COMPLICATIONS IN THE POST-ANESTHESIA CARE UNIT: AN INTEGRATIVE REVIEW

Complicações na sala de recuperação pós-anestésica: uma revisão integrativa

Complicaciones en la sala de recuperación pos-anestésica: una revisión integrativa

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ABSTRACT: Objective: To analyze production of knowledge about postoperative complications and nursing interventions at the Post-Anesthesia Care Unit (PACU). **Method:** Integrative review based on studies published from 2006 to 2016 in the following databases: Literatura Latino-Americana e do Caribe em Ciências da Saúde (LILACS), Medical Literature Analysis and Retrieval System Online (MEDLINE), Scientific Electronic Library Online (SciELO), Base de Dados de Enfermagem (BDENF), United States National Library of Medicine (NLM), and National Institutes of Health (PubMed). **Results:** The sample was composed of 30 articles. The most common surgical complications were pain, nausea, hypothermia, urinary retention, desaturation, and hypertension. Two studies mentioned nursing interventions, which encompassed drug administration, oxygen therapy, installation of thermal blanket, observation, vital signs monitoring, and application of dressings. **Conclusion:** This review shows the need for further studies with scientific evidence about this theme and more focus on nursing interventions (Nursing Intervention Classification) when it comes to postoperative complications.

Keywords: Postoperative complications. Anesthesia recovery period. Recovery room. Post-anesthesia nursing. Nursing care.

RESUMO: Objetivo: Analisar a produção do conhecimento sobre as complicações pós-operatórias e as intervenções de enfermagem na Sala de Recuperação Pós-Anestésica (SRPA). **Método:** Revisão integrativa, mediante consulta às bases de dados Literatura Latino-Americana e do Caribe em Ciências da Saúde (LILACS), *Medical Literature Analysis and Retrieval System Online* (MEDLINE), *Scientific Electronic Library Online* (SciELO), Base de Dados da Enfermagem (BDENF) e *United States National Library of Medicine* (NLM) *and National Institutes of Health* (PubMed) no período de 2006 a 2016. **Resultados:** A amostra resultou em 30 artigos. As complicações cirúrgicas mais prevalentes foram dor, náuseas, hipotermia, retenção urinária, dessaturação e hipertensão. As intervenções de enfermagem foram citadas em dois estudos, expressas por administração de medicamentos, oxigenioterapia, instalação de manta térmica, observação, monitoramento de sinais vitais e realização de curativos. **Conclusão:** Esta revisão demonstrou que há necessidade de estudos com evidências científicas sobre a temática e maior enfoque nas intervenções de enfermagem (*Nursing Intervention Classification*), diante das complicações pós-operatórias.

Palavras-chave: Complicações pós-operatórias. Período de recuperação da anestesia. Sala de recuperação. Enfermagem em pós-anestésico. Cuidados de enfermagem.

RESUMEN: Objetivo: Analizar la producción del conocimiento sobre las complicaciones pos-operatorias y las intervenciones de enfermería en la Sala de Recuperación Pos-Anestésica (SRPA). **Método:** Revisión integrativa, mediante consulta a las bases de datos Literatura Latinoamericana y del Caribe en Ciencias de la Salud (LILACS), *Medical Literature Analysis and Retrieval System Online* (MEDLINE), *Scientific Electronic Library Online* (SciELO), Base de Datos de la Enfermería (BDENF) y *United States National Library of Medicine* (NLM) *y National Institutes of Health* (PubMed) en el período de 2006 a 2016. **Resultados:** La muestra resultó en 30 artículos. Las complicaciones quirúrgicas más prevalentes fueron dolor, náuseas, hipotermia, retención urinaria, desaturación e hipertensión. Las intervenciones de enfermería fueron citadas en dos estudios, expresadas por administración de medicamentos,

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oxigenoterapia, instalación de manta térmica, observación, monitoreo de señales vitales y realización de curativos. **Conclusión:** Esta revisión demostró que hay necesidad de estudios con evidencias científicas sobre la temática y mayor enfoque en las intervenciones de enfermería (*Nursing Intervention Classification*), ante las complicaciones pos-operatorias.

Palabras clave: Complicaciones posoperatorias. Periodo de recuperación de la anestesia. Sala de recuperación. Enfermería posanestésica. Atención de enfermería.

INTRODUCTION

The Post-Anesthesia Care Unit (PACU) is meant for patients under anesthesia effects. The assistance given to the patient at the PACU is required until full consciousness and homeostasis are recovered, with constant monitoring and prevention of complications[1].

The recovery period encompasses the moment when the patient is discharged from the operating room until they leave the PACU. The multi-professional team must take an active role and assist patients who need continuous observation and specific care[2].

The immediate postoperative (IPO) period requires attention from the health team as the patient can present physiological changes associated with: age, anesthetic interventions, comorbidities, surgical complication, and efficiency of therapeutic measures applied[1,2]. Therefore, the main postoperative complications are related to the respiratory, circulatory, digestive, nervous, and urinary systems.

During the IPO period, the nurse is in charge of planning actions for the prevention and treatment of complications, observing organic functions, and contributing to knowledge production by giving subsidies to improve patient care in this period.

The high incidence of postoperative complications that occur at the PACU[1], and the need to build a knowledge foundation for clinical practice that aids in the development of future investigations justify this study.

Thus, the question to be answered was: what is the national and international scientific production on postoperative complications from 2006 to 2016 and which interventions are mostly adopted by the nursing team at a PACU?

OBJECTIVE

To analyze the production of knowledge about postoperative complications and nursing interventions at the PACU.

METHOD

This is an integrative literature review based on national and international scientific production from the past ten years and conducted in six stages: theme identification, research question; studies inclusion and exclusion criteria; sampling; categorization; evaluation, discussion of results; and review presentation[4].

Inclusion criteria were: original articles, available in full on indexed databases, written in Portuguese, English, and Spanish, published between 2006 and 2016. Review studies and meta-analyses, dissertations and thesis, editorials and experience reports were excluded.

The databases used to search the articles were: Literatura Latino-Americana e do Caribe em Ciências da Saúde (LILACS), Medical Literature Analysis and Retrieval System Online (MEDLINE), Scientific Electronic Library Online (SciELO), Base de Dados de Enfermagem (BDENF), United States National Library of Medicine (NLM), and National Institutes of Health (PubMed). The descriptors used for search were: postoperative complications, care unit, anesthesia recovery period, post-anesthesia nursing, and nursing care. For quantitative increase, we used six associations between descriptors (Figure 1).

The final sample had 30 articles selected by perusal of headings, abstracts, and full texts, and application of inclusion and exclusion criteria. To categorize the studies, the instrument developed by Ursi and Galvão[5] was adapted with the purpose of systematically recording the data collected. The analysis started by searching the following aspects: year of publication, country of origin, methodology, sample, name of journal, postoperative complications that happened at the PACU, nursing interventions, and results, all recorded in an instrument adapted for this study. Afterwards, a synthesis of the selected studies was made according to author, country/year, databases, name of journal, methodology, and results (postoperative complications and nursing interventions).

The analysis was conducted through systems, and data were processed in Microsoft Office Excel®, followed by a descriptive statistics and presentation in the form of tables.

RESULTS

Of the 30 articles selected, 18 (60.0%) were published in MEDLINE, 8 (26.7%) in LILACS, 3 (10.0%) in SciELO, and 1 (3.3%) in PubMed. Articles had been published in 11 countries, and the predominant language was English. The country with most studies was Brazil, (13 articles; 43.3%), followed by the USA (5; 16.7%) and Portugal (3; 10.0%). Most Brazilian publications were available in both English (14; 46.66%) and Portuguese (13; 43.33%).

We observed that, for ten years, there was no increase in publications, with oscillations: in 2008 and 2010, the number of publications on the theme was larger, but decreased after 2011.

Regarding the type of periodical, 14 (46.6%) articles had been published journals of the medical field, 5 (16.6%) in general nursing, 5 (16.6%) in perioperative nursing, 3 (10.0%) in general medicine, and 3 (10.0%) in other health areas.

The methodological design of studies was: eight descriptive, seven prospective, five retrospective, four exploratory/observational, three cohort, two case studies/cross-sectional, one desk, one analytical, and one interventional case-control.

There were 28 quantitative studies, 1 qualitative, and 1 quasi-experimental. This shows the low score of scientific evidence of papers, according to the Oxford Centre for Evidence-Based Medicine, since most articles had level 5[6].

Chart 1 presents an overview of the selected studies according to author, country and year of publications, database, method, postoperative complications, and nursing interventions.

Of the 30 articles included, 27 (90.0%) analyzed events that occurred with adults, and 3 (10%) with children.

The most frequent postoperative complications addressed in studies were pain and hypothermia; hypertension and

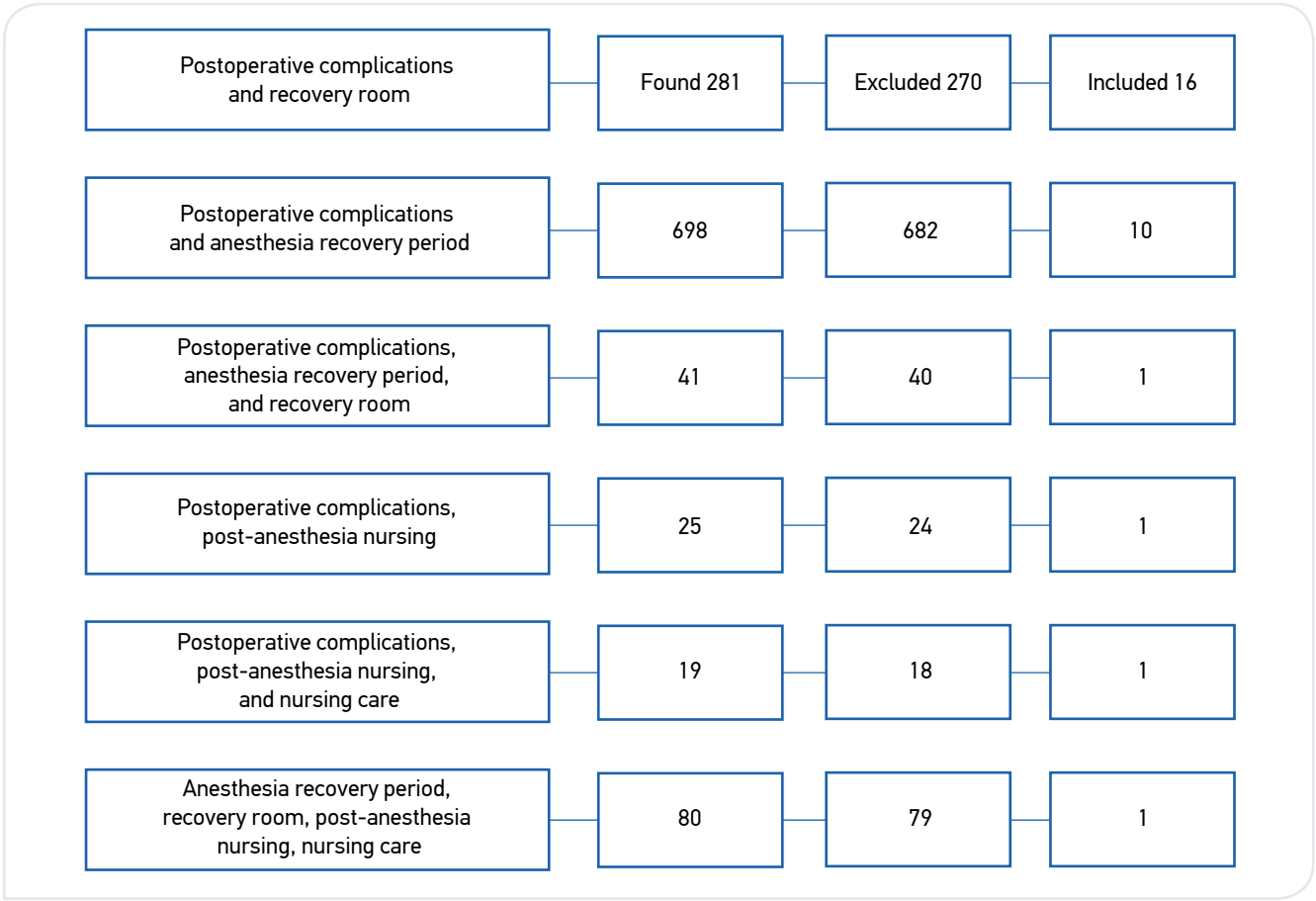

Figure 1. Article selection according to the association between descriptors. Aracaju, Sergipe, Brazil, 2016.

Chart 1. Summary of studies included in sample. Aracaju, Sergipe, Brazil, 2016.

Reference	Country (year)	Database	Periodical	Method	Post-anesthesia complications	Nursing interventions
3	Brazil (2009)	SciELO	Rev. Esc. Enferm. USP	Exploratory, descriptive, with quantitative approach	- Pain - Nausea - Vomiting - Hypoxemia - Hypothermia	- Analgesia - Oxygen therapy - Dressing - Hydration - Additional tests - Observation - Thermal blanket - Urinary catheterization
7	Brazil (2008)	SciELO	Revista da Escola de Enfermagem da USP	Retrospective, with quantitative approach	- Pain - Desaturation - Tachycardia	Analgesia administration
8	Brazil (2010)	LILACS	Revista Dor	Descriptive, with quantitative approach	Pain	Analgesia administration
9	Spain (2012)	MEDLINE	Rev Esp Anestesiol Reanim	Clinical Case	- Erythematous rash - Pruritus - Nausea/vomiting - Mild chest discomfort	Drug administration
10	Portugal (2015)	MEDLINE	Archivos em Broncopneumologia	Observational, prospective, with quantitative approach	- Inability to breathe deeply - Hypoxemia - Difficulty in breathing, swallowing, and talking	Not reported
11	Brazil (2012)	MEDLINE	Cient. Ciênc. Biol. Saúde	Descriptive, cross-sectional, with quantitative approach	Hypothermia	Not reported
12	Scandinavia (2011)	MEDLINE and PubMed	Acta Anaesthesiol Scandinavia	Exploratory, with quantitative approach	Urinary retention	Urinary catheterization
13	Brazil (2014)	LILACS	Revista SOBECC	Prospective, with quantitative approach	- Hypothermia - Pain - Hypoxemia - Bradycardia - Hypotension	Not reported
14	USA (2008)	MEDLINE and PubMed	Journal of Perianesthesia Nursing	Exploratory, with quantitative approach	Urinary retention	Not reported
15	Brazil (2015)	LILACS	Salusvita	Qualitative, using Bardin's methodology	Pain	Identification and measures for pain relief
16	Canada (2013)	PubMed and LILACS	Journal of Clinical Anesthesia	Exploratory, with quantitative approach	Desaturation	Not reported
17	Brazil (2010)	SciELO	Enfermeria Global	Descriptive, with quantitative approach	- Hypothermia - Pain - Tachypnea - Hypertension - Nausea - Anxiety	Specific care for each complication
18	Brazil (2008)	LILACS	Arquivos Catarinenses de Medicina	Cross-sectional	Hypothermia	Not reported

Continue...

Chart 1. Continuation.

Reference	Country (year)	Database	Periodical	Method	Post-anesthesia complications	Nursing interventions
19	USA (2016)	SciELO	Revista Brasileira de Anestesiologia	Case Report	Non- epileptic seizures	Not reported
20	Japan (2013)	MEDLINE and PubMed	Journal of Perianesthesia Nursing	Descriptive, with quantitative approach	Urinary retention	Stimulation of spontaneous micturition and urinary catheterization
21	Germany (2008)	MEDLINE and PubMed	British Journal of Anesthesia	Observational, with quantitative approach	Delirium	Testing of instruments to assess delirium
22	USA (2010)	MEDLINE and PubMed	Journal of Perianesthesia Nursing	Retrospective, with quantitative approach	Arrhythmia	Not reported
23	Portugal (2013)	MEDLINE and PubMed	Journal of Clinical Anesthesia	Prospective, with quantitative approach	Delirium	Not reported
24	Egypt (2013)	MEDLINE and PubMed	Anaesthesia	Quasi-experimental	- Delirium - Agitation - Vomiting	Not reported
25	Switzerland (2015)	MEDLINE	BMC Anesthesiology	Prospective, with quantitative approach	Delirium	Not reported
26	Portugal (2014)	MEDLINE	Revista Portuguesa de Pneumologia	Case-control	- Hypoxia - Difficulty in breathing deeply	Not reported
27	Korea (2015)	MEDLINE and PubMed	Journal of International Medical Research	Retrospective, with quantitative approach	- Agitation - Pain	- Pain management - Urinary catheterization
28	USA (2015)	MEDLINE and PubMed	British Journal of Anesthesia	Cohort	Delirium	Not reported
29	Brazil (2012)	MEDLINE and SciELO	Revista Brasileira de Anestesiologia	Cohort	- Nausea/vomiting - Pain - Thrombophlebitis	Not reported
30	Germany (2010)	MEDLINE and PubMed	European Journal of Pain	Cohort	Pain	Application of scales
31	Brazil (2008)	LILACS and SciELO	Revista Brasileira de Anestesiologia	Observational, with quantitative approach	Nausea/vomiting	Drug administration
32	Brazil (2010)	LILACS and SciELO	Revista Brasileira de Anestesiologia	Descriptive, prospective, with quantitative approach	Urinary retention	Urinary catheterization
33	Brazil (2010)	MEDLINE and SciELO	Investigación y Educación en Enfermería	Descriptive, retrospective, with quantitative approach	- Hypothermia - Pain - Hypertension - Nausea/vomiting - Dyspnea/tachypnea - Bradycardia	Not reported
34	USA (2009)	MEDLINE and PubMed	Journal of Perianesthesia Nursing	Prospective and randomized	- Delirium - Agitation	Allow parents at the PACU
35	USA (2009)	MEDLINE and PubMed	Journal of Perianesthesia Nursing	Prospective and randomized	- Delirium - Agitation	Allow parents at the PACU

hypotension; desaturation and hypoxemia; nausea and vomiting; and urinary retention, which involved the nervous, circulatory, respiratory, digestive, and urinary systems, respectively, as shown in Table 1.

The surgical specialties that had more complications were: general surgery, orthopedics, and gynecology. The higher incidence was for general anesthesia, as displayed in Table 2.

DISCUSSION

Nineteen studies reported complications of the nervous system at the PACU. The studies[8,30] that evaluated pain intensity using a numerical scale showed scores 3 and 4 as the most frequent. Among children who had undergone surgical interventions at a hospital of São Paulo and reported pain while at the PACU, the mostly cited intensity scores were 3 and 4, for those who spent more time in the unit[8]. Similarly, a study conducted in Germany identified that pain incidence and score were lower than 4 in the majority of the population studied and higher than 4 in the remaining[30].

When correlating pain and type of surgical intervention, musculoskeletal surgeries had the highest incidence (38.2%)[30].

A qualitative research using Bardin's method of content analysis demonstrated that pain, in most cases, is identified by the professional and the patient, so the results were grouped in nurse-patient verbal communication and non-verbal communication[15].

The most frequent neurological complication was hypothermia, identified in 80[8], 55.5[13] and 43%[3] of patients. Although not statistically significant, it was the most common event in patients who had been submitted to general, proctological or gynecological surgery with both inhalation or spinal anesthesia[18].

As for surgery complexity and body temperature in the IPO period, patients undergoing major and intermediate surgeries presented mild and moderate hypothermia, but not severe[11].

Table 1. Postoperative complications at the Post-Anesthesia Care Unit, according to body systems. Aracaju, Sergipe, Brazil, 2016.

Systems	Complications	n=30	%
Nervous	Pain	12	40.0
	Hypothermia	08	26.7
	Delirium	06	20.0
	Agitation	04	13.3
	Seizure	01	03.3
Circulatory	Hypertension	04	13.3
	Hypotension	02	06.7
	Tachycardia	02	06.7
	Bradycardia	01	03.3
	Thrombophlebitis	01	03.3
	Arrhythmia	02	06.7
	AMI*	01	03.3
	Bleeding	01	03.3
Respiratory	Desaturation (O_2)**	05	16.7
	Hypoxemia	03	10.0
	Hypoxia	01	03.3
	Difficulty in breathing deeply	02	06.7
	Dyspnea	01	03.3
	UA obstruction***	01	03.3
	Tachypnea	01	03.3
Digestive	Nausea	08	26.7
	Vomiting	08	23.3
Immune	Anaphylactic reaction	01	03.3
Urinary	Urinary retention	06	20.0

*AMI: acute myocardial infarction, **O_2: oxygen, ***UA: upper airways.
Source: published articles.

Table 2. Type of anesthesia and surgical specialties of postoperative complications. Aracaju, Sergipe, Brazil, 2016.

		n=30	%
Anesthesia	General	24	80.0
	Spinal	08	26.7
	Combined*	06	20.0
	Epidural	04	13.3
	Local	02	06.7
	Brachial plexus block	01	03.3
Surgical specialty	General surgery	12	40.0
	Orthopedic	11	36.7
	Gynecological	10	33.3
	Head/neck	05	16.7
	Otolaryngology	04	13.3
	Neurosurgery	02	06.7
	Plastic	02	06.7
	Vascular	02	06.7
	Urologic	07	23.3
	Gastroenterological	01	03.3
	Proctological	01	03.3
	Cardiothoracic	01	03.3

Combined*: regional and general.

Regarding length of stay at the PACU and hypothermia, 80% of patients remained hypothermic for up to 30 minutes, and 60% of them returned to normal temperature in 60 minutes[34]. However, a similar study showed that the average incidence of hypothermia was 33.6% of patients at the time of admission to the care unit (minute 0)[13].

The most common manifestations of hypothermia were tremors (66.6%) and hypoxemia (73.3%), with mean of 1.83 per patient[34].

Delirium was identified in 19% of the 400 patients studied. Signals were detected upon admission, after 30 minutes, 1 hour, and upon discharge in 124 (31%), 59 (15%), 32 (8%), and 15 (4%) patients, respectively[28]. In a similar study, 4.3% of patients presented delirium while at the PACU (138.4±55.2 min)[25].

A research with 266 patients showed that 8.6% of them experienced emergence delirium and 6.4% had an episode of hypoactive delirium[23]. In another study, hypoactive delirium occurred in 56% of patients at the time of admission and in 92% during their stay at the PACU[28].

Risk factors identified for emergence delirium were: prolonged preoperative fasting, higher surgical risk, higher scores in pain scale, frequent nausea and vomiting[23], and administration of opioids in the care unit[28].

By correlating age and surgical specialty, a study with 287 patients reported 30 individuals aged up to 70 years (28.7%) diagnosed with delirium. Orthopedics and urology were the specialties with the most cases of delirium[25].

Regarding the circulatory system, the most prevalent complications at the PACU were: hypertension[17,33], tachycardia[7], and bradycardia[33]. At two surgical centers in the USA, among 185 patients classified by the American Society of Anesthesiologists (ASA I) and who had undergone surgery, 16 had arrhythmias while at the PACU, including tachycardia and sinus bradycardia[22].

The most common adverse events observed were: inability to breathe deeply, mild and moderate hypoxemia, weakness, obstruction of upper airways (UA), signs of respiratory distress or imminent respiratory failure[10], severe hypoxemia[3], dyspnea and tachypnea[17,33], and desaturation[7].

Incidence of desaturation upon arrival at the PACU was 19.12% when patients had been transferred without oxygen supplementation, and 0.8% with supplementation. The results suggest that the most important predictor of desaturation at the care unit was transportation without oxygen[16], and hypoxemia was statistically significant when related to routine and oxygen therapy[3].

In a study with obese patients, the incidence of respiratory complications in the postoperative period and the length of stay at the PACU were higher compared to a group of non-obese patients. Inability to breathe deeply was the most common complication in 26% of obese patients and 4% of non-obese patients. Obesity and residual neuromuscular blockade after surgery were considered significant risk factors for respiratory complications[26].

Nausea and vomiting were the most common gastrointestinal complications seen at the PACU[17,29,33]. A research conducted in Brazil reported 35 patients experiencing postoperative nausea and vomiting (PONV). The most prevalent risk factors were: smoking abstinence, female gender, use of opioids, and previous history of PONV. Comorbidities with possible impact were detected in 26.2% of patients and included diabetes, chronic renal insufficiency, and previous chemotherapy and/or radiotherapy[31].

In the urological field, studies have shown patients admitted to the PACU with urinary volumes greater than or equal to 400 mL presenting with post-anesthesia urinary retention[12,14,20,32].

In a study conducted in the USA, factors related to urinary retention in the postoperative period included infusion of fluids in intraoperative period and volume of the bladder at the time of admission to the PACU. There was no association between urinary retention and age, gender, surgical complexity, anesthesia level, and surgical service[14].

In a study in Japan, 7 out of 34 patients developed urinary retention. Among the risk factors listed, the most significant ones were: clinical history, type and length of surgery and anesthesia. However, there was no sufficient data to establish a relationship between anesthetic technique, medication, and amount of fluids administered[20].

In regard to surgical specialty, 19 patients developed post-anesthesia urinary retention. Orthopedic and vascular surgeries had a higher incidence of retention, with odds ratio of 4.33[32].

In this integrative review, only two studies described the nursing interventions used in the event of postoperative complications at the PACU. For pain relief, the nurses administered oxygen therapy and analgesics and changed dressings. For agitation and anxiety, the interventions were oxygen therapy and administration of anxiolytics[3]. The mostly used preventive actions for hypothermia were warmed intravenous infusion and use of thermal blankets[34].

In an American research on children agitation in the IPO period, parents declared feeling useful in providing

care and reducing anxiety when present at the PACU[35]. This study showed the relevance of comfort to individuals and their relatives.

Nursing interventions for hypotension were: hydration, referrals to additional tests, and observation. For hypertension, the only intervention highlighted was observation; to reduce bleeding, nurses applied compression dressings[3].

Hypoxemia was significant when related to the routine (vital signs monitoring, safety measures, physical and neurological evaluation) and oxygen therapy[3]. The higher frequency was a consequence of the need to use an oxygen mask to keep saturation above 91%[8].

With respect to nausea and vomiting, the nursing care depended on specific protocols of each institution and on the administration of antiemetics[3].

To optimize the implementation of nursing interventions, the nursing team working at the PACU must be trained to plan and execute actions that reduce complications related to anesthesia and surgical procedures or prevent such events, mindful of each patient's safety, comfort, and characteristics.

The limitations of the present study include the scientific evidence level of the articles selected, low statistical correlation — including length of surgery, type of anesthesia, surgical intervention, and post-anesthetic complication at the PACU —, in addition to the specific approach of restricting the identification of other complications. It is also important to consider the lack of studies encompassing nursing interventions, which are so relevant and indispensable to a full and immediate recovery of surgical patients.

CONCLUSION

After analyzing 30 articles, objects of this study, the most frequent complications related to anesthesia and surgery were: pain, nausea and vomiting, hypothermia, urinary retention, and hypertension. The nursing interventions that stood out were: drug administration, oxygen therapy, observation, installation of thermal blanket, and vital signs monitoring.

We highlight the importance of prior awareness by the nursing team about early identification of complications and implementation of preventive measures. This highlights the need for studies based on a specific nursing intervention system.

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