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Original article

Analysis of perioperative variables and their relationship with complications in the Post-Anesthetic Care Unit*

Análise das variáveis perioperatórias e sua relação com as complicações em Sala de Recuperação Pós-Anestésica

Análisis de variables perioperatorias y su relación con complicaciones en la Unidad de Cuidados Postanestésicos

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Abstract

Objective: to analyze the frequencies of complications in the Post-Anesthetic Care Unit (PACU) by surgical specialties and their association with pre-, intra- and immediate postoperative variables. **Method:** cross-sectional study with 98 patients. Perioperative data were used, collected through interviews, physical examination and electronic medical records; and descriptive, bivariate and logistic regression analyses. **Results:** hypothermia was more frequent in general and gynecological surgeries in women, being associated with general or spinal anesthesia and lithotomy positioning ($p<0.05$); nausea in general and gynecological surgeries ($p=0.05$), and vomiting in general ($p=0.01$); pain in general surgeries, associated with general anesthesia and intraoperative prescription of analgesics ($p<0.05$). General surgery increased the chances of pain in the PACU by 3.5 times ($p=0.01$). **Conclusion:** there was a higher frequency of hypothermia, pain and nausea/vomiting associated with gynecological and general specialties, female sex, lithotomy surgical position, intraoperative analgesic prescription and spinal and general anesthesia.

Descriptors: Anesthesia Recovery Period; Operative Surgical Procedures; Postoperative period; Postoperative Complications; Perioperative Nursing

Resumo

Objetivo: analisar as frequências das complicações em Sala de Recuperação Pós-Anestésica (SRPA) por especialidades cirúrgicas e sua associação com variáveis pré, intra e pós-operatórias imediatas. **Método:** estudo transversal, com 98 pacientes. Utilizaram-se dados perioperatórios, coletados por meio de entrevista, exame físico e prontuário eletrônico; e análises descritivas, bivariadas e regressão logística. **Resultados:** hipotermia foi mais frequente nas cirurgias geral e ginecológica em mulheres, sendo associada às anestesias geral ou raquidiana e ao posicionamento litotômico (p<0,05). Náuseas em cirurgias gerais e ginecológicas (p=0,05), e vômitos nas gerais (p=0,01). Dor nas cirurgias gerais, associada à anestesia geral e à prescrição de analgésicos no intraoperatório (p<0,05). Cirurgia geral aumenta 3,5 vezes as chances de dor em SRPA (p=0,01). **Conclusão:** encontrou-se maior frequência de hipotermia, dor e náuseas/vômitos, associadas às especialidades ginecológica e geral, ao sexo feminino, posicionamento cirúrgico litotômico, à prescrição de analgésicos no intraoperatório e às anestesias raquidiana e geral.
Descritores: Período de Recuperação da Anestesia; Procedimentos Cirúrgicos Operatórios; Período Pós-Operatório; Complicações Pós-Operatórias; Enfermagem Perioperatória

Resumen

Objetivo: analizar las frecuencias de las complicaciones en la Unidad de Cuidados Post Anestésicos (UCPA) por especialidades quirúrgicas y su asociación con variables pre, intra y postoperatorias inmediatas. **Método:** estudio transversal con 98 pacientes. Se utilizaron datos perioperatorios, recolectados a través de entrevistas, examen físico y prontuario electrónico; y análisis de regresión descriptiva, bivariada y logística. **Resultados:** la hipotermia fue más frecuente en cirugías generales y ginecológicas en mujeres, asociándose a anestesia general o espinal y posicionamiento litotómico (p<0.05). Náuseas en general y cirugías ginecológicas (p=0.05), y vómitos en general (p=0.01). Dolor en cirugías generales, asociado a anestesia general y prescripción intraoperatoria de analgésicos (p<0.05). La cirugía general aumenta las posibilidades de dolor en la UCPA 3.5 veces (p=0.01). **Conclusión:** hubo mayor frecuencia de hipotermia, dolor y náuseas/vómitos, asociados a especialidades ginecológicas y generales, sexo femenino, posicionamiento quirúrgico litotómico, prescripción analgésica intraoperatoria y anestesia raquídea y general.
Descriptores: Período de Recuperación Anestésica; Procedimientos Quirúrgicos Operatorios; Período Postoperatorio; Complicaciones Postoperatorias; Enfermería Perioperatoria

Introduction

The perioperative period is the interval that comprises the stages of immediate preoperative, transoperative, intraoperative, anesthetic recovery and immediate postoperative period.[1] The immediate preoperative period consists of the 24 hours prior to surgery. The transoperative period occurs from the patient's entry to the Surgical Center (SC) to the exit from the Operating Room (OR).[1] In turn, the intraoperative period occurs from entry to exit from the OR. The immediate postoperative period covers the first 24 hours after surgery.[1]

Anesthetic recovery occurs within the immediate postoperative period and takes place in an area of the SC called the Post-Anesthetic Care Unit (PACU), which aims to provide conditions for the recovery of consciousness and stability of vital signs of patients undergoing to anesthetic-surgical procedures.[1]

From the point of view of complications, the post-anesthetic recovery stage is considered critical, as these can dramatically affect the recovery of patients and increase the length of stay, influencing the flow of the operating room.[2-3]

In this way, care for patients in recovery from anesthesia involves prevention and immediate care of complications, which is one of the objectives of the Nursing team that works in PACU.[1] For this, it is essential to identify the risks, establish patient safety protocols, optimize the surgical outcomes, and promote the acceleration of the postoperative recovery process.[3-4]

Complications that occur in PACUs have several related factors. Knowing such factors helps in the identification of risks.[5] The surgical specialty is one of these factors,[6] which can help in the identification of the clinical profile in procedures to which patients are exposed. Based on the analysis of secondary data, a relationship with higher rates of complications is described for the general, gynecological and orthopedic specialties.[7] However, there is no analysis of the related risks in the literature.

In this scenario, there are studies that address complications in the PACU,[5–8] however, in the last 10 years, there have been no increasing publications on the subject.[7] Thus, the present study proposed to carry out an analysis involving primary data, identifying the relationships between the set of possible complications, considering variables inherent to patients and anesthetic-surgical procedures, including the surgical specialty.

Due to the high rates of complications in the PACU and the absence of recent publications on the subject,[1,7] it is important to carry out primary studies that provide scientific evidence to support clinical practice, supporting the identification of the profile of patients at higher risk among surgical specialties and, consequently, prevent complications.

The objective of this study was to analyze the frequencies of complications in the PACU by surgical specialties and their association with pre-, intra- and immediate postoperative variables.

Method

This is an observational, cross-sectional and exploratory study carried out in the PACU of a hospital linked to the Brazilian Unified Health System, located in the urban periphery of the Federal District (FD).

The sample was non-probabilistic, consisting of 98 patients. The selection took place in the preoperative period and by criterion of convenience, consisting of approaching all patients eligible for the research on dates previously established and defined according to the dynamics of the service where the research was carried out and the schedule of the researcher who collected the data.

Individuals undergoing elective surgical procedures of both sexes, aged ≥18 years, admitted to the PACU were included. Those who were unable to respond for themselves in the preoperative period, who died in intraoperative period and/or underwent local anesthesia were excluded.

The patients in this study were allocated into groups, corresponding to the surgical specialties: general, orthopedic and gynecological. The choice of such specialties was due to their importance for the subject studied. Such specialties make up not only the profile of surgeries most frequently performed and with higher rates of complications at the study site, but also in general hospitals in Brazil.[7]

Data collection was carried out by a single researcher in the period of April 2017 in the pilot study phase, being subsequently conducted from September to November 2018. A structured instrument was used with data referring to the moments of: 1) immediate preoperative, 2) intraoperative and 3) post-anesthetic recovery. Subsequently, for a better analysis, the data were separated into immediate pre-, intra- and postoperative variables.

In the first stage (immediate preoperative period), sociodemographic and preoperative clinical information were collected through the electronic medical record and interview with the patients, which was carried out in the inpatient unit of a surgical

or orthopedic clinic. This information supported the classification of the American Society of Anesthesiologists (ASA) and cardiovascular risk.[1,9]

In the intraoperative stage, data were collected from the surgical, anesthetic and nursing procedure reports described in the patients' electronic medical record.

In the post-anesthetic recovery stage, a careful evaluation of the patients was carried out by the responsible researcher, with a view to identifying complications in the PACU. For this, vital signs were measured and the patient's physical examination was performed, respecting the intervals of 15 to 15 minutes in the 1st hour after surgery, every 30 minutes in the 2nd hour and every 1 hour in the 3rd hour.[1,10] The Ramsey Sedation Scale, the Aldrete and Kroulik Index (AKI), and the Numerical Pain Scale were also used.[1,10]

The following parameters of normality were considered: 1) Heart rate: from 60 to 100 beats per minute;[11] 2) Blood Pressure (BP): unchanged if variation below 20% of the pre-anesthetic level;[1,10] 3) Respiratory rate: from 12 to 20 incursions per minute;[11] 4) Oxygen Saturation: values ≥92% in ambient air;1 5) Temperature: from 36 °C to 38 °C.[11]

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) for Windows, version 22.0 and The R Project for Statistical Computing (R), version 3.6.1. Descriptive analysis of the variables was performed and the Shapiro-Wilk test was used to test the normality of the variables. Thus, non-parametric tests were used. Categorical variables were expressed as percentages and absolute values. For comparison between groups, the chi-square test and likelihood ratio were used. Odds ratios for the presence of complications in the PACU were analyzed by logistic regression. In all analyses, a statistical significance level of 5% was considered, with a confidence interval of 95%.

The study was approved by the Research Ethics Committee, under opinion nº 2,000,293. All research procedures respected the precepts of the Declaration of Helsinki (2000), Resolution nº 466, of December 12, 2012, and Resolution nº 516, of June 3, 2016, of the National Health Council of Brazil. The patients' participation was voluntary and all participants were included in the research after agreeing and signing the Informed Consent Form.

Results

The sample consisted of 98 elective surgery patients distributed in the following groups: 1) Orthopedic surgery (42.8%, n=42), 2) General surgery (37.8%, n=37), 3) Gynecological surgery (19.4%, n=19). Information collected in the immediate preoperative, intraoperative and immediate postoperative period (PACU) was analyzed.

Immediate preoperative period

The preoperative variables analyzed included demographic and clinical data (Table 1). There were significant differences between the surgical specialties in the frequency of variables: female sex, dyslipidemia, use of anticoagulants and use of benzodiazepines ($p \leq 0.05$).

Table 1 – Percentages (absolute frequencies) and p-values of demographic and preoperative clinical variables of patients distributed by surgical specialties (n=98). Brazil, 2018.

Variables	Total (n=98) n(%)	Orthopedic surgery (n=42) n(%)	General surgery (n=37) n(%)	Gynecological surgery (n=19) n(%)	p-value*
Sex					
female (53)	53(54.1)	13(31.0)	21(56.8)	19(100.0)	<0.001†
Age group					
18 - 39 years	39(39.8)	17(40.5)	17(45.9)	5(26.3)	0.17‡
40 - 59 years	41(41.8)	14(33.3)	15(40.5)	12(63.2)	
>60 years	18(18.4)	11(26.2)	5(13.5)	2(10.5)	
External causes	33(33.7)	33(78.6)	-	-	§
Comorbidities	49(50.0)	18(42.9)	20(54.1)	11(57.9)	0.45†
SAH‖	27(27.6)	11(26.2)	9(24.3)	7(36.8)	0.59†
DM II¶	16(16.3)	9(21.4)	4(10.8)	3(15.8)	0.43‡
Psychiatric disorders	6(6.1)	2(4.8)	2(5.4)	2(10.5)	0.70‡
Dyslipidemia	5(5.1)	-	3(8.1)	2(10.5)	0.05‡
DMSCT**	5(5.1)	3(7.1)	2(5.4)	-	0.31‡
Lifestyle					
Smoking	21(21.4)	11(26.2)	6(16.2)	4(21.1)	0.55‡
Previous smoking	9(9.2)	3(7.1)	6(16.2)	-	0.05‡
Alcoholism	14(14.3)	7(16.7)	6(16.2)	1(5.3)	0.38‡
Illicit substances	5(5.1)	4(9.5)	1(2.7)	-	0.14‡
ASA Rating††					
I	32(32.7)	12(28.6)	12(32.4)	8(42.1)	
II	42(42.9)	18(42.9)	17(45.9)	7(36.8)	0.83‡
III and IV	24(24.5)	12(28.6)	8(21.6)	4(21.1)	
Surgical history	39(39.8)	16(38.1)	13(35.1)	10(52.6)	0.42†
Medicines					
Analgesics	12(12.2)	6(14.3)	5(13.5)	1(5.3)	0.52‡
Anticoagulants	8(8.2)	7(16.7)	1(2.7)	-	0.01‡
Benzodiazepines	7(7.1)	1(2.4)	1(2.7)	5(26.3)	0.007‡

Antiemetics	6(6.1)	1(2.4)	4(10.8)	1(5.3)	0.28‡
Antihypertensives	5(5.1)	3(7.1)	1(2.7)	1(5.3)	0.65‡
Opioids	4(4.1)	3(7.1)	1(2.7)	-	0.27‡
Antibacterials	4(4.1)	4(9.5)	-	-	§
Antiulcer	4(4.1)	3(7.1)	1(2.7)	-	0.27‡
Antidiabetics	2(2.0)	1(2.4)	1(2.7)	-	0.64‡
NSAIDs‡‡	2(2.0)	1(2.4)	1(2.7)	-	0.64‡

*Significance level (p<0.05); †Chi-square test; ‡Likewise Ratio Test; §Statistical testing was not performed because all observations were in a single specialty; ||SAH: Systemic Arterial Hypertension; ¶DM II: Type II Diabetes Mellitus; **DMSCT: Diseases of the Musculoskeletal System and Connective Tissue; ††ASA: American Society of Anesthesiologists; ‡‡NSAIDs: Non-Steroidal Anti-Inflammatory Drugs.

Intraoperative period

As for the intraoperative variables (Table 2), significant differences were observed between the surgical specialties in the following variables: cardiovascular risk, surgical positioning, type of anesthetic, use of benzodiazepines and muscle relaxants adjuvant to anesthesia, non-opioid analgesic drugs (dipyrone), opioids and anti-ulcers administered in intraoperative way (p≤0.05).

Table 2 – Percentages (absolute frequencies) and p-values of intraoperative clinical variables of patients distributed by surgical specialties (n=98). Brazil, 2018.

Variables	Total (n=98) n(%)	Orthopedic surgery (n=42) n(%)	General surgery (n=37) n(%)	Gynecological surgery (n=19) n(%)	p-value*
Cardiovascular risk					
Low	20(20.4)	4(9.5)	9(24.3)	7(36.8)	0.03†
Intermediary	78(79.6)	38(90.5)	28(75.7)	12(63.2)	
Surgical time					
<60 min.	16(16.3)	7(16.7)	5(13.5)	4(21.1)	0.70†
60 – 120 min.	45(45.9)	20(47.6)	19(51.4)	6(31.6)	
>120 min.	37(37.8)	15(35.7)	13(35.1)	9(47.4)	
Surgical positioning					
Supine	77(78.6)	37(88.1)	33(89.2)	7(36.8)	<0.001†
Lithotomy	14(14.3)	-	2(5.4)	12(63.2)	
Side	6(6.1)	5(11.9)	1(2.7)	-	
Prone	1(1.0)	-	1(2.7)	-	
Anesthesia					
Spinal	65(66.3)	32(76.2)	18(48.6)	15(78.9)	<0.001†
General	22(22.4)	2(4.8)	17(45.9)	3(15.8)	
Block	7(7.1)	7(16.7)	-	-	
General + Epidural	4(4.1)	1(2.4)	2(5.4)	1(5.3)	
Adjuvants					
Opioids	77(79.4)	29(69.0)	31(86.1)	17(89.5)	0.08†
Benzodiazepines	61(64.2)	31(75.6)	15(42.9)	15(78.9)	0.004‡
Relax. muscle§	21(22.1)	1(2.4)	18(51.4)	2(10.5)	<0.001†

Complication	37(38.1)	17(41.5)	10(27.0)	10(52.6)	0.14‡
No registry	61(62.2)	25(59.5)	27(73.0)	9(47.4)	
hypotension	34(34.7)	15(35.7)	10(27.0)	9(47.4)	0.21†
Bleeding	3(3.1)	2(4.8)	-	1(5.3)	
Medicines					
Antiemetics	68(69.4)	30(71.4)	23(62.2)	15(78.9)	0.40‡
Antibacterials	65(66.3)	31(73.8)	23(62.2)	11(57.9)	0.37‡
Corticosteroids	51(52.0)	21(50.0)	17(45.9)	13(68.4)	0.26‡
Analgesics	46(46.9)	13(31.0)	24(64.9)	9(47.4)	0.01‡
NSAIDs||	41(41.8)	13(31.0)	21(56.8)	7(36.8)	0.06‡
Vasoconstrictors	35(35.7)	15(35.7)	10(27.0)	10(52.6)	0.16‡
Opioids	20(20.4)	3(7.1)	15(40.5)	2(10.5)	0.001†
Antiulcer	6(6.1)	-	4(10.8)	2(10.5)	0.03†
Coagulants	5(5.2)	5(12.25)	-	-	¶

*Level of significance (p≤0.05); †Likewise Ratio Test; ‡Chi-square test; §Relax Musc.: Muscle Relaxants; ||NSAIDs: Non-Steroidal Anti-Inflammatory Drugs; ¶Statistical testing was not performed because all observations were in a single specialty.

Immediate postoperative period - PACU

As postoperative variables (Table 3) analyzed in the PACU, a higher frequency of the following complications was observed: hypothermia (85.7%), arterial hypotension (80%), tachypnea (53.1%), bradycardia (42.9%), oxygen desaturation (37.8%) and pain (34.7%).

There were significant differences in the prevalence of hypothermia, pain, nausea and vomiting among the surgical specialties (p≤0.05).

Table 3 – Percentages (absolute frequencies) and p-values of complications in the Post-Anesthetic Care Unit presented in patients distributed by surgical specialties (n=98). Brazil, 2018.

Variables	Total (n=98) n(%)	Orthopedic surgery (n=42) n(%)	General surgery (n=37) n(%)	Gynecological surgery (n=19) n(%)	p-value*
Total complications	97(99.0)	41(97.6)	37(100.0)	19(100.0)	0.42†
Cardiovascular	88(89.8)	38(90.5)	32(86.5)	18(94.7)	0.59†
Hypotension	80(81.6)	35(83.3)	28(75.7)	17(89.5)	0.40†
Bradycardia	42(42.9)	16(38.1)	16(43.2)	10(52.6)	0.56‡
Tachycardia	12(12.2)	6(14.3)	6(16.2)	-	0.06†
Hypertension	5(5.1)	3(7.1)	2(5.4)	-	0.31†
Metabolic	84(85.7)	32(76.2)	33(89.2)	19(100.0)	0.01†
Hypothermia	84(85.7)	32(76.2)	33(89.2)	19(100.0)	0.01†
Tremors	3(3.1)	-	3(8.1)	-	§
Respiratory	64(65.3)	23(54.8)	27(73.0)	14(73.7)	0.16‡
Tachypnea	52(53.1)	21(50.0)	21(56.8)	10(52.6)	0.83‡
Desaturation	37(37.8)	14(33.3)	14(37.8)	9(47.4)	0.58‡
Dyspnea	2(2.0)	1(2.4)	1(2.7)	-	0.64†
UAW obstruction||	1(1.0)	-	1(2.7)	-	§
Neurological	36(36.7)	9(21.4)	19(51.4)	8(42.1)	0.02‡
Pain	34(34.7)	9(21.4)	18(48.6)	7(36.8)	0.03‡

Altered level of consc. [¶]	2(2.0)	-	1(2.7)	1(5.3)	0.28[†]
Dizziness	2(2.0)	-	1(2.7)	1(5.3)	0.28[†]
Gastrointestinal	11(11.2)	1(2.4)	6(16.2)	4(21.1)	0.03[†]
Nausea	10(10.2)	1(2.4)	6(16.2)	3(15.8)	0.05[†]
Vomiting	6(6.1)	-	5(13.5)	1(5.3)	0.01[†]
Abdominal distension	2(2.0)	-	1(2.7)	1(5.3)	0.28[†]
Muscular	1(1.0)	-	-	1(5.3)	[§]
Weakness	1(1.0)	-	-	1(5.3)	[§]

[*]Level of significance (p≤0.05); [†]Likewise Ratio Test; [‡]Chi-square test; [§]Statistical testing was not performed because all observations were in a single specialty; [||]UAW: Upper Airway; [¶]Altered level of consc.: Altered level of consciousness.

The odds ratios showed that being submitted to general surgeries increases 3.5 (CI: 1.3-9.6) times the chances of pain in the PACU (Table 4).

Table 4 – Odds ratios [confidence intervals] and p-values determined by logistic regression analysis of complications in the Post-Anesthetic Care Unit presented in patients distributed by surgical specialties (orthopedic surgery as the reference group) (n=98). Brazil, 2018.

Variables/Complications	General surgery RC [CI]*	p-value[†]	Gynecological surgery RC [CI]*	p-value[†]
Cardiovascular	0.7 [0.1-2.7]	0.6	1.9 [0.2-38.5]	0.6
Hypotension	0.6 [0.2-1.9]	0.4	1.7 [0.4-12.2]	0.5
Bradycardia	1.2 [0.5-3.1]	0.6	1.8 [0.6-5.5]	0.3
Tachycardia	1.2 [0.3-4.1]	0.8	[‡]	[‡]
Hypertension	0.7 [0.1-4.7]	0.7	[‡]	[‡]
Metabolic	2 [0.6-7.03]	0.2	[‡]	[‡]
Hypothermia	2.6 [0.8-10.2]	0.1	[‡]	[‡]
Tremors	[‡]	[‡]	[‡]	[‡]
Respiratory	2.2 [0.9-5.9]	0.1	2.3 [0.7-8.2]	0.1
Tachypnea	1.3 [0.5-3.2]	0.5	1.1 [0.4-3.3]	0.8
Desaturation	1.2 [0.5-3.1]	0.7	1.8 [0.6 -5.5]	0.3
Dyspnea	1.1 [0.04-29.5]	0.9	[‡]	[‡]
UAW obstruction[§]	[‡]	[‡]	[‡]	[‡]
Neurological	3.9 [1.5-10.7]	0.006	2.7 [0.8-8.8]	0.1
Pain	3.5 [1.3-9.6]	0.01	2.1 [0.6-7.1]	0.2
Altered level of consc.[||]	[‡]	[‡]	[‡]	[‡]
Dizziness	[‡]	[‡]	[‡]	[‡]
Gastrointestinal	7.9 [1.3-154]	0.06	10.9 [1.5-233.3]	0.03
Nausea	7.9 [1.3-154]	0.06	7.7 [0.9-162]	0.08
Vomiting	[‡]	[‡]	[‡]	[‡]
Abdominal distension	[‡]	[‡]	[‡]	[‡]
Muscular	[‡]	[‡]	[‡]	[‡]
Weakness	[‡]	[‡]	[‡]	[‡]

*Adjusted odds ratios; [†]Level of significance (p≤0.05); ‡It was not possible to calculate the odds ratios, confidence intervals and p-values; [§]UAW: Upper Airway; [||]Altered level of consc.: Altered level of consciousness.

Discussion

In this study, primary data collected in the PACU of a hospital in the public health network of the FD were analyzed. Statistically significant relationships were found between pre- and intraoperative variables and complications in the PACU, as well as the chances of their occurrence, when analyzed by surgical specialty.

In the literature, complication rates in the PACU range from 8.2 to 94.1%.[6,12] The higher rate found in this study of 99.1% can be explained by the use of primary data and rigor in the evaluation parameters adopted, which vary considerably between studies.

Hypothermia was the most frequently found complication, with rates ranging from 27% to 94.1% being described.[2,12] Risk factors for hypothermia are: female sex, type of surgery, surgical positioning, low temperature in the operating room, infusion of liquids and inhalation of cold gases, transport from the operating room to the PACU, general anesthesia and regional anesthesia.[1,5-6,10,12-13] Although the values found in this study for orthopedic surgery cannot be ignored, higher rates were observed in surgeries general and gynecological conditions, revealing the need for attention to this complication in PACU patients in all specialties with immediate care and adoption of preventive measures.

Regional anesthesia is more frequently reported for orthopedic and gynecological surgeries,[1,14] as found in this study. Spinal anesthesia is described as a risk factor for hypothermia[15] and may be the cause of this complication for patients treated in these specialties. This technique involves a longer duration of anesthetic after surgery, which reduces the threshold of cutaneous vasoconstriction, favoring heat loss, which is an important mechanism involved in body thermoregulation.[12] The effect of general anesthetics is well documented as a cause of hypothermia due to its central actions, which explains the rate found for general surgeries.[1,10] Thus, although general anesthesia is important for hypothermia,[5] the data presented in this study suggest that a risk for hypothermia should be included when Regional anesthesia is used, especially in female patients.

Dorsal decubitus is indicated for abdominal, orthopedic and gynecological surgeries, while lithotomy is primarily for gynecological surgeries,[1] which explains the

differences found in this study between specialties. The lithotomy position in gynecological surgeries is related to a higher risk of hypothermia in the PACU.[6] In addition, women have smaller body surface and muscle mass, being more susceptible to heat loss.[12] In the present study, the gynecological and general specialties had higher rates of hypothermia and a higher frequency of females, suggesting this relationship.

The rates of arterial hypotension and bradycardia in the PACU are: 4% to 63% and 8.2% to 18%, respectively.[6,16] In this study, BP values lower than 20% of the preanesthetic level were adopted as a criterion for hypotension.[1,10] It is important to note that, when this parameter is not adopted, the frequency of hypotension drastically reduces, and may not be observed.[6] Thus, its impact on the prevalence of this complication[6,16] is evidenced and the need for uniformity, both in studies and in clinical records.

Risk factors for hypotension in the PACU include: intraoperative blood loss, use of anticoagulants, residual effect of anesthetics (both general and regional), use of analgesics and antiemetics, in addition to insufficient volume replacement.[1,10,17] In this case study, the use of anticoagulants in the immediate preoperative period was higher in orthopedic surgeries. These drugs are indicated for the prophylaxis of deep vein thrombosis and pulmonary thromboembolism, which are conditions associated with the frequent need to restrict movement in the preoperative period of orthopedic surgeries. Despite the differences found between the types of surgery in the use of anticoagulants in the preoperative period, there were no statistical differences in the frequencies of intraoperative complications, hypotension and hemorrhage between the specialties analyzed. Thus, for the study population, the use of anticoagulants did not influence the presence of these complications.

Although no significant difference was found between specialties regarding the prevalence of cardiovascular complications, it can be speculated that their causes are not the same, impacting the planning of perioperative nursing care. For orthopedics, the main cause may be the higher cardiovascular risk found. In turn, for general and gynecological surgeries, complications may be associated with a higher frequency of women, who tend to have lower blood pressure levels up to 50 years of age,[11] in addition to the lithotomy position.[1] The type of anesthetic may also be related to general

surgeries, considering that hemodynamic changes are more frequent in general anesthesia than in regional anesthesia.[17]

Tachypnea in the PACU occurs at rates of 10.9 to 43.3%, being caused by the accumulation of carbon dioxide that occurs as a consequence of tremors, excitement upon awakening from anesthesia, pain and anxiety.[6,18] It can also occur as a physiological response compensatory to mild hypothermia (32.2 to 35°C).[19] It is related to oxygen desaturation,[11,18] the latter being one of the most prevalent complications in the sample of this study, a finding similar to what is reported in the literature, which indicates an approximate rate of 17%.[7] The variables that influence its presence are: female sex, age over 55 years, smoking, general anesthesia, ASA II and III, residual action of opioids and tremors.[8,12,20]

No significant differences were found between specialties regarding the prevalence of respiratory complications. However, for the general and gynecological surgical specialties, such complications may be associated with the decrease in metabolism caused by hypothermia, more frequently in women. In addition, for the general surgical specialty, there was a higher frequency of general anesthesia and intraoperative use of opioids.

Pain in the PACU has incidence rates ranging from 25.9 to 41%,[14,21] being associated with the female sex, higher ASA classification, high levels of anxiety, surgical specialty, incision size, type of anesthetic and prolonged surgery time, among others.[1,22–24] The present study found a relationship and greater chances of developing pain in the PACU for general surgery patients when compared to those in the gynecological and orthopedic specialties. However, there is evidence of this relationship also for the orthopedic,[7] oncological and traumatological specialties,[24] as well as the absence of a relationship between pain or differences in its intensity between the surgical specialties.[6] Considering the surgical specialty, general anesthesia has been described as a factor of independent and predictive risk for pain in the PACU in individuals undergoing general surgery.[22–24] This association can be established, considering that the findings of the present study reveal a higher frequency of general anesthesia and pain the PACU in the general surgical specialty. In addition, greater use of opioids and analgesics is observed in the intraoperative period of general surgeries, which is a

prophylactic measure based on evidence that postoperative pain is one of the expected complications of abdominal surgeries.[1,22]

Despite the lower frequencies of gastrointestinal complications, a significant difference was found for the occurrence of nausea and vomiting in the general surgical specialty, and nausea for the gynecological specialty. Surgery of the abdominal cavity, general anesthesia, female sex, and postoperative pain are some of the risk factors present in the studied sample.[3,10,17] Thus, there is a clear relationship of these complications with general surgery and gynecological specialties.

In addition to their direct impact, decreasing the flow of patients and the number of visits, and increasing costs to the health system, complications in the PACU are indicators of quality of care,[1] showing the relevance to the well-being, satisfaction and safety of patients. Thus, reducing them and improving such quality indicators are goals to be achieved by health services. One of the strategies includes the use of instruments that allow risk analysis to develop them with a view to their prevention.[1,5,25] Therefore, establishing the frequency of these complications and association with perioperative variables based on scientific evidence can provide tools for planning perioperative nursing care.

As limiting factors of this study, we can mention the size and design of the sample, directly influenced by the use of primary data and by the option of collecting data by a single researcher, in order to avoid bias. Due to the characteristics of the service where the research was carried out and the schedule established for the research, it was not possible to analyze the influence of minimally invasive surgery modalities (approach by videolaparoscopy or robotic surgery) on complications in the PACU. Patients undergoing urgent and/or emergency surgeries were also not included, due to the fact that they presented a markedly different surgical profile.

Conclusion

This study found a higher frequency of hypothermia, pain and nausea/vomiting complications for gynecological and general specialties. In addition to the surgical specialty, hypothermia was associated with female sex, general or spinal anesthesia, and lithotomy surgical positioning. Likewise, pain was associated with general

anesthesia and intraoperative analgesic prescription. Logistic regression analysis showed 3.5 times more likely to have pain in general surgery patients.

The data evidence the association between the surgical specialty, the perioperative variables and the complications of hypothermia, pain and nausea/vomiting in the PACU. The scientific evidence found in the present study can help in more precise care approaches from the point of view of identifying the profile of patients at higher risk and proposing actions to prevent complications in the PACU.

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