverse effects, and include a physical examination and evaluation of vital signs, paying attention to the signs and symptoms of respiratory depression and sedation related to the use of opioids.

The use of the PCA pump in IV and epidural routes is effective in POP care, as it promotes quality analgesia and patient autonomy. Nursing care is essential in the educational process, preventing errors and complications and promoting patient safety. Thus, there is still a need for more specific studies on the conduct of the nursing team in this context.

AUTHORS' CONTRIBUTIONS

Rafaela Silva Motta
Data Collection, Conceptualization, Research, Methodology, Writing - Preparation of the original, Writing - Review and Editing, Visualization
Karina Brito da Costa Ogliari
Data Collection, Research, Methodology, Writing - Preparation of the original, Visualization
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Data Collection, Research, Methodology, Visualization
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Data Collection, Conceptualization, Project Management, Research, Methodology, Writing - Preparation of the original, Writing - Review and Editing, Supervision, Visualization

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