

# Nurse interventions and the complications in the post-anesthesia recovery room

AS INTERVENÇÕES DO ENFERMEIRO E AS COMPLICAÇÕES EM SALA DE RECUPERAÇÃO PÓS-ANESTÉSICA

LAS INTERVENCIONES DEL ENFERMERO Y LAS COMPLICACIONES EN LA SALA DE RECUPERACIÓN POSTANESTÉSICA

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## ABSTRACT

The objective of this study was to identify the prevalent complications in the post-anesthesia recovery room (PARR), and correlate nurses' work hours with the complications. The sample consisted of 400 records of patients older than 18 years, who had major and medium surgical procedures, admitted at the PARR unit, with a stay of at least one hour. The prevalent complications were pain and hypothermia. The following complications showed a statistically significant relationship with the nursing intervention: pain: routine, oxygen therapy, medication and bandages; agitation/anxiety: routine and oxygen therapy; hypotension: hydration, complementary exams, and observation; hypertension: observation; tremor: mat heater, blood transfusion; nausea/vomiting: routine, medication and urinary catheterization; bleeding: routine, medication and bandages; hypoxemia: routine and oxygen therapy; hypothermia: routine, mat heater, and medication. Pain, nausea/vomiting, agitation and bleeding showed a statistically significant relationship with the PARR nurse.

## KEY WORDS

Recovery room.  
Postoperative complications.  
Nursing care.

## RESUMO

Este estudo objetivou identificar complicações prevalentes em Sala de Recuperação Pós-Anestésica (SRPA); relacionar as complicações às intervenções de enfermagem realizadas; relacionar o esquema de jornada de trabalho dos enfermeiros às complicações. A amostra compôs-se de 400 prontuários de pacientes maiores de 18 anos, submetidos a procedimentos cirúrgicos de grande e médio porte, admitidos na unidade de SRPA, com tempo de permanência superior à uma hora. As complicações prevalentes foram: dor e hipotermia. Complicações que apresentaram relação estatisticamente significativa com intervenção de enfermagem - dor: rotina, oxigenioterapia, medicação e curativo; agitação/ansiedade: rotina e oxigenioterapia; hipotensão: hidratação, exames complementares e observação; hipertensão: observação; tremor: manta térmica, transfusão sanguínea; náuseas/vômitos: rotina, medicação e sondagem vesical de alívio; sangramento: rotina, medicação e curativos; hipoxemia: rotina e oxigenioterapia; hipotermia: rotina, manta térmica e medicação. A dor, náuseas/vômitos, agitação e sangramento obtiveram relação estatisticamente significativa com o enfermeiro fixo em SRPA.

## DESCRIPTORIOS

Sala de recuperação.  
Complicações pós-operatórias.  
Cuidados de enfermagem.

## RESUMEN

Este estudio objetivó identificar las complicaciones prevalentes en la Sala de Recuperación Postanestésica (SRPA); relacionar las complicaciones a las intervenciones de enfermería realizadas; relacionar el esquema de jornada de trabajo de los enfermeros con las complicaciones. La muestra estuvo compuesta de 400 fichas de pacientes mayores de 18 años, sometidos a procedimientos quirúrgicos de grande y medio porte, admitidos en la unidad de SRPA, con tiempo de permanencia superior a una hora. Las complicaciones prevalentes fueron: dolor e hipotermia. Complicaciones que presentaron relación estadísticamente significativa con la intervención de enfermería - dolor: rutina, oxigenoterapia, medicación y curativo; agitación/ansiedad: rutina y oxigenoterapia; hipotensión: hidratación, exámenes complementares y observación; hipertensión: observación; tremor: manta térmica, transfusión sanguínea; náuseas/vómitos: rutina, medicación y sondaje vesical de alivio; hemorragia: rutina, medicación y curativos; hipoxemia: rutina y oxigenoterapia; hipotermia: rutina, manta térmica y medicación. El dolor, náuseas/vómitos, agitación y hemorragia obtuvieron relación estadísticamente significativa con el enfermero fijo en SRPA.

## DESCRIPTORES

Sala de recuperación.  
Complicaciones postoperatorias.  
Atención de enfermería.

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## INTRODUCTION

Concerns over surgical patients' safety are historically located prior to the discovery of the anesthesia. In Newcastle, 1801, patients who were submitted to surgery were forwarded to a place attached to the surgery room where they could be observed<sup>(1)</sup>.

In the 1940's, some of this unit's working characteristics were already very well defined, among them the performance of specialized nurses who were able to recognize alterations in patients' post-anesthetic evolution, as well as plan and implement specific care to prevent complications resulting from the surgical anesthetic procedure<sup>(1)</sup>.

The ordinance MS/GM 1884/94 from 11 November 1994<sup>(2)</sup>, which revoked ordinance MS 400/77 (Official Gazette 15 December 1977), established the compulsoriness of the PARR to simultaneously receive at least two patients under satisfactory conditions. This ordinance highlights that the room's operational capacity must have a work program specifically determined to the unit.

The PARR is set to receive patients submitted to general and/or locoregional anesthesia in immediate postoperative procedures, where intensive care is implemented up until the moment the patient recovers awareness, presenting protective reflexes and stability of vital signals. For that account specialized technical and human resources are necessary to support the precocious prevention, detection and implementation of specific care<sup>(3)</sup>.

The first 24 hours after the surgery procedure require the healthcare team to be specially attentive, as the patient may present pulmonary, cardiovascular, and renal disorders, among others, which must be identified and immediately treated, thus avoiding further complications<sup>(4)</sup>.

The multiprofessional team engaged in this process has the following objectives: offer support to the patient during the anesthetic recovery period up until the patient reaches cardiorespiratory stability and conscience; prevent or treat eventual complications; settle measures to relieve postoperative pain<sup>(5)</sup>.

This team is comprised of the anesthesiologist, the nurse, the nursing technician, and the nursing assistant. The nurse is required to render a safe, rational and individualized assistance, providing the patient with support throughout his return to a normal post-anesthetic physiological status.

Nursing intervention processes must be mostly focused on safeguarding patients; for this reason, a sufficient amount of nurses must be allocated<sup>(5)</sup>. For a more precise dimension of the needed human resources, a proportional calculation between the number of nursing professionals

and the amount of patients at the PARR must be taken into account<sup>(6)</sup>.

In Brazil, the calculation model for nursing personnel is grounded on the number of beds at the PARR, being: one nurse for five beds, one nursing technician for three beds, and one nursing assistant for five beds<sup>(7)</sup>. One of the objectives of this proportion is to offer an individualized nursing intervention according to the degree of dependence each patient presents, that is, compatible with the patient's alterations and affected basic needs<sup>(8)</sup>.

There has been a steady concern about the quality of the assistance rendered to surgical patients, especially when it is related to high complexity care statuses at PARRs<sup>(8)</sup>. A research was carried out in order to investigate the number of nurses associated with the mortality risk of surgical patients with complications; the study concluded that high proportion of nurses was related to low mortality rates and low complication levels<sup>(9)</sup>. Bearing this degree of complexity in mind and verifying the relevance of the nurse as a necessary element towards a safe assistance process in the patient's post-operative period, the following question, which became the guiding principle of this study, arose: does the nurse's work schedule at the PARR interfere in the onset of immediate post-operative complications and nursing interventions?

## OBJECTIVES

This present study was aimed to characterize patients at PARRs according to sex, age, ASA anesthetic risk classification, type of surgery and type of anesthesia, and time of permanence at this unit. It also aimed to identify more frequent complications in the post-anesthetic recovery period, and to correlate performed nursing interventions and the work schedule of nurses at PARRs with the complications.

## METHODOLOGY

This exploratory, retrospective, descriptive, quantitative-based study was carried out in a large-sized healthcare institution located in the municipality of Sao Paulo. The hospital has 231 beds, providing private assistance and medical care, and complying with philanthropic agreements. Both surgical and clinical healthcare assistance have a general basis, encompassing all surgical specialties. In 2007, this hospital performed around 765 surgeries a month and received an average of 566 patients monthly at its PARRs. These units develop three different nurse work schedules, as follows: schedule 1 - a fixed nurse at the PARR throughout all the professional's shift; schedule 2 - a nurse is responsible for the PARR, the Surgical Center, the Supply Unit and the Materials and Sterilization Center; schedule 3 - the

The first 24 hours after the surgery procedure require the healthcare team to be specially attentive, as the patient may present pulmonary, cardiovascular, and renal disorders, among others.

nurse spends half of his shift at the PARR and in the other half he is responsible for the Surgical Center, the Supply Unit and the Materials and Sterilization Center. The work schedules received the above mentioned titles and classifications in order to facilitate the understanding of this study.

The research was approved by the Institution's Committee of Ethics (protocol 2007/07). Next, the records of patients operated between January and February 2007 were made available by the Medical Archive Service; the study further selected for a previously scheduled consultation process those who met the following inclusion criteria: patients older than 18 years of age submitted to large and medium surgical procedures in accordance with the cardiologic risk - when the risk of blood and fluid loss at the PARR is large or medium, respectively<sup>(10)</sup> - and with permanence time of over one hour at this unit. The selection process gathered a sample of 400 medical records.

The data collection process made use of a form comprised of three sections: 1. Characteristics of the PARR - number of beds, nurses' work schedule, and average of patients/month at the PARR. 2. Characteristics of the patient - age, sex, type of surgery according to the specialty (general orthopedic, head and neck, plastic and thoracic), type of anesthesia, pre-existing comorbidities, time of permanence at the PARR, classification of anesthetic risk in accordance with the ASA, as follows: ASA 1 - normal healthy patient, without pre-existing diseases; ASA 2 - patient with mild systemic disease; ASA 3 - patient with severe systemic disease; ASA 4 - intense systemic disease with a constant threat to life; ASA 5 - a moribund patient; ASA 6 - a declared brain-dead patient whose organs are being removed for donor purposes<sup>(10)</sup>. 3. Complications and interventions at the PARR - the study took into account those more frequent complications quoted by specific literature in that moment, that is, pain, hypothermia, hypoxemia, nausea and vomiting, agitation/anxiety, bleeding, hypertension, hypotension, tremors and chills<sup>(11-12)</sup>, period of occurrence of these complications, and performed nursing intervention.

Regarding the performed nursing interventions it should be highlighted that those activities noted down and executed by the nursing team at the moment they occurred were transcribed and identified as follows: routine (R), which defines a set of actions that entails cardiac and vital signal monitoring, safety maintenance - that is, raised grids and safety markings -, pain-related observation, as well as steady assessment of the patient's physical and emotional status; placement of the oxygen mask (O2); placement of mat heaters (MH); medication (M); insertion of relief vesical probes (RVP); hydration (H); placement of bandages (B); complementary exams (CE); washing and replacement of delay vesical probes (WRDVP); observation (O); and blood transfusion (BT).

One of the authors of this study collected data from the nursing annotations registered on the validated record instrument used at this Institution's PARRs. It is worth pointing out that this validated record instrument is the result of a research carried out and incorporated by this unit; therefore, it is presumed that the filling-out process was properly performed<sup>(13)</sup>. Those instruments that did not present necessary data were disregarded. Data concerning the characteristics of the unit were provided on request by the nurse responsible for the Surgery Center.

The quantitative variables were described taking into account the average and the median standard deviation. The Kolmogorov-Smirnov test<sup>(14)</sup> was applied in order to check the normality of the quantitative variables. The categorical variables were descriptively presented by absolute and relative frequencies. Proportions were compared in 2x2 contingency tables by means of either the Chi Square or Fisher's exact test, whenever appropriate. The Fisher-Freeman-Halton exact test was employed to compare proportions in over 2x2 contingency tables; p values lower than 0.05 were considered as statistically significant.

## RESULTS

Data showed that the majority of the individuals (222) were males (55.4%), with average age of 53.3 years (standard deviation - 16.9 years).

Regarding the estimates and risk, in compliance with the ASA, the majority (220 individuals, 55%) belong to the ASA 3 classification. The prevalent comorbidity was systemic arterial hypertension (SAH) with 129 individuals (40.7%). The predominant type of surgery was the general surgery, with 281 cases (70.2%). The predominant anesthetic procedure was the general anesthesia, 381 (95.2%). Regarding the permanence time in the PARR, data shown an average of 111.6 minutes (dp = 67.8).

The prevalent complications in the PARR were pain (sensorial system) in 216 (54%) patients in the immediate post-operative period, followed by hypothermia (thermoregulatory system) in 174 (43%) patients. As per the complications and the physical status, in compliance with the ASA, it was observed that the significant results are related to nausea and vomiting (digestive system), hypoxemia (respiratory system), and hypothermia (thermoregulatory system), presenting p values of 0,0010,  $p < 0,0001$  and  $p = 0,0417$ , respectively.

Tables 1, 2 and 3 display the distribution of complications and nursing interventions carried out in patients at the PARR.

**Table 1** - Distribution of the correlations between complications and nursing interventions performed at the PARR - Sao Paulo - 2007

Interventions	Complications								
	Pain			Agitation/Anxiety			Hipotension		
	N	%	P	N	%	P	N	%	P
R	203	65.7	<0.0001	36	11.6	0.0194	12	3.9	0.3132
O <sub>2</sub>	47	72.3	0.0013	12	18.4	0.0099	2	3.1	1.0
MH	51	62.9	0.0741	9	11.1	0.6500	3	3.7	0.7324
M	173	73.3	<0.0001	29	12.3	0.0419	99	3.8	0.4521
RVP	5	83.3	0.2249	0	0	1.0	0	0	1,0
H	6	60	0.7593	1	10	1.0	8	80	<0.0005
B	25	86.2	<0.0005	6	20.7	0.0512	1	3.5	1.0
CE	8	80	0.1170	2	20	0.2546	2	20	0.0381
WRDVP	2	100	0.5022	1	50	0.1862	0	0	1.0
O	7	41,2	0.3242	3	17.6	0.2251	3	17.6	0.0141
BT	1	33,3	0.5956	1	33.3	0.2661	0	0	1.0

**Table 2** - Distribution of the correlation between complications and nursing interventions performed at the PARR - Sao Paulo - 2007

Interventions	Complications								
	Hypertension			Tremor/chills			Nausea/vomiting		
	N	%	P	N	%	P	N	%	P
R	17	5.5	0.0879	6	1.9	0.3445	45	14.6	0.0004
O <sub>2</sub>	5	7.6	0.1898	1	1.5	1,0	6	9.2	0.5260
MH	3	3.7	1,0	4	4.9	0.0171	9	11.1	0.8951
M	13	5.5	0.2482	4	1.7	1,0	43	18.2	<0.0001
RVP	0	0	1,0	0	0	1,0	3	50	0.0224
H	0	0	1,0	0	0	1,0	0	0	0.6130
B	2	6.9	0.3821	1	3.5	0.3660	5	17.2	0.3589
CE	0	0	1,0	0	0	1,0	1	10	1.0
WRDVP	0	0	1,0	0	0	1,0	0	0	1.0
O	6	35.3	<0.0005	0	0	1,0	1	5	0.7057
BT	0	0	1,0	1	33.3	0.0445	1	33.3	0.3082

**Table 3** - Distribution of the correlations between complications and nursing interventions performed at the PARR - Sao Paulo - 2007

Interventions	Complications								
	Bleeding			Hypoxemia			Hypothermia		
	N	%	P	N	%	P	N	%	P
R	24	7.8	0.0064	55	17.8	0.0002	162	52.4	<0,0001
O <sub>2</sub>	6	9.2	0.2521	53	81.5	<0.0001	32	49.2	0.3178
MH	3	3.7	0.4374	11	13.6	0.8389	56	69.1	<0.0001
M	22	9.3	0.0008	33	14	0.8353	125	53	<0.0001
RVP	0	0	1.0	1	16.7	1.0	1	16.7	0.2382
H	0	0	1.0	3	30	0.1593	4	40	1.0
B	22	75.9	<0.0005	6	20.7	0.2796	17	58.6	0.0905
CE	0	0	1.0	0	0	0.3693	4	40	1.0
WRDVP	0	0	1.0	1	50	0.2656	2	100	0.1896
O	0	0	0.6129	1	5.9	0.4863	10	58.8	0.1961
BT	0	0	1.0	0	0	1.0	2	66.7	0.5827

A number of complications were statistically significant regarding the nursing interventions carried out in the PARR, such as pain and routine ( $p < 0.0001$ ); pain and oxygen therapy ( $p = 0.0013$ ); pain and medication ( $p < 0.0001$ ); and pain and bandages ( $p < 0.0005$ ). Agitation/anxiety followed the routine ( $p < 0.0194$ ), anxiety and oxygen therapy ( $p = 0.0099$ ), and pain and medication related interventions ( $p < 0.0001$ ). The hypotension related to the nursing interventions displayed hydration ( $p < 0.0005$ ), complementary exams ( $p < 0.0381$ ), and observation ( $p < 0.0141$ ). Arterial hypertension presented a significant correlation only with the observation ( $p < 0.0005$ ).

Tremor showed a meaningful positive correlation with the placement of the mat heater ( $p = 0.0171$ ) and blood transfusion ( $p = 0.0445$ ). Nausea and vomiting are related to the routine ( $p < 0.0004$ ), medication ( $p < 0.0001$ ), and relief vesical probe ( $p = 0.0224$ ). Bleeding is correlated with the implementation of the routine ( $p = 0.0064$ ), medication ( $p = 0.0008$ ), and bandages ( $p < 0.0005$ ). Hypoxemia is statistically significant when it is related to the routine ( $p = 0.0002$ ) and the oxygen therapy ( $p < 0.0001$ ). Hypothermia had a significant correlation with the routine ( $p < 0.0001$ ), mat heater ( $p < 0.0001$ ), and medication ( $p < 0.0001$ ).

**Table 4** - Distribution of complications and work schedule at the PARR - Sao Paulo - 2007

Complication	Work Schedule						P	Total
	Schedule 1		Schedule 2		Schedule 3			
	N	%	N	%	N	%		
Pain	127	53.1	51	47.7	38	70.4	0.0224	216
Hypothermia	107	44.8	42	39.3	25	46.3	0.5597	174
Hypoxemia	28	11.7	16	15	13	24	0.0639	57
Náusea/Vomiting	27	11.3	7	6.5	12	22.2	0.0131	46
Agitation	18	7.5	11	10.3	10	18.5	0.0490	39
Bleeding	11	4.6	3	2.8	10	18.5	0.0001	24
Hypertension	10	4.2	4	3.7	4	7.4	0.5053	18
Hypotension	9	3.8	2	1.9	2	3.7	0.7108	13
Tremor/Chills	4	1.7	0	0	2	3.7	0.1287	6
Others	36	15.1	17	15.9	7	13	0.8852	60
None	15	6.3	9	8.4	2	3.7	0.5092	26

Table 4 displays the distribution of occurred complications correlated with the work schedules carried out by nurses. Pain ( $p = 0.0224$ ), nausea and vomiting ( $p = 0.0131$ ), agitation ( $p = 0.0490$ ), and bleeding ( $p = 0.0001$ ) presented a statistically significant correlation with the work schedules developed at the PARR.

## DISCUSSION

The sample verified the major incidence of male ASA 2 patients and SAH comorbidity. In Brazil, the SAH stands out as one of the major challenges to the population's healthcare. Due to its complications, the SAH is now considered as a public health problem as a result of its high medical and social costs, among them the cerebrovascular and coronarian arterial diseases, as well as the cardiac and renal insufficiency<sup>(15)</sup>.

At the PARR, other factors contribute to the increase of the patient's arterial pressure (AP), which are not necessarily connected to basic SAH, such as pain, the fear of taking deep breaths, occlusive bandage, and the association of drugs. The disease can also be related to hypothermic vasoconstriction, large amounts of liquids in the intra-operative period, CO<sub>2</sub> retention, urinary retention, and agitation<sup>(16)</sup>.

The general surgery was predominantly carried out, including large-sized abdominal, urological and vascular surgeries, totaling 251 (62.8%); the general anesthesia was the predominant type of applied anesthetic. The time of permanence of patients at the PARR did not differ from those recorded in specific literature; most patients remain an average of 2-3 hours in this unit.

The incidence of complications at the PARR is related to pre-surgery clinical conditions, the extension and the type of surgery, surgical or anesthetic complications, and the effectiveness of the treatment. Therefore, it depends on both the patient's intrinsic factors that can be acknowledged after a proper pre-anesthetic assessment, and extrinsic factors that are bound to training processes that count on a continued instruction at the healthcare institution, development of routines, periodic inspection of devices and equipments, and improvement of human resources<sup>(16)</sup>.

Pain was the most prevalent complication at the PARR. Pain treatment is based on subjective reasons and must minimize physiological and psychological responses to the surgical trauma, improving the post-operative evolution, the functional recovery, the precocious mobilization, and the prevention of chronic pains, especially the neuropathic one<sup>(11)</sup>.

Another prevalent complication at PARRs identified by this study was hypothermia. During the anesthetic-surgical procedure, moderate, non-intentional hypothermia is a common occurrence, showing a reduction of 1-3 degrees Celsius in the patient's temperature as a consequence of the central inhibition of the body's thermoregulatory system, decrease of metabolism induced by the anesthetic, and the exposure of the patient to low temperatures at surgery rooms<sup>(17)</sup>.

The maintenance of the body temperature both during the surgical procedure and in the PARR is quite relevant, once hypothermia is associated with a number of complications. This fact was highlighted in studies that assessed the effect of hypothermia on the consumption of oxygen during the patient's permanence at the PARR in individuals from different age groups<sup>(17)</sup>. Results showed that the loss of 0.2 degrees produced a light increase of 7% in the oxygen consumption level, while individuals who lost over 3°C experienced an elevation of up to 40% in the oxygen consumption level.

In the PARR of the institution where this study was carried out, the patient's temperature is continually followed-up by a sensor connected to a multiparametric monitor. The mat heater is installed based on temperatures lower than 35°C on the patient's armpits, and in the presence of tremors and chills.

When complications identified in this study are correlated with the clinical conditions presented by patients, a significant difference between ASA 1, 2, and 3 patients and complications such as nausea, vomiting, hypoxemia and hypothermia were observed.

Nausea and vomiting in the post-operative period are results of assorted causes. Vomiting is related to the time length of anesthesia, the amount of anesthetic used and the types of associated anesthetic and medications. These complications take place more often in obese patients and in those who show a history of vertigo. Other factors are: post-operative ileum, gastroparesis, and mechanic intestinal obstruction; age - prevalent in children; females - more prevalent in young women; previous history of post-operative nausea and vomiting; and anxiety<sup>(11)</sup>. The fact of finding nausea and vomiting in 1.9% of ASA 3 patients may demand a more efficient prophylactic anti-emetic control, a better gastric emptying and gastro-intestinal preparation of these patients; it also points out that the risk of nausea and vomiting decreases with age on males - although tests have not yet been carried out. These conditions were presented by the majority of the sample analyzed by this study.

As per the hypoxemia, this study found a p value of < 0.0001 to the correlation with the ASA. Studies show that the occurrence of hypoxemia in the post-operative period is high; therefore, the use of pulse oxymetry at the PARR identifies hypoxemic patients and points out the use of oxygen therapy. Research shows significant statistics in ASA 3 patients, being 24.48% hypoxemic with a p value of < 0.05 between normoxemic and hypoxemic groups<sup>(18)</sup>.

ASA 3 (33.3%) and ASA 2 (15.5%) patients were identified in this study; these rates were quite significant and confirmed that ASA 2 and ASA 3 patients need more oxygen in the PARR. Hypoxemia results in drowsiness, enhancing the patient's recovery time and usually forwarding him to the admittance unit for a supplement of oxygen. The use of opioids in the anesthesia can be associated with post-anesthetic hypoxemia. This effect is observed in the first minutes of the patient's recovery process; therefore, the patient's respiratory movements must be carefully followed-up<sup>(18)</sup>.

A number of studies show that the oxygen saturation is routinely monitored in 83.4% of patients, and the oxygen therapy is routinely employed in 57.2% of patients<sup>(19)</sup>. The risk factors to hypoxemia, according to some studies, were: people younger than 55 years, oxygen saturation lower than 95% in the post-operative period, anesthesia with enflurane and clinically detected hypoventilation<sup>(18)</sup>.

As per the hypothermia, we have a significant correlation between ASA 1, 2 and 3 ( $p < 0.0417$ ) patients that presented results of 38.3, 49.1, and 33.3%, respectively. The factors that lead to hypothermia depend upon the duration of the procedure, type of surgical procedure, as well as type of employed anesthesia, and demand preventive measures in all surgical patients due to potential hypothermic complications. There is no correlation whatsoever with the patient's pre-operative physical status; however, its occurrence is more often found in ASA 2 patients, advising us to take more effective preventive measures into account against intra-operative hypothermia, such as, for instance, the employment of active heating systems, also used in PARRs to recover normal values of the body temperature. Patients that present hypothermia can also display tremors and chills that can lead to eventual unbalances of apparently controlled systemic diseases.

### **Complications and nursing interventions carried out at PARRs**

As a complication, pain was significantly correlated with the oxygen therapy, taking into account the fact that patients who present pain display higher oxygen consumption levels and often receive opioids, enhancing drowsiness and the need of oxygen therapy; similarly, pain and placement of bandage are correlated with the constriction provoked by the occlusive bandage, increasing the pain or even the need of replacing the bandage.

### **Agitation/anxiety**

It is worth emphasizing that agitation and anxiety are often a result of pain, urinary urgency, abdominal distension, cold, and so on, and not only related to torpor and waking up from the anesthesia. It significantly responds whenever the nursing intervention is routinely employed by the unit, that is, by means of monitoring vital signals, pulse oxymetry, heating, raised grids, administration of prescribed medication, surveillance, as well as oxygen therapy, mostly in elderly people, such as observed in this study.

Among the interventions considered as critical against anxiety and agitation, the assessment of the patient's mindset and awareness level by means of the Andrete Kroulik index, which identifies the conscience level, is quite an important condition for the patient's discharge from the PARR.

### **Hypotension**

The correlation is significant whenever the intravenous hydration is implemented. It can be inferred that the blood loss in the surgery and the vasoconstriction provoked by anesthetic drugs indirectly demand the need of collecting complementary exams, such as the hematocrit and the hemoglobin. Regarding the significant correlation between observation and hypotension, it is suggested that before a more aggressive intervention with vasoactive drugs is made, the presence of pain should be investigated and observed.

### **Hypertension**

It is necessary to take into account that ASA 2 and 3 patients present greater risks of blood pressure and cardiac frequency oscillation in the anesthetic induction; this status can be enhanced in the intubation process, and later in the patient's stabilization process during the surgery. At the end of the procedure, the cardiac index and the arterial pressure increases once again, from the extubation process up until the patient awakens up. In patients with hypertension, these variations can produce the presence of arrhythmia, myocardium ischemia, cerebral ischemia, and myocardium infarction. It is fundamental to clinically assess the patient, aiming to identify other cardiovascular factors, diagnose diseases associated with the etiology of the hypertension and confirm high levels of arterial pressure.

### **Tremor and chills**

Post-operative tremor is inserted into the list of complications whose cause is the release of medullar reflexes, pain, lower sympathetic activity, liberation of pyrogens, and quite commonly the normal thermoregulatory response against the inter-operative loss of heat. Spasms can enhance O<sub>2</sub> consumption from 300% to 800%, which in healthy patients is detected by the elevation of the cardiac debt, with virtually no hemodynamic endangerment. Now, in patients with a limited myocardial reserve, tremors can result in the decrease of the mixed venous O<sub>2</sub>, diminishing the arterial content of O<sub>2</sub> and consequently the liberation of O<sub>2</sub> in the tissues<sup>(16)</sup>. There was a significant correlation when the nursing intervention made use of the mat heater.

### **Nausea and vomiting**

Nausea and vomiting are two of the most prevalent complications in the post-anesthetic recovery room. The

employment of ether in 60% of the patients back in the 1960's was a major complication. Currently, in spite of the new anesthetic and anti-emetic agents, nausea and vomiting persist in 20% to 30% of patients<sup>(20)</sup>. Nausea and vomiting responded significantly when the performed nursing interventions were related to the implementation of the routine, medication and the relief vesical probe.

### **Bleeding**

Bleeding can be a result of either hemostasis or a consequence of coagulopathies. Other causes, such as coagulation factors, are less observed in PARRs. In this study the correlation was not significant when performed nursing interventions were routine, medication and bandage.

### **Hypoxemia**

Hypoxemia is mainly manifested in ASA 1 patients in PARRs; most of the times, it is related to the anesthesia. In a general perspective, the patient presents a respiratory depression by the residual action of opioids and neuromuscular blockers as a result of the loss of reflexes by the vasoconstrictors, of the increase of the oxygen consumption and muscle tremor<sup>(16)</sup>. In this research, the correlation was quite significant when the performed nursing interventions were routine and oxygen therapy.

### **Hypothermia**

Hypothermia can lead to several post-operative complications, including infections in the operatory wound, myocardial ischemia, arrhythmia, increase of catecholamines, enhancement of the recovery time, coagulopathies, and tremor<sup>(16)</sup>. The correlation was quite significant when the performed nursing interventions were routine, mat heater and medication.

### **Correlation between the occurrence of complications and work schedule in PARRs**

Pain, nausea and vomiting, agitation and bleeding presented the most significant correlation with the work schedule that has one fixed nurse per shift in the PARR (schedule 1). It can be inferred that in those shifts in which there is one exclusive nurse for the PARR, complications such as pain, nausea and vomiting, agitation and bleeding are immediately detected, although agitation and bleeding present identification values close to the other schedules carried out in the work shifts. Another factor that can be associated with the results of the correlation between complications and work schedule is the fact that the intervention of the routine is implemented regardless the presence or absence of the nurse. It is worth highlighting that it does not justify the absence of the nurse at the PARR and that legally, in the professional exercise, the presence of this professional is mandatory in critical units such as the PARR<sup>(21)</sup>.

## CONCLUSIONS

The sample was composed, in its vast majority, of males. The average age was 53.3 years (standard deviation = 16.9 years). Most of the individuals complied with the ASA 2 classification. The most frequent comorbidity was the SAH. The predominant type of surgery and anesthesia was the general one. After the surgical procedure, patients' average permanence in the PARR reached 111.6 minutes (dp = 67.8).

The most frequent complications were pain, followed by hypothermia. Some complications presented a statistically significant correlation with the performed nursing intervention, such as pain and routine; pain and oxygen therapy; pain and medication; pain and bandage; agitation/anxiety and routine; agitation/anxiety and oxygen therapy. Hypotension was correlated with the nursing intervention of hydration, complementary exams and observation. Hypertension presented a statistically significant correlation only with the observation intervention. Tremor presented a statistically significant correlation with mat heater and blood transfusion interventions. Nausea and vomiting were correlated with the routine, medication and RVP interventions. Bleeding responded significantly to the implementation of the routine, medication and bandage. Hypoxemia is statistically significant when correlated with routine and oxygen therapy. Hypothermia had a significantly positive correlation with routine, mat heater and medication.

Pain, nausea and vomiting, agitation/anxiety and bleeding had a significantly positive correlation with the work schedule when one nurse is fixed at the PARR.

Thus, it is suggested that the number of nurses recommended by specific literature be kept, in compliance with the legal aspect referred to by the Regional Nursing Council (COREN). Academic content concerning the perioperative nursing area should be maintained in the Nursing

graduation curriculum, guaranteeing proper work conditions and encouraging Specialization courses to take on new proposals and trends, thus stimulating research that can improve assistance to surgical patients.

As data collection was originated only in a private institution, the study was somehow restricted. We suggest the performance of comparative studies between institutions of similar sizes that maintain different nurse work schedules and distinct assistance characteristics, in a way to compare data and provide statistically relevant responses to the issues raised by this study.

In our option for a retrospective study, we risked finding incomplete data and the need of interpreting them according to the author's experience at the locus of the study. We do not believe this fact diminishes the relevance of the collected data; however, for future studies, we recommend the collection of data be made by means of a proper instrument at the very moment the complication, as well as the respective nursing interventions under the supervision of the responsible researcher, are occurring, in an attempt to lower the possibility of having either incomplete or irrelevant data.

The description of nursing interventions was also a hard task, confirming that the nursing team still has severe limitations regarding the recording process and showing that we have a major challenge ahead in terms of properly registering occurrences and systematizing facts and interventions, particularly in this PARR related study.

The PARR is very important in the continuity of the patient's caring process in the post-operative period; therefore, we highlight the need of carrying out studies that value the nurse in this unit. The presence of this professional has quite a positive and relevant impact in the patient's recovery process, as well as in the decrease and precocious detection of post-anesthetic and post-operative complications.

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