OPEN SCIENCE AND *PREPRINT*

Ciência aberta e preprint

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The expression *open science* has been taking shape in the publishing industry for approximately 30 years, but in the past decade, it became a reference model of scientific practice that aims at sharing more information in the network. Until a few years ago, authors, reviewers, and journals were in charge of communication and evaluation. The journal, respecting the ethical and scientific premises of the publication, would accept or reject the manuscript submitted by authors, not always in an ideal or appropriate time to ensure the relevance of the information[1].

With the open science movement, several aspects considered essential when publishing a manuscript fell apart, replaced by other priorities. Authors became the holders of the information about their work. The process starts with an open evaluation (open peer review), that is, reviewers cannot hide in the anonymity of the assessment and must weigh all their comments about the quality of the manuscript with greater care. Another important factor to the scientific community in recent decades is evaluating how science can contribute more effectively and efficiently to solve emerging issues and develop a fairer and more sustainable society. This factor meets another one in defense of open science: open data, which allows researchers to support each other through the public access to databases stored in repositories, so different groups can consult them for further analysis, leading to the development of knowledge and the cure of diseases. We can only imagine how soon the cure for AIDS could have been found if studies had been shared immediately after each discovery of development mechanisms of the disease. Open science ends the withholding of knowledge and contributes to society.

The debate on the exclusive use of bibliometrics and the need to expand the way of monitoring science evaluation are expressed in recent manifestos organized by the global scientific community, such as the *Leiden Manifesto* (STI Conference, 2014), the *San Francisco Declaration on Research Assessment* (DORA, 2012), and the *Slow Science* manifesto (Slow Science Academy, 2010), among others[2].

Another tool in agreement with open science and that aims to accelerate the dissemination of research results is called preprint. According to a group of researchers from the National Institutes of Health and the Whitehead Institute, a preprint submission is a complete written description of a scientific work that has yet to be published in a journal[3].

A preprint can be a research article, editorial, review, or another type of document ready to be submitted to a journal for peer review, being reviewed, or even that has been rejected, but the authors are willing to make its content public, regardless of the final outcome[4].

In 1991, the Physics field followed later by other disciplines, including Mathematics, Computer Science, and Quantitative Biology, began the tradition of sharing preprints in the arXiv repository, which currently has more than a million preprints. The availability of preprints in the Biomedicine field has attracted significant attention from the scientific community lately, resulting in the creation of a scientist-led effort – *ASAPbio* – to promote their use[4].

In Brazil, in the past two years, the growth rate of preprint articles registered was ten times higher than the one of journal articles registered, making preprints one of the types of content that most grow. Among the benefits of preprints, authors mention that they accelerate the sharing of results, prioritize discoveries and ideas, facilitate career advancement, and improve the culture of communication within the academic community[5].

We believe that all aspects exposed above foster new ways of producing, socializing, and discussing a more transparent and collaborative science, and, together, they approach what is understood as open science. The responsibility of researchers is not diminished in any respect, on the contrary, their exposure to a pointed, public, and immediate critic – when, for instance, the preprint opens the text to the scientific community, as well as the

general population – fills them with a broader sense of social and scientific responsibility. We underline that open science promotes not only access to study results in the form of qualified publications but also to data used as a research source.

Society, in general, and the scientific community, in particular, must be the watchful evaluators of what is being shared and decide whether the documents are reliable or not.

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THE IMPACT OF PROFESSOR KAZUKO'S STUDIES

Impacto dos estudos da Professora Kazuko

Impacto de los estudios de la profesora Kazuko

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As a nurse, researcher, and former scientific editor of Rev. SOBECC, I would like to make a few comments on the review article authored by Professor Doctor Eliana Auxiliadora Magalhães Costa titled "Reprocessing of products: state of the art in the light of the studies of Kazuko Uchikawa Graziano", published in the latest edition of Rev. SOBECC" [2018;23(3):143-54].

The author conducted a literature review and presented the analysis of 34 articles published by Professor Doctor Kazuko in its results, classifying them into five categories: Processing of instruments used in videolaparoscopy, endoscopy, dialyzers, and laryngoscopes; Processing of ophthalmic and orthopedic instruments; Processing of single-use health products; Studies related to methods of cleaning, disinfection, sterilization, and Packaging of health products. She underlined the contributions of Professor Doctor Kazuko to society, identified journals, and indicated the technological innovations for the Material and Sterilization Center that were a product of these studies[1].

What I would like to add to the author's analysis is the impact of the work of Professor Doctor Kazuko on the Qualis of journals that published these studies.

Qualis is a set of procedures used by the Coordination for the Improvement of Higher Education Personnel (*Coordenação de Aperfeiçoamento de Pessoal de Nível Superior* – CAPES) – agency under the Ministry of Education – to stratify the quality of the intellectual production of graduate programs. The result of this assessment is a classification list of journals available for researchers so they can publish their production. Qualis Journals is divided into eight strata, in descending order of value: A1, A2, B1, B2, B3, B4, B5, and C, thus, assigning grades for graduate programs[2].

For instance, the first four strata were classified as[2]:

- A1 - Impact factor equal to or greater than 3.800;
- A2 - Impact factor between 3.799 and 2.500;
- B1 - Impact factor between 2.499 and 1.300;
- B2 - Impact factor between 1.299 and 0.001.

When the author identified the journal, she allowed the readers to check the Qualis of the medium that published the studies. Based on the quadrennium 2013 to 2016 for the Nursing area, they are distributed as follows:

- 10 articles in stratum A1;
- 17 articles in stratum A2;
- 1 article in stratum B1;
- 3 articles in stratum B3.

Three studies were not graded for Nursing graduate programs but for Medical ones – two of them in stratum B1 and one in stratum B3. Therefore, studies by Professor Doctor Kazuko extrapolate Nursing Science, and her work impacts different health areas.

Consequently, it is essential that all nurses – be them professionals or students with different levels of training – consider disseminating scientific knowledge in indexed journal articles. In a time of fast changes, globalization of information, numerous care scenarios, and patients with complex conditions, Nursing must increasingly impart its knowledge and skills as a way to be heard and occupy its space in the health context[3].

The Material and Sterilization Center, Surgical Center, and Anesthesia Recovery areas allow us to identify questions not yet answered, while research offers the pursuit of solutions that can create new knowledge.

Congratulations to Professor Doctor Eliana for highlighting the work of Professor Doctor Kazuko as an example to be followed.

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ANALYSIS OF NON-CLINICAL RISKS IN A MATERIAL AND STERILIZATION CENTER

Análise dos riscos não clínicos em um centro de material e esterilização

Análisis de los riesgos no clínicos en un centro de material y esterilización

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ABSTRACT: Objective: To analyze the non-clinical risks of a material and sterilization center (MSC). **Method:** This is an observational, analytical and longitudinal study conducted between March and November 2017 at the MSC of a regional hospital in the countryside of Piauí. Data collection took place in different shifts, using a form. The analysis was performed according to the classification of degree of severity and likelihood of risk. **Results:** Ergonomic hazards are partially in line. The risks of burns, electric shocks and fire were worrisome, as they have issues in non-compliance. As for the biological hazards, there is a lack of training/qualification of the professionals about the contamination by sharps equipment. The most common risks were those of class 1 and the least found ones, those of class 3. **Conclusion:** There was a greater register of factors for class 2 risk, that is, medium risk.

Keywords: Risk. Occupational risks. Risk management.

RESUMO: Objetivo: Analisar os riscos não clínicos de um centro de material e esterilização (CME). **Método:** Trata-se de um estudo observacional, analítico e longitudinal, realizado entre março e novembro de 2017 no CME de um hospital regional do interior do Piauí. A coleta de dados ocorreu em turnos distintos, utilizando um formulário. A análise foi realizada conforme classificação do grau de severidade e probabilidade do risco. **Resultados:** Os riscos ergonômicos estão parcialmente em conformidade. Os riscos de queimaduras, choques elétricos e incêndio se mostraram preocupantes, pois têm quesitos em não conformidade. Quanto aos riscos biológicos, existe falta de treinamento/capacitação dos profissionais acerca da contaminação por equipamentos perfurocortantes. Os riscos mais encontrados foram os de classe 1 e os menos encontrados, os de classe 3. **Conclusão:** Houve maior registro de fatores para risco de classe 2, ou seja, moderado.

Palavras-chave: Risco. Riscos ocupacionais. Gestão de riscos.

RESUMEN: Objetivo: Analizar los riesgos no clínicos de un centro de material y esterilización (CME). **Método:** Se trata de un estudio observacional, analítico y longitudinal, realizado entre marzo y noviembre de 2017 en el CME de un hospital regional del interior de Piauí. La colecta de datos se realizó en turnos distintos, utilizando un formulario. El análisis fue realizado de acuerdo con la clasificación del grado de severidad y probabilidad del riesgo. **Resultados:** Los riesgos ergonómicos están parcialmente en conformidad. Los riesgos de quemaduras, descargas eléctricas e incendio se mostraron preocupantes, pues tienen cuestiones en no conformidad. Cuanto a los riesgos biológicos, existe falta de entrenamiento/capacitación de los profesionales acerca de la contaminación por equipos cortopunzantes. Los riesgos más encontrados fueron los de clase 1 y los menos encontrados, los de clase 3. **Conclusión:** Hubo mayor registro de factores para riesgo de clase 2, o sea, moderado.

Palabras clave: Riesgo. Riesgos laborales. Gestión de riesgos.

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INTRODUCTION

The work in the health sector, although needed for human development due to its inherent characteristic to the care of the neighbor, has potential harmful to the health of workers, since the exposure of these to the most diverse risks from labor is a problem of not only the scientific community[1].

The risks to which health professionals are exposed in a hospital environment can be classified into clinical and non-clinical. In the latter case, those originated by procedures and practices of activities related to the maintenance of the physical structure and the assistance support[2]. The non-clinical risks that affect workers of health institutions are derived from physical, chemical, biological and ergonomic factors, which represent elements capable of harming productivity, the quality of the care provided and the health of professionals themselves[3].

In the Material and Sterilization Center (MSC), the main problems relate to the non-clinical risks to which workers are exposed. This is considered to be a complex environment, both for its dynamics of operation and for the activities performed in which professionals work routinely exposed to organic fluids, heat and chemicals used in the cleaning, disinfection and sterilization processes[4]. Such working conditions may put health professionals at risk and interfere with the quality of care provided to the patient by the sector.

The MSC environment is considered to be one of the sectors where there are more non-clinical accidents within a hospital because of the handling of articles and products that must be carefully processed. This is corroborated by the number of notifications in the hospital *locus* of the survey, which is 30% higher than in other areas of the institution.

Therefore, careful analysis of these risks must be carried out, so that strategies can be drawn up to prevent and extinguish possible fragilities and/or failures in the service, in order to mitigate them at acceptable levels and implement preventive and corrective actions. In this context, it is the responsibility of health facilities to promote adequate management so that they can continuously identify, analyze, evaluate and monitor such failures and/or weaknesses. It is therefore necessary to prepare studies on this subject.

The relevance of this study is due to the fact that new knowledge on the subject will allow a re-evaluation of the work processes and the functioning of the MSC in general, in order to reduce non-clinical risks, improving the quality of work process and of patient care.

OBJECTIVE

To analyze the non-clinical risks of a MSC in a hospital in the countryside of Piauí.

METHOD

This is an observational, analytical and longitudinal study, through which we sought to analyze non-clinical risks in a MSC, as it is in the practice of working in the daily routine of the field of this research.

The study was conducted in the period from March to November 2017, in a regional hospital in the coutryside of Piauí, located about 310 kilometers from the capital Teresina. This facility was chosen due to its being a reference unit for the whole macro-region, attending to clinical and surgical conditions of patients from 52 surrounding municipalities, besides functioning as a school hospital.

The MSC is classified as type II and presents a physical structure divided into dirty and clean areas, which process hospital articles for use in general, gynecological and orthopedic surgeries, in addition to the routine use of ventilatory assistance. Its team consists of one day-care nurse and four Nursing technicians, working on 12/36-hour shifts, for both categories.

Data collection was carried out during the month of October 2017, in the morning (9a.m. to 12p.m.) and afternoon (2a.m. to 6p.m.), on previously established days, according to convenience for the reception of the researchers in the sector. Three observations were made (observation 1: afternoon shift; observation 2: afternoon shift; and observation 3: morning shift), and the intervals between these were two days from the first to the second one and from six days from the second to the third one. This number was chosen because it is an odd number, since it could reduce the chances of collecting repetitive data and thus improve their reliability.

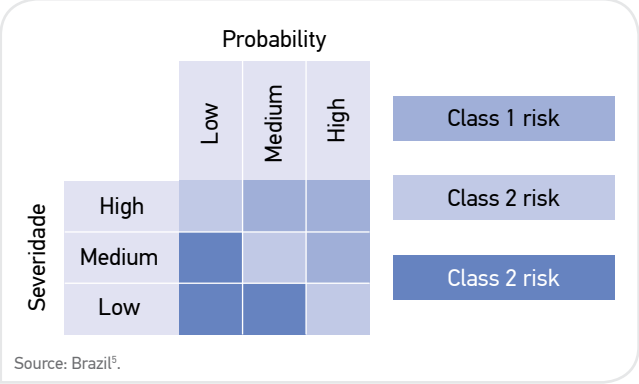
By means of direct non-participant observation, a form-type instrument created by the researchers was used based on the recommendations of the National Agency of Sanitary Surveillance (*Agência Nacional de Vigilância Sanitária* – ANVISA), observing the following variables: environmental risks; machine maintenance; biological hazards; fire hazards; ergonomic hazards; risks of burns and structural and physical risks.

A previous simulation of the data collection at the research site, with the instrument and equipment to circumvent the Hawthorne effect, was performed, as well as to pre-test the instrument, in order to evaluate the reliability, operability and validity of the instrument, observing its relevance to the research and the need to add, replace or remove some topic. It should be emphasized that there were no changes in the instrument after the pre-test. The validity of the instrument was evaluated by three teachers in the area of Perioperative Nursing.

The following equipment were used to evaluate the variables: measuring tape, measured in centimeters, to measure the physical size of the area; Digital Incoterm TDEC100C digital meter to measure the noise level; and 4IN1 Multifunctional Environment Meter to quantify brightness, temperature and humidity parameters. It should be noted that all equipment must be calibrated and certified by the National Institute of Metrology, Quality and Technology (*Instituto Nacional de Metrologia, Qualidade e Tecnologia* – INMETRO). It should be noted that all devices were used according to the manufacturer's instructions.

After data collection, the data related to environmental risks were organized as a table. Next, the non-clinical risk stratification analysis was performed in three classes: class 1, class 2 and class 3, with reference to the severity of the impact and the probability that a given risk has to occur[5], according to the figure below (Figure 1).

It is worth mentioning that probability was stratified into: high (when risk is present and there is an expectation of long-term correction, or when there is no expectation of correction); mild (when the risk is present and there is an expectation of correction in the medium term); and low (when the risk is present and there is expectation of short-term correction). On the other hand, severity followed the criteria: high risk (when it affects the safety of workers and generates permanent damage), medium risk (when it affects the safety of worker and causes the need for clinical intervention), and low risk (when it affects the safety of workers, but causes no damage)[5].



Source: Brazil[5].

Figure 1. Method for assessing and classifying a risk.

RESULTS

Results are divided into two topics: variables of non-clinical risks and classification of non-clinical risks.

Variables of non-clinical risks

The observed non-clinical risks that influenced the safety of the professional, and indirectly the safety of the patient, are: ergonomic hazards, risks of burns and electric shock, fire hazards, biological hazards and water quality (Chart 1).

As for the variable ergonomic risks, the work space was in agreement with the standardization of ANVISA[6]; the quantity and the disposition of the tables and benches, as well as the distance between equipment, were out of the established conformities / standard, generating risk for those who manipulate them (Chart 1).

On the risks of burns and electric shocks, compliance and non-compliance levels were balanced. On the one hand, it was verified the existence of energy stabilizers linked to the machines, equipment connected in the voltage specified by the manufacturers and exclusive outlets for all the machines, which helps to reduce the risks of fire, since all these aspects are directly involved with electrical power and therefore have high potential to produce electric discharges. On the other hand, there were aspects in non-compliance with the recommended, including existence of apparent electrical wires, lack of training of the professionals to handle the machines, distance between machines and quantity of undersized professionals. These items increase the risk of burns and electric shock, since the equipment works at high temperatures.

Regarding the fire hazard variable, only the existence of an Internal Accident Prevention Commission (CIPA) was in line with the recommendation. All other items were in non-compliance, as there are no requirements for fire prevention and control, as well as training against fire with employees, thus hindering the safety of professionals, equipment, stock of MSC materials and, consequently, of patients (Chart 1).

Regarding the variable biological hazards, only one item of non-compliance was found, which is the lack of training or training of employees against the risk of contamination by sharps. In-compliance items are: use of adequate personal protective equipment (PPE) and existence of a solid waste management plan (SWM) (Chart 1).

Classification of non-clinical risks

In Chart 2, the classification of the non-clinical risks of the receiving and cleaning area can be verified, according to the probability of the error and the severity of the damage. The variables risk of burns and electric shock and fire hazards had mild probability of occurrence and high severity of damage, classified as a class 1 risk. The variable biological hazard had both mild probability and severity; thus, it is classified as a class 2 risk. Environmental risks had mild severity and low probability, classified as a class 3 risk, along with ergonomic hazard, which had low probability and low severity.

Chart 1. Description of compliance and non-compliance of non-clinical risk variables of MSC.

Variables	Compliance	Non-compliance
Ergonomic hazards	- Work space	- Distance between machines - Insufficient tables and work benches - Absence of seats and/or chairs
Risk of burns and electric shocks	- Energy stabilizers connected to the equipment (autoclave and heat sealer) - Equipment (autoclave and heat sealer) plugged at specified manufacture's voltage - Equipment (autoclave and heat sealer) plugged to exclusive sockets	- Exposed wires connected to the electric network - Absence of training for the handling of equipment (autoclave and heat sealer) - Distance between autoclaves and professionals
Fire hazard	- There is CIPA	- Insufficient requirements for fire prevention and control - Absence of training against fire
Biological hazards	- Appropriate PPE - There is SWM	- Absence of training to prevent the risk of accidents with sharps

CIPA: International Accident Prevention Comission; PPE: presonal protective equipment; SWM: solid waste management.

In the area of packaging and sterilization, the risks of burns and electric shock and environmental and biological hazards were of mild probability; high probability was identified in fire hazards; and low probability was verified in ergonomic hazards. According to high severity: risk of fire, burns and electric shock; mild severity: environmental and biological hazards; and low severity: ergonomic hazards. Thus, the following results were obtained: class 1 ergonomic hazards, class 2 environmental and biological hazards, and fire, burn and class 3 electric shock hazards (Chart 3).

In the storage and distribution area, there are no machines or electrical equipment. In this way, the risks of electric shock, burns and fire were discarded. Environmental and ergonomic hazards were of low probability and high severity, being classified as class 2; biological hazards were of low probability and low severity, being classified as class 3 (Chart 4).

Thus, according to Charts 2, 3 and 4, the most common risks were those of class 1, with three risk variables in the reception and cleaning area and three variables in the packaging and sterilization area. The lowest risks were those of class 3, with two risk variables in the reception and cleaning area, one in the area of packaging and sterilization and one in the area of storage and distribution. It is noteworthy that the most serious risks (class 1) were found in two of the three areas of the MSC.

DISCUSSION

Among the factors of ergonomic risks to which Nursing professionals in the MSC are exposed, the adequacy of the tables and benches to carry out the work, the space of work

Chart 2. Classification of risks in the reception and cleaning area of the material and sterilization center.

		Probability		
		Low	Medium	High
Severity	High		- Risk of burns and electric shock - Fire hazard	
	Medium	- Environmental hazards	- Biological hazard	
	Low	- Ergonomic hazards		

: Class risk 1; : Class risk 2; : Class risk 3.

for locomotion of the worker and the distance between the machines stand out. It is known that the labor activity in this sector is demarcated by monotonous and repetitive tasks, in a physical space isolated from the other hospital sectors, demanding great responsibility and attention from the professionals who work in this scenario[7].

After carrying out a study about the ergonomic hazards to which nursing professionals are submitted, it was evidenced that for the professional to develop activities that demand effort in inappropriate conditions, more body mobilizations are required, such as: excessive work rhythm, inadequate posture and various loads. Measures to prevent exposure to ergonomic hazards, if taken in a selective and uncontrolled way, can lead to disequilibrium and development of diseases[8].

Board Resolution (RDC) RDC/ANVISA/2002-307[9], which changed RDC/ANVISA/1988-50, is the legal document that regulates the minimum guidelines to be adopted by health establishments in Brazil regarding the physical and architectural features of the area built. It determines that, regardless of the care complexity, minimum conditions of comfort and ergonomics should be offered to professionals, as well as, through planning in cooperation with engineers, architects and health workers, to create barriers to reduce infections related to health care.

Chart 3. Classification of risks in the packaging and sterilization area of the material and sterilization center.

		Probability		
		Low	Medium	High
Severity	High		- Risk of burns and electric shock	- Fire hazard
	Medium		- Environmental hazards - Biological hazard	
	Low	- Ergonomic hazards		

: Class risk 1; : Class risk 2; : Class risk 3.

Chart 4. Classification of risks in the storage and distribution area of the material and sterilization center.

		Probability		
		Low	Medium	High
Severity	High	- Environmental hazards - Ergonomic hazards		
	Medium			
	Low	- Biological hazard		

: Class risk 1; : Class risk 2; : Class risk 3.

Non-conformities have been verified regarding the risks of burns and electric shocks, which, when associated with improper use of electrical equipment, may cause electric shock. According to a study[10], there is no employee training for the correct handling of electrical equipment; however, it is known that professionals must be trained and qualified to handle the equipment, as well as to know the instructions for use (IFU) and the specifications provided by the manufacturers, such as voltages and distances that employees must keep from them[10]. In addition to these observations, it is worth noting that it is important to use stabilizers in all equipment that use high voltages and high energy consumption, thus helping to reduce the risks of short circuits and explosions in the electrical network[10,11].

In the MSC studied, there are several fire hazard factors that do not comply with the recommended. The only item found to be in compliance is the existence of the CIPA, which is an important accident prevention tool, available to employees, since it should be composed of representatives of the company and employees[12].

Even with the presence of CIPA, there are no other measures for fire prevention and control, nor training with employees. This indicates the need to promote and reinforce safe work practices, provide risk-free environments, control materials and equipment against the possibility of a fire, clearly signal emergency exits, and train health professionals to use firefighting equipment[13].

When considering biological hazard, MSC workers are exposed to organic secretions when washing and handling contaminated articles, which are a source of transmission of microorganisms to professionals when preparing an article that will be sterilized and handling an already sterilized item[14]. The results found regarding biological hazards were reasonably satisfactory when it comes to workers' safety, since they use PPE established by the Ministry of Health (MoH).

According to the results of this study[4], there is no training for employees regarding the risk of contamination with sharps in the MSC, which increases the risk of contamination. Using safe practices, having knowledgeable professionals and developing conscious self-care leads to greater visibility

of work at the MSC, which encourages health promotion, occupational safety, prevention and health care[4,15].

A study that analyzed occupational hazards showed that the most prevalent risks were those of low degree of damage and observed that the least prevalent ones are the high-damage risks. In a way, this result relieves the workers of health institutions, once that, despite the existence of many risks, those that are less harmful to health professionals are prevalent[16]. The important thing is that several questions are raised from this study, since the amount of risks found in the MSC shows the number of deficiencies related to the work process in hospital units. The lack of investment by managers is also evidenced, although workers in this sector seek to minimize risks by making use of alternatives considered as a sort of "improvisation". The reduction or extinction of these risks depends on administrative aspects and the proper use of financial and material resources.

The results of this study show problems that should be explored in order to come up with solutions to reduce the non-clinical risks in the MSC and even the hospital unit as a whole, since some of the risks of this sector can also be identified in other hospital sectors, although this general analysis has not been done yet. Actions taken to reduce or extinguish these risks embedded in the work environment can contribute to the better health condition of the professionals and, consequently, the improvement of the health care delivery of patients. In this way, valuing the quality of life of professionals, as well as strengthening their connections with permanent and continuous education, is imperative in ensuring the health of those involved.

CONCLUSION

There was a greater number of records for class 2 risk factors, that is, medium risk, but it is worth noting that a set of measures for the reduction of class 1 risks is necessary, since these present a high degree of health compromise and cause more severe damage. The low incidence of class 3 risks does not imply that these should be forgotten because, in the course of the work processes, they can also affect the safety of the worker, causing damage to their health.

Among the non-clinical risks identified, the risks of burns, fire and electric shocks by machines were the most representative ones. Professionals should be critical in surveying occupational hazards to which they are exposed, emphasizing the risk of harm with greater severity and greater probability of occurring. As a limitation, it should be emphasized that the study was conducted in only one MSC, thus not representing the regional reality.

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ASSESSMENT OF MICROBIAL CONTAMINATION IN SURGICAL INSTRUMENT IDENTICATION TAPES AND RESINS

Avaliação da contaminação microbiana em fitas e resinas identificadoras de instrumental cirúrgico

Evaluación de la contaminación microbiana en cintas y resinas identificadoras de instrumental quirúrgico

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ABSTRACT: Objective: To assess the sterility of colored tapes and resins used to identify surgical instruments. **Method:** We conducted an experimental laboratory study, which used a sample of 140 different stainless-steel surgical instruments, identified with tape or resin, voluntarily donated by Central Sterile Services Department to this research. The samples were inoculated directly into trypticase soy broth (TSB) and sodium thioglycolate and incubated for 14 days. **Results:** We found positive growth in three tape samples and none in resin samples. **Conclusion:** Identification tapes harbored microorganisms in the instruments assessed, possibly protected by biofilm.

Keywords: Surgical instruments. Sterilization. Foreign bodies. Biofilms.

RESUMO: Objetivo: Avaliar a esterilidade de fitas coloridas e resinas utilizadas como identificadores em instrumentos cirúrgicos. **Método:** Foi realizado um estudo experimental, laboratorial, que utilizou uma amostra de 140 instrumentos cirúrgicos diversos, de aço inoxidável, identificados com fita ou resina, doados voluntariamente por Centros de Material e Esterilização para a presente investigação. As amostras foram inoculadas diretamente em *trypticase soy broth* (TSB) e em tioglicolato de sódio e incubadas por 14 dias. **Resultados:** Foi observado crescimento positivo em três amostras de fita e nenhum crescimento foi observado nas amostras de resina. **Conclusão:** Marcadores de instrumental do tipo fita albergaram microrganismos nos instrumentais avaliados, possivelmente protegidos por biofilme.

Palavras-chave: Instrumentos cirúrgicos. Esterilização. Corpos estranhos. Biofilmes.

RESUMEN: Objetivo: evaluar la esterilidad de las cintas de colores y las resinas utilizadas para identificar los instrumentos quirúrgicos. **Método:** Realizamos un estudio de laboratorio experimental, que utilizó una muestra de 140 instrumentos quirúrgicos de diferentes aceros inoxidable, identificados con cinta o resina, donados voluntariamente por el Departamento Central de Servicios Estériles para esta investigación. Las muestras se inocularon directamente en caldo de cultivo de soja tripticasa (TSB) y tioglicolato de sodio y se incubaron durante 14 días. **Resultados:** Encontramos un crecimiento positivo en tres muestras de cinta y ninguna en muestras de resina. **Conclusión:** las cintas de identificación albergaban microorganismos en los instrumentos evaluados, posiblemente protegidos por biofilm.

Palabras clave: Instrumentos quirúrgicos. Esterilización. Cuerpos extraños. Biopelículas.

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INTRODUCTION

The Central Sterile Services Department (CSSD) is a functional unit that reprocesses medical devices (MD) and should provide them safely for virtually all health service units[1], particularly the Operation Room (OR), its main and largest consumer. In this regard, one of the main challenges in the management and control of surgical instruments consists of identifying them to optimize internal processes and save time.

The visual identification of surgical instruments in the CSSD aims to determine in which set or tray a given instrument belongs, facilitating the separation, assembling, and count at the time of preparation, allowing even less experienced professionals to carry out these procedures. Different resources[2] are available to create markers, from the simplest and low-cost to the more technological, which consequently are more expensive.

Radio-frequency identification (RFID) and a Data Matrix code[3] are modern technologies that have a high acquisition cost, as they depend on equipment and software to perform the reading. As an alternative, the CSSD team can put tapes or resins, both colored, on surgical instruments to facilitate their immediate visual identification. These options are widely adopted due to their practicality and lower cost.

Although their advantages are recognized, we should consider some aspects about the safety of their use, as publications available in the scientific literature that evaluate this issue are too scarce and old to allow the CSSD manager to make a safe decision. The main question is whether microbial growth occurs under the colored tape or resin.

Thus, we developed the present study to assess the sterility of colored tapes and resins used to identify surgical instruments, in order to aid the CSSD manager in deciding the best method to use as instrument marker and ensure patient safety.

OBJECTIVE

To assess the sterility of colored tapes and resins used to identify surgical instruments.

METHOD

We conducted an experimental laboratory study, using a purposive sample of 140 different stainless-steel surgical instruments. Among them, 120 were identified with tape and 20 with resin.

We asked for donations of instruments identified and used in CSSD for at least a year (both the instrument and identification) to ensure that the reprocessing practice was reproduced in the experiment. We received numerous types of instruments (anatomical forceps, Kelly forceps) with resins and tapes both new and worn and peeling. Two experimental groups were created: "tape" and "resin."

In a biosafety cabinet (class II, Veco), fully equipped (long sleeved laboratory coat, cap, sterile gloves, and mask), and following the aseptic technique, we used a sterile scalpel to remove samples from each instrument, previously sterilized in saturated steam under pressure (134°C for 5 minutes) and sealed in sterilization pouches. To compose the experimental group, a random part of the samples was inoculated directly into 50 mL of trypticase soy broth (TSB; Difco™ BD, France) and another into 50 mL of sodium thioglycolate (Probac do Brasil®, Brazil). Next, the samples were incubated for 14 days in an oven at 36±2°C, with daily readings to search for microbial growth, characterized by media turbidity.

The positive control group consisted of 30 identification tapes and 30 identification resins extracted from study groups, intentionally contaminated after staying 24 hours in a suspension of *Serratia marcescens* (ATCC 14756) at 10^6 CFU/mL, prepared in a TSB culture medium. After contamination, the samples were placed in test tubes with TSB and incubated in an oven at 36±2°C for 72h, with daily readings to search for microbial growth. The purpose of the positive control group was to confirm the possibility of aggregation and survival of microorganisms on the surface of the samples.

RESULTS

Three samples presented positive growth in the tape group, two in TSB medium and one in sodium thioglycolate medium. We found no growth in samples of the resin group. Table 1 shows the identification of microorganisms of each sample. The positive control group revealed microbiological growth in all tape and resin samples.

DISCUSSION

Despite only samples of the tape group having microorganisms recovered, this study – with non-controlled

sample representativeness – did not allow us to conclude that resin is more secure than adhesive tape for instrument identification. The growth of *S. marcescens* in the positive control group of resin samples confirms that this material can harbor microorganisms, negating the hypothesis that it prevents adhesion. Possibly, the small sample size is a limitation.

Initially, the study only intended to identify the possible microbial contamination of surgical instrument markers but was confronted with most samples presenting some degree of damage, such as partial peeling and breaks. This finding added the risk of foreign bodies in the cavities of surgical patients to the risk of contamination of these identifications.

Regarding tapes, new markings are usually firmly fixed to the surface of the instrument. However, they tend to peel off after successive processing – including mechanical action, contact with chemicals, and high temperatures –, promoting an environment conducive to the accumulation of organic matter, which could lead to sterilization failure, justifying the three samples with positive growth in this study, two of them with genus capable of sporulating in adverse conditions (*Bacillus*). The instruments evaluated in this experiment had more than one year of use, with no control of the number and quality of processing.

Among the microorganisms recovered, coagulase-negative *Staphylococcus* is usually found in human skin and clinical samples, representing an important agent of health care-associated infections (HCAI), for its presence in biofilms formed in MD, such as catheters[4,5]. The thermolability of the vegetative microorganisms recovered allows the inference that the biofilm formed in the samples must have protected them from the sterilization action. *Bacillus subtilis* is found in soil and water and can also cause opportunistic infections[6].

Table 1. Number of positive samples and identification of the microorganisms isolated, according to culture media and sample type.

Instrument markers	Tapes		Resins	
Culture media	TSB	STG	TSB	STG
Positive/tested samples	2/60	1/60	0/10	0/10
Microbial identification	*Bacillus subtilis* CoNS	*Bacillus sp*	–	–

TSB: trypticase soy broth; STG: sodium thioglycolate; CoNS: coagulase-negative *Staphylococcus*.

Although surgical instrument tapes facilitate and expedite the preparation of surgical sets due to the immediate visual identification, their use is also related to surgical site infections (SSI). In 1983, four out of six patients undergoing oral surgery developed abscess 4 to 13 days into the postoperative period. The microorganism identified in the infection site was the *Staphylococcus epidermidis*, the same one found in tapes that marked the instrument used, with the same sensitivity pattern to antibiotics. Removing the tapes from the instrument coincided with the end of the outbreak[7].

A 1993 study challenged the saturated steam sterilization in flashcycle (135ºC for 3 minutes) by using disks impregnated with *Bacillus stearothermophilus* spores extracted from biological indicators and adhered to the metallic surface of the instrument under an identification tape. The microorganism test was not recovered at the end of the experiments[8], but it is noteworthy that the authors did not use organic matter as a contaminant.

Any factor that hinders the cleaning will increase the risk of accumulation of organic matter, which is not always noticed. Organic waste found in orthopedic cannulas containing *Staphylococcus epidermidis* was considered the cause of sterilization failure in the cannulas used in two patients submitted to surgeries and infected by the same microorganism isolated in the instrument[9]. Another report on an infection outbreak identified *Staphylococcus* recovered from the knees of patients who underwent orthopedic surgeries and found the same microorganism and organic waste inside the cannulas used in the surgeries. Although there are no studies that can confirm that the microorganism came from the same strain, the authors credited the outbreak to cleaning and sterilization failures[10]. The last report refers to an outbreak of *Pseudomonas aeruginosa* that survived sterilization in instruments for orthopedic surgeries, due to the organic matter adhered to them. DNA analyses allowed the authors to relate the strains isolated from patients to the ones retained in the waste found in the instrument[11].

We could also observe the fragmentation of the resin in many instruments used as samples in this experiment, confirming the concern with the peeling of markers during the surgical act. Additionally, when the resin falls or is removed from the instrument, the place worn from the application hinders the cleaning and could enable the formation of biofilm.

The successive processing of these markers can also wear them, evidenced by the peeling and fragmentation observed

in both types of identification in the samples of this study. Tapes and resins can accidentally fall, and the surgical team might not notice it during the surgical act[7,12], resulting in the called "retained surgical items", topic of guidelines aimed at surgical patient safety[13,14].

Even in a small volume, any item forgotten or that inadvertently falls and remains unnoticed inside the operative cavity or wound of a patient can lead to damage, such as infections and even death[14,15], and, although rare, this event is considered a preventable error that can cause harm[13]. Given that both tapes and resins can peel off and fall during surgery and that, as demonstrated here, they can be contaminated, the use of these markers is worrying.

The protocol for the safe use of identification resins and tapes should contain expiration dates to change these resources. Removing defective materials or those that can put patient safety at risk is recommended and must be rigorous[16]. Despite this variable being little explored in the experimental design used, the regular replacement of tapes is a premise for the safe use of this resource.

The Standard Operating Procedure (SOP) for inspection of surgical instruments should include, at the time of instrument preparation after cleaning, checking the adhesion of all visual markers used. In addition, CSSD must implement a routine to exchange markers and remove any instrument with damaged identification or signs of peeling or dirtiness. Manufacturers of these instrument markers should be involved in the definition of dates for periodic preventive replacement.

The current resources available are restricted to colored tapes and resins, as advanced technologies that innovated the marking of surgical instruments with optical reading are targeted at control management of misplaced items and not at assisting CSSD workers in visually identifying instruments when assembling surgical boxes. In this regard, this study identified the need for new technologies that replace the current ones and comply with the worldwide guideline for safe surgery, proposed by the World Health Organization (WHO)[17].

The results of this research indicated that, at the moment, the resources for instrument marking, be them tapes or resins, require discipline to ensure their safe use, that is, rigorous review of their integrity and adhesion to the surface of the instrument to minimize the risk of contamination.

CONCLUSION

The study showed that surgical instrument identification tapes could protect microorganisms from sterilization. Despite the lack of microorganisms in resin markers, their samples presented peelings and damages, which also put patient safety at risk. Determining best practices related to the care given to surgical instruments is essential to make surgeries safer.

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PROFILE OF WOMEN WITH HIGH RISK FOR OBSTRUCTIVE SLEEP APNEA SYNDROME

Perfil de mulheres com alto risco para síndrome da apneia obstrutiva do sono

Perfil de mujeres con alto riesgo para síndrome de la apnea obstructiva del sueño

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ABSTRACT: Introduction: Obstructive apnea syndrome is considered to be highly prevalent in the population, primarily related to males and with little information on clinical signs and epidemiological profile in women. **Objective:** To analyze the clinical profile and to verify the association of the variables with the high risk of women developing obstructive sleep apnea syndrome. **Method:** This is an analytical and quantitative study, with a retrospective method of collecting data from outpatient clinics performed from June 2014 to June 2016 at the Ambulatory of Perioperative Assessment of a regional hospital in the Federal District. **Results:** The existence of a dependence association between obstructive apnea syndrome and the following variables: age range, body mass index, venous thromboembolism, presence of systemic arterial hypertension and diabetes mellitus were verified. There was no significant association with smoking or the presence of a difficult airway predictor. **Conclusion:** Obese, hypertensive women with a risk of thrombosis and those over 40 years of age are at increased risk for obstructive apnea syndrome.

Keywords: Perioperative care. Sleep apnea, obstructive. Patient care team. Women.

RESUMO: Introdução: A síndrome da apneia obstrutiva é considerada de alta prevalência na população, primariamente relacionada ao sexo masculino e com pouca informação sobre os sinais clínicos e o perfil epidemiológico em mulheres. **Objetivo:** Analisar o perfil clínico e verificar a associação das variáveis com o alto risco de mulheres desenvolverem síndrome da apneia obstrutiva do sono. **Método:** Trata-se de um estudo analítico e quantitativo, com método retrospectivo de coleta de dados das consultas ambulatoriais realizadas no período de junho de 2014 a junho de 2016 no Ambulatório de Avaliação Perioperatória de um hospital regional do Distrito Federal. **Resultados:** Verificou-se a existência de uma associação de dependência entre a síndrome da apneia obstrutiva e as seguintes variáveis: faixa etária, índice de massa corporal, tromboembolismo venoso, presença de hipertensão arterial sistêmica e diabetes mellitus. Não houve associação significativa com o tabagismo ou com a presença de algum preditor de via aérea difícil. **Conclusão:** Mulheres obesas, hipertensas, com risco de trombose e maiores de 40 anos possuem maior risco de síndrome da apneia obstrutiva.

Palavras-chave: Assistência perioperatória. Apneia obstrutiva do sono. Equipe de assistência ao paciente. Mulheres.

RESUMEN: Introducción: El síndrome de la apnea obstructiva es considerada de alta prevalencia en la población, primariamente relacionada al sexo masculino y con poca información sobre las señales clínicas y el perfil epidemiológico en mujeres. **Objetivo:** Analizar el perfil clínico y verificar la asociación de las variables con el alto riesgo de mujeres de desarrollar síndrome de la apnea obstructiva del sueño. **Método:** Se trata de un estudio analítico y cuantitativo, con método retrospectivo de colecta de datos de las consultas ambulatorias realizadas en el período de junio de 2014 a junio de 2016 en el

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Ambulatorio de Evaluación Perioperatoria de un hospital regional del Distrito Federal. **Resultados:** Se verifico la existencia de una asociación de dependencia entre el síndrome de la apnea obstructiva y las siguientes variables: rango de edad, índice de masa corporal, tromboembolismo venoso, presencia de hipertensión arterial sistémica y diabetes mellitus. No hubo asociación significativa con el tabaquismo o con la presencia de algún predictor de vía aérea difícil. **Conclusión:** Mujeres obesas, hipertensas, con riesgo de trombosis y mayores de 40 años poseen mayor riesgo de síndrome de la apnea obstructiva.
Palabras-clave: Atención perioperativa. Apnea obstructiva del sueño. Grupo de atención al paciente. Mujeres.

INTRODUCTION

Obstructive sleep apnea syndrome (OSAS) is a respiratory disorder characterized by episodes of obstruction leading to hypopnea and apnea during sleep. It is estimated that 11.4% of men and 4.7% of women have moderate and severe OSAS, so it is considered of high prevalence in the population[1]. In surgical patients, estimates can reach 22%[2,3].

These obstructions result in recurrent awakening, which can last for more than 10 seconds. This sleep fragmentation aids in the pathophysiology of OSAS, comprising specific signs and symptoms such as daytime sleepiness, snoring and cardiovascular diseases. The prevalence of OSAS is a risk factor for morbidity and mortality following surgical interventions, as it influences the length of hospitalization and the incidence of hypoxemia, elevations in blood pressure, heart rate, ventilation, and sympathetic tone. Therefore, it is extremely important to identify surgical patients who require greater risk-related care for OSAS[3-5].

The STOP-BANG questionnaire was developed in Canada to assess the risk of OSAS. It is an easy-to-apply questionnaire, consisting of eight questions with yes or no answers, based on risk factors and symptoms of OSAS risk, including sleep snoring, daytime tiredness, sleep apnea, diagnosis of hypertension, body mass index greater than 35 kg/m^2, age greater than 50 years, neck circumference greater than 40 cm and being male. For each affirmative answer, add 1 point; and for each negative one, 0 points are added, with a maximum score equal to 8. If the patient scores between 0 and 2, a low risk for OSAS will be considered, the presence of 3 or 4 affirmations indicates a moderate risk and when the score is greater than 5, there is a high risk for OSAS. The questionnaire has high sensitivity to detect OSAS, with 83, 92 and 100% sensitivity for mild, moderate and severe classification, respectively[6-9].

During the consultation at the Ambulatory of Perioperative Assessment (APA-HRG), the nurse performs anamnesis, physical examination (anthropometry, vital signs, cardiopulmonary auscultation, identification of difficult airway predictors) and applies the risk stratification for OSAS through the STOP-BANG score, functional capacity questionnaire (MET) and risk flow chart for venous thromboembolism (VTE) by the Safety-Zone algorithm in patients classified as high risk for performing the anesthetic act.

OSAS is primarily related to males. However, there is little information on clinical signs in women and few epidemiological studies addressing the female audience. Knowledge about snoring, daytime sleep, hypertension, age and obesity is limited in this public[7]. Thus, the question was raised whether women are being underdiagnosed due to some bias[7,10,11].

OBJECTIVE

To analyze the clinical profile of women at high risk for OSAS and to verify if there is dependence among the variables in this population.

METHOD

Analytical study that sought to associate variables of the profile of women with high risk for OSAS, quantitative, with a retrospective method of collecting data from the consultations conducted from June 2014 to June 2016 at the Ambulatory of Perioperative Assessment of a Federal District regional hospital (APA-HRG).

The population had a total of 230 medical records of women classified as high risk in the period from June 2014 to June 2016. According to the protocol of the service, those aged 65 years or younger than 65 years of age with a history of allergies, systemic diseases, use of medications in a continuous way and/or physical limitation and/or cognitive limitation and/or previous history of intercurrence in anesthesia-surgical procedure are considered high-risk patients.

Within the study population, we used as inclusion criteria the physical and electronic records of female patients who were consulted in the chosen period, over 18 years of age, who had a moderate- to high-risk stratification for OSAS according to the STOP-BANG questionnaire, totaling 49 medical records. All charts with absence of classification

or with low risk for OSAS, those that were outside the chosen period and the medical records of male patients were excluded from the analysis.

For data collection, a form containing the following variables was used: age, body mass index (BMI), surgical specialty, associated diseases, difficult airway predictor, smoking, alcoholism, and thrombosis risk classification.

These variables were analyzed using the statistical software R (R Development Core Team 2008 version 3.3 for Windows®), and are presented in descriptive percentiles. The χ^2 test was performed to analyze whether there is an association of existing dependence of the variables with the high risk of OSAS. We adopted p-value <0.05 for the calculation of the hypotheses.

Null hypothesis: there is no association of patients with high risk of OSAS with clinical variables. Alternative hypothesis: there is an association of patients with high risk of OSAS with clinical variables.

If the value of the χ^2 calculated is greater than the χ^2 in the table, it can be stated that there is an association between the variables, if the χ^2 calculated is smaller than the χ^2 in the table, there is no association between the variables. Therefore, the higher the value of χ^2, the more significant the relationship between the variables.

The research work was approved by the Research Ethics Committee of the Foundation for Teaching and Research in Health Sciences (FEPECS), under CAAE No. 60740916.8.0000.5553 (umbrella project), being carried out in accordance with the requirements of Resolution No. 466/2012 of the National Health Council.

RESULTS

The mean age was 61.26 years and its standard deviation was 12.88. There was a predominance of women aged over 40 years (95.92%), submitted to gynecological surgeries (46.94%), non-smokers (69.39%), hypertensive (89.80%), obese (BMI>30 kg/m²=63.30%) and with a high risk of VTE (86.05%). Only 10.2% were from other specialties, such as mastology and vascular surgery — data not shown in the table. Table 1 shows the distribution of these variables.

Assuming p-value <0.05 for the hypotheses formulated, when testing the χ^2 between the variables identified in the female profile with the high risk of OSAS, a significant association was found between OSAS and the following variables: age range, presence of comorbidities, BMI and VTE (Table 2).

There was no association between dependence among women at high risk of OSAS with the habit of smoking and the predictor of difficult airway.

DISCUSSION

Diagnosing women with OSAS can be difficult, since they have more generalized symptoms than men, related to depression, insomnia, morning headaches, anxiety, tired legs, nightmares,

Table 1. Clinical profile of the female population at high risk of developing obstructive sleep apnea syndrome.

Surgical specialty	Gynecological	General	Orthopedic
%	46.94	20.41	22.45
Age range (years)	20–40	41–60	>60
%	4.08	40.82	55.1
Body mass index (kg/m²)	<30	30–34.9	>35
%	36.7	28.6	34.7
Comorbidity	Hypertension	Hypertension and diabetes	
%	63.27	26.53	
Risk of thrombosis	Low	Moderate	High
%	6.98	6.98	86.05
Predictor of difficult airway	Yes	No	–
%	50.00	50.00	–
Smoking	Yes	No	–
%	14.29	69.39	–

Table 2. Result of the hypothesis test between the variables of the patients.

	χ^2	Degrees of freedom	p	Expected χ^2
Age range	10.253	02	0.006	5.991
Comorbidity	30.771	03	0.000	7.815
Body mass index	22.441	01	0.000	3.841
Venous thrombolism	16.516	02	0.000	5.991
Smoking	6.061	11	0.869	19.675
Pedictor of difficult airway	3.093	01	0.079	3.841

palpitations and hallucinations. The Wiscon Sleep Cohort Study estimates that 90% of the female public is underdiagnosed and that the reason may be related to this presence of atypical symptoms[12]. The classic symptoms of the syndrome are the presence of snoring and apnea, which are most commonly referred by men[13].

In a comparative clinical study with 130 homogeneous pairs of men and women with OSAS, the authors found that women refer to insomnia as poorly slept nights, are less aware of apnea symptoms, and are often diagnosed with depression. These differences in the clinical presentation of the syndrome in women should be better evaluated[11].

A survey[7] randomly evaluated 400 women from a sample of 10,000 women aged between 20 and 70 years old, who completed a questionnaire on the presence of snoring and were submitted to the polysomnography test. As a result, 50% of the sample was diagnosed with OSAS, related to age, obesity and the presence of hypertension, but not with diurnal somnolence or snoring. It was concluded that women with hypertension or obesity should be investigated for OSAS.

Taking into account our audience of 230 women, 21.3% of them presented a high risk for OSAS, which was the sample of this study. Most of them were older than 40 years of age and coming from the gynecological clinic, with only 2 in the range of 20 to 30 years old. Recent studies involving women have shown percentages between 12 and 50% of them evaluated with OSAS by means of the polysomnography examination and stratification questionnaires[7,11,14].

Age is one of the risk factors evaluated in the STOP-BANG questionnaire and it scores one more point when age is greater than 50 years. Although the risk of having the syndrome increase with advancing age, women may be prone to this diagnosis sooner. As age progresses, the risk of OSAS increases, as a result of increased body mass, decreased progesterone production and increased neck circumference[14].

OSAS is often related as a risk factor for hypertension, diabetes, cerebrovascular and coronary diseases, myocardial infarction and increases the chance of mortality[6]. In our study, 89% of women were diagnosed with hypertension, which is the same reported in an European survey[7].

Women with established cardiovascular diseases experience more coronary events, thromboembolic events, and increased risk of mortality when prescribed hormone replacement therapy. As the incidence of cardiovascular risk factors is high in OSAS, and in our study there was a correlation with both the presence of hypertension and the high risk of developing thrombosis, this therapy can bring significant damages to these patients[12]. In these cases, the control of BMI, diabetes and hypertension, evaluating the previous cardiovascular history and the use of continuous positive pressure therapy (CPAP) is a good treatment alternative[12].

Although smoking and alcohol consumption were considered risk factors for developing the syndrome, our sample consisted mostly of non-smokers, with no significant association of this variable with the risk of developing the syndrome, which is shown in agreement with another study[7].

The prevalence of OSAS is high in obese subjects[14]. In our study, the mean BMI was 32.05 kg/m^2 and 63% were classified as obese, which is somewhat lower than that reported in another study[7]. The questionnaire only scores when BMI>35 kg/m^2, and 35% of our sample had this index. Therefore, 65% of our sample had a high-risk OSAS score, regardless of the BMI. Researchers report that women with OSAS are more likely to be obese than men with similar degrees of the syndrome[12].

Studies suggest that progesterone and estrogen exert a protective role in the upper airway and in the distribution of fat in the body, playing an important role in sleep physiology in different age groups in women. There are indications that women undergoing hormone replacement have a lower incidence of OSAS[13]. The present study did not evaluate how many women were in menopause, or who did hormone replacement.

The association between dependence between OSAS and the presence of hypertension, or hypertension and diabetes, age group, BMI and VTE ($p<0.05$) was observed through the χ^2 test. These same findings were analyzed in an epidemiological study carried out in South Korea[14].

Although no significant correlation was found in our sample between difficult airway predictors and the syndrome, women with broad neck, obese and with abnormal facial anatomical structures (oropharyngeal narrowing, retrognathia, macroglossia, uvula lengthening, high arched palate, deviated nasal septum) should be investigated. Each anatomical finding increases the likelihood of having OSAS[12].

CONCLUSION

In view of the correlation of OSAS with vascular diseases and with post-surgical morbidity and mortality, it is necessary to establish an accurate diagnosis of OSAS. The STOP-BANG questionnaire is an accessible and highly sensitive tool to detect the syndrome.

The questionnaire was administered at the outpatient level during the preoperative consultation at APA-HRG. Our public was mostly over 40 years old, diagnosed with hypertension and obese.

The clinical profile of women with OSAS is difficult to diagnose. The hypothesis of the relationship of OSAS with age, comorbidity, BMI and thrombosis was tested, with results of associations between variables and OSAS. But there was no relationship with smoking or presence of any predictor of difficult airway.

Thus, it was found that obese, hypertensive women with a risk for thrombosis and those over 40 years of age are at higher risk for developing OSAS.

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SAFE SURGERY: EVALUATION OF CHECKLIST ADHERENCE IN A TEACHING HOSPITAL

Cirurgia segura: avaliação da adesão ao checklist em hospital de ensino

Cirugía segura: evaluación de la adhesión al checklist en un hospital de enseñanza

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ABSTRACT: Objective: To estimate adherence to the safe surgery checklist in a medium-sized teaching hospital. **Method**: A cross-sectional study with a sample of 334 patients submitted to surgery in the year 2015. Data were collected using an instrument based on the World Health Organization's standard checklist. The sample was described by frequency distribution. The prevalence of adherence to the checklist was estimated considering the presence of the instrument of check in the medical records. The bivariate analysis investigated the association of the outcome with the independent variables. The strength of this association was evidenced through Logistic Regression. **Results**: The checklist was verified in 90.72% of the medical records. No surgery had a fully filled checklist. The complete filling of the three surgical moments was found in no instrument. The existence of the checklist in the medical record was associated with the classification of the surgery for urgency (OR=4.3; 95%CI, 1.88–8.73). **Conclusion**: Although the checklist has already been introduced in the surgical practice, the results reveal that its adequate use still presents itself as a great challenge, which may compromise the expected results in surgical safety.

Keywords: Patient safety. Checklist. Surgical procedures, operative.

RESUMO: Objetivo: Estimar a adesão ao *checklist* de cirurgia segura em um hospital de ensino de médio porte. **Método**: Estudo transversal com uma amostra de 334 pacientes submetidos à cirurgia no ano de 2015. Os dados foram coletados com auxílio de um instrumento baseado no *checklist* padrão da Organização Mundial da Saúde. A amostra foi descrita por distribuição de frequências. A prevalência de adesão ao *checklist* foi estimada considerando a presença do instrumento de checagem nos prontuários. A análise bivariada investigou a associação do desfecho com as variáveis independentes. A força dessa associação foi evidenciada por meio da Regressão Logística. **Resultados**: Verificou-se a existência do *checklist* em 90,72% dos prontuários. Nenhuma cirurgia apresentou *checklist* totalmente preenchido. Em nenhum instrumento foi encontrado o preenchimento completo dos três momentos cirúrgicos. A existência do *checklist* no prontuário foi associada à classificação da cirurgia quanto à urgência (OR=4,3; IC95% 1,88–8,73). **Conclusão**: Mesmo que o *checklist* já tenha sido introduzido na prática cirúrgica, os resultados revelam que sua adequada utilização ainda se configura como um grande desafio, podendo comprometer os resultados esperados na segurança cirúrgica.

Palavras-chave: Segurança do paciente. Lista de checagem. Procedimentos cirúrgicos operatórios.

RESUMEN: Objetivo: Estimar la adhesión al *checklist* de cirugía segura en un hospital de enseñanza de mediano porte. **Método**: Estudio transversal con una muestra de 334 pacientes sometidos a la cirugía en el año 2015. Los datos fueron recolectados con ayuda de un instrumento basado en el *checklist* estándar de la Organización Mundial de la Salud. La muestra fue descrita por distribución de frecuencias. La prevalencia de adhesión al *checklist* fue estimada considerando la presencia del instrumento de chequeo en los prontuarios. El análisis bivariado investigó la asociación del desenlace con las variables independientes. La fuerza de esta asociación fue evidenciada por medio de la Regresión Logística. **Resultados**: Se verificó la existencia del *checklist* en el 90,72% de los prontuarios. Ninguna cirugía presentó *checklist* totalmente llenado. En ningún instrumento se encontró el llenado completo de los tres

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momentos quirúrgicos. La existencia del *checklist* en el prontuario fue asociada a la clasificación de la cirugía en cuanto a la urgencia (OR=4,3, IC95% 1,88–8,73). **Conclusión**: Aunque el *checklist* ya se ha introducido en la práctica quirúrgica, los resultados revelan que su adecuada utilización todavía se configura como un gran desafío, pudiendo comprometer los resultados esperados en la seguridad quirúrgica.

Palabras clave: Seguridad del paciente. Lista de verificación. Procedimientos quirúrgicos operativos.

INTRODUCTION

Currently, surgery has been considered an essential therapeutic modality in the health area, being an integral part of health care and becoming the treatment of choice against many complex diseases, increasing the possibilities of cure. The World Health Organization (WHO), based on data from 56 member countries, estimated that 234 million operations are performed worldwide annually at a ratio of 1 procedure for every 25 people alive[1,2].

However, complications related to surgical procedures have been frequently reported in the literature, in studies that seek to estimate the occurrence of adverse events (AE) among surgical patients[2-4]. In addition to the severity of AE, which includes temporary or permanent physical damage, incapacity, suffering and death, it is necessary to consider the excessive increase of costs related to treatment, becoming a major public health problem today[5,6].

AE is understood to mean any unintentional incident related to health care that leads to unnecessary impairment of bodily function, including illness, injury, suffering and death[7]. It should be noted that surgical AE contribute to half or three quarters of all damages associated with health care[8,9].

With the goal of improving patient safety and qualifying care in health services, WHO launched the Global Patient Safety Alliance in 2004. As part of it, the Safe Surgery Survival Program was instituted in 2008, recommending the use of a checklist, which aims to help surgical teams to systematically follow critical safety steps, contributing for the reduction of complications among surgical patients[2].

The standard checklist proposed by the WHO includes basic safety procedures and tasks, consisting of 19 check items. The instrument should be applied at three moments of surgery: Sign in (before anesthetic induction – entrance), Time out (before surgical incision – surgical pause) and Sign out (before the patient leaves the surgical room – exit)[2]. The recommendation is that a single and any member of the team participating in the surgical procedure conducts the checklist application. Studies show that the nursing team has assumed a leading role in conducting the safe surgery checklist[2,10,11].

In Brazil, the government mobilized, in 2013, through the National Agency of Sanitary Surveillance (*Agência Nacional de Vigilância Sanitária* – ANVISA), establishing the Protocol for Safe Surgery, attached to the Resolution of the Collegiate Board of Directors (RDC) No. 36/2013. This protocol describes, encourages and makes official the use of the checklist as a strategy to reduce the risk of surgical incidents[12].

Studies have shown that the use of the checklist in surgical procedures reduces mortality and complication rates, as well as the number of errors due to communication failure among the team[13-15]. In Brazil, the use of the WHO safe surgery checklist is a recent implantation technology. The studies regarding adhesion and impact brought about by the application of this instrument are still scarce[16,17]. Thus, the results brought by this study contribute to elucidate the way the checklist has been used in surgical practice, subsidizing the evaluation regarding the need for adjustments and adequacy so that its impact on the safety of the surgical patient is reached.

OBJECTIVE

The present study aimed to verify the adherence to the safe surgery checklist in a medium-sized teaching hospital.

METHOD

Cross-sectional study carried out in a teaching hospital, located in a municipality of Minas Gerais. The surgical center (SC) of this institution has five operating rooms, performing about 350 monthly surgeries, in the specialties of gynecology and obstetrics, general surgery, urology, ophthalmology, orthopedics, otorhinolaryngology, vascular surgery and plastic surgery.

In 2014, the checklist was implemented through the articulation between nursing academics of a public university in the city and the nursing coordination of this unit. The checklist used in the institution contemplates the three moments of the standard instrument proposed by the WHO. However, in the third moment, the items "professional confirms patient name", "problems with equipment to be resolved" and "essential concerns for patient recovery" were excluded. Also, additional information previously collected in another form were added that, seeking to optimize the records related to the surgical procedure. This information refers to the anesthetic technique used, the position of the patient during surgery, the invasive procedures performed and the location of the surgical wound.

To calculate the sample, the population size of 4,200 surgical patients was considered, corresponding to the total number of patients undergoing surgery in all specialties in 2015. Of the 4,200 surgeries, 1,890 were performed by the Unified Health System (*Sistema Único de Saúde* – SUS) and the remainder by insurance/private sources. Inclusion criterion was defined as all surgeries, of all specialties (without equivalence among them), performed by the SUS in the year 2015. Surgeries performed by insurance were excluded due to the operational difficulty to find the medical records in the institution's file, as these are archived separately.

The expected proportion of checklist completion was 61%, based on a pioneering Brazilian study conducted in two university hospitals in Rio Grande do Norte[16]. Error of 0.05 and confidence level of 95% were considered. Thus, the sample size established for this study was 334 patients who underwent surgery in the year 2015. For sample selection, systematic sampling was used. From the institution's surgical record book, the first medical record was randomly selected and, subsequently, the others were selected using fixed intervals.

Data collection took place in August and September 2016, from the review of medical records and observation of the completion of the checklist. To do so, the researchers constructed an instrument based on the standard checklist proposed by the WHO with fields that allowed the "Yes" or "No" answers for each of the check items.

The dependent variable was adherence to the checklist, defined as the presence of the instrument in the medical record, with complete, incomplete and blank instruments. The independent variables investigated from the checklist were:

- related to the surgical procedure: month, shift (morning, afternoon and night); operating room where the surgery was performed, surgical specialty, type of anesthesia (local, regional, general), surgery classification regarding urgency (elective, urgency, emergency), surgery classification regarding potential contamination (clean, contaminated, potentially contaminated, infected) and patient's destination after surgery (post-anesthetic care unit (PACU), hospitalization units, intensive care unit (ICU));
- related to the patient: age, gender, origin (internal or external).

These variables were chosen because they are available in the medical records and because they have already been studied in previous researches[16,17].

The data were coded, typed and analyzed using Epi info version 7.1. The initial analysis included a description of the study sample through frequency distribution. Subsequently, the prevalence of adherence to the safe surgery checklist was estimated. A bivariate analysis was performed to investigate the association of the outcome with the independent variables, using the Pearson χ^2 test, with a significance level of 5%. The strength of the association between the outcome and the independent variables was assessed through the Logistic Regression with the presentation of the results as *odds ratio* (OR), with their respective 95% confidence intervals (95%CI).

The research was approved by the Committee of Ethics and Research with Human Beings of a university of Minas Gerais, under the opinion No. 1.708.651. The ethical standards for research involving human beings were rigorously followed in accordance with Resolution No. 466/2012 of the National Health Council (*Conselho Nacional de Saúde* – CNS).

RESULTS

A total of 334 medical records of patients with varied specialties, submitted to surgery in the year 2015, were analyzed. The checklist was verified in 90.72% of the medical records. There was predominance of female patients (48.20%), aged between 21 and 40 years (30.53%). Among the surgical specialties found, the most frequent ones were: general (36.8%), gynecological (20.9%) and orthopedic surgeries (21.2%). Elective surgeries were the predominant ones (56.9%), classified as clean, performed in the morning shift, with regional anesthesia being the most used in the analyzed procedures. The characteristics of the sample regarding adhesion to the checklist and the variables related to the surgical procedures performed are shown in Table 1.

No surgery had a fully filled out checklist. The complete filling of each of the three surgical moments was also not found in the sample of medical records analyzed. Three blank instruments were found, with only the patient identification data filled out.

In the first surgical moment, the items less filled out were: "confirmation of the surgical site by the patient" (5%), "difficult airway / risk of aspiration" (24%) and "risk of blood loss" (24%). On the other hand, other items that are also part of the anesthesiologist's evaluation were the most filled: "anesthesia equipment checked" (71%) and "working pulse oximeter in the patient" (86%). There was an increasing frequency of filling of the items during the first surgical moment (Figure 1).

At the second surgical moment, when most of the check items are confirmed by the surgeon, the items "critical steps", "patient-specific concerns", "equipment issues" and "imaging tests availability" were the least checked ones (with only 22, 23, 26 and 38% of filled out items, respectively). The percentage of filled out check items also increased during the second surgical moment (Figure 2).

In the third step, the items "professional confirms patient's name", "problems with equipment to be solved" and "essential concerns for patient recovery" were not assessed because they were not present in the instrument adapted and used by the institution. Among the items evaluated, the "instrument count, compresses, gauzes and needles" was checked in 55% of the surgeries and the "identification of material for anatomopathological samples" in 80% of them (Figure 3).

The association between the outcome and the independent variables included in the study was tested by bivariate analysis. Only the variable "classification of the surgery for urgency" was associated with the presence of the checklist in the medical chart ($p<0.05$). The Logistic Regression evidenced the strength of the association between the adhesion to the checklist and the classification of the surgery regarding its urgency, identifying that, in elective surgeries, there is a four-times higher chance of using the instrument (OR=4.0262, 95%CI: 1.8571–8.728) when compared to urgency and emergency surgeries (Table 2).

DISCUSSION

The purpose of the implementation of the checklist is to prevent the occurrence of errors and AEs and, consequently, to improve the quality and safety of the surgical assistance[18]. The results of the present study demonstrated the interest of the team in using the checklist, being verified the existence of the instrument in most of the charts analyzed. In contrast, no fully completed instrument was

Table 1. Characteristics of the sample of surgical patients regarding the adhesion to the checklist and the variables related to the surgeries performed.

Variable	n (334)	%
Use of checklist		
Yes	303	90.72
No	31	09.28
Surgical specialty		
General	123	36.82
Orthopedic	71	21.25
Gynecological/obstetrical	70	20.96
Vascular	42	12.57
Urological	15	4.5
Head / Neck	06	1.8
Thoracic	05	1.5
Plastic	02	0.6
Shift		
Morning	186	55.69
Afternoon	72	21.56
Evening	08	2.40
Not filled out	68	20.35
Type of anesthesia		
General	34	10.18
Regional	189	56.59
Local	20	5.99
Not filled out	91	27.24
Classification of surgery regarding potential for contamination		
Clean	101	30.24
Contaminated	78	23.35
Potentially contaminated	10	2.99
Infected	6	1.80
Not filled out	139	41.62
Classification of surgery regarding urgency		
Elective	190	56.89
Urgency	80	23.95
Emergency	9	2.69
Not filled out	55	16.47

Source: the authors.

found. Corroborating this finding, a recent survey conducted in a public teaching hospital located in Belo Horizonte, Minas Gerais, also found a low completeness of the instrument. Of the 24,421 surgeries performed in the 5 year period, only 58.5% of them presented the checklist completely filled out[17]. These findings suggest that the reflexes expected from the use of the checklist in the safety of the surgical patient may not be achieved.

In the present study, the existence of the checklist on the patient's medical chart was associated with the classification of the surgery regarding urgency, showing that patients submitted to elective surgery had a greater chance of having the checklist on the patient's chart. In agreement with these findings, a survey conducted at a Canadian obstetric hospital revealed that the checklist may be difficult to use in an emergency/urgency situation and that three months after its implantation, 30% of professionals believed that its use was an inconvenience in these cases. However, the instrument was equally applicable to emergency/urgency surgeries, improving compliance with standard safety measures[19].

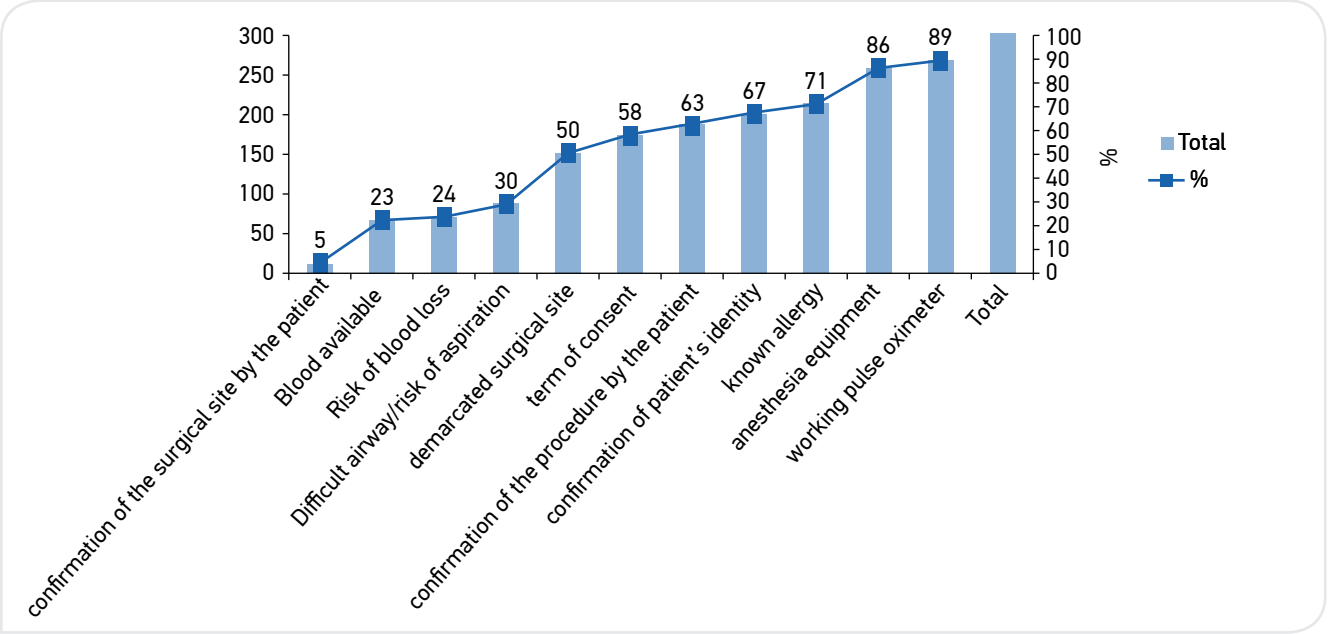

Figure 1. Percentage of items filled out in the first surgical moment of the safe surgery checklist in the sample analyzed.

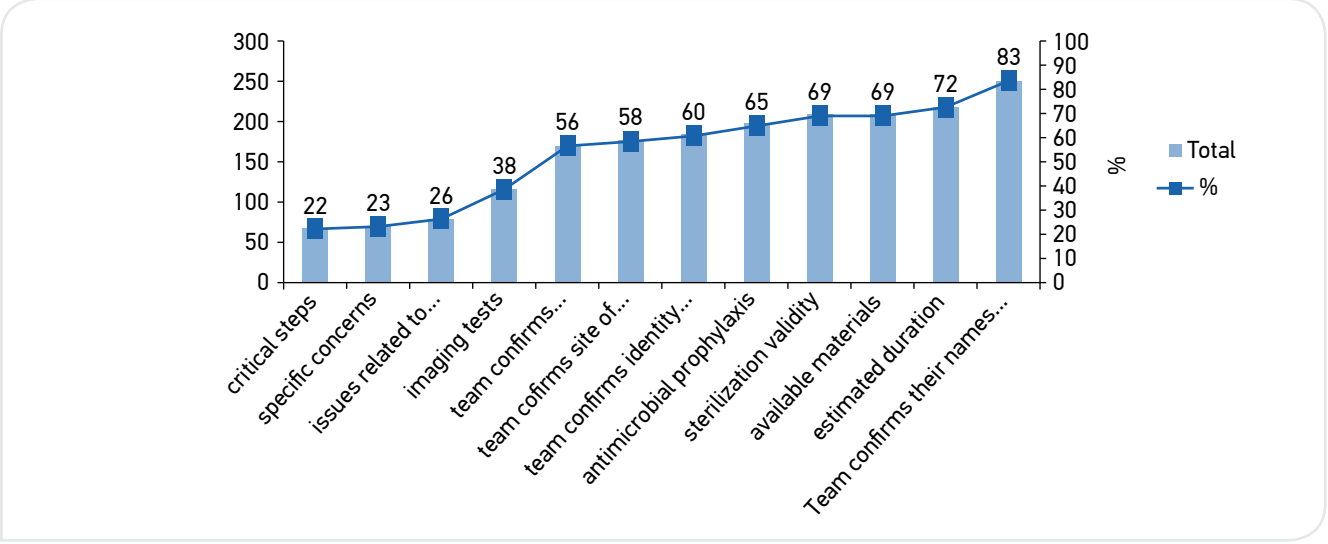

Figure 2. Percentage of items filled out in the second surgical moment of the safe surgery checklist in the analyzed sample.

In practice, it is clear that an emergency/urgency service requires more agility of the team in a short time. However, patients who require this type of treatment have a higher risk of complications. Also, stress and hurry at those times are greater, increasing the likelihood of some error going unnoticed. Thus, in emergency/urgency situations, the checklist can act as a valuable tool to help the team to follow safety steps in a systematic way[19].

In the present study, it was observed a higher frequency of filled out items in the first moment when compared to the following two moments. A study on the completion of the checklist stages in a university hospital in Ethiopia also revealed that the first moment was the most filled out one (69.5%)[18]. In addition, the results obtained here also revealed an increase in filled out percentage over time. Two studies in Brazil have identified similar results when they demonstrate that the percentage of filled out items increased progressively over the three surgical moments[16,17].

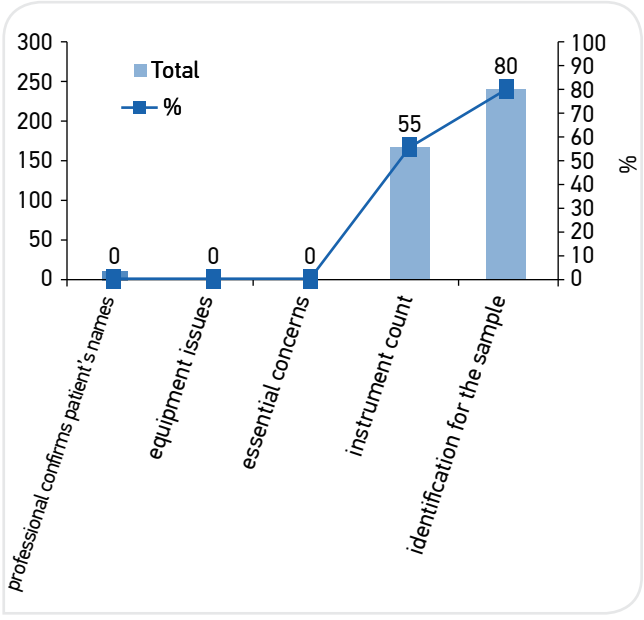

Figure 3. Percentage of items filled out in the third surgical moment of the safe surgery checklist in the analyzed sample.

Table 2. Bivariate analysis of the association between the variable "classification of the surgery regarding urgency" and adherence to the checklist in the sample analyzed.

Classification regarding urgency	Checklist		OR (95%CI)	p-value*
	Yes	No		
Elective	178 (58.75%)	12 (38.7%)	4.3 (1.88–8.73)	<0.001
Urgency/ Emergency	70 (23.1%)	19 (61.3%)		
Not filled out	55 (18.15%)	0 (0%)		
Total	303 (100%)	31 (100%)		

It should be noted that the team's adherence to the filling of the check items throughout the anesthetic-surgical act is essential to reach the goal of achieving a reduction in the rates of complications and death, improving safety in surgical care. In this context, it is necessary that all the professionals who participate in the checking process know the purpose and importance of each proposed item, avoiding inconsistencies in filling out and limitations in obtaining the proposed information[17].

After "confirmation of the surgical site by the patient", the items that are part of the medical evaluation ("difficult airway/risk of aspiration" and "risk of blood loss/blood available") were the least checked. It is noteworthy that the identification of a difficult airway and the risk of bleeding in the preoperative period is fundamental, since occurrences related to ventilation, oxygenation and perfusion are significant causes of morbidity and mortality[2]. Thus, the evaluation and confirmation of such items are essential to anticipate unexpected situations and provide adequate planning, contributing to the reduction of complications[10]. Regarding the possibility of blood loss, a study conducted at a teaching hospital in Ireland showed that 30% of patients requiring transfusion had underestimated blood loss by more than 500 mL, showing difficulty in evaluating the risk of blood loss by part of the medical team[20].

A research carried out in Northeast Brazil showed high verification levels of important aspects to patient safety, such as "patient identification and consent", and "known allergy", with more than 90% of the items filled out. Some of the most checked items were those directly related to the risk of death, such as "allergies", "difficult airway" and "risk of blood loss"[16]. In addition, studies indicate that the items interpreted as more important or of greater risk to the patient tend to have better adherence by the professional responsible for their verification[16,17].

In the second surgical moment, this study showed that most of the team members were presented by names and functions, considering the filling of this item in the checklist. Although the evaluation is limited to completing the checklist, these findings suggest adequate communication among

team members, a factor considered essential for the success of the procedure and the prevention of errors. Results of a study that included orthopedic surgeries in a teaching hospital in the southern region of Brazil showed that, at the second moment, the verification items were checked. However, the confirmation was not conducted verbally, as advocated by the WHO[21]. Another research conducted in Thailand also showed that most of the surgical team professionals were unable to introduce their name and function to others, and in 22% of cases, communication failure was the main factor responsible for the occurrence of AE in patients[22].

Surgical pause should be performed with verbal checking of the entire team to ensure that the patient, location, and procedure are correct, as well as ensuring that all patient equipment, documents, and information are accessible[2]. In the present study, although most of the items were checked, it is not known if the confirmation was verbal, which could compromise the veracity of the records. It is important to emphasize that filling out the items without verification implies legal and ethical aspects implied to all the professionals of the surgical team[21]. In addition, if surgery staff only ticks the check items without committing themselves to the actual goals of using the checklist, the expected patient safety impacts will not be achieved[23].

Still in the second moment, the less checked items were "critical steps", "patient-specific concerns", "equipment issues", and "imaging tests availability". In anticipation of critical events, the checklist coordinator conducts a quick discussion between the team about critical situations and safety planning. If there is nothing specific to be said, the professional can simply state that there is nothing outside the routine to be remembered[3]. It was verified in the present study that this item was simply checked without specifying the critical event or was not checked, with nothing stated.

Regarding the third surgical moment, it is important to mention that the instrument used by the institution was adapted and excluded essential items included in the standard checklist proposed by the WHO, making it difficult to evaluate the completion and analysis of the results. On this issue, the WHO recommends that the standard checklist be adapted to include items considering the needs for each service. However, there is no recommendation for the exclusion of items already recommended and with favorable scientific evidence[16,17].

Compared to the two other previous surgical moments, the third was the least executed. This finding is in agreement with the results of research carried out in hospitals in Ethiopia[18] and in Thailand[22]. The low completion rate of the third moment may be associated with the team's concern with technical issues, such as the final count of the instruments, the preparation of the PACU room, the preparation of the patient to leave the room and the preparation of the operating room for the procedure[12]. A systematic review in Canada related the low adherence to the third moment with the fatigue of the team and the fact that the surgeon in charge is no longer present in the operating room, reinforcing the idea that the absence of some professionals before the completion of the filling this instrument makes it difficult to finalize it[24].

At this stage, the item related to the counting of gauzes, compresses, needles and surgical instruments was not checked in 44% of the surgeries, a relatively high percentage given the complexity of the damage caused by the forgetfulness of any material inside the patient after the end of the surgery. A study carried out in Paraná reported cases of laparotomies in which surgical compresses were retained inside the patient, causing abdominal pain and intestinal occlusion. Foreign body diagnosis was performed only during reoperation. One of the patients developed a perforation of the terminal ileum and died of sepsis[25]. The counting of surgical materials should be performed in a careful and methodical manner, preferably by two professionals, to reduce the chance of erros[2].

Studies show that one of the greatest barriers to the implementation of the checklist is the lack of capacity of the team to reflect on potential errors and to avoid them[8,25]. Moreover, the non-adherence of the professionals to the protocol and the non-commitment of the institution also constitute important barriers[19]. New evidence suggests that good checklist usage depends on how this tool is used[26,27].

Thus, time should be devoted to the training of surgical teams, to emphasize the relevance of the instrument's use, enabling professionals to use it correctly[26]. Studies suggest that individual perceptions of the professionals about the importance of each checklist item directly influence their implementation[16,27]. For this reason, periodic assessment of adherence is also recommended, providing feedback to surgical teams about indicators of checklist effectiveness in reducing complications, sensitizing them through local evidence of their positive impact[16].

This study brings important contributions in order to elucidate aspects related to adherence to the safe surgery checklist in a context not previously explored. Nevertheless, some limitations must be considered in the comparison/generalization of results. It should be emphasized that the analysis was restricted to the surgeries performed by SUS. In addition, the research portrays the regional reality of a teaching hospital. Another

limitation refers to the use of secondary data (medical chart) to observe the completion of the checklist, and a direct observation of this action is not done, which does not allow to confirm if the information was shared by the whole team or if the steps that require checking them out loud were actually performed. Another issue to be considered is that the implementation of the checklist in the institution is recent, with a short time for the use of this technology to be consolidated with greater effectiveness.

CONCLUSION

Although the checklist was found in most surgeries analyzed, no fully completed instrument was found. As a result, its utilization rate was satisfactory, but the overall compliance rate of the check items was below ideal. The third moment was clearly seen as the most difficult and with the lowest completeness when compared to the first two moments. Since each step carries check items related to potential risks to the surgical patient, the results of the study suggest that the checklist may not be producing the expected impact in order to raise safety standards and decrease the occurrence of AE.

The need for a change in the organizational culture of managers and the team involved in surgical care for the recognition of the checklist as an instrument capable of contributing to the incorporation of safety elements into daily practice is evident, bringing positive results not only to patients, but also for teamwork. In addition to developing strategies to improve adherence to the checklist, conducting a regular audit of completing the instrument is important to provide information on the positive impacts on care, ensuring that this valuable tool is used effectively.

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NURSING CARE IN THE INTRAOPERATIVE PERIOD FOR BODY TEMPERATURE MAINTENANCE

Cuidados de enfermagem no período intraoperatório para manutenção da temperatura corporal

Cuidados de enfermería en período intraoperatorio para el mantenimiento de la temperatura corporal

Érica de Oliveira Souza[1], Natália Gonçalves[2]*, Ana Graziela Alvarez[3]

ABSTRACT: Objective: To describe nursing care in relation to body temperature maintenence during the intraoperative period. **Method:** Descriptive, cross-sectional study, performed in June 2015 in the operating department of a hospital in the state of São Paulo. Data were collected using an instrument developed for this study, which contained sociodemographic, clinical, surgical and nursing care data. Descriptive analyzes were performed for all variables. **Results:** Nursing care was analyzed in 19 surgeries, with the highest incidence being laparoscopic cholecystectomy (26.3%), under general anesthesia (52.6%). The mean duration of anesthesia was 113 minutes. Hypothermia was identified in 84.2% of the patients in the postoperative period. The active cutaneous heating method, with intravenous solution infusion was used in all patients intraoperatively. **Conclusion:** Unintentional hypothermia is a recurrent condition in the operating department and comprimises patients' recovery. Its prevention is related to the achievement of safer nursing care and the reduction of postoperative complications.

Keywords: Nursing care. Hypothermia. Perioperative nursing.

RESUMO: Objetivo: Descrever os cuidados de enfermagem para manutenção da temperatura corporal durante o intraoperatório. **Método:** Estudo descritivo, transversal, realizado em junho de 2015 no centro cirúrgico de um hospital no interior de São Paulo. Os dados foram coletados por meio de instrumento desenvolvido para este estudo, o qual continha dados de caracterização sociodemográfica, clínica, cirúrgica e cuidados de enfermagem. Para todas as variáveis, foram realizadas análises descritivas. Resultados® Foram analisados os cuidados de enfermagem em 19 cirurgias, sendo a de maior incidência a colecistectomia videolaparoscópica (26,3%), sob anestesia geral (52,6%). O tempo médio de duração da anestesia foi de 113 minutos. A hipotermia foi identificada em 84,2% dos pacientes no período pós-operatório. O método de aquecimento utilizado em todos os pacientes no intraoperatório foi do tipo cutâneo ativo, com infusão de solução aquecida por via endovenosa. Conclusão® A hipotermia não intencional é uma condição real no centro cirúrgico, causando prejuízos à recuperação dos pacientes. Sua prevenção está relacionada à realização de cuidados de enfermagem mais seguros e à redução de complicações pós-operatórias.

Palavras-chave: Cuidados de enfermagem. Hipotermia. Enfermagem perioperatória.

RESUMEN: Objetivo: Describir los cuidados de enfermería para manutención de la temperatura corporal durante el intraoperatorio. **Método:** Estudio descriptivo, transversal, realizado en junio de 2015 en el centro quirúrgico de un hospital en el interior de São Paulo. Los datos fueron colectados por medio de instrumento desarrollado para este estudio, el cual contenía datos de caracterización sociodemográfica, clínica, quirúrgica y cuidados de enfermería. Para todas las variables fueron realizados análisis descriptivos. **Resultados:** Fueron analizados los cuidados de enfermería en 19 cirugías, siendo

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la de mayor incidencia la colecistectomía video-laparoscópica (26,3%), bajo anestesia general (52,6%). El tiempo promedio de duración de la anestesia fue de 113 minutos. La hipotermia fue identificada en un 84,2% de los pacientes en el período postoperatorio. El método de calentamiento utilizado en todos los pacientes em el intraoperatorio fue del tipo cutáneo activo, con infusión de solución calentada por vía endovenosa. **Conclusión:** La hipotermia no intencional es una condición real en el centro quirúrgico, causando perjuicios a la recuperación de los pacientes. Su prevención está relacionada a la realización de cuidados de enfermería más seguros y a la reducción de complicaciones postoperatorias.

Palabras-clave: Atención de enfermería. Hipotermia. Enfermería perioperatoria.

INTRODUCTION

Hypothermia is defined as a body temperature below 36ºC[1], which can be classified as unintentional or therapeutic, the first being more frequent in most patients submitted to anesthetic-surgical procedures[2,3]. Different factors can cause unintentional hypothermia in the surgical process, such as type and duration of anesthesia, operating room temperature (OR), medications administered, use of solutions and cold intravenous infusions[2,4] as well as factors related to individuals such as age, body mass index and the presence of associated diseases or traumas[2,5]. Thus, hypothermia canlead to systemic complications, compromise the healing process and increase the risk of surgical site infection, bleeding and cardiac alterations[2,4].

To avoid the complications resulting from hypothermia, it is essential to implement preventive measures, even by the nursing team. The methods used to maintain body temperatur can be described as active or passive skin warming. Active heating methods include the use of thermal mattresses with water circulation, infusion of heated solutions, heating and humidification of the administered gases[6]. In passive heating, patients are heated using sheets or blankets[3].

Hypothermia is recurrent in clinical practice and, often, professionals do not give due importance to this complication and its repercussions in the surgical patient. In an area of great complexity, such as the operating department (OD), all professionals need to act in a preventive manner, thereby improving nursing care and, consequently, the well-being of the patient as a whole.

Nurses play a crucial role in this scenario, as they are responsible for planning and implementing interventions that minimize the complications and risks involved in this phase.

OBJECTIVE

To describe nursing care for the maintenance of adequate body temperature and the prevention of hypothermia during the intraoperative period.

METHOD

This was a cross-sectional, observational, quantitative study performed in the OD of a municipal hospital in the state of São Paulo, in June 2015.

Nursing professionals (nurses, technicians and nursing assistants), over 18 years old, working in the OD during the period of the study and who agreed to participate in the study were invited to participate in the data collection. Professionals on vacation, maternity or health leave, and those scheduled for emergency / emergency and / or midwifery surgeries were excluded from the study.

Three nursing technicians present in the period of data collection and rostered to assist in elective surgeries in the OD of the studied hospital accepted to participate in the research and, therefore, assisted in the participant observation. The technicians were aged between 28 and 35 years and had between 7 and 12 years of professional experience. One of the professionals had been working in the industry for five years and the others for one and two years. During the period of collection, the three nursing professionals provided care to 19 subjects and these data were considered for the analysis.

The data collection took place in three periods:

- before surgery;
- during surgery;
- immediately after surgery.

The data were recorded by the first researcher and by the participating nursing team, using a form developed for this study.

The instrument was submitted to appearance and content validation by three nursing professionals who work in patient care in the perioperative period. This procedure aimed to refine the instrument.

The first stage occurred prior to surgery, at the patient's admission to the OD on the hospital trolley, where the patient waited to be seen by the anesthetist and the surgeon. At that

moment, the nursing professionals filled out the characterization form and sociodemographic data of the patient. Then, inside the operating room, they continued to fill out the form with the surgery time, name of surgery, comorbidities, medications, weight, height, body mass index (BMI), vital signs (temperature, blood pressure, heart and respiratory rate), the nursing care applied to prevent hypothermia and the cutaneous method used (active or passive), as well as its specifications.

In relation to BMI, the classification proposed by the World Health Organization (WHO) was used:

- obesity I: BMI from 30 to 34.99 kg / m^2;
- severe obesity II: BMI of 35 to 39.99 kg / m^2;
- morbidly obesity: BMI > 40 kg / m^2.

This data was calculated by the researchers, based on the weight and height of the patients.

The second stage occurred during surgery, when the professionals filled in the fields related to the type of anesthesia, air temperature and humidity in the OR, patient's vital signs and method used to prevent hypothermia (active or passive).

The third stage occurred immediately after surgery. In the same way as in the previous steps, the professionals filled out the data regarding the method used to prevent hypothermia (active or passive) and the patient's vital signs at that time.

The researchers collected the completed questionnaires and the data were entered, organized and analyzed on a spreadsheet, with the help of Excel version 2010 software. Descriptive analyzes (simple frequency, percentage, minimum and maximum) were performed for the variables studied.

The study complied with the recommendations of Resolution 466/2012 of the National Health Council and was approved by the Ethics Committee of the Faculdade de Jaguariúna, São Paulo (CAAE 44601315.3.0000.5409).

RESULTS

During the month of June 2015, 68 surgical procedures were performed, among which 19 were included in the study. The majority of operated patients were females (11, 57.9%), with a mean age of 39 years (SD = 21.2, 3-77), 4 were aged between 3 and 10 years and 4 were older than 60 years.

Seven patients (36.8%) had the following comorbidities: asthma, bronchitis, systemic arterial hypertension, diabetes mellitus, gallstones, hypothyroidism, heart disease or depression, and 2 of them had more than one disease. In addition, 6 patients (31.5%) used medications prior to surgery (glibenclamide, fluoxetine, omeprazole, budesonide, hydrochlorothiazide, depakote, cetalapram or losartan).

Regarding BMI, two presented class I obesity; one presented class II obesity; five were overweight; eight had ideal weight; two were underweight and one patient was not weighed.

Among the surgeries performed, laparoscopic colecystectomy was the most frequently performed surgery (26.3%) (Table 1).

Ten patients (52.6%) underwent general anesthesia, followed by spinal anesthesia (7; 36.8%) and associated general anesthesia (2; 10.5%). The mean duration of surgery was 113 minutes (30-465).

The OR temperature at the time of surgery was, on average, 21.1°C (SD = 19; 19.6-23.4) and the humidity was 59% (SD = 0.1; 21-69).

Preoperative period

During their admission to the OD, the patients remained on hospital trolleys where vital signs were measured and recorded (Table 2). It must be noted, that 2 of the 6 patients (36.8%) with mild hypothermia in this period were children aged 3 and 6 years.

Table 1. Procedures included in the study, according to the surgeries performed.

Surgical procedure	n (%)
Videolaparoscopic cholecystectomy	5 (26.3)
Surgical treatment of bilateral varices	2 (10.5)
Umbilical herniation + postectomy	1 (5.3)
Umbilical herniation	1 (5.3)
Umbilical Hernioplasty	1 (5.3)
Total hysterectomy	1 (5.3)
Left inguinal hernia repair	1 (5.3)
Surgical treatment of bilateral varicose veins + saphenectomy	1 (5.3)
Exploratory laparotomy	1 (5.3)
Postectomia	1 (5.3)
Septoplastia + cauterização de cornetos	1 (5.3)
Colecistectomia convencional	1 (5.3)
Adenoidectomia + cauterização de cornetos	1 (5.3)
Hemorroidectomia	1 (5.3)
Total	19 (100.0)

Regarding nursing care in this period, the active cutaneous method of intravenous solution infusion and the passive cutaneous method using cotton sheets were used in all patients (19; 100.0%) to maintain body temperature. It should be noted that in one patient, the lower limbs were wrapped with orthopedic cotton.

Intraoperative period

During this time, most of the patients (13; 68.4%) remained normothermic during the surgical procedure (Table 3). Sixteen patients presented a temperature change between the immediate preoperative period and during the procedure; 3 patients' temperatures increased, ranging from 0.1 to 0.4°C and 10 showed a decrease, ranging from 0.1 to 1.7°C. Among the four patients who presented a decrease of at least 1°C in body temperature, two had been submitted to general anesthesia for laparoscopic cholecystectomy and umbilical hernioplasty.

The main nursing care applied during this period was the infusion of heated intravenous solution and the use of a cotton surgical drapes. (Table 4).

Immediately after surgery

After the end of surgery, the patients' vital signs were recorded, and the predominance of hypothermia was identified in most patients (16; 84%) (Table 5).

The variation of body temperature between the surgical procedure and immediately after the surgery was 0 to 2.8°C. The biggest alteration was presented by a patient who underwent umbilical herniorrhaphy under spinal anesthesia.

In this period, the type of nursing care used for body temperature maintenance was the active cutaneous method with intravenous solution infusion and the passive cutaneous method with the use of cotton sheets, used with all patients (19, 100, 0%). Only one patient had their lower limbs wrapped with orthopedic cotton.

DISCUSSION

In this study, we sought to identify nursing care in relation to maintaining body temperature during the intraoperative period and immediately before the surgical procedure.

Table 2. Vital signs of patients in the preoperative period.

Vital signs				n (%)
Blood pressure	Normotensive			8 (42.1)
	Hypertensive			5 (26.3)
	Stage 1	Stage 2	Stage3	
	04	1	0	
	Hypotensive			4 (21.5)
	Unidentified			2 (10.5)
Heart rate	Normocardic			13 (68.4)
	Tachycardic			0 (00.0)
	Bradicardic			5 (26.3)
	Unidentified			1 (5.2)
Respiratory rate	Normal			13 (68.4)
	Tachypneic			6 (31.5)
	Bradypnea			0 (00.0)
	Unidentified			0 (00.0)
Axillary temperature	Normothermic			13 (68.4)
	Hyperthermic			0 (00.0)
	Hypothermic			6 (31.5)
	Mild	Moderate	Severe	
	6	0	0	
	Unidentified			0 (00,0)

Table 3. Patients' body temperature during the surgical procedure.

Temperatura	n (%)
Normothermic	13 (68.4)
Hyperthermic	0 (00.0)
Mild hypothermia	3 (15.7)
Moderate hyperthermia	2 (10.5)
Severe Hypothermia	0 (00.0)
Unidentifed	1 (5.2)

Table 4. Nursing care to maintain body temperature during the intraoperative period, during the procedure.

Nursing care	n (%)
Active methods	
Infusion of heated introvenous fluids	19 (100.0)
Infusion of heated solution by cavity wash	1 (5.0)
Passive methods	
Cotton surgical drapes	14 (74.0)
Surgical drapes + cotton sheets	2 (11.0)
Wrapping lower limbs with orthopedic cotton + cotton surgical drapes	3 (16.0)

According to the results presented, before the surgery, while in the preparation room, all the patients received heated fluids via intravenous route and were covered with cotton sheets. The heating of the patient prior to anesthetic induction is important for the redistribution of body temperature throughout the surgical procedure, since it increases the body temperature in the peripheral regions and also causes vasodilation[7]. Studies show that, for the period prior to surgery, the most effective heating system is forced air[2,7,8], however, the effectiveness of preheating may be influenced by external factors, such as the low temperature of the environment, which is applicable to this study, as well as metabolic factors.

During the surgical procedure, the temperature of the OR, the type of surgery, the anesthetic agents, as well as the care provided may influence hypothermia development[2,5]. Regarding the environment, the mean OR temperature was 21.1°C, which is below the recommended value (24°C) for the maintenance of patient body temperature[2].

On average, the length of surgery found in this study was 113 minutes and the most performed surgery was cholecystectomy (26.3%). This type of surgical procedure is considered a type II surgery, lasting between two and four hours[9] and, therefore, has an average risk of presenting post-surgical complications, such as hypothermia.

Table 5. Vital signs of patients immediately after surgery.

Vital signs				n (%)
Blood pressure	Normotensive			4 (21.5)
	Hypertensive			2 (10.5)
	Stage 1	Stage 2	Stage 3	
	2	0	0	
	Hypotensive			11 (57.8)
	Unidentified			2 (10.5)
Heart rate	Normocardic			11 (57.8)
	Tachycardic			0 (00.0)
	Bradycardic			8 (42.1)
	Unidentified			0 (00.0)
Respiratory rate	Normal			13 (68.4)
	Tachypneic			5 (26.3)
	Bradypnea			0 (00.0)
	Unidentified			1 (5.2)
Axillary temperature	Normothermic			3 (15.7)
	Hyperthermic			0 (00.0)
	Hypothermic			16 (84.2)
	Mild	Moderate	Severe	
	13	3	0	
	Unidentifed			0 (00.0)

Although it was not possible to perform more robust statistical analyzes that related the variables of interest such as OR temperature, type of surgery and anesthesia, age and BMI, with the change in body temperature, the factors presented in this study contribute to the decrease in temperature, which may have influenced the results.

During the anesthetic-surgical procedure, ten patients had a decrease in body temperature. The main nursing care provided at that time was the infusion of heated intravenous fluids and the use of cotton surgical drapes. Studies have shown that only forced air intraoperatively managed to warm the patient and maintain body temperature[7,10,11] and therefore seems to be an important method in the prevention of unintentional hypothermia.

The emergence of new technologies which prevent hypothermia started in the 1990s.

However, it is still common to find the OD using traditional methods of cutaneous heating, such as in the hospital studied. As found in this study, authors report that the main method used to warm the patient was the passive method, with the use of cotton sheets[12]. The authors recommend the implementation of protocols aimed at patient safety, based on scientific evidence[12.]

In this study, all patients presented alterated body temperatures, comparing the first measurement, in the preoperative period, with the last evaluation, immediately after surgery. Only three patients remained normothermic at the end of the procedure. The most used nursing care in this period were the same ones applied in the preoperative period: heated intravenous fluid (100.0%) and cotton sheets (100.0%).

Studies have shown that the active heating method, such as heated intravenous fluids, is more efficient for skin warming than passive methods such as cotton sheets or drapes[7,13,14].

However, the active method of heated fluid infusion should be completmentary to hypothermia prevention and should not be the only means of preventing hypothermia. It is recommended to use passive methods, such as sheets and limb wrapping, and active methods, such as cutaneous heating and infusion of heated fluids[12,14].

In addition to the care required to avoid hypothermia, nursing plays an important role in identifying patients with other risk factors, such as advanced age, BMI, surgery time and type of anesthesia[15]. In this study, 4 patients were children, aged between 3 and 4 years, and 4 patients were elderly, over

60 years. Age is a risk factor for the development of hypothermia, especially for children and the elderly, due to the physiology of the thermoregulatory system[3,15]. These risk factors should be evaluated by the team in order to ensure a safe surgical procedure and maximum patient recovery.

As limitations of the study, we can consider that it was not possible to calculate the preheating time before the surgical procedure. Preheating time between 30 and 60 minutes is an important peice of information for the analysis of the maintenance of body temperature in the intraoperative period[7]. Moreover, the small sample of professionals and operated patients prevented more robust analyzes of the data, not allowing generalization.

CONCLUSION

The main heating methods used in the 19 procedures analyzed in this study were the infusion of heated fluids and the use of cotton sheets, however they were not enough to prevent hypothermia. As an active heating method, in addition to infusion of fluids, the use of other technologies available in the market is recommended.

According to the results, nursing professionals need to perform more effective planning of surgical patient care, aimed at the prevention of unintentional hypothermia, incorporating new technologies and protocols based on evidence, in order to guarantee patient safety in the anesthetic-surgical procedure.

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SURGICAL COUNT AND PATIENT SAFETY IN THE PERSPECTIVE OF THE OPERATING ROOM CIRCULATING NURSE

Contagem cirúrgica e segurança do paciente na perspectiva do circulante de sala operatória

Conteo quirúrgico y seguridad del paciente en perspectiva del circulante de quirófano

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ABSTRACT: Objective: To investigate the perspective of the operating room circulating nurse on surgical count for patient safety. **Method:** Qualitative exploratory study, performed at the surgical center of a large hospital in the Northeast of Brazil, between January and March 2018. We carried out a Content Analysis of the interviews conducted with 11 operating room circulating nurses using theoretical saturation. **Results:** The responses were organized in two thematic categories – "Surgical count for patient safety" and "Flaws in the surgical count protocol" –, revealing the need to invest in practice change, as most interviewees understood or acknowledged the importance of surgical count for patients. **Conclusion:** The relevance of surgical count is empirically recognized and must be strengthened through actions that guarantee the understanding of the extent and impact of this practice on patient safety.
Keywords: Perioperative nursing. Patient safety. Nursing research. Nursing care.

RESUMO: Objetivo: Investigar a perspectiva do circulante de sala operatória sobre a contagem cirúrgica para a segurança dos pacientes. **Método:** Estudo exploratório, qualitativo, realizado em um centro cirúrgico de um hospital de grande porte do Nordeste do Brasil, entre janeiro e março de 2018. Foi realizada Análise de Conteúdo das entrevistas realizadas com 11 circulantes de sala operatória por saturação teórica. **Resultados:** As falas foram organizadas em duas categorias temáticas — "Contagem cirúrgica para a segurança do paciente" e "Falhas no protocolo de contagem cirúrgica" — , revelando que a mudança da prática deve ser investida, visto que a maioria entende ou reconhece a importância da contagem cirúrgica para os pacientes. **Conclusão:** Há o reconhecimento empírico da relevância da contagem cirúrgica, devendo ser reforçada por meio de ações que garantam a compreensão da dimensão e a repercussão dessa prática na segurança dos pacientes.
Palavras-chave: Enfermagem perioperatória. Segurança do paciente. Pesquisa em enfermagem. Cuidados de enfermagem.

RESUMEN: Objetivo: Investigar la perspectiva del circulante de quirófano sobre el conteo quirúrgico para la seguridad de los pacientes. **Método:** Estudio exploratorio, cualitativo, realizado en un centro quirúrgico de un hospital de grande porte del Nordeste de Brasil, entre enero y marzo de 2018. Fue realizado Análisis de Contenido de las entrevistas realizadas con 11 circulantes de quirófano por saturación teórica. **Resultados:** Las conversas fueron organizadas en dos categorías temáticas — "Conteo quirúrgico para la seguridad del paciente" y "Fallas en el protocolo de conteo quirúrgico" —, revelando que el cambio de la práctica debe ser invertida, visto que la mayoría entiende o reconoce la importancia del conteo quirúrgico para los pacientes. **Conclusión:** Hay el reconocimiento empírico de la relevancia del conteo quirúrgico, debiendo ser reforzada por medio de acciones que garanticen la comprensión de la dimensión y la repercusión de esa práctica en la seguridad de ldos pacientes.
Palabras clave: Enfermería Perioperatoria. Seguridad del paciente. Investigación en enfermería. Atención de enfermería.

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INTRODUCTION

The process of counting the items used during surgery is often called surgical count. This practice is crucial to ensure that items such as instruments, sponges, and needles are not forgotten inside of patients[1]. They must be counted before closing the incision, as they can be accidentally disposed of in the trash or remain in the operative fields at the end of the procedure[2]. Despite being a rare event, forgetting sponges and instruments at the end of the surgery is an adverse event with severe implications[2].

The World Health Organization (WHO) recommends that, during the implementation of the Surgical Safety Checklist, in the Time out phase, the whole team confirms if the count of items is correct, and, if it is not, they must review the count and check trash cans and hampers[3]. WHO elected Surgical Count as the Objective 7 for Safe Surgery worldwide[4].

The circulating nurse, a specialized nursing technician (NT) that stays in the room during the whole intraoperative period, is responsible for recording the events and materials used in the surgery and is essential for the implementation of patient safety protocols in the surgical center.

Considering the importance of this professional for patient safety, this study aimed to answer the following question: "What is the perspective of circulating nurses on surgical count for patient safety?"

OBJECTIVE

To investigate the perspective of operating room circulating nurses on surgical count for patient safety.

METHOD

This is a qualitative exploratory study, performed at the surgical center (SC) of a large university hospital in the Northeast of Brazil, between January and March 2018.

The SC used for this study has 14 surgical specialties in ten operating rooms (ORs), including highly complex (cardiac, thoracic, neurological, and transplants), elective, and urgent surgeries. Small and ambulatory surgeries are performed in another SC at the same hospital. During service, there was no standardized routine to count needles, but a Standard Operating Procedure (SOP) was being implemented. Even though the institution has a notification system for adverse events (AE), counts that do not match are rarely notified.

The surgical count protocol of the hospital where the study was conducted includes measures that must be taken to prevent the Retention of Surgical Items and is the result of a project that implemented evidence-based nursing care called "Surgical count in open surgeries: a project to implement evidence-based best practices." This project was developed in the Brazilian Center for Evidence-based Healthcare: Joanna Briggs Institute Center of Excellence, at the Nursing School of Universidade de São Paulo (EEUSP), designed to be used in the service of the study site. The research preceded the implementation of the evidence-based protocol in SC.

The study was based on interviews with the following guiding question: "What is the importance of surgical count protocols for patient safety?".

The research included nursing technicians who worked as OR circulating nurses on the data collection period for at least six months and only during the day shift, given that the unit does not perform elective surgeries on the night shift, just the occasional urgent surgery.

The sample of technicians was intentional, and we estimated the number of interviewees using the theoretical saturation method[5]. Interviews were transcribed in full and read exhaustively to identify units of analysis in the responses; statement themes and types were compiled for each one of them, combined in pre-categories, and distributed in a table as new units of analysis were found[5]. Saturation occurred when the interviews showed no new units of analysis[5]. This table enabled us to determine the saturation or repetition of data after 11 interviews (Table 1).

After identifying the theoretical saturation, we conducted the Content Analysis proposed by Bardin[6,7]. Researchers performed the final categorization of responses based on the stages of pre-analysis, material exploration, and treatment of results, grouping data by semantic content similarity. The previous process of identifying theoretical saturation facilitated this analysis[5,6].

The first stage of the analysis consisted of formulating a reproducible study protocol and elaborating a guiding question and secondary ones of easy comprehension for the participants. The second stage – development – comprised the identification of theoretical saturation. The interviews

were conducted ethically and respectfully, based on interviewer-interviewee interaction. Since the first approach, each participant knew all ethical aspects involved, that they would remain anonymous, and that their answers would not be submitted to their managers as a form of evaluation. Interviews were recorded and transcribed in the same week. The third stage - assessment of results – used the researcher triangulation technique, conducted in this study with two researchers present at the time of interview and a different transcriber. Respondents revised the transcriptions, which represented an important step in validating the content collected. Subsequently, the two researchers who conducted the interview reviewed the content collected and categorization[8].

Circulating nurses were approached for the interview outside surgery time, after they finished the day procedures, to not disturb their work. Responses were identified by the letter "E" followed by a number drawn by the respondents, which did not reflect the order of interviews (E1, E2, E3, and so on). This research complied with the principles of Resolution No. 466/2012 of the National Health Council. Data collection started only after consideration and approval by the Research Ethics Committee of the institution (Report No. 2,430.629/2017, CAAE: 79740517.10000.5208).

RESULTS

We interviewed 11 OR circulating nurses, four males and seven females. Their mean age was 35.08±9.3 years; they had an average of 10.03±4.21 years of SC experience and 3.89±6.23 years working in the SC of the study site. Five technicians had degrees in Nursing and one in another area. Only three of them worked on other services at the time of data collection. No technician reported having attended any continuing education course in SC nursing or patient safety in the past two years besides the training provided by the institution, and only three declared having participated in events in the area during this period.

Table 1 shows the theoretical saturation of interviews that contributed to delimit the sample.

We present the responses below in two thematic categories: "Surgical count for patient safety" and "Flaws in the surgical count protocol."

Surgical count for patient safety

At first, one of the factors that stands out is the lack of knowledge about surgical count. Most interviewees mentioned only the count of sponges: *"It's the process of counting sponges"* (E1); *"It's counting instruments at the end of the surgery to know if any of them are missing"* (E5); *"It's when we count to see if no sponges were left inside the patient"* (E10).

Only two circulating nurses included the count of sharp objects in the process: *"I think we're supposed to count everything that we put on the table: sponges, gauzes, sharp objects, instruments, everything"* (E4); *"To me, we're supposed to count everything we put on the field, and that can be left inside the patient: sponges, needles, blades, clamps, everything"* (E8).

Regarding the importance and purpose of the count, most interviewees seem to understand the relevance that should be attributed to the process due to the AE effect it can cause: *"It's very important this thing of counting everything we use on the patient, so we don't forget anything inside"* (E11); *"We have to count everything, because a sponge left inside is already a big*

Table 1. Report on the theoretical saturation of interviews. Recife (PE), Brazil, 2018.

Statements about surgical count	Interviewee											Recurrence
	1	2	3	4	5	6	7	8	9	10	11	
Unawareness of sharp objects being counted	X	X	X		X	X	X		X	X	X	9
Identification of only sponges being counted	X	X	X		X	X	X		X	X	X	9
Technician's role in the count	X			X	X	X			X		X	6
Responsibility of the scrub nurse	X	X	X		X	X	X	X	X	X	X	10
Purpose of the count	X	X	X	X	X	X	X	X	X		X	10
Importance of the count	X		X	X		X	X	X	X		X	8
Flaws in the count	X	X	X	X	X	X	X	X	X	X	X	11
Need for involvement of the team	X	X	X		X	X	X	X	X	X	X	10

problem, imagine a clamp?" (E9); *"People don't care much about this because it is rare to forget, but they have to understand that if it happens, the damage is huge"* (E10); *"Imagine the mess: you start to feel pain, a pain that nobody knows what it is and it ends up being a sponge or a mosquito* [Halsted forceps] *that someone forgot inside you*?" (E1).

Flaws in the surgical count protocol

The retention of items at the end of the surgery appeared in some responses as an aspect perhaps more common than documented: *"I've seen people forgetting sponges. I've seen it about three times"* (E2); *"I saw a sponge that people had to open to remove after years. I've never seen an instrument, but I've heard stories"* (E3);

> *I've many years of surgical center. I've seen everything. The worst thing is that when they remove the sponge left inside, which is rotten, they say that it was a surgery to remove a foreign body, they don't say what it was not to compromise the team that did the surgery and forgot it there* (E7).

Responses also included near miss AEs, when circulating nurses identified situations in which the count did not match and, in a review of the field, the missing item was found:

> *He* [the resident doctor working on instrumentation] *insisted with me that the problem was mine, that I hadn't counted right, and that the missing sponge was in the trash. I stood my ground and said that it was inside the patient. The surgeon asked him to look all over again in front of him. In the end, it was there, full of blood. They were going to close it, and the sponge would stay there, but I insisted, I was sure!* (E7).
>
> *When they began to close the surgery site, I said that it was missing. They said it was my count that was wrong and that there was nothing there, that they were sure there wasn't anything left inside. I was firm with them. I said that I had counted correctly and would write it on the nursing and medical records. They scowled, but checked anyway, opened a few stitches, stuck a hand inside, and found it. It was so red that no one would have seen it there in the back. I stayed silent. I didn't need to say anything. Later, one of them came to thank me. The others remained silent* (E8).

Circulating nurses declared that the scrub nurse was responsible for the counting process, not them, but admitted that the entire team should be involved: *"I don't think it's my responsibility, the person in instrumentation is responsible. The person in instrumentation is the one who has to count things"* (E1); *"I think that it's the person in instrumentation who has to count everything, you know? It's not us. We just write everything down to see if it matches later. How am I supposed to see if there was anything left inside?"* (E2);

"I think everyone is responsible. Because I, who am out of the field, write down everything that I put on the table. The scrub nurse needs to be organized and separate everything correctly. And the surgeon has to look inside the cavity. If everyone does their work, the patients reap the benefits, because nobody is going to forget anything inside them" (E5).

Possible causes of flaws in the counting process came up gradually over the discourse of all circulating nurses: *"I believe the problem is that some surgeons, in 2018, still have the nerve to say that we don't need to count sponges!"* (E3); *"To me, we don't count everything we should because nothing happens, ever, when someone forgets something inside. If it did, everyone would care"* (E8);

> *"It's very hard to write everything down and count correctly when the team rushes to finish and pester us to get things done faster. Sometimes, they start the surgery without even waiting for us to empty the trash! It's hard to work like this"* (E9).
>
> *"A lot of people don't care. I'm not talking about surgeons only, but other circulating nurses as well. Some people think it's all right not to count because it's less work, but it's worse for the patient, and we have to do it, it's not to please anyone, it's for the patient because it could have been our mother or child in there"* (E10).

Lastly, only two technicians identified surgical count as a protocol to prevent accidents for the professionals involved:

> *"I think that we have to count everything, and sharp objects are the least counted and the most important for us. Because if the scrub nurse separated everything correctly and we counted to ensure they are all in there, there would be less chance of us being pierced while removing dirty instruments at the end of surgery"* (E11).
>
> *Once, a colleague was pierced while removing the instruments. The scrub nurse said he had placed all sharp objects on a small basin, but he hadn't, one was*

out, and she hadn't seen it. If they had counted, they'd know that there was one missing in the basin, precisely the one that pierced her!" (E8).

DISCUSSION

The responses indicate that professionals and health institutions should invest in practice change, as most of them understand or recognize the importance of surgical count for patients. In their responses, circulating nurses showed no concern for the financial aspect involved, given that many instruments can be lost in the fields or the trash if not counted. Most of them expressed, in some way, concern and understanding that surgical count is important for patient safety.

Currently, the manual count is predominant, and some studies reveal that needles are the least counted item[9-12]. Circulating nurses identified risk in removing sharp objects from the operative field and that counting them could prevent accidents. Professionals did not report knowing alternatives to the manual count in their interviews, but several centers use bar codes to count instruments[9-12].

Standardized procedures to prevent the Retention of Surgical Items (RSI) involve at least two moments and two professionals. Two members of the surgical team, one inside the operative field and one outside, count the items immediately after they are placed on the sterile field and count them again at the end of surgery before the patient leaves the OR[1]. If the count at the end does not match the one of items provided, the team cannot ensure patient safety and must take an x-ray as soon as possible[9,12-15]. Every discrepant count should be settled before the patient leaves the OR[1,4,9,10]. Circulating nurses must understand the importance of their role not only in recording the items provided in the operative field but also in drawing the attention of the team for the count. More than one person, besides the circulating nurse, should do the recount and the nurse must be present to participate, writing down the count that does not match as an AE and taking safety measures for the patient[1].

No interviewee mentioned the WHO objectives for safe surgeries, evidence, or references that justify the practice, only an empirical knowledge and ethical reflection on the impact of the retention of surgical items.

The Joanna Briggs Institute (JBI), an Australian institution committed to producing, disseminating, and implementing evidence-based clinical practice worldwide, has organized the best practices in surgical count for OR. In a recent evidence summary based on systematic literature reviews and evidence, JBI included results from well-designed studies to be considered as a high level of evidence, indicating the best practices recommended in the topic Operating Room: Surgical Counts[1].

The document reveals the persistence of RSI and surgical count errors, leading to a high priority in developing more effective standardized count procedures. Automated processes to count and use sponges marked in surgery show strong evidence of a decrease in count errors and RSI. JBI reinforces the need to introduce a new practice, protocol, or technology followed by good training[1].

Circulating nurses did not mention the possibility of using x-rays to prevent RSI. Routine X-rays in the intraoperative period of high-risk surgeries can be a useful measuring instrument to reduce the incidence of RSI[1,4,9,12,14].

The multidisciplinary approach of the surgical team should emphasize the responsibility of preventing RSI. Training of the surgical team, standardized surgical count, formal review of all stages when the count does not match at the end, and an organizational policy to prevent RSI are some initiatives recommended to reduce the number of discrepant counts[1,2,4,9,10,12,16-19]. The surgical team must understand and respect the time to prepare the OR and to implement the security protocol correctly[1,10,16-19].

FINAL CONSIDERATIONS

The study showed that circulating nurses recognize the importance of surgical count. However, we identified the need to strengthen the protocol with permanent and continuing education actions so the professionals can understand the extent and impact of this practice on patient safety.

Investments in the permanent training of the entire surgical team are necessary, with systematic evaluation and monitoring of the criteria used – through an audit –, according to the recommendation of scientific evidence-based best practices.

A limitation of the study was assessing the reality of only one center and not investigating factors related to the lack of knowledge and other barriers that contribute to the non-compliance with the criteria described in the literature on the best evidence about the theme. Further studies should validate strategies to implement best practices in surgical count that stimulate the adherence of all surgical team.

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INTENSIVE CARE PATIENTS IN THE POST-ANESTHESIA CARE UNIT: DIFFICULTIES IN NURSING CARE

Pacientes intensivos na recuperação pós-anestésica: dificuldades na assistência de enfermagem

Pacientes intensivos em la recuperación posanestésica: dificultades en la asistencia de enfermería

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ABSTRACT: Objective: To describe the difficulties of the nursing team in relation to intensive patient care in the Post Anesthesia Care Unit (PACU). **Method:** An exploratory, descriptive study was carried out through the application of a questionnaire, with 40 nursing professionals who work in the PACU of a public hospital in Rio Grande do Sul. **Results:** Intensive care patients are frequently admitted to the unit and the team's greatest difficulties are related to the delay in medical and multiprofessional care, the presence of family members in emergency situations, and the supply and handling of equipment such as respirators and infusion pumps. As for the actual care, the greatest difficulties are the performance of pressure injury prevention measures and the completion of the patient records. **Conclusion:** It is important to emphasize the need to adapt the nursing staff in each shift according to the number and classification of the patients, as well as the presence of the nurse and the intensive care physician 24 hours a day in order to provide quality care to the intensive care patient admitted to the PACU.
Keywords: Recovery room. Period of anesthesia recovery. Nursing in recovery room. Perioperative nursing. Intensive care.

RESUMO: Objetivo: Descrever as dificuldades da equipe de enfermagem na assistência ao paciente intensivo na Recuperação Pós-Anestésica (RPA). **Método:** Estudo exploratório, descritivo, realizado com 40 profissionais de enfermagem que atuam na RPA de um hospital público no Rio Grande do Sul, por meio da aplicação de um questionário. **Resultados:** É frequente a admissão de pacientes intensivos no setor, e as maiores dificuldades da equipe estão relacionadas à demora do atendimento médico e multiprofissional, presença de familiares em situações de emergência e oferta e manuseio dos equipamentos, como respiradores e bombas de infusão. Quanto à assistência propriamente dita, as maiores dificuldades são a realização de medidas de prevenção de lesão por pressão e o preenchimento dos registros. **Conclusão:** Ressalta-se a necessidade de adequação no dimensionamento da equipe de enfermagem em cada plantão, segundo a quantidade e a classificação dos pacientes no período, bem como a presença exclusiva do enfermeiro e do médico intensivista 24h/dia, sendo todos os colaboradores habilitados para oferecer assistência de qualidade ao paciente intensivo admitido na RPA.
Palavras-chave: Sala de recuperação. Período de recuperação da anestesia. Enfermagem em sala de recuperação. Enfermagem perioperatória. Cuidados intensivos.

RESUMEN: Objetivo: Describir las dificultades del equipo de enfermería en la asistencia al paciente intensivo en la Recuperación Post-Anestésica (RPA). **Método:** Estudio exploratorio, descriptivo, realizado con 40 profesionales de enfermería que actúan en la RPA de un hospital público en Rio Grande do Sul, a través de la aplicación de un cuestionario. **Resultados:** Es frecuente la admisión de pacientes intensivos en el sector, y las mayores dificultades del equipo están relacionadas a la demora de la atención médica y multiprofesional, presencia de familiares en situaciones de emergencia y oferta y manejo de los equipos, como respiradores y bombas de infusión. En cuanto a la asistencia propiamente dicha, las mayores dificultades son la realización de medidas de prevención de lesión por presión y el llenado de los registros. **Conclusión:** Se resalta la necesidad de adecuación en el dimensionamiento del equipo de enfermería en cada turno, según la cantidad y la clasificación de los pacientes en el período, así como la presencia exclusiva del enfermero y del médico intensivista 24h/día, siendo todos los colaboradores habilitados para ofrecer asistencia de calidad al paciente intensivo admitido en la RPA.
Palabras clave: Sala de recuperación. Periodo de recuperación de la anestesia. Enfermería posanestésica. Enfermería perioperatoria. Cuidados críticos.

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INTRODUCTION

The Post Anesthesia Care Unit (PACU) has become an increasingly frequent alternative for the admission and and treatment of critical surgical patients due to bed unavailability in the Intensive Care Unit (ICU)[1-3].

At its core, PACU is related to the care of patients classified as requiring intermediate and semi-intensive care. Therefore, the admission of critical patients to the unit raises the question of how to guarantee care for this category of patient in a clinical perspective, focused not only on recovering the effects of the anesthetic-surgical act, but also on comprehensive care, in order to provide safe care[3].

Although scare, literature on the subject indicates that the intensive patient care in the PACU requires the adjustment of the unit with respect to the environment, the materials and equipment used, and especially the complexity of the care provided to this patient, which include ventilatory support, invasive monitoring, administration of medications via infusion pumps and enteral diets, as well as patient hygiene, which are not part of the daily routine of the unit[1,2].

Understanding that the situational diagnosis is a fundamental step for the implantation of interventions and the establishment of a more favorable environment for the practice of nursing care[4], it is questioned: do the nurses who work in the PCU have difficulties in relation to caring for the intensive care patient?

Thus, learning about the daily practice of nursing care for the intensive care patient in the PACU is relevant so that the difficulties involved in the care process are perceived and actions are implemented that promote safe and humanized care.

OBJECTIVE

To describe the difficulties of the nursing team related to the intensive care patient in the PACU.

METHOD

An exploratory, descriptive study with a quantitative approach, performed in a medium-sized public hospital with 264 beds, a reference for the care of polytrauma patients in Rio Grande do Sul, and an ICU with 29 beds.

The operating room department has seven operating rooms (ORD), where an average of 525 surgeries per month are performed in the specialties of Neurosurgery, General Surgery, Traumatology, Plastic Surgery, Vascular Surgery and Buccomaxilar Surgery.

The PACU has 12 available beds for non-critical patients during the immediate post-operative period (IPO), as well as intensive care patients in the IPO period, who are waiting for available beds in the ICU. Based on the institution's database, 22,333 patients were admitted to the PACU in the last five years (between July 2012 and July 2017), of which 717 (3.2%) were patients who required intensive care.

The participants of this research were members of the nursing team. The inclusion criteria were: to be an actively working nurse or nurse technician in the PACU during the morning, afternoon and evening shifts and to accept to participate in the research by signing an Informed Consent Form (ICF).

The data collection took place in December 2017. A semi-structured questionnaire with 23 questions was used as a research instrument which was applied by the first researcher during working hours in the work environment, which upon completion, was returned to the same researcher, together with the ICF.

The research data were organized using an Excel spreadsheet and analyzed by means of descriptive statistics, using frequency and percentage tables and calculation of statistical measures, such as average and standard deviation, with presentation of the results in charts and tables.

This research was approved by the Research Ethics Committee of the institution under study, via *Plataforma Brasil,* under CAAE Nº 78636917.8.0000.553.

RESULTS

There was a total of 40 (100%), nursing professionals working in the PACU, 14 (35%) working in the morning period, 10 (25%) in the evening period, and eight (20%) in each night period.

Regarding the sociodemographic characterization, the majority were female, married, with children and aged

between 28 and 61 years (mean = 44.3 years / SD = 8.8 years). The details of the sociodemographic profile are presented in Table 1.

The participants of this research have worked in the institution for between 7 months and 38 years (mean = 14.6 years) and, have specifically worked in the RPA, for between 7 months and 22 years (mean = 8.8 years). Only six (15%) employees have another professional activity and have an average monthly family income of nine minimum wages.

The 40 (100%) participants in this study declare to appreciate the work in the PACU, and 37 (92.5%) claim to frequently provide care to intensive care patients in the unit.

Thus, 16 (40.0%) employees feel unprepared to care for the intensive care patient in their daily care routine; only 10 (25.0%) reported having received specific training for this type of care; and 38 (95.0%) would like to receive new training and refresher training in order to provide better critical patient care.

Table 1. Sociodemographic characterization of the nursing staff of the Post Anesthesia Recovery Unit.

Variable	N	%
Sex		
Female	32	80.0
Male	08	20.0
Age group (years)		
28–32	04	22.5
33–37	06	15.0
38–42	07	17.5
43–47	08	20.0
48–52	08	20.0
53–57	03	7.5
58–62	04	10.0
Marital status		
Married	27	67.5
Single	07	17.5
Divorced	05	12.5
Widow	01	2.5
Children		
Yes	28	70.0
No	12	30.0
Academic training		
Nurse technician	23	57.5
Nurse	17	42.5
Total	40	100.0

In order to provide quality care, 27 (67.5%) participants of the research stated that the current number of nursing professionals per shift is insufficient, and more nursing staff is necessary.

The difficulties listed by the subjects regading the different aspects of intensive patient care in the PACU are presented in Table 2.

At the end of the data collection, the participants were asked if they would like to make any suggestions for the improvement of care provided in the PACU. Twenty-five (62.5%) subjects gave one or more suggestions, such as: the presence of an intensive care physician in the PACU 24 hours a day, exclusively for the unit; adequate number of nursing professionals for the number of intensive care patients in a shift; the presence of the nurse exclusively for the care of the unit, preferably with ICU experience; technical training of PACU employees; and adequate supply of equipment in good working order.

DISCUSSION

The admission and care of the intensive care patient is a reality in the institution under study, which is line with a tendency increasingly more compatible with the Brazilian reality, which presents ICU bed deficits[1-3]. According to the database of the institution, 717 (3.2%) of the 22,333 patients admitted to the PACU in the last five years were intensive care patients.

In spite of admitting intensive patients to the unit, a considerable percentage of employees feel unprepared to provide this type of care. In addition to presenting organ system failure, which results in imminent emergency situations and constant alertness common to patients in the IPO period, the intensive care patient requires multiple invasive procedures[5], which causes a high level of stress to the PACU team.

In addition, one can mention the staffing of personnel working shifts where there is an intensive care patient next to patient in the IPO period in the unit. It is understood that the classification of patients is imperative in order to identify the staff required to care for users in their different levels of dependence[2,6].

Thus, The Brazilian Society of Surgical Center Nurses, Anesthesia Recovery, Sterilization and Center of Material

Table 2. Difficulties in care to the intensive care patient in the Post-Anesthesia Recovery Unit.

Type of care	Justification	Yes		No	
		N	%	N	%
Bed preparation and admission of intensive care patient	Have to go get equipment in the ICU; assemble respirators and infusion pumps.	13	32.5	27	67.5
Filling out forms of the unit	Insufficient space for intensive care patient records	19	47.5	21	52.5
Movement of the team in the PACU	Insufficient space between patients and equipment.	17	42.5	23	57.5
Availability of materials and equipment	Inadequate replacement of equipment; doesn´t always work well.	24	60.0	16	40.0
Bedbathing / intimate hygiene	Insufficient space between beds; insufficient staffing	10	25.0	30	75.0
Pressure injury prevention measures	Insufficient staffing and overwork.	22	55.0	18	45.0
Surgical wound dressings, drains, and catheters	No additional comments	13	32.5	27	67.5
Control of infusion and debits / fluid balance	Infusion pumps and uniformity are missing from the note routine.	14	35.0	26	65.0
Administration of enteral or parenteral diet	No additional comments	00	00	40	100
Administration of vasoactive drugs	Lack of standard in drug dilution.	15	37.5	25	62.5
Administration of blood components	No additional comments	00	00	40	100
Handling of respirators, infusion pumps and other equipment	Technical inability to use respirators; absence of physiotherapy service.	23	57.5	17	42.5
Care for patient in isolation	Existence of only one bed for insolation; there is no adequate ventilation in the unit.	13	32.5	27	67.5
Exit and transportation of the patient to perform exams	Time requried for exit and readmission; absence of a professional to accompany the transfer.	09	22.5	31	77.5
Patient care in cases of death	Psychological shock of employees and patients in the IPO period who witness the situation.	12	30.0	28	70.0
Daily visit of the intensivist doctor and / or surgeon in charge	Difficulty due to weekends / holidays.	40	100	00	00
Immediate medical care in emergency situations	Difficulty due to weekends / holidays.	40	100	00	00
Daily visit of the physiotherapist to the patient on mechanical ventilation	Difficulty due to weekends / holidays.	40	100	00	00
Periodic visit of nutritionist, occupational therapist or other professional	There is no such type of care in PACU.	40	100	00	00
Family visits	One relative / day is permitted to visit, which needs to be organized	15	37.5	25	62.5
Presence of family members in the PACU	There is high turnover of people in the unit; disrupts care in emergency situations.	30	75.0	10	25.0

ICU: Intensive Care Unit; PACU: Post Anesthesia Care Unit; IPOI: Immediate Post-operative.

Storage, in accordance with current legislation, recommends the presence of one nursing technician for each group of three patients and one care nurse for every eight beds of non- ventilator dependent patients or three to four critical patients, in the PACU.

It is important to emphasize that the presence of the intensive care patient is not a daily occurence in the institution, and the number of patients treated and their length of stay in the PACU is also inconsistent, which causes difficulties for the nurse in relation to the preparation of the daily care schedule.

Therefore, correct staffing of personnel is a vital resource to provide adequate nursing professionals, respect the level of patient dependency, ensure user-centered care and the creation of favorable practice environments[8].

A previous study performed in this institution which dealt with the occurrence of deaths in intensive care patients in the PACU, estimated the average length of stay of this patient in the unit as 14.8 hours (888 minutes)[9], which differs greatly from the time spent by a patient in the IPO period in a PACU bed - on average of 1.8 hours (111.2 minutes)[10]. Length of stay increases the quantity and nature of the care received by this patient, as well as directly impacting bed rotation, affecting the maximum surgical capacity and the generation of income for the institution[11].

Faced with this situation, the research participants highlighted their difficulties in different aspects of care in the unit, principally the intensive care physician, who must stay in the PACU at all times, due to the presence of intensive care patients in order to ensure immediate care in emergency situations, considering that units with critical patients require uninterrupted medical and nursing care[12].

This difficulty extends to other members of the multiprofessional team who need to care for the ICU patient temporarily located in the PACU, such as occupational therapists, nutritionists and physiotherapists, the latter being considered of great importance due to the need for respiratory physiotherapy in patients with orotracheal intubation and the use of mechanical ventilation equipment[1].

On the contrary, the subjects highlight the presence of relatives in the PACU during special visiting hours as a dificulty, an uncommon practice in the routine of the unit, which increases the turnover of people in a limited physical space and disrupts care, especially in emergency situations.

Another difficulty refers to the equipment used in intensive patient care, which begins in the location and proper functioning of respirators and infusion pumps and is aggravated by the inability of PACU nursing professionals to use them correctly, in addition to the lack of support from the physician and the physiotherapist for adequate respiratory parameters and the correct dilutions of vasoactive drugs.

The literature highlights that knowledge regarding the manipulation of these equipments and vasoactive drugs and their interactions, dosages and dilutions is characteristic of the intensive care nurse[3] and that the lack of these skills has resulted in a significant increase in the number of incidents associated with equipment use[5,13] , a situation that can be solved by training the nursing professionals in the PACU.

Writing patient record notes is added to the group of difficulties listed by the professionals, since the institution uses the PACU forms for intensive care patient records, which do not have enough space for the range of controls and neccesary annotations. This fact may compromise the quality of care in the PACU due to the lack of records and the possibility of increasing the risk of discontinuation of care[14].

It can be observed in the results of the study that the difficulties related directly to nursing care are lower than those related to multiprofessional care or to the use of specific equipment. However, although to a lesser extent, other difficulties were highlighted such the patient´s admission to the bed and its preparation, followed by their reception, monitoring and identification of clinical status after the shift as well as assembling the necessary equipment for the continuity of care, which is repeated every time the patient needs to leave the unit for examinations in another unit.

In addition to the time spent on bringing the patient to another unit and then readmitting the patient after the examination, a staff member should be made available to accompany this transfer, who must be prepared for prompt intervention in possible intercurrences and for the correct use of the patient monitoring equipment which must be in proper working conditions[15].

In addition to the team's difficulty in carrying out pressure injury prevention measures, already aggregated to the care provided in the PACU, but in a shorter time period of the patient's stay, due to the insufficient number of professionals involved in the care. It is understood that the bedridden and dependent patient becomes more vulnerable

to pressure injuries without adequate care and that it is the nurses responsibility to carry out strict pressure injury prevention measures [16].

Bedbathing is a difficulty for a small portion of the participants. This procedure, which is less complex, requires the collaboration of at least two employees, which puts pressures on the team involved in the care of intensive care patients and patients in IPO period simultaneously[1].

The presence of the intensive care patient changes the routine of the PACU, but when in isolation, the difficulties faced by a group of professionals are increased, since there is only one bed in the unit for this type of care and, in addition, its ventilation is inadequate, which causes risks to the team and to the other patients in the IPO period. Thus, patients are exposed to the cross-contamination of microorganisms, a complex situation that requires intervention from the Hospital Infection Control Service (HICS) regarding the bed management of the institution.

Death is the last difficulty listed by the team, which is a completely different situation to the reality of the PACU. Between July 2012 and July 2017, 30 deaths occured at the unit in the institution under study. This situation can cause a psychological shock to the nursing team, as well as to the other patients who are in IPO period and fully conscious, who witness the actions and the stress of the medical and nursing teams performing cardiopulmonary resuscitation, in addition to the procedures regarding body preparation[9].

In contrast to these data, the participants of this study highlight the administration of diets and blood components as the only aspects of intensive care in which they do not encounter difficulties.

Among the suggestions for improving intensive patient care in the PACU is the exclusive and coninuous presence of an intensive care physician and nurse, who must have ICU experience. In this context, the American Society of PeriAnesthesia Nurses (ASPAN)[17] approved recommendations that include the need for adequate staff to maintain safe and competent nursing care for critical and non-critical patients, and that nurses working in the PACU must obtain intensive care skills, which has already been a reality in another institution in São Paulo[3].

The importance of correct professional staffing is also highlighted, according to the number and classification of the patients in each shift, and the offer of training to the team, including the provision of adequate equipment in good working order.

The results obtained in this study are limited to a local observation. Therefore, they do not reproduce the national reality of the care provided by the nursing professionals working in PACU, and future studies are necessary to verify the existence of intensive care patient admission to the PACU in different regions of the country. Although local, these results can help to improve the management of the PACU units that provide treatment to intensive care patients, despite not being the appropriate scenario, favoring the development of adaptation strategies for the environment and the team in order to improve quality of care.

CONCLUSION

Despite the fact that it is not the ideal scenario, the admission of intensive care patients to the PACU of the institution under study is a reality. Although nursing care in the PACU is directed at patients who are hemodynamically unstable and susceptible to diverse intercurrences, the participants of this research highlighted difficulties in caring for intensive care patients in the unit.

The difficulties highlighted include, the flow of care provided by the intensive care and multiprofessional physician to this patient; the presence of family members in the unit, especially in emergency situations; and adequate supply and operation / use of equipment such as respirators and infusion pumps.

As for the care itself, the greatest difficulties are the implementation of measures to prevent pressure injuries, staffing issues, and the patient record forms of the unit, which do not have enough space to include patient record notes related to the intensive care activities.

There is a need for institutional adjustments reagarding the law of supply and demand of intensive care beds so that this situation does not become a rule, but an exception. Due to the need of this type of admission to the PACU adequate nursing staff in each shift is required, according to the number and classification of the patients, as well as the exclusive presence of a nurse and physician intensivist 24 hours a day, as well as all employees being able to provide quality care and safety to the intensive care patient.

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NURSE'S ROLE IN CLEANING PROCESS AT A MATERIAL AND STERILIZATION CENTER

Atuação do enfermeiro no processo de limpeza em um centro de material e esterilização

Función de la enfermera en el proceso de limpieza en un centro de materiales y esterilización

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ABSTRACT: Objective: To examine the role of nurses in the process of cleaning hospital materials in the Material and Sterilization Center. **Method:** Experience report that emerged from the activities developed in the discipline "Supervised Practice in Material and Sterilization Center", Lato Sensu Postgraduate Course "Nursing in Surgical Center, Post-Anesthesia Recovery and Material and Sterilization Center" of a private university in Rio Grande do Sul. **Results:** The nurse's role in the cleaning process occurs in response to the needs of the sector, such as training the team, promoting the use of personal protective equipment, participating in the acquisition of equipment and supplies, certifying cleaning methods, understanding the complexity of surgical instruments, participating in water quality control and rinsing, drying, lubrication and inspection of materials, and chosing the indicators to verify the quality of the processes, according to current law. **Conclusion:** This study provided an insight into the responsibilities inherent to the nurse's work in the Material and Sterilization Center, which reflects the safety of the patient.
Keywords: Nurses. Nurse's role. Sterilization. Materials management, hospital.

RESUMO: Objetivo: Contextualizar a atuação do enfermeiro no processo de limpeza de materiais hospitalares em um Centro de Material e Esterilização. **Método:** Relato de experiência que emergiu das atividades desenvolvidas na disciplina "Prática Supervisionada em CME", do Curso de Pós-Graduação *Lato Sensu* "Enfermagem em Centro Cirúrgico, Recuperação Pós-Anestésica e Centro de Material e Esterilização" de uma universidade privada no Rio Grande do Sul. **Resultados:** A atuação do enfermeiro no processo de limpeza ocorre frente às necessidades do setor, tais como qualificar a equipe; estimular o uso dos equipamentos de proteção individual; participar da aquisição de equipamentos e insumos; qualificar o método de limpeza; conhecer a complexidade do instrumental cirúrgico; participar do controle de qualidade da água, do enxágue, da secagem, da lubrificação e da inspeção dos materiais; e escolher os indicadores para comprovar a qualidade dos processos, conforme as legislações vigentes. **Conclusão:** Este estudo proporcionou ampliar conhecimentos sobre as responsabilidades inerentes à atuação do enfermeiro no Centro de Material e Esterilização, o que reflete em segurança para o paciente.
Palavras-chave: Enfermeiros. Papel do profissional de enfermagem. Esterilização. Administração de materiais no hospital.

RESUMEN: Objetivo: Examinar el papel de las enfermeras en el proceso de limpieza de los materiales del hospital en el Centro de Materiales y Esterilización. **Método:** Informe de la experiencia que surgió de las actividades desarrolladas en la disciplina "Práctica Supervisada en el Centro de Materiales y Esterilización", Lato Sensu Curso de Postgrado "Centro de Enfermería en Cirugía, Recuperación Post-Anestesia y Centro de Materiales y Esterilización" de una universidad privada en Rio Grande do Sul. **Resultados:** El papel de la enfermera en el proceso de limpieza ocurre en respuesta a las necesidades del sector, como capacitar al equipo, promover el uso de equipos de protección personal, participar en la adquisición de equipos y suministros, certificar métodos de limpieza, comprender la complejidad de Instrumentos quirúrgicos, participando en el control de calidad del agua y enjuague, secado, lubricación e inspección de materiales, y seleccionando los indicadores para verificar la calidad de los procesos, de acuerdo con la legislación vigente. **Conclusión:** este estudio proporcionó una perspectiva de las responsabilidades inherentes al trabajo de enfermeros en el Centro de Material y Esterilización, que refleja la seguridad del paciente.
Palabras clave: Enfermeros. Rol de la enfermera. Esterilización. Administración de materiales de hospital.

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INTRODUCTION

The Material and Sterilization Center (MSC) is concerned with the processing of health care products (HCP), with sufficient quality and quantity for patient care and safety. It is the sector responsible for the cleaning, inspection, packaging, sterilization, storage and distribution of HCP to the consumer units[1].

The MSC, classified as level II and according to the complexity of the materials it processes, calls for the separation of the reception and cleaning area from the others[2]. With the purpose of making surgical procedures less invasive and traumatic, the design of surgical instruments has evolved over time, making them more complex. Thus, there is a need for a critical cleaning process that produces reliable results and optimization of the work processes[3], since the effectiveness of the disinfection or sterilization process requires that HCP be subjected to a methodical cleaning process, either manual or automated, to ensure the removal of organic and inorganic contaminants.

In the MSC, the nurse is responsible for coordinating the team and activities developed, evaluating and participating in the cleaning process steps, shaping the staff, contributing to the prevention and control of adverse events, guiding the service users, implementing good practices for the processing of HCP, and standardizing the use of products, materials and equipment. He/she also works in conjunction with infection control, to plan and validate the phases of the processing of instruments and materials, leading to a reduction in the rates of infection related to health care (IRHC) [1].

The responsibilities of nurses in the MSC are often unknown in the eyes of professionals who work in different sectors of health care institutions and who fail to recognize this reality.

OBJECTIVE

To report the experience of the nurse's role in the cleaning process in a hospital MSC class II of a private hospital in the rural region of Rio Grande do Sul, Brazil .

METHOD

This was a descriptive, narrative study of the experience report type, where the purpose to describe the work carried out by the nurse in an MSC class II, according to the Resolution of the Collegiate Board (RDC) No. 15/20122. This experience report dealt with a scientific and methodological production that reflects the description of professional experiences that contribute to the area of teaching, research, care and extension[4].

The study site was in a medium-sized private hospital, located in the northwest region of the state of Rio Grande do Sul, which has 112 beds and performs on average 380 surgeries per month and sterilizes around 22,166 items monthly, considering the demand for hospital admissions and surgical procedures.

This study developed from the interests of the discipline "Supervised Practice in MSC" of the Lato Sensu Postgraduate Course "Nursing in Surgical Center, Post-Anesthesia Recovery and Material and Sterilization Center," at a private university in the state of Rio Grande do Sul, whose agenda addresses the possibility of postgraduate students experiencing the activities in an MSC. The discipline "Supervised Practice in MSC" has a 20-hour workload and aims to combine theory and practice. It should be emphasized that the activities proposed by the discipline go from management actions in nursing to care measures, and that the interfaces of these educational practices are presented in this report.

Because it was an experience report, there was no need to use an informed consent form. However, prior permission from the hospital's management was requested to perform the curricular training. In addition, no data will be released that make it possible to identify the hospital or the professionals who work there, as recommended by Resolution No. 466/2012 of the National Health Council (CNS).

RESULTS

The MSC where the training was carried out has a team of 15 nursing technicians, where the size of the team was based on the size of the hospital. A nurse was part of this team, and he/she performed his/her activities exclusively in this sector. This professional followed the activities carried out by the nursing team, to conduct training in the appropriate practices, while guiding other professionals about care in the transportation and storage of materials after use.

The nurse responsible for the MSC in question participated in periodic meetings of the Hospital Infection Control Service (SCIH) and was involved in the planning and validation

of processes related to HCP and in the analysis of the quality of the water used in rinsing. This nurse was also a part of the Multiprofessional Committee for the Processing of Materials and Equipment.

Emphasis was placed on the nurse's incentive to conscientiously use personal protective equipment (PPE) in the cleaning area for the prevention of occupational accidents. Meanwhile, the nurse standardized the following as PPE: nitrile gloves or non-slip rubber gloves, goggles, waterproof apron, hat, closed-toe shoes for exclusive use, disposable mask and proper clothing.

Regarding the management of products for the cleaning of materials and equipment, an inventory was recommended at the beginning of each shift, guided by the nurse and developed by a nursing technician, especially regarding the availability and validity of detergents in the cleaning area, aimed at avoiding possible failures in the process.

The sector nurse standardized the concentration, dilution, and validity of high-level chemical and enzymatic detergents. This information was posted in the sector for employees to see, for recommendation of good practices. Regarding the qualification of the equipment, weekly and annual preventive maintenance was standardized.

Complex instruments were dismantled whenever possible and washed piece by piece, gently scrubbing. All HCP were subjected to manual cleaning. After cleaning and manual rinsing, the products were subjected to automated cleaning, rinsing and lubrication in the ultrasonic washer, and the processed products were then approved by the nurse.

The ultrasonic washer cavitation tests were performed, interpreted and recorded weekly by the nurse, and the automated and manual cleaning tests twice a week in two different shifts to determine if there was contamination on the material and whether detergent residue had been properly removed.

The nurse professional also did a quarterly inventory of the arsenal of HCP, submitted requests for replacement of materials, equipment and instruments, and validated the quality of the processed items. One of the most frequent process failures on receiving was the delivery of surgical boxes with missing items.

DISCUSSION

The analysis of the results highlighted the variety of activities that make up the cleaning area of the MSC, which requires the involvement of the nursing staff and effective communication for the proper steps in the process. With regard to communication, interpersonal relationships and teamwork in the MSC, the nurse is the coordinator of the team and forms a web of relationships while maintaining contact with collaborators[5].

The nurse plays an important exclusive role in the MSC unit in the supervision of daily activities and standardization of products and work procedures, along with the preparation of protocols and guidance of employees, which contributes to good practice in all the stages in the processing of HCP, infection control and, consequently, providing users with safe care [6,7].

Regarding the flow of HCP, the importance of alignment is seen through protocols[2]. Considered were the nurse's involvement in committees and the use of physical and technical barriers, favorable points for the development of the team's work.

Regarding the standardization of PPE, an earlier study carried out at the hospital level noted that the main accidents in this type of sector included those related to employee carelessness, such as high-level disinfectants in the eyes and accidents with sharps[8]. A similarity was found between the PPE mentioned in that study and that used in the daily practice of the sector in question here, showing concern about the well-being of professionals.

As regards the management of the incoming materials used in the cleaning area, standardization is essential, so that there are no breaks in the process due to a lack of needed material or incorrect dilution[9]. The management of these items in the hospital under study was standardized by the nurse, with the approval of the Multiprofessional Committee.

In the cleaning of HCP, the law specifies that these items must be dismantled, whenever possible.[1] After cleaning and manual rinsing, the materials need to be sent for automated cleaning, rinsing and lubrication, in accordance with current law, which is on the need to complement manual cleaning[2]. The Association of PeriOperative Registered Nurses (AORN) also recommends the use of cleaning equipment and emphasizes that this needs to have advantages over manual cleaning by reducing biological and ergonomic risks[10].

After cleaning, there is a need for rinsing thoroughly to remove contamination and detergent residue, drying and visual inspection. These steps are also important for instrument storage [5-11]. It was observed in the MSC studied that there was compliance with the current legal

recommendations and the availability of an ultrasonic washer as well.

As for the tests required to release the equipment for use, they should include the evaluation of temperature and time parameters, compared to the data obtained in the qualification[3]. The nurse is also responsible for the training of the nursing team, regarding the handling of the equipment, the selection of HCP that can be processed and their quality after handling.

With regard to the management of the arsenal of materials in a hospital, there is a lack of studies in the literature that theoretically address the complexity of the activities performed in the MSC, considered the heart of health care institutions.

FINAL CONSIDERATIONS

This study made it possible to understand the nurse's role in an MSC, especially in the cleaning area, since this is an essential step in the processing of hospital materials. The performance of this professional is increasingly evident in the work processes of the hospital area, mainly due to the role in the organization of the processes, with regard to the prevention of IRHC and patient safety. The nurse handles the work management, following the current law, with a wealth of detail about the areas that make up the sector, aimed at the assessment of the team, use of PPE, acquisition of incoming materials, maintenance of equipment, and choice of process quality indicators, among other tasks.

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