QUALITATIVE RESEARCH

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Qualitative research is a multi-faceted field, defined by different orientations and methodologies that allow for the completion of in-depth scientific investigations surrounding a variety of topics related to a singular reality or multiple realities, and capturing the meaning of subjective phenomena from the perspective of the study participants[1]. Therefore, in order to encompass the multiplicity of the objects of study, qualitative research does not follow one unique model, rather there exists a diversity and richness of approaches, data collection techniques and models of analysis, which can vary depending on the objective of the investigation or the epistemological and theoretical position of the researcher[2].

In the 1960s (20th century), social and educational problems led to a favorable scene for the growth of qualitative investigation in the social and human sciences[2,3]. Currently, qualitative research has been quite utilized by different social science disciplines, such as anthropology, political science, psychology, and sociology, in addition to diverse professions related to administration, education, nursing, and others[1]. Even though it is a mode of investigation that is more and more employed and accepted, qualitative research has been the target of criticism, contestation, and suspicion by an expressive portion of the hard sciences scientific community[4]. Within positivism, the basis of scientific truth is based on the logical-deductive model, which requires the formulation of "fundamental theoretical propositions," aimed at reducing the "necessary logical consequences[2]." On the other hand, within qualitative research, the inductive model tries to propose a "question to reality," determining the practical procedures that will be implemented to answer it[2].

Nursing as a historically constructed social practice, with its philosophical and social roots, has tried to understand through qualitative research various unresolved problems left by quantitative research, whose foundations belong to a positivist epistemology. In the health field, in particular in the Surgical Center, the Central Sterile Supply Department and the Post-Anesthetic Care Unit, the necessity to develop research directed toward human behavior – the field of qualitative studies – arose because of the complexity and the multidimensionality of the sectors, in addition to the technological advancements and the advancements in knowledge. It is "necessary to go beyond the epistemological debate and understand science as a human production, and thus, a result of social relations[4]." As such, in this century, the qualitative approach has been presented as a more and more widespread alternative in the health field.

Yin[1] highlights five characteristics that define qualitative research:

1. study the meaning of life of people in their everyday conditions;
2. represent the opinions of the participants of the study;
3. include the context in which the people live;
4. reveal existing concepts that allow for the explanation of human social behavior; and
5. use multiple sources for the collection of data.

Thus, the researcher should obtain a deepened panorama of the context being studied, of the interactions of the everyday life of people, groups, communities, and/or organizations. Then, they should work with a naturalist approach that intends to understand phenomena within their own specific contexts of "real life."

There is not one formal qualitative research typology, because there exist many models and variations that can be followed, such as research-action, case study, ethnography; ethnomethodology; phenomenological study; life history; substantiated theory; narrative investigation; observer–participant study; and others[1]. The research problem and the goals established should determine the methodological design. Many consistent studies that follow the five characteristics mentioned previously are conducted only as "qualitative research" or as a "field study" because they do not fit in any of the particular variants[1].

The methods used by qualitative researchers for data collection can be diverse, including interviews (open or semi-structured); observations (participants or non-participants); focus groups; questionnaires; document, photograph, and video recording analysis; and other means[5]. In order to deepen the investigation, the researcher associates

two or more methods to the collection of data. The way in which this will occur will depend on the paradigm of the study being adopted[5].

Scientific criteria were progressively incorporated in qualitative research in the same way that the postulates for positivism; therefore, ethics, rigor, logic, and coherence are requirements in both quantitative and qualitative studies[2].

It is important to remember that qualitative data are open to multiple interpretations, allowing for the inclusion of voices participating in the study, in addition to the research, once the reflections, actions, and field observations performed by the researchers become an integral part of the data collection[5].

Qualitative studies can be indicated in situations in which relatively little is known about the phenomenon, or in order to obtain new perspectives about known questions or to identify types of concepts or variables that previously could be tested quantitatively[5]. The complementary nature between quantitative and qualitative research was amply debated in the recent past; however, nowadays such structural and analytical complementarity is widely recognized[2].

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DUALITY BETWEEN FULFILMENT AND SUFFERING IN THE WORK OF THE NURSING STAFF IN OPERATING ROOMS

Dualidade entre satisfação e sofrimento no trabalho da equipe de enfermagem em centro cirúrgico

Dualidad entre la satisfacción y elsufrimiento en el trabajo equipo de enfermería en el centro quirúrgico

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ABSTRACT: Objective: We aimed at understanding the nursing staff's perception of the correlation between the work in the operating room (OR) and health. **Method:** A descriptive and qualitative study conducted in a medium-sized hospital in Northwest Paraná. Twenty-three members of the nursing staff working in the OR participated in this study. In September 2014, the data were collected by means of an interview with two guiding questions. The results were grouped into thematic categories, according to the content analysis technique proposed by Bardin, and interpreted within the theoretical framework by Dejours. **Results:** We ascertained that nursing staff has been handled a duality of emotions: satisfaction/pleasure – represented by interpersonal relationships established at work, constant learning and scientific knowledge – and by suffering – due to the work process organization and manifested by physical and psychosocial symptoms factors that have repercussions for health. **Conclusion:** To identify the correlation among work, health, and factors that create suffering in the OR work is critical to support strategies that promote occupational health and improve working conditions.

Keywords: Occupational health. Employee satisfaction. Psychological stress. Nursing staff. Operating rooms.

RESUMO: Objetivo: Buscou-se apreender a percepção da equipe de Enfermagem sobre a relação entre trabalho em centro cirúrgico (CC) e saúde. **Método:** Pesquisa descritiva e qualitativa, realizada em hospital de médio porte da Região Noroeste do Paraná. Vinte e três membros da equipe de Enfermagem atuantes em CC participaram desta pesquisa. Em setembro de 2014, os dados foram coletados por meio de entrevista com duas questões norteadoras. Os resultados foram agrupados em categorias temáticas, de acordo com a Análise de Conteúdo de Bardin, e interpretados no referencial teórico de Dejours. **Resultados:** Apreendeu-se que a Enfermagem vivenciou uma dualidade de sentimentos: satisfação/prazer — representada pelas relações interpessoais estabelecidas no trabalho, pelo aprendizado constante e pelo conhecimento científico — e sofrimento — decorrente da organização do processo de trabalho e manifestado por sintomas físicos e psicossociais que repercutem na saúde. **Conclusão:** Reconhecer a relação entre trabalho e saúde e os fatores geradores de sofrimento no trabalho em CC é fundamental para subsidiar estratégias de promoção da saúde do trabalhador e melhoria das condições de trabalho.

Palavras-chave: Saúde do trabalhador. Satisfação no emprego. Estresse psicológico. Equipe de Enfermagem. Centros cirúrgicos.

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RESUMEN: Objetivo: Se buscó aprender la percepción del equipo de Enfermería sobre la relación entre trabajo en centro quirúrgico (CQ) y salud. **Método:** Investigación descriptiva y cualitativa, realizada en hospital de mediano porte de la Región Noroeste de Paraná. Veintitrés miembros del equipo de Enfermería actuantes en CQ participaron de esta investigación. En septiembre de 2014, los datos fueron colectados por medio de entrevista con dos cuestiones orientadoras. Los resultados fueron agrupados en categorías temáticas, de acuerdo con el Análisis de Contenido de Bardin, e interpretados en el referencial teórico de Dejours. **Resultados:** Se aprendió que la Enfermería vivenció una dualidad de sentimientos: satisfacción/placer — representada por las relaciones interpersonales establecidas en el trabajo, por el aprendizaje constante y por el conocimiento científico — y sufrimiento — decurrente de la organización del proceso de trabajo y manifestado por síntomas físicos y psicosociales que repercuten en la salud. **Conclusión:** Reconocer la relación entre trabajo y salud y los factores generadores de sufrimiento en el trabajo en CQ es fundamental para subsidiar estrategias de promoción de la salud del trabajador y mejoría de las condiciones de trabajo.

Palabras clave: Salud laboral. Satisfacción en el trabajo. Estrés psicológico. Grupo de enfermería. Centros quirúrgicos.

INTRODUCTION

The operating room (OR) is a unit that has a prominent place in the hospital, considering the purposes and the complexity of procedures performed in patients, whether in elective, urgent, and emergency surgeries. However, as this is a complex environment, there are several stressors, which, associated with singular factors, can compromise the health and the well-being of the professionals who work there and, therefore, impair their performance and the quality of assistance provided to clients[1].

The nursing care dynamics in this environment focus on the development of objective and technical actions, seeking the recovery of the individual. Thus, considering the peculiarities of the sector, social interaction in care is often restricted and influences the satisfaction of employees with the work done[2].

Work satisfaction is considered as an important variable simultaneously associated with productivity and personal fulfillment. Feeling well in the work space is a fundamental need as satisfaction is directly connected to the well-being of individuals in all aspects of their lives[3]. We reiterate that satisfaction and dissatisfaction in health care jobs have direct implications for health of employees and quality of life as well as for the quality of the care provided[4].

Regarding that, social interaction between staff members and between these members and patients are fundamental aspects of the search for more efficiency and quality of care[5]. In this context, understanding the OR nursing staff's perception of work, health, and their correlation help identify problems in health care services, plan possible solutions and improve the work environment, which may affect the quality of the care provided.

Therefore, considering the importance of surgical care for global public health, the identification of the role of the nursing staff in this type of complex care and the relevance of occupational health, the present study aims at capturing the nursing staff's perception of the relation between OR work and health.

METHOD

This is a qualitative and descriptive study. Participants were 23 members of the nursing staff of an OR of a medium-sized hospital in Northwest Paraná.

The OR has seven operating suites, allowing small- and medium-sized surgeries, predominantly procedures in the following specialties: Orthopedics, Gastroenterology, Gynecology/Obstetrics, and Urology. Regarding participants, we used intentional sampling through the following inclusion criteria: nursing professionals working in the nursing staff of the institution's OR, present at the moment of data collection. The population comprised 24 nursing staff members; one member was rejected as their day off was at the time of data collection.

In September 2014, subjects were invited to participate in the study through a printed invitation containing information about the study thematic as well as date, time, and place for data collection. Data were compiled over three consecutive weekends, during 12-hour daytime shifts of the staff, after they signed the Informed Consent Form (ICF). The choice of weekends was due to the work dynamics in the sector, since the number of surgical procedures in those days is reduced. To promote a suitable atmosphere for reserved and comfortable

communication with participants, an administrative room was previously prepared within the OR, where interviews were held.

For data collection, the following guiding questions were created:

1. What does working in an operating room mean to you?
2. Can working in the operating room affect your health? (If so, how?).

Statements were recorded, verbatim transcribed, structured into categories and analyzed qualitatively through the content analysis technique proposed by Bardin[6]. Result interpretation and discussion occurred according to the theoretical framework of Dejours, which extensively analyzes the correlation between work and health, especially regarding mental health aspects, which can be influenced by work, and defensive strategies adopted by employees[7-10].

The study complies with the ethical principles under Resolution No. 466/2012 of the National Health Council (CNS) and was approved by the Research Ethics Committee of the State University of Maringá (UEM), by Statement No. 684.994, from 2014, and CAAE (Application Certificate for Ethical Review) No. 27811214.3.0000.0104. The identification of participants was preserved using a Hindu-Arabic numeral for each respondent.

RESULTS

Work aspects that create satisfaction in the nursing staff in the operating room

The work background in the OR is permeated with positive meaning that leads to the satisfaction of nursing staff. Aspects that cause satisfaction regarding the subjectivity of employee include extreme value attributed to the work. The characteristics of the work process – such as positive interpersonal relationships characterized by comradeship of co-workers – also satisfy them. In addition, environment aspects also create satisfaction when respondents perceive them as promoters of scientific knowledge and constant learning, according to the following statements:

> I like it here very much because, in short, it's my second home […] (Respondent No. 3)

> To me, the operating room, it is one of the most important sectors of the hospital because they [*sic*] accept those who need treatment and these people expect trust. […] it's like my second home […] (Respondent No. 7)

> I think the assistance in the operating room is very important […] (Respondent No. 2)

> To me, I love the work in the operating room, I'm passionate about it; as it is true for all types of service, you must love what you do […] (Respondent No. 15)

> Working in the operating room is, well, something I like very much; it's about team effort, comradeship… fellowship, you know… It conveys all of that to me… To me, the OR represents knowledge. It was my first place of work, and I've been working here for a short time; I've gained lots of knowledge. (Respondent No. 18)

Routine aspects of the work that creates suffering in the nursing staff in the operating room

The nursing staff believes the OR work sometimes causes suffering and frustration, even regarding organizational characteristics, which is evidenced by professional devaluation, productivity demands, staff absence, work overload, and, consequently, lack of time, which is reiterated by the following statements:

> […] if there was acknowledgement, it would be much better […] (Respondent No. 7)

> […] there is little recognition for the place; it is very important, but not acknowledged enough, it should receive better attention, especially regarding employees. (Respondent No. 14)

> […] we should receive better assistance, because we do not have health insurance, we have nothing […] (Respondent No. 15)

> […] they want tasks to be performed quickly, work productivity, as if we were in a poultry processing plant. […] often doctors do not recognize our

> work… Lately, the number of surgeries has increased greatly, but the number of employees is the same… Rather than taking care of six patients you have to take care of 18 patients with the same staff. […] as we do not have the time to assist patients, which is the true priority; not that you do not want to, you do not have to offer all that care portion of the treatment to patients; we try not to let them go to their rooms in pain, but sometimes that happens because there are three, four of them in PACU (post-anesthesia care unit), we cannot take care of them as we should, and they deserve more, that's troublesome […] (Respondent No. 23)

> […] we are so poorly recognized that sometimes we even forget how important we are […] (Respondent No. 2)

> […] there is also the productivity issue for which the demand is always very, very high… everything must be done very quickly (Respondent No. 6)

> […] the lack of quality is due to their demands for quantity […] but the psychological pressure we feel harms each person here. Working every day in a place where you must deliver, deliver, you cannot make any mistakes… But sometimes it happens – it affects us a little, too […] (Respondent No. 1)

> You rush around, from here to there, giving everything you have so that many happy people can leave this place […] (Respondent No. 18)

Aspects related to characteristics of the work process and specific to the OR environment are also perceived negatively, such as the power relation that is striking and present among the different professional categories working in the OR, a fact supported by the following statements:

> […] doctors often arrive, nervous, and take their frustrations on us […] (Respondent No. 14)

> […] doctors usually do not recognize our work […] (Respondent No. 19)

> […] surgeons want swiftness and put a lot of pressure on us […] (Respondent No. 15).

Physical, psychological, and social repercussions for the nursing staff resulting from the work in the operating room

The nursing staff understands the OR as an environment filled with occupational risks. Some work conditions affect the physical condition, resulting in musculoskeletal pain, fatigue, arthritis, arthrosis, and cephalea, which is conveyed by the following statements:

> Before I started at this institution, 13 years ago, I would not have headaches; over the years, I developed cervical fibromyalgia, RSI\WMSDs and so forth… I had spinal surgery […] (Respondent No. 14)

> Yes, repetitive motion, it affects you. Here, you start without pain at the age of 20 and leave as if you were 60, using a cane. (Respondent No. 23)

> It certainly affects you physically, but sometimes because we worry about getting a sick note, and so many other things, we withstand it, deal with it… And then we get by the best way we can, since most of us have cervical and lumbar spinal conditions. But that's the reality: you are always performing the same duties, repetitively, then you get really affected… I have developed cervical fibromyalgia. (Respondent No. 15)

> […] too much repetitive motion. (Respondent No. 3)

> […] you get patients, you pull patients, you pick up weight, all of these repetitive movements. (Respondent No. 4)

> […] there is the risk of perforation, the risk of X-ray exposure, because we are inside the room, all the time […] (Respondent No. 9)

The influence of work on psychosocial conditions of employees was established, manifested by stress, anxiety, irritability, nervousness, and tension, as stated below:

> I think here in the OR… mental and emotional aspects also affect us a lot, due to tension and stress. (Respondent No. 5)

> And we get stressed out here, we go home stressed out… We get stressed at home, too. (Respondent No. 4)

> […] mentally as well, we must be really responsible, we must do everything very quickly, and it has to be just right, there can't be any mistakes, there's too much pressure on us. (Respondent No. 6)

> Too many demands, but not for others… And I also end up taking it out on someone or doing something that annoys the other person, so the whole staff suffers because of it, leading to lots of arguments and fights. (Respondent No. 16)

> It is a lot of pressure; we are psychologically affected by it, a lot. We spend a lot of time together here, sometimes we have quarrels […] (Respondent No. 22).

DISCUSSION

In this study, the nursing staff's perception of the OR work created a duality of emotions: between satisfaction and suffering.

In relation to employee satisfaction, Dejours' theory emphasizes that inventiveness, cooperation, trust, and the sense of social utility dialectically articulated with task content – thus, the worker expresses them in the task while being reinvigorated by it – are essential aspects for pleasure at work[7,8].

Working is not just about productivity, it is also about living together. Therefore, it is a unique opportunity to learn about respect for others, trust, coexistence, solidarity and is also a way to contribute to the development of work rules that are not limited to technical rules, covering social rules that favor the pleasant aspects of the occupational activity[7-9].

Dejours[10] determined occupational pleasure increases if the actual work exceeds the stipulated tasks, or the preset *modus operandi*, performed under extreme rigorous parameters. Therefore, strict non-observance of procedures, that is, strict non-completion of the stipulated work, provides space for actual work feasibility, allowing it to be invented and discovered by the employee, valuing patient subjectivity and allowing the creativity to surface, which enables personal satisfaction and potential integration.

Well-being is related to a rewarding environment. When this feeling is provided in such an environment, employees like the product created. However, suffering is related to the exploitation of labor; when that occurs, anger is imparted to the product. Thus, work is adapted by affection; affection implies "love" or "hate" towards work and generates other parallel binomials: "joy" or "sadness," "enthusiasm" or "discouragement," "aspiration" or "contempt"[7].

Nevertheless, OR work causes distress towards institutional aspects, the work process and the OR environment. Pressure related to working conditions is primarily targeted at employees' organisms, which can cause strain, aging, and somatic disorders[8].

The shortage of employees combined with high patient demands and work overload reported in this study sometimes leads employees to perform their duties under pressure with a low level of concentration and task interruptions, since there is an increased overload of labor activities[10]. Common work situations are permeated by unexpected events, malfunctions, incidents, organizational incoherences, unforeseen occurrences arising from matter, tools, machines, or other employees, colleagues, bosses, subordinates, staff, hierarchy, and clients[7].

As for formality, the institution conveys elements that lead to suffering in the routine of the nursing staff. The situations presented here reveal that suffering is significantly related to work organization, which is understood as the division of tasks, the hierarchical system, power, and control relationships, the absence of autonomy and organization objectives and goals, which impact occupational health[8].

From the health perspective of the employees, this study showed physical and psychosocial repercussions for the nursing staff attributed to work. Among the physical aspects, musculoskeletal pain was confirmed as an important occupational risk. A study conducted in Bahia on health risks in nursing professionals in a public hospital found that musculoskeletal complaints were the most commonly reported among occupational diseases, corroborating this study findings[11].

The risk to health of employees is developed in a multicausal model, considering their objective and subjective experiences. Studies on occupational illnesses and the ways they interact with work have gained attention in the scientific community and provide a broad understanding of the incidence and course of health problems and their consequences to individuals, families, and society[11].

As for psychosocial repercussions, stress was a prominent aspect. It is well known that stress is harmful to health

and can influence the ability of individuals to develop their work[12]. The sense of frustration and discontent may arise in relation to responsibility and the professional practice, affecting health and work performance, thus creating a high level of stress[13]. The lack of interference to minimize this situation, employees may feel exhausted, without energy and depressed, being susceptible to various diseases[14].

A study carried out in the surgical ward of a university hospital highlighted interpersonal relationships – the most frequent mention – environment, surgical procedures, inappropriate materials and equipment, behavior of surgeon, uncertainties, and conditions of patients as stress generators[15]. By investigating elements that trigger stress and its consequences, we obtain the basis to aid the planning of actions to promote health and maintain or restore work capacity, aimed at physical and psychological well-being of employees[12].

In this context, health care services must acknowledge and value the perception of professionals working in this environment to plan and implement measures that minimize stress and employee dissatisfaction. One example is the development of continuing education actions that enhance professional performance and its routine obstacles[16]. Moreover, training in self-control techniques and stress management consolidate the optimism and self-esteem of the professional[17].

Studies developed in France by Dejours show that work organization, in line with the Taylorist approach, is responsible for painful or unfavorable consequences for psychic functioning of employees. The author states that suffering experiences may occur at work, being expressed through specific symptoms related to the socioprofessional context and the personality structure[7].

Dejours offers a broad approach to the concept of work suffering; specifically, we emphasize his approach to the well-being/madness ambivalence. This ambivalence conveys that suffering at work can be understood "as the space of struggle that exists between, on the one hand, well-being, and, on the other hand, mental illness or madness". Suffering becomes pathogenic when it is not possible to conciliate the internal demands of individualand the work organization[7-9].

It is possible to establish the antagonistic relationship in the work process of nursing staff, indicating that the conditions and organization of this system can interfere and potentiate suffering and satisfying situations at work and regarding work. The multiplicity of activities, institutional demands, peer relationship difficulties, and the work profile are important process elements. Correspondingly, the ambiguity of emotions experienced by employees (for example, pleasure and suffering) composes living and working processes, considering the degree of subjectivity, faced well through healthy mechanisms[18].

Dejours stated that suffering is the source of organizational exploitation, as the resulting defense mechanisms lead to workforce maximization to continually increase productivity, suppressing free will of employees. Furthermore, suffering is not what is explored; above all, defensive strategies used in contrast to suffering are examined[7].

Therefore, the present study makes relevant contributions to the understanding of the correlation between work and health of the OR nursing staff. However, the uniqueness of the results is a limitation because they only reflect the reality of an OR. Thus, caution is required before generalizing results, as each work environment has its own characteristics that influence the work process and the connection with occupational health.

CONCLUSION

In the routine work of the OR, the nursing staff experienced a duality of emotions: satisfaction/pleasure and suffering. Satisfaction culminated in subjectivity of employees, which includes the extreme value attributed to the work, positive interpersonal relationships, and the environment, which fosters scientific knowledge and constant learning. The manifestation of suffering, however, was expressed as physical and psychosocial symptoms in the nursing staff. This evidence can contribute to the development of more assertive strategies to promote occupational health by hospital managers, including the improvement of working conditions regarding organizational aspects and the work process.

Discussing the work process with the nursing staff in a collaborative and collective manner can stimulate the group's critical and reflexive comprehension of this important theme, contributing to the understanding of their reality, the awareness of their role as transforming agents of health practices in favor of quality, and satisfaction of clients and employees.

Moreover, the results of the correlation between work satisfaction and health are relevant so this knowledge becomes the foundation for the conception, implementation, and assessment of preventive and corrective measures in the psychosocial work environment, aiming at promoting and protecting occupational health.

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PREVALENCE OF AND RISK FACTORS FOR SURGICAL SITE INFECTIONS IN PATIENTS WITH MYELOMENINGOCELE

Prevalência e fatores de risco para infecção de sítio cirúrgico em mielomeningocele

Prevalencia y factores de riesgo para infección del sitio quirúrgico en mielomeningocele

Natalie Rosa Pires Neves[1], Marilene Evangelista Correa Noleto[2], Virgínia Sousa Ribeiro[3]

ABSTRACT: Objective: To determine the prevalence of and risk factors for surgical site infections (SSIs) in the treatment of children with myelomeningocele. **Methods:** The medical records of children who underwent the procedure were listed; only the cases that tested positive for SSI were analyzed. **Results:** From 2005 to 2010, 155 medical records were listed, 123 (79.35%) of which were found. Of these, 14 (9.03%) were discarded, and 109 (70.32%) remained for analysis. There was a 33.94% prevalence of SSIs; the lumbosacral localization (32.43%) and ruptured lesions (83.78%) are predominant. The majority (86.49%) of the children underwent surgical correction after 48 hours of life. In 11 (27.73%) cases, material from the surgical wound was cultured, all of them (100%) were positive; *Klebsiella pneumoniae* (46.66%) and *Pseudomonas aeruginosa* (26.67%) prevailed. **Conclusion:** The prevalence rate of SSIs in this study was high when compared to other types of surgery; for infected surgeries, however, the levels found are consistent with the literature, which reports from 7% to 40%.

Keywords: Myelomeningocele; infection; risk factors.

RESUMO: Objetivo: Determinar a prevalência e os fatores de risco para infecção de sítio cirúrgico (ISC) no tratamento de mielomeningocele infantil. **Métodos:** Foram listados os prontuários de crianças que se submeteram ao procedimento e analisados apenas os casos positivos para ISC. **Resultados:** De 2005 a 2010, foram listados 155 prontuários, dos quais 123 (79,35%) foram localizados. Destes, 14 (9,03%) foram descartados, restando 109 (70,32%) para análise. Houve 33,94% de prevalência da ISC, e predominaram a localização lombossacral (32,43%) e lesões rotas (83,78%). A maioria (86,49%) das crianças realizou correção cirúrgica após 48 horas de vida. Em 11 (27,73%) casos se fez cultura de material proveniente da ferida operatória, todas (100%) positivas; predominaram *Klebsiella pneumoniae* (46,66%) e *Pseudomonas aeruginosa* (26,67%). **Conclusão:** A taxa de prevalência de ISC neste estudo foi considerada alta quando comparada a outros tipos de cirurgia; no entanto, para cirurgias infectadas os níveis encontrados acordam com a literatura, que relata de 7 a 40%.

Palavras-chave: Mielomeningocele; Infecção; Fatores de risco.

RESUMEN: Objetivo: Determinar la prevalencia y los factores de riesgo para infección del sitio quirúrgico (ISQ) en el tratamiento de mielomeningocele infantil. **Método:** Fueron listados los históricos de niños que se sometieron al procedimiento y analizados apenas los casos positivos para ISC. **Resultados:** De 2005 a 2010, fueron listados 155 históricos, de los cuales 123 (79,35%) fueron ubicados. De estos, 14 (9,03%) fueron descartados, restando 109 (70,32%) para análisis. Hubo un 33,94% de prevalencia de la ISC, y predominaron la ubicación lumbosacra (32,43%) y lesiones rotas (83,78%). La mayoría (86,49%) de los niños realizó corrección quirúrgica tras 48 horas de vida. En 11 (27,73%) casos se hizo cultivo de material proveniente de la herida operatoria, todas (100%) positivas; predominaron Klebsiella pneumoniae (46,66%) y Pseudomonas aeruginosa (26,67%). **Conclusión:** La tasa de prevalencia de ISQ en este estudio fue considerada alta cuando comparada a otros tipos de cirugía; sin embargo, para cirugías infectadas los niveles encontrados acuerdan con la literatura, que relata de un 7 a un 40%.

Palabras clave: Mielomeningocele; Infección; Factores de Riesgo.

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INTRODUCTION

Myelomeningocele is characterized by a failure in the closure of the neural tube that compromises the medulla, the vertebral arches, and the cutaneous mantle, is presented as a tumor with variable volume and extension. It is in the midline, at any level of the vertebral column, with a predisposition for the lumbosacral region, where 75% of the cases occur, as ruptured, intact, or epithelial lesions[1].

The cause of the disease is still unknown, but there is evidence that factors such as radiation, drugs like valproic acid, malnutrition, and the use of chemical substance may be associated with it. There is strong proof that the maternal folic acid intake reduces the incidence of neural tube defects in at-risk pregnancies. The diagnosis is based on clinical manifestations and meningeal sac examination[2].

Nevertheless, surgery is inevitable. It is performed to close the lesion and recommended up to 48 hours after birth as it is believed that this can minimize the risk of infections and new spinal cord injuries to which the patient is susceptible. It consists of an update on microsurgical techniques for the anatomical reconstitution of the spinal cord, the preservation of the largest possible amount of functioning nervous tissue, and the prevention of infection and subsequent loss of function[3,4].

In the immediate postoperative period, the patient is vulnerable to several complications, usually associated with preoperative clinical conditions, the extent and type of surgery, surgical or anesthetic complications, and the efficacy of the therapeutic measures adopted. Surgical site infections (SSIs) are a relevant postoperative complication as it contributes to increased patient morbidity and mortality, causing physical or emotional disorders, and considerably increasing the cost of treatment and hospitalization, which indicates the epidemiological importance of the subject[5,6].

Two-thirds of SSIs are confined to superficial tissues (skin and subcutaneous tissues), and deep soft tissues (fascia and muscles), and a third involves organ, or space, penetrated during the surgical procedure. The Brazilian Health Surveillance Agency (ANVISA) establishes the superficial SSI is "an infection in the surgical incision, diagnosed up to 30 days after the procedure and involves only skin and subcutaneous tissue." It is characterized by one of the signs/symptoms: purulent drainage of the superficial incision, isolation of pathogen in the fluid culture or the incision tissue, presence of signs or symptoms of infection – pain or tenderness, localized edema, erythema or heat – if the incision is opened by the surgeon or the diagnosis made by the surgeon or attending physician. The ANVISA also believes deep SSIs include at least one of the following criteria: purulent drainage of deep soft tissue after incision, spontaneous dehiscence, or wound opening by the surgeon in the presence of hyperthermia or local pain, except for negative cultures, abscess, or other evidence of a deep status and/or diagnosis by the attending physician. Furthermore, the SSI in an organ or space that has been opened or manipulated during the occurrence of the surgical procedures if there is a positive culture of the local material, abscess, or other evidence of infection at that level and/or medical diagnosis[6].

There are several factors that interfere with the SSI pathogenesis, which may be related to the microorganism (microbial load, virulence), patient (underlying diagnosis, such as diabetes mellitus, obesity, hypertension, immune suppression, and age extremes) and perioperative period (prior use of antibiotics, previous length of hospitalization, trichotomy prior to surgical procedure, surgical technique, ventilation and perfusion, hemodynamic conditions, duration of the procedure, presence of devitalized tissues). Surgical contamination classification is very relevant, since "the contamination potential is an important variable because it estimates the bacterial inoculum in the surgical wound[8]." In the case of myelomeningocele, the following factors are added: the status of the spinal cord lesion at the time of surgery (ruptured, intact, or epithelial lesions), its location, the child's age at the time of correction, presence or absence of infectious complications before surgery (such as sepsis and ventriculitis)[9].

Since the beginning of infection control programs, epidemiological surveillance is important to identify problems of infection and the development of effective prevention measures. It is of the utmost importance that the entire health care service monitors SSI rates, with an active search of cases, surgical separation, and relation with the contamination potential of the procedure[8]. In the case of myelomeningocele surgery for correction, the relation between the procedure and the subsequent development of meningitis is still discussed if the time elapsed between birth and the correction is significant for the infection, and the adopted antibiotic therapy is effective in reducing the risk of infection[9].

Thus, health professionals must have knowledge of infections and their risk factors in order to implement a program

to improve the quality of health care with effective prevention actions. In their daily practice, health care staffs should assess patients, the monitoring factors, proposing, and implementing preventive relevance measures, such as the use of the checklist that is part of the Safe Surgery Saves Lives Program, established by the World Health Organization (WHO) to improve the quality of global surgical care. The SSI ranks third among all infections related to health care in Brazil, which justifies its continued relevance in the hospital experience[5].

Therefore, this study is aimed at broadening the knowledge on myelomeningocele infections in children in the postoperative period, a procedure with an infection incidence much higher than all the other procedures performed in the central nervous system[4].

OBJECTIVES

To determine the prevalence of and risk factors for SSIs in the postoperative period of the surgical treatment of myelomeningocele, identify the microbial flora in SSIs, and show the sensitivity and resistance profile of microorganisms that cause SSIs in the postoperative myelomeningocele period.

METHODS

This is a transversal, descriptive, quantitative, and retrospective study carried out in a public, university and reference hospital for the treatment of children with meningomyelocele in the state of Maranhão. All medical records of children who underwent surgery for myelomeningocele correction from 2005 to 2010 – a period whose data were available at the time of collection – recorded in the pediatric operation room. Only the medical records of patients who were diagnosed with SSIs were analyzed, focusing on risk factors for their incidence. The length of hospitalization variable was tabulated for the total number of records available, described as a possible risk factor.

The project was approved by the Research Ethics Committee of the University Hospital of the Federal University of Maranhão (HUUFMA), Process No. 076/12. After approval, researchers began collecting the data, complying with all the ethical principles from Resolution No. 196/96 of the National Health Council (CNS).

The data were obtained from a documentary source, that is, from the medical records of the patients, in their totality – medical, nursing, and examination notes – in search of the SSI diagnosis. Infection risk factors were gathered using a data collection tool with the following information: identification, type of delivery, lesion topography, lesion status, previous infectious complications, length of hospitalization before and after the surgical procedure, details of antibiotic therapy, and microbial flora found.

The medical records were divided between the patients diagnosed with SSIs and those without the problem to discover the prevalence of SSIs in this case, using the prevalence formula shown in Figure 1. The data in the medical records of the patients who had an infection were categorized by question, and the relative frequencies were calculated. All data were tabulated in the Excel® software, presented in graphs and tables, analyzed according to the results, and discussed based on the existing literature.

RESULTS

There were 155 cases in the time interval studied. Of these, 32 (20.65%) medical records were not located by the Medical and Statistical Archive Service (SAME), 11 (7.1%) were discarded because they did not contain the minimum information for data collection, and three (1.93%) were not considered because the patients had died before 30 days, making it impossible to diagnose SSIs. Therefore, 109 (70.32%) records were analyzed for the presence or absence of SSIs. Of the records analyzed, 37 (33.94%) cases of SSI were found, resulting in a prevalence of 33.94% of SSIs in correction surgery for myelomeningocele from 2005 to 2010. Among the 37 SSIs, 22 (59.46%) were classified as deep, 10 (27.03%) as superficial and five (13.51%) as organ/space (Figure 2).

Of the SSI cases, 15 (40.54%) were caesarean sections and 14 (37.84%) were vaginal deliveries; in eight (21.62%) cases, the route of delivery was not informed in the medical records. Among these same 37 cases in which the SSI

$$\text{Prevalence of SSIs} = \frac{\text{number of SSI cases}}{\text{total of assessed cases}}$$

SSI: surgical site infection.

Figure 1. Calculation of the prevalence of surgical site infections in the study population.

was detected, we observed that the predominant localization of the lesion at the spinal level was lumbosacral, with 12 (32.43%) cases. In addition, nine (24.32%) cases were at the lumbar level, four (10.82%) cases were at the sacral level; two (5.40%) cases were in the cervical/occipital region; in 10 (27.03%) cases the medical records did not mention the location of the spinal cord lesion (Table 1).

Regarding the status of the lesion when the defect was corrected, 31 (83.78%) children had a ruptured lesion, four (10.82%) had an intact lesion, one (2.70%) had an epithelial lesion; one (2.70%) did not have their lesion status informed in the medical records (Table 1).

Concerning infectious complications prior to surgical correction, in 31 (83.78%) cases we considered the presence of an infected and ruptured lesion, even if the infectious process was not included in the medical records, due to a higher period than six hours after rupture (trauma) in all of them. In four (12.90%) of these cases, in addition to the local infection, sepsis was recorded; in five (13.52%) cases, there was no previous infection record; in another case (2.70%), the lesion status was not highlighted nor was there a record of an infectious complication prior to the procedure (Table 1).

The average length of hospitalization was 49.83 days, with an average of 10.11 days prior to surgery and 39.73 postoperative days for the cases in which there were SSIs. For the uninfected cases, the average was 9.67 days before the surgical procedure and 24.34 days in the hospital after the procedure.

Only five (13.51%) children underwent correction of myelomeningocele within 48 hours after birth and after the first 48 hours of life for the other 32 (86.49%) children affected by SSIs.

Of the 37 patients who had SSIs, only three (8.11%) used an antimicrobial prophylactically. The others (91.89%) used the antibiotic for curative purposes before the surgical procedure because of an infectious process. The most commonly used antimicrobial, whether for preventive or curative purposes, was oxacillin, which was chosen as the starting drug in all patients; combinations were made with gentamicin, amikacin, ceftriaxone, meropenem, vancomycin, and cephalexin.

Table 2 establishes that in 11 (27.73%) cases the surgical wound was cultured using a lesion fragment in two (18.18%) samples and swabbed secretion in the other nine (81.82%). From the total of cultures, all (100%) samples were positive; in four (36.36%) cases more than one predominant microorganism

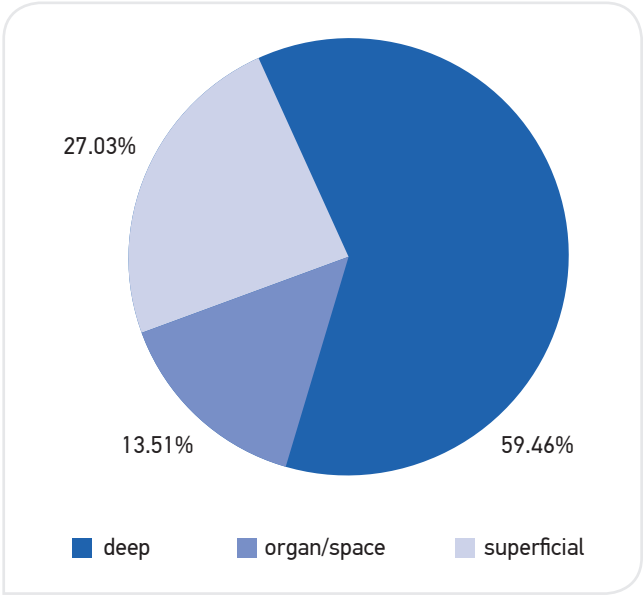

Figure 2. Classification of the found surgical site infections according to the subtypes determined by the Brazilian Health Surveillance Agency (ANVISA).

Table 1. Characteristics of meningomyelocele in children assisted by a public pediatric hospital, São Luís, Maranhão, 2005–2010.

Variables	Frequency	Percentage (%)
Location of the lesion		
Lumbosacral	12	32.43
Lumbar	9	24.32
Sacral	4	10.82
Cervical	2	5.40
Not informed	10	27.03
Total	37	100
Lesion status		
Ruptured	31	83.78
Intact	4	10.82
Epithelial	1	2.70
Not informed	1	2.70
Total	37	100
Presence of infectious complications prior to surgery		
Presence of infected ruptured lesion	31	83.78
No infection	5	13.52
Not informed	1	2.70
Total	37	100

Source: Data from the Medical and Statistical Archive Service (SAME) of the *Hospital Universitário Materno-Infantil* (University Maternal and Child Hospital), 2012.

was found. The microbial flora found comprised *Klebsiella pneumoniae* in seven cases (46.66%), *Pseudomonas aeruginosa* in four cases (26.67%), *Escherichia coli* in two cases (13.34%), coagulase-negative *Staphylococcus*in one case (6.66%), and *Enterobacter*sp. in one case (6.67%).

The sensitivity profile of *Klebsiella* sp. was 71.42% to ciprofloxacin and meropenem and 42.86% to imipenem and piperacillin + tazobactam; it is mainly resistant to amikacin and gentamicin (57.14% each), 42.86% to ampicillin and amikacin as well as 28.57% to ampicillin with sulbactam, cefotaxime, and ceftazidime. *P. aeruginosa*, however, was sensitive to piperacillinin 75% and amikacin in 50% of cases with predominant resistance to ampicillin and gentamicin (50%).

DISCUSSION

The prevalence of SSIs in myelomeningocele correction found in this study was high (33.94%) when compared to the results of other similar studies, which indicate 22.8% of postoperative complications associated with SSIs[10]. We found 11.7% of infectious complications after surgical treatment in a Brazilian study[11]. These authors[12,13] conclude SSIs are an important and frequent complication in this type of surgical procedure, given the conditions it is usually performed, its surgical classification and the other risk factors that will be discussed next. The result found here is superior, but compatible, with the expected SSI rate in infected surgeries, which is from 30% to 40%[7].

Table 2. Microbial flora found in culture of material from the surgical wound after surgical treatment of myelomeningocele in children assisted at *Hospital Público Infantil*, São Luís, Maranhão, 2005-2010.

Variables	n	%
Surgical site culture performed		
Yes	11	27.73
No	26	72.27
Total	37	100.00
Material used for culture		
Lesion fragment	2	18.18
Secretion through swab	9	81.82
Total	11	100.00
Microbial flora found*		
Klebsiella pneumoniae	7	46.66
Pseudomonas aeruginosa	4	26.67
Eschericcia coli	2	13.34
Negative *Sthaphylococcus coagulase*	1	6.66
Enterobacter sp.	1	6.67
Total	37	–

*In some cases, more than one microorganism was found per sample.
Data obtained from the Medical File Service (acronym in Portuguese – SAME) of *Hospital Universitário Materno Infantil*, 2012.

There are reports in the literature about the type of delivery as a risk factor for this type of SSI[10], but the findings of this study did not show a significant difference between the caesarean section, with 15 (40.54%) of the positive cases, and the vaginal delivery, with 14 (37.84%), corroborating other authors[14], who reported there is no conclusive evidence that the caesarean section improves the outcome in children with myelomeningocele in relation to the vaginal delivery.

The lesion topography is more frequent in the lower vertebral column, while the lumbosacral localization (32,43%) predominates in this study; however, most of the findings do not establish that this is a significant factor for surgical wound infection[3,13,15]. Other authors[11] find different predominant lesion topographies in their publications, reinforcing the possibility that this factor does not have as much influence on SSI incidence. In the present study, the result was compromised by the absence of data in 27.03% of the records studied, impairing a deeper analysis of the condition.

Regarding the lesion status, most were ruptured (83.78%), following the tendency described in the literature on lesions found in patients with myelomeningocele. In these cases, surgical treatment is characterized as a procedure with prior microbial contamination[7]. Several authors[17,13] state in their studies that the probability of SSIs is directly affected by potential surgery contamination, which is also suggested by this research findings.

About length of hospitalization, we observed that the average before surgery was 10.1 days in the positive infection cases against 9.67 days in negative cases, indicating an irrelevant difference, which counters investigators[8,12] that referred to a prolonged preoperative hospitalization period as a risk factor for surgical wound infections. However, analyzing the length of postoperative hospitalization, the indexes found (average of 39.7 days for positive cases vs. 24.14 days for negative cases) coincide with reports[18] that state SSIs increase the length of hospitalization.

Most authors[3,9]concur that a surgical closure longer than 48 hours is an important risk factor for SSIs and other complications as evidenced by other studies regarding the lower rate of dehiscence when the surgical correction happened at the optimum time[19]. In the present study, the value of such risk factor in the SSI etiology is suggestive, with 86.49% of the children who developed surgical wound infection having the defect corrected after 48 hours of life.

The majority of patients with SSIs (83.78%) had infectious complications prior to surgery, which justified the use of antibiotic therapy. Conversely, the antibiotic prophylaxis was not included in any medical records, which is the use of antibiotics without any evidence of established infections at the time of surgery[6]. In addition, antimicrobial prophylaxis is not indicated in clean surgeries, as it is the case of intact meningomyelocele, nor in infected ones[17] (ruptured lesion), thus justifying the lack of practice in this type of surgery.

Regarding the antibiotic usually prescribed, the physician must analyze if it comprehends the spectrum of pathogens that most commonly cause SSIs on the location undergoing surgery, always preferring first-generation antibiotics, such as cefazolin, since the use of antibiotics, although adequate, can lead to the selection of resistant pathogens[20].

All cultures collected from the surgical wound were positive for microorganisms, confirming a local infectious process. The presence of *P. aeruginosa*is confirmed by other studies[6,19] in class-III wounds – contaminated and infected – as one of the most frequently isolated in surgical wound cultures, proving one of this study findings, of 26.67% for this microorganism.

The *K. pneumoniae* specimen was the most prevalent microorganism in global nosocomial infections in investigations carried out in different locations and at different times; *P. aeruginosa* is also a major specimen in SSIs, a result also found in this study. The major challenge nowadays is developing multi-drug-resistant bacteria, making known microorganisms virtually insurmountable obstacles, as antimicrobial sensitivity is severely reduced[6,20].

The surgical wound culture and antibiogram are important to determine the patient's therapeutic plan to thwart the present infection. Few of the SSI cases in this study were cultured, but they became a significant sample due to the predominance of two microorganisms and the resistance and sensitivity profiles compatible with a large percentage. Analyzing the clinical features of the SSI cases, we detected that the most commonly used antibiotic, oxacillin, was not included in the resistance profiles nor in the sensitivity profiles; there were two widely used antibiotics (gentamicin and amikacin) that were quite resistant; however, of the others – ceftriaxone, meropenem, vancomycin, and cephalexin – meropenem was the only one listed for sensitivity and as predominant. Therefore, it is necessary to systematically collect and analyze surgical wound cultures for antimicrobial prescription to optimize the use of sensitive antimicrobials, leading to clinical improvement and the cure of infection, thus avoiding the selection of multi-resistant strains and other complications, such as death.

Some of the limitations of this study include those imposed by the use of secondary data, not collected by the authors, besides the incompleteness of medical records and insufficient information that damage the quality of data. In addition, the final sample was small, and it was not possible to proceed with statistical data tests.

CONCLUSION

This study concludes that the prevalence rate of SSIs is high in myelomeningocele correction. The most prevalent variables in the occurrence of SSIs were lesion status, infectious complications prior to surgery, length of postoperative hospitalization, and lesion correction more than 48 hours after birth. Type of delivery, location of the lesion, and length of preoperative hospitalization were not prevalent variables for SSIs.

The most prevalent microorganism in cases of infection was *K. pneumoniae*, sensitive to ciprofloxacin, meropenem, imipenem, and piperacillin + tazobactam and resistant to amikacin, gentamicin e ampicillin. Despite advances in control and prevention practices, SSIs still are a substantial cause of morbidity and mortality among patients undergoing surgical procedures, prolonging length of hospitalization and burdening health care services. Due to the constant change in this pattern of surgical infection, periodic studies (aimed at documenting the epidemiological profile of infections in these patients), the reassessment of risk factors for infection and, especially, the evaluation of the antimicrobial resistance profile are essential. It is necessary to implement he assessment of the epidemiological surveillance system of SSIs to minimize issues that limit the achievements of such studies, such as failure to provide information due to incomplete data or even absence of medical records.

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SAFETY ASSESSMENT OF REPROCESSING OF FLEXIBLE INTRAMEDULLARY BONE REAMERS FOR ORTHOPEDIC SURGERY

Avaliação da segurança do processamento de fresas intramedulares flexíveis para cirurgia ortopédica

Evaluación de la seguridad del procesamiento de fresas intramedulares flexibles para cirugía ortopédica

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ABSTRACT: Objectives: To assess the efficacy of a standard operational procedure to clean flexible intramedullary bone reamers, as well as the sterilization level, and to show the cytotoxicity of the residual dirtiness of a flexible reamer used in care practice. **Methods:** Flexible intramedullary bone reamers were weighed before processing, after challenge contamination and after cleaning. They were contaminated with the Soil Test™, Geobacillus stearothermophilus suspension, in the concentration of 10^6 cfu/ml, and bovine bone flour. After processing, the samples were inoculated into a culture medium and incubated for 21 days. Residual dirtiness of a flexible intramedullary bone reamer used in practice was submitted to in vitro cytotoxicity test. **Results:** Despite being sterilized, the samples indicate to accumulated dirtiness and the processing was inefficient. Residual dirtiness presented a cytotoxic effect. **Conclusion:** It is recommended that the flexible design of reamers is discontinued by the lack of safety of reprocessing.

Keywords: Nursing. Orthopedics. Sterilization.

RESUMO: Objetivos: Avaliar a eficácia de um procedimento operacional padrão para limpeza de fresas intramedulares flexíveis, bem como o alcance da esterilidade, e evidenciar a citotoxicidade da sujidade residual de uma fresa flexível utilizada na prática assistencial. **Métodos:** Fresas intramedulares flexíveis foram pesadas antes do processamento, após contaminação desafio e depois da limpeza. Elas foram contaminadas com Soil Test™, suspensão de *Geobacillus stearothermophilus*, na concentração de 10^6 UFC/mL, e farinha de osso bovino. Após processamento, as amostras foram incubadas em meio de cultura por 21 dias. A sujidade residual de uma fresa utilizada na prática foi submetida ao teste de citotoxicidade *in vitro*. **Resultados:** As amostras, embora esterilizadas, apontaram acúmulo de sujidade e o processamento foi ineficaz. A sujidade residual apresentou efeito citotóxico. **Conclusão:** Recomenda-se que o *design* flexível das fresas seja descontinuado pela insegurança no processamento.

Palavras-chave: Enfermagem. Ortopedia. Esterilização.

RESUMEN: Objetivos: Evaluar la eficacia de un procedimiento operacional estándar para limpieza de fresas intramedulares flexibles, así como el alcance de la esterilidad, y evidenciar la citotoxicidad de la suciedad residual de una fresa flexible utilizada en la práctica asistencial. **Métodos:** Fresas intramedulares flexibles fueron pesadas antes del procesamiento, tras contaminación desafío y después de la limpieza. Fueron contaminadas con Soil Test™, suspensión de Geobacillus stearothermophilus, en la concentración de 10^6 UFC/mL, y harina de hueso bovino. Tras el procesamiento, las muestras fueron incubadas en medio de cultura por 21 días. La suciedad residual de una fresa utilizada en la práctica fue sometida al test de citotoxicidad in vitro. **Resultados:** Las muestras, aunque esterilizadas, apuntaron acumulación de suciedad y el procesamiento fue ineficaz. La suciedad residual presentó efecto citotóxico. **Conclusión:** Se recomienda que el design flexible de las fresas sea descontinuado por la inseguridad en el procesamiento.

Palabras clave: Enfermería. Ortopedia. Esterilización.

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INTRODUCTION

Flexible intramedullary bone reamers are medical devices that can be reprocessed, besides being thermoresistant, with complex conformation. They present extreme cleaning difficulties. These products are constituted of stainless steel and are characterized by a shaft whose flexibility is provided by two stainless steel ribbons overlapped in a spiral shape, one spiralled clockwise and another one spiralled counter-clockwise, forming a flexible structure similar to a coil. This shaft is connected to a tip developed to ream the surface of the intramedullary canal of long bones.

The difficulty in cleaning is attributed not only to its conformation, but also to the dirtiness resulting from the surgical procedure itself, which includes blood, bone, and bone marrow. This dirtiness is spread over the shaft, and most of it is retained in the space between the two steel ribbons, especially in the extremities (with lower flexibility), making it difficult to remove it, since this space is inaccessible to the artifacts and technologies available for cleaning.

The literature about flexible intramedullary bone reamers is concentrated on functional aspects and is scarce as to the safety in cleaning and sterilization. This is a matter of concern, once the scientific literature reports the survival of microorganisms in its vegetative form in the instruments used for orthopedic surgeries after steam sterilization, due to flaws in cleaning.

In 1999, a report was published on three cases of *Staphylococcus epidermidis* septic arthritis. The authors identified dry organic matter in cannulas that would be used in orthopedic procedures[1]. In another study, published in 2009, the authors found organic matter in lumens, with positive culture for coagulase-negative *Staphylococcus*, *S. epidermidis,* and *Streptococcus mitis*[2]. In 2011, an outbreak of *Pseudomonas aeruginosa* was also associated with flaws in the reprocessing of orthopedic surgery instruments, which had residues of organic matter[3].

Besides the risks related to the infection, associated with the difficulty or the impossibility of cleaning, the toxicity of residual dirtiness contained inside the reamers has not been shown yet, and the impact of these residues in the occurrence of local and systemic inflammatory processes is not known.

On the basis of these reports, this article aims at assessing the efficiency of a standard operating procedure (SOP) for cleaning flexible intramedullary bone reamers, as well as the sterilization level, besides showing the cytotoxicity of residual dirtiness in a flexible intramedullary bone reamer used in care practice.

METHODS

This is a laboratory experimental study conducted in two stages, between 2015 and 2016, and carried out in the following laboratories: Laboratory of Microbiological Trials, in the Nursing School of *Universidade de São Paulo*, Laboratory of Microbiology in the Pathology Department of the School of Medical Sciences at *Santa-Casa de São Paulo*, and the Group of Cell Culture in *Instituto Adolfo Lutz* (São Paulo).

Stage 1: evaluation of cleaning and sterilization

Samples were flexible intramedullary bone reamers for the humerus, 27.5 mm long and with internal diameter of 0.4 mm (Tech Tools®, Brazil) (Figure 1). In this evaluation, three newly manufactured reamers were used, which had not been used in care practice. They were identified by the colors, green, blue, and red.

To evaluate the cleaning, each reamer was weighted in three moments: before each reprocessing (basal weight), after the challenge contamination, and after cleaning. So, the accumulated value was calculated, given by the difference between weight after cleaning and basal weight, using a weigh digital scale (0.01g sensitivity) (Shimadzu Corp., Japan). To simulate its care use, each sample was submitted to a challenge contamination, internally and externally, with Soil Test™,

Figure 1. Semi-rigid intramedullary orthopedic reamer (above) and flexible intramedullary reamer for humerus used as a sample in this study (below).

and *Geobacillus stearothermophilus* suspension in the concentration of 10^6 cfu/ml, containing spores.

After being contaminated with the solution, the samples were contaminated, internally and externally, with bovine bone flour (~3,5 g), simulating the bone residue at the end of a surgical procedure[4]. Contact with contaminants was maintained for 3 hours, which is the estimated time of a surgical procedure. After this period, the samples were processed according to SOP: pre-humectation in tap water for 5 minutes; brushing of the external shaft surfaces (Mack Medical®, Brazil); brushing of the external surfaces of the tip (Mack Medical®, Brazil); clearance of the lumen with a guidewire (when necessary); lumen washing with a pressure water gun (RFQ®, Germany), for 5 seconds, or until it is no longer obstructed; brushing the lumen five times (Mack Medical®, Brazil); rinsing in tap water; washing with enzymatic detergent Endozime™ Xtreme Power (Ruhof®, United States of America) in ultrasonic cleaner (Medisafe® SI Digital, United Kingdom) with cannulated instrument connections at 50°C for 5 minutes; rinsing in tap water; complementary rinsing with purified water; drying the internal surfaces with filtered compressed air; inspection; individually wrapped in surgical grade papers/film (Amcor®, Australia); and sterilization in autoclave at 135°C for 4 minutes (Tuttnauer®, Israel).

After sterilization, the samples were inoculated in 250-ml test tubes, with sterile tryptic soy broth medium (BD®, United States of America). This procedure was carried out with an aseptic technique, inside a biological safety cabinet. Then, the samples were incubated at 56°C for 21 days, with daily reading of the recovery of *Geobacillus stearothermophilus*.

These procedures were repeated three times to simulate three reuses of each sample. To test the validity of the results, the simulated reuses were followed-up with a negative control, that is, a new reamer without a challenge contamination, submitted to reprocessing and incubated in a sterile tryptic soy broth medium for 21 days. We also used a positive control, that is, a reamer submitted to the challenge contamination and incubated in a tryptic soy broth medium right after – both at 56°C.

Stage 2: *in vitro* cytotoxicity test

In vitro cytotoxicity assays are methods aiming at determining the biological response of mammal *in vitro* cells, through defined biological parameters, constituting an attempt to simulate or exaggerate conditions of clinical use, in order to show toxic risk[5]. In this stage, a flexible intramedullary reamer for femur was used after eight reuses in care practice. The external steel ribbon was removed, and the dirtiness adhered to the internal ribbon was collected, aseptically, in a test tube. After this procedure, the *in vitro* cytotoxicity test of the residual was conducted, using the agar diffusion test. Triplicate analyses were carried out.

This assay used the cell line *National Collection of Type Cultures* (NCTC) clone 929 (L cell, L-929, derivative of Strain L) (American Type Culture Collection® CCL1™), registered in the collection of the Group of Cell Culture in *Instituto Adolfo Lutz*, number CCIAL020. This test used the following procedures: NCTC clone 929 cells were seeded in Petri dishes, treated for cellular cultures, measuring 60x15 mm (TPP®, Switzerland), in a concentration of 3×10^5 cells/mL and volume of 5 mL. The cultures were incubated for 48 hours at 37°C±1°C, in an atmosphere containing 5% of CO_2. After this period, cellular monolayers were assessed as to confluence, and the culture medium was replaced by an overlay medium composed of a twice concentrated Eagle's medium and agar (BD®, United States of America) at 1.8% with 0.01% of neutral red vital stain. In preparation[6], agar was proportionally mixed (1:1) to the Eagle's medium, both at 44°C. Cellular toxicity was observed in a microscope by the alteration of morphology or the death of cells around or under the sample; and, macroscopically, for the formation of the colorless halo around the cytotoxic material[6]. After the measurement of the extension of the colorless halo taken from the sample, the cytotoxicity was classified according to the levels of reactivity for the agar diffusion test described in ISO 10.993-5:2009 standard[5].

RESULTS

The cleaning SOP used was inefficient, as it was not able to completely remove the dirtiness of the samples. The mean difference in the weight of the samples after the reuses was of 0.30 g (Table 1).

Even though the SOP had failed, the required sterilization level was observed in all samples; therefore, no turbidity was observed in the culture medium at the end of the 21-day-incubation period. The results of the negative and positive control were in accordance with expectancies for the three simulated reuses.

Residual dirtiness obtained in the flexible intramedullary reamer for femur pointed out to a cytotoxic effect with degree 3 of biological reactivity, average of 0.31 cm of halo in the triplicates, that is, moderate cytotoxic effect.

DISCUSSION

Inefficacy of the standard operating procedure

Brazilian legislation demands that each stage of surgical instrument reprocessing be conducted using an elaborated SOP, based on updated scientific references and pertinent regulation[7]. This study used manual and automatic cleaning methods, with demonstrated efficacy, but still, the conformation of the reamers did not allow the complete removal of dirtiness.

In complex conformation instruments, the impossibility to totally remove the dirt was also observed in a study conducted with instruments used for minimally invasive surgeries, which used the contaminant ATS® (Artificial Test Soil), composed of 85.2 mg/mL of protein, 12.3 mg/mL of carbohydrates, and 4.12 mg/mL of hemoglobin. In this case, the authors obtained a reduction of 99% in contaminants after the ultrasonic cleaning of the samples[8].

The quantification of insoluble residues is a method that has been described in the literature to assess the dirtiness in the orthopedic instrument. An investigation from 2012 used the membrane filtration technique and the weighing of insoluble organic matter (clotted blood and bovine bone flour) in products with lumen for orthopedic surgeries[9]. In this study, this technique was not feasible due to the internal space between the metallic ribbons constituting the body of the reamers, which did not allow the elution of insoluble dirt; therefore, to perform residues control using the total weight of the samples was necessary.

The same study analyzed residues in orthopedic devices with lumen, which were artificially contaminated with bone cement, and observed the retention of residues after ten cycles of contamination and cleaning[9]. The authors concluded that the complexity of the design influences the retention of dirt, similarly to what was observed for flexible intramedullary reamers.

Because of the design of the flexible reamer, the SOP included several manual steps during the cleaning stage, which would require special attention from the cleaning staff. During the experiments, only the application of the cleaning stages, including drying, required approximately 15 minutes for each sample.

In the daily routine of a central sterile service department (CSSD), especially in major general hospitals, with great diversity in instruments, it would be impossible for an employee to spend 45 minutes of his or her six-hour shift in only three products. Besides cleaning, other activities are also required, like receiving, checking, separating, disassembling, and referring the products.

In most cases, SOPs are validated in laboratory conditions, without considering the dynamics of work processes or the dimension of human resources and infrastructure. Even though the products of complex conformation require more elaborated SOPs, it is necessary to observe that a very long SOP, with many manual cleaning steps, may lead to the non-adherence to all of the stages, especially at times with higher demand in the cleaning area of the CSSD.

Non-systematic observations show that the services tend to sacrifice the efficacy and favor the efficiency of processes. In other words, the high demand for production, added to the deficit in infrastructure and human resources, may lead to the suppression of important steps of product cleaning. Therefore, it is urgent that health product manufacturers prioritize not only functionality, but also the effective processing, investing in more accessible design for manual or automatic cleaning stages, such as semi-rigid reamers.

Table 1. Distribution of weight in flexible orthopedic nails after reuses in comparison to basal weight. São Paulo, 2016.

Nail	Basal weight (g)	Accumulated weight (g)			Final weight (g)	Difference (g)
		1. Reuse	2. Reuse	3. Reuse		
Red	72.58	0.28	0.31	0.18	72.88	0.30
Blue	76.17	0.31	0.30	0.23	76.52	0.35
Green	73.27	0.31	0.23	0.19	73.51	0.24
					Mean (g)	0.30

The main facilitator for the management of SOPs in the CSSD is the accessible design for cleaning. The management of SOPs by brand and type of product is required; however, in a major general hospital that works with several surgical specialties, there would be an excessive number of SOPs in the cleaning area, which could prevent its application because of reasons related to the efficiency of processes and the rationalization of work. An alternative that should be discussed in the scientific field is to advance from a SOP addressed to each type of product to the categorization of products by design, which would have a standard SOP. As an example, SOP for <5 mm lumen products and SOP for conventional surgical tweezers would make it easier to separate and direct the workflow in the cleaning area, whereas specific SOPs would be addressed to exotic or delicate products, such as products with electronic components and hydrodissection cannulas for ophthalmological surgery.

Sterilization level in samples with dirtiness

Unlike the expected, the samples, even with residual dirtiness, did not allow the recovery of microorganisms. A similar study contaminated the cannulas for meniscus repair with 0.5 mL of blood containing 200–500 cfu of coagulase-negative *Staphylococcus*, which were tested in three SOPs:

1. Manual cleaning and rinsing in the operating room, sterilization in the unwrapped flash cycle (132°C for 10 minutes);
2. Cleaning and rinsing with enzymatic detergent, pressure water jet, sterilization (132°C for 45 minutes);
3. Cleaning in ultrasonic cleaner, sterilization (132°C for 45 minutes).

No microorganism was recovered after these procedures; however, the authors still observed blood in the cannulas processed in SOPs 1 and 2[1]. These results reinforce the possibility of a product being without viable microorganisms, even with the adhered organic matter, although it cannot be considered safe for use due to the biological response, such as systemic inflammatory response syndromes and toxic anterior segment syndrome.

Another study showed dirtiness in cannulated products from the DePuy Mitek® Intrafix system, with positive culture for coagulase-negative *Staphylococcus*, *S. epidermidis* and *S. mitis*. In this study, the authors identified that the CSSD did not have brushes with the proper diameter to remove the dirt of the instrument[2], and this fact indicates a major deviation in good practices of health product processing. There was no mention to the monitoring of the steam sterilization process, so it was not possible to make other interpretations of the results obtained.

In 2011, during an outbreak of infections associated with flaws in the processing of orthopedic surgery instruments, the authors mentioned residues of organic matter and brush bristles in the products, besides the non-adherence to good practices, as the arthroscopy cannulas were only washed with tap water. Another important aspect is that, even with the observance of the SOPs provided by the manufacturer, some products still had residues of organic matter[3]. In this study, the fact that the residues were found in places whose visualization was only possible through a borescope was remarkable. That means that the visual inspection of the external surfaces of the products with internal spaces was not effective, reinforcing the need to invest in technologies of visualization in the preparation area, cleaning monitors, and qualification of automatic cleaning equipment, according to the Brazilian legislation[7]. Besides, the accessible design for cleaning and the validation of the practical application of SOPs are important to mention, because, in the aforementioned study, the instructions of the manufacturer were not efficient.

Cytotoxic residue

Sterilization is a critical safety aspect of medical devices; however, it is not the only one, because, even if sterile, a product can be toxic to the body. In the processes of cleaning validation, the possibility of reaching the "absolute zero" in organic residues is ruled out, even though reductions of about 99% have been reported[8]. Therefore, it is essential that the biological response to that residual dirtiness, even if minor, be demonstrated, so that a processed product can be considered safe, as proposed by laboratory studies of SOP validation[10,11].

In the obtained data, the toxicity of residual dirtiness obtained degree 3, which is therefore an unacceptable risk for use in surgical procedures, emphasizing the thesis that if a product cannot be cleaned, it cannot be safely reused.

CONCLUSION

The SOP used, elaborated in the best sequence of steps, in accordance with the practicable, was ineffective; flexible intramedullary reamers did not show the recovery of *Geobacillus stearothermophilus*; however, residual dirtiness had a cytotoxic effect. Therefore, the results sustain the discontinuity of

the flexible design due to the lack of safety in the reprocessing. It is important to mention that this fact should be considering by the committees of health products reprocessing, and also by all surgical teams, product manufacturers, and regulating institutions.

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SELF-ESTEEM AND SEXUAL SATISFACTION AFTER SURGICAL COMPLICATIONS OF RADICAL PROSTATECTOMY

Autoestima e satisfação sexual após complicações cirúrgicas da prostatectomia radical

Autoestima y satisfacción sexual tras complicaciones quirúrgicas de la prostatectomía radical

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ABSTRACT: Objective: To compare the measurements of self-esteem and sexual satisfaction according to the presence of erectile dysfunction (ED) and urinary incontinence (UI) in patients submitted to radical prostatectomy (RP), in the five first postoperative years. **Method:** Cross-sectional study with a descriptive analysis of 81 patients submitted to RP. **Results:** Mean age was 65.5 years. Most patients (85.2%) sought urology care while being asymptomatic, and 76.6% had high-risk tumors. A considerable number of patients reported arterial hypertension (53.1%). After surgery, patients presented with ED (90.1%) and UI (33.3%). A majority of patients (70.4%) had zero to poor performance. A worse self-esteem score was observed (p=0.0190), as well as worse sexual performance (p<0.001) among patients with ED. **Conclusion:** The possible after affects of RP may change sexuality and, consequently, have an impact on self-esteem.

Keywords: Prostatectomy. Erectile dysfunction. Urinary incontinence. Self concept.

RESUMO: Objetivo: Comparar as medidas de autoestima e de satisfação sexual segundo a presença de disfunção erétil (DE) e incontinência urinária (IU) em pacientes submetidos à prostatectomia radical (PR), nos primeiros cinco anos do pós-operatório. **Método:** Estudo transversal, com análise descritiva de 81 pacientes submetidos à PR. **Resultados:** A média etária foi de 65,5 anos. A maioria dos pacientes (85,2%) procurou a urologia assintomáticos e 76,6% possuíam tumores localizados de alto risco. Um número considerável referiu hipertensão arterial (53,1%). Após a cirurgia, os pacientes apresentaram DE (90,1%) e IU (33,3%). A maioria (70,4%) tinha desempenho de nulo a ruim. Foi observado pior escore de autoestima (p=0,019) e pior desempenho sexual (p<0,001) em pacientes com DE. **Conclusão:** As possíveis sequelas da PR podem alterar a sexualidade e consequentemente impactar a autoestima.

Palavras-chave: Prostatectomia. Disfunção erétil. Incontinência urinária. Autoimagem.

RESUMEN: Objetivo: Comparar las medidas de autoestima y de satisfacción sexual según la presencia de disfunción eréctil (DE) e incontinencia urinaria (IU) en pacientes sometidos a la prostatectomía radical (PR), en los primeros cinco años del pos-operatorio. **Método:** Estudio transversal, con análisis descriptiva de 81 pacientes sometidos a la PR. **Resultados:** El promedio de edad fue de 65,5 años. La mayoría de los pacientes (85,2%) buscó la urología asintomática y un 76,6% poseían tumores localizados de alto riesgo. Un número considerable refirió hipertensión arterial (53,1%). Tras la cirugía, los pacientes presentaron DE (90,1%) e IU (33,3%). La mayoría (70,4%) tenía desempeño de nulo a malo. Fue observado peor escore de autoestima (p=0,019) y peor desempeño sexual (p<0,001) en pacientes con DE. **Conclusión:** Las posibles secuelas de la PR pueden alterar la sexualidad y consecuentemente impactar la autoestima.

Palabras clave: Prostatectomía. Disfunción eréctil. Incontinencia urinaria. Autoimagen.

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INTRODUCTION

Currently, cancer is one of the main causes of death around the world and considered as a public health issue in developed and developing countries. The World Health Organization (WHO) has estimated that 27 million incident cases of cancer are expected in 2030, as well as 17 million deaths by cancer and 75 million people living with cancer a year. The last global estimation indicated prostate cancer (PC) as the second most common type of cancer among men, with about 1.1 million new cases in Brazil in 2012[1].

In Brazil, the estimation for 2016, also valid for 2017, reinforces the magnitude of the problem. Approximately 596,000 new cases are expected, 61,200 being PC, which is still the second most common neoplasm among men. The increasing life expectancy, evolution of diagnostic methods and improved quality of information systems in the country may explain the increasing incidence rates throughout the years[2]. This means that it is not about an increase in the number of occurrences of the illness, but the refined ability to diagnose the disease and greater concern of the population regarding their health.

Findings in clinical examinations, combined with the result of the serum dosage of PSA (Prostatic Specific Antigen), may suggest the existence of the disease. In suspicious cases, prostate biopsy is indicated with an anatomopathological report to provide the histological Gleason grading system. The goal is to identify the probable tumor growth rate and its tendency to disseminate in addition to helping to define the best treatment for the patient[3].

PC is a heterogeneous disease with different behavioral aspects. Therefore, it defines subgroups with high risk of recurrence after local treatment. In order to simplify data interpretation before treatment, and also to define the most appropriate strategy for each patient, D'Amico proposed the stratification of risk groups in three categories (low, intermediate, high), using PSA values for diagnosis in addition to the histological Gleason grading system and clinical staging[4].

Patients with PC must be treated in accordance with the stage of the disease, as such, radical prostatectomy (RP) is considered the gold standard for PC treatment in cases of tumors restricted to the prostate for its excellent survival rates[4].

All therapy modalities present significant risks and side effects, causing a negative impact on the quality of life (QoL) of patients. In the case of RP, the main complications are related with urethral stenosis, urinary incontinence (UI) and erectile dysfunction (ED). Studies indicate the last two as the main factors affecting QoL after RP[3].

Behavioral changes may have a decisive influence on QoL, the evolution of the disease and the prognosis. It is essential that the diagnosis be associated with a psychodiagnostic test for proper treatment, also in regard to the acceptance of the disease and understanding how to manage feelings that appear in this moment[3].

RP and the possibility of after effects increase and facilitate the onset of fear related with impotence, loss and death. Early detection and treatment must consider the emotional aspects involved since they lead to the appearance of sexual conflicts, and constitute a threat to the male integrity and identity[3].

The feeling of impotence causes repercussions in the lives of patients with PC. Although there has been progress in terms of possible treatments, since this organ affects male sexual sensitivity, the feeling of impotence is present even for those experiencing transient impotence. Depression and emotional changes affect sexuality, which changes the physiology of the erection. An erectile dysfunction may anticipate failure and produce or increase anxiety[5].

It is widely known that urogenital tumors lead to additional implications, especially for men. Besides the important emotional consequences caused by issues related to cure and death, it is common that both the diagnosis and the treatment involve loss of masculinity, lower self-esteem (SE), confrontation with life changes, body image, personal relationships and suffering, which affect physical and the emotional well-being, compromising QoL overall[5].

In this sense, the male population with cancer needs attention. The role of the nurse in health promotion and in the rehabilitation of post-radical prostatectomy patients is essential, since nervous lesions resulting from this type of procedure may lead to erectile dysfunctions and urinary incontinence. The nurse should conduct meticulous observation searching for strategies that fulfill the health needs of these men, providing assistance towards at a better QoL.

Confronting the effects of diagnosis and surgical treatment and understanding the profile of patients to create a care plan becomes essential. This also raises the following question: Do the main surgical complications of RP, ED, and UI interfere in self-esteem and sexual satisfaction of postoperative patients?

OBJECTIVE

To compare the measurements of self-esteem and sexual satisfaction according to the presence of ED and UI in the first five postoperative years, in patients with PC submitted to RP.

METHODS

This is an observational, descriptive, and correlational cross-sectional study. The population participating in the study consisted of 187 patients submitted to RP from September 2006 to September 2011, in a hospital specialized in oncology.

Eighty-one patients who met the following inclusion criteria participated in the study: living in Uberaba (MG); diagnosed with localized or locally advanced prostate cancer; undergone radical retropubic prostatectomy with or without lymphadenectomy; presenting the cognitive conditions to understand the questions; and having had surgery for a period of at least three months. Exclusion criteria were: psychiatric diagnosis or taking medication with effects on the central nervous system; having been submitted to rescue RP, or participation in adjuvant therapy, without any information about the clinical staging of the tumor in the medical records.

Before data collection, a pilot test was conducted, without replacement. We obtained the list of patients from the hospital's medical file who were included in the selected period. Using simple randomness, five individuals were selected. Data collection began after the test was concluded. Researchers invited the patients by phone to attend the service at a specific date and time to apply the instruments. In this situation, they understood the objectives and the importance of the study, the right to not participate, without any damage to the treatment, anonymity, secrecy and privacy.

The first part of data collection was conducted in a previously booked outpatient clinic at the hospital outside the working hours of the routine outpatient rooms. This strategy aimed to ensure privacy and a greater return of patients in a timely manner. A male health professional, responsible for the clinical follow-up of the patient, performed the questionnaires. The questions were asked in a single, private meeting after the patients read and signed the Informed Consent Form.

The second part of collection was conducted through the hospital's medical files, by consulting the medical charts in order to obtain information about the clinical and surgical history of the patients.

The sociodemographic and clinical-surgical variables analyzed were: date of birth (day, month and year); presence of arterial hypertension (AH), diabetes mellitus (DM), and heart disease; and date of surgery and risk classification according to D'Amico. The following instruments were used to obtain scores of ED, UI, SE and sexual performance: International Index of Erectile Function (IIEF-5), International Consultation on Incontinence Questionnaire – Short Form (ICIQ-SF), Rosenberg Self Esteem Scale (EAR) and Male Sexual Quotient (M - SQ).

IIEF-5 has 15 items, and was translated to Portuguese and validated as a self-applicable scale to assess sexual function. IIEF-5 is psychometrically valid and easy to apply in clinical studies. Five factors are identified: erectile function, orgasmic function, sexual desire, satisfaction in sexual intercourse, and global satisfaction. According to the responses, erectile dysfunction can be classified from severe to absent[6].

The ICIQ-SF, also validated and translated into Portuguese, presents psychometric properties such as validity, reliability, and responsivity to both sexes. It comprises 6 questions, and the final score (0 to 21) is the sum of the scores in questions 3, 4 and 5. In this study, the two first questions were ruled out. We maintained the three questions composing the score, and the last question, which is descriptive. All men whose sum was higher than three were considered incontinent[7].

The SE scale elaborated by Rosenberg (1965) is a unidimensional instrument that assesses personal self-esteem. It is a four-point Likert scale (strongly agree, agree, disagree, strongly disagree), translated into Portuguese, adapted and validated for the Brazilian cultural context. The score ranges from 0 to 30, and low SE is indicated by high values[8].

The Male Sexual Quotient (M-SQ) is a questionnaire elaborated and validated by Abdo[9], contemplating physical and emotional components of sexual function. Its results suggest that the total score obtained may clearly distinguish individuals with and without sexual dysfunction. The response options range from never (zero) to always (five), and performance can go from null to excellent[9].

A spreadsheet was built to store data, using the software Microsoft® Office Excel® 2007 (Microsoft Corporation,

Redmond, Washington, The United States). The data collected were typed in double input in order to verify the consistency and consolidation. The data stored and validated in the software Microsoft® Office Excel® 2007 were imported into the application Statistical Package for Social Sciences (SPSS), version 16.0.

The characterization of the population used descriptive measures, that is, we used the distribution of frequencies for the categorical variables, and centrality (mean and median) and dispersion measures (standard deviation, minimum and maximum values) for numerical variables.

Age was categorized in age groups (<40; 40 – 50; 50 – 60; 60 – 70; 70 – 80; ≥80), becoming ordinal categorical. Postoperative time (quantitative variable), obtained from the date of surgery, was dichotomized (up to a year of surgery and more than a year). ED and UI scores were re-categorized, making them dichotomic (presence and absence), and age was divided in tow age groups (adult and elderly).

To compare measures of SE and sexual satisfaction, according to the presence or absence of ED and UI, the Mann-Whitney nonparametric test was used according to the results of Shapiro Wilk's normality test. The significance level adopted was α=0,05. The internal consistency of the instruments (IIEF-5 and ICIQ) was verified using the Cronbach's alpha coefficient.

The project was submitted to the Human Research Ethics Committee and after the approval's report, n. 2099/2011, a pilot test and data collection were initiated.

RESULTS

Regarding sociodemographic characteristics, age ranged from 37 to 81 years old, with mean age of 65.5 years (SD=8.4), with 77.8% older than 60. In relation to comorbidities, a total of 53.1% mentioned arterial hypertension; 17.3%, diabetes mellitus; and 27.2%, some sort of heart disease.

Patients were asked about the reasons that led them to look for the urology service. Most of them sought a routine prostate evaluation (85.2%), whereas only 14.8% presented with urinary symptoms. The mean postoperative time was 25.9 months, with variation of 6 to 48.4 months (±1.3), and most of them had undergone RP less than 1 year before (76.5%). According to D'Amico's classification, 76.6% of the localized tumors were high risk.

With regard to ED, IIEF-5 presented a mean of 6.9 (±10.2) in the responses, with score variation of 1 to 30 points. Cronbach's alpha of 0.99 indicated high internal consistency and homogeneity of items. Most patients after surgery did not participate in sexual activity (74.1%) or try penetration (75.3%), and also presented very low confidence about erection (69.1%). According to the IIEF-5 score, most (90.1%) patients had some level of ED – mostly severe ED (75.3% of them). The association between postoperative time and ED was significantly higher in the group of elderly (p=0.01). Of the total number of patients with ED, 76.7% had high-risk tumors.

Regarding urinary incontinence, ICIQ-SF presented Cronbach's alpha of 0.90, which indicates high internal consistency and homogeneity of items. A 33.3% frequency of UI was observed, with mean score of 3.26 (±5.37), and variation of 0 to 21. Most had undergone surgery more than 1 year before (70.4%) and were elderly (81.5%). This study did not show significant differences of UI among patients with up to one year of surgery in relation to those with more than one year, as well as among adults and the elderly.

The EAR instrument presented Cronbach's alpha of 0.95. The mean scores of the answers was 5.38 (SD=6.6), with variation of 0 to 28 points, indicating high SE.

Data in Table 1 show that patients with ED and UI had higher mean scores (worse self-esteem), and this correlation was significantly higher among patients with ED (p=0.019).

The M-SQ had Cronbach's alpha of 0.98. The mean score of the answers was 20.57 (SD=32.5), with variation of 0 to 100 points. Most patients presented null to poor sexual performance as an overall trend (70.4%). This result may be related with surgical complications of RP (Table 2).

Table 1. Comparison of self-esteem scores among patients who underwent radical prostatectomy, according to the presence of erectile dysfunction and urinary incontinence. Uberaba (MG), 2012.

	Median	Mean score	P value*
Erectile dysfunction			
Yes	4.0	42.99	0.019
No	0	22.88	
Urinary incontinence			
Yes	5.0	44.37	0.350
No	1.5	39.31	

*P value obtained by the Mann-Whitney nonparametric test.

Data show that patients without ED had higher mean scores, that is, higher sexual satisfaction in relation to those with ED (p<0.001). Patients without UI also presented higher scores, which indicates they have a better pattern of sexual performance, even though there was no significant difference between those who had UI and the ones who did not.

DISCUSSION

PC is considered a cancer that affects the elderly, as the onset of 75% of global cases occur after the age of 65. The incidence of PC increases with age, reaching almost 50% of the individuals at the age 80, which indicates that this tumor probably will not spare any man who lives up to 100[10]. According to the *Instituto Nacional do Câncer* (INCA), the only well-established risk factor for the development of PC is age: approximately 62% of the cases diagnosed in the world affect men aged 65 years old or more. In this study, mean age was 65.5 years old. Similar results were found in other studies. In a hospital cohort composed of patients with localized PC, mean age was 73 years (40 – 87), 63 as the mean for those who were submitted to RP[11]. Another study showed the mean age as 66 years (43 – 77), and 81% were older than 60 years[3].

There is a direct and linear relation between arterial pressure and age, being the prevalence of systemic arterial hypertension (SAH) higher than 60% in the population aged more than 65 years. Therefore, the high levels of hypertensive patients in this study may be related with the frequency of elders.

Table 2. Comparison of Male – Sexual Quocient scores (M-SQ) among patients who underwent radical prostatectomy according to the presence of erectile dysfunction and urinary incontinence. Uberaba (MG), 2012.

	Median	Mean score	P value*
Erectile dysfunction			
Yes	1.0	37.21	<0.001
No	4.5	75.63	
Urinary incontinence			
Yes	1.0	38.65	0.458
No	1.0	42.18	

*P value obtained by the Mann-Whitney nonparametric test.

Regarding PC etiology, risk factors related with age and heredity stand out. However, some exogenous factors may play an important role in the development of PC and in the impact on the risk of progression of latent cancer to its clinical form. These factors are usually associated with clinical conditions, such as SAH, DM and heart conditions, which can function as potential postoperative complications[12]. Therefore, the results of the clinical variables in this study are important data, possibly associated with etiology or surgical complications (ED and UI).

Most patients in the study group looked for a routine prostate evaluation, without any urinary symptoms. One of the peculiarities of PC is its ability to be found in a high number of individuals without causing them any harm. A recent systematic review of studies that evaluated the prostate through necropsies of men who passed away without an apparent prostate condition revealed neoplastic spots in individuals who did not present clinical manifestations related to PC in their lives. The study shows that tumors in the elderly age group have an indolent aspect, are asymptomatic and that people affected by it die for other reasons; that is, they die with the cancer, but not because of it[13].

Concerning ED, most patients after surgery were observed to not participate in sexual intercourse, did not try penetration and presented very low confidence regarding erection. Most presented some level of ED. These data coincide with those in other scientific findings, which shows that reported impotence rates are discrepant and high, ranging from 60 to 90%[14].

The age of the patient at the time of surgery is essential to determine the recovery of erectile dysfunction after surgery. Studies have shown the association between age and ED, indicating that better rates of potency in the postoperative period are obtained in the youngest population, which is also more prone to having better preoperative erectile function and being more interested in sexual recovery after surgery[15-17]. In this study, ED was associated to the group of elderly.

The nerve preservation should be considered for patients with localized PC, and the best candidates are those with low risk tumors according to D'Amico[15]. Although this study did not assess preoperative erectile function and the nerve preservation, it is possible to assume that, for most patients, such preservation was not possible, once the high-risk group was prevalent.

The UI rate was in accordance with other scientific findings, considering the variables that generate great range in their indexes. It is important to mention that UI was not classified, and patients who presented any loss were considered as incontinent. UI rates vary considerably – possibly related with differences in surgical approaches – in UI definitions, in the study's methodologies, as well as time of follow-up and the instrument used for urinary function evaluation. Scientific findings show a variance of 8 to 77%[18]. Moderate or severe UI is present in 3 to 5% of the cases, when intervention is conducted by skilled teams[10].

Regarding SE, there has been a significantly higher correlation among patients with ED. Studies point out that the involvement of the urinary and reproductive system and the chances of changes in urinary incontinence and sexual function may cause major emotional responses in patients who underwent prostatectomy[5,14].

A prospective study showed that even though patients present with ED or UI, they either report not having problems or a minor one. Therefore, despite not having erections and losing urine involuntarily, those patients apparently adjusted to the stressful agents, maintaining a positive self-image[19]. When qualitative methods are associated with the studies, men report that ED causes great postoperative affliction, with expressive reduction in SE. Another study showed that men like to demonstrate to themselves and others that they deal with the problems easily, tending to decrease or deny the existence of difficulty to prevent family concern in addition to not being perceived by others as vulnerable[20].

Data concerning sexual satisfaction corroborate with literature, which shows the relationship between sexuality, masculinity and the prostate. A study showed men who presented with satisfactory sexual activity before RP, and after surgery began to present the following characteristics: presence of ED, inhibition of desire, marital conflict and masturbation[3].

Whereas sexual function certainly decreases with age, sexuality and the sense of oneself as a sexual being is still a major aspect in the life of men. Although PC alone may lead to a reassessment of life, ED may challenge their identity further, causing changes in the way men see themselves as sexual beings, how they are inserted in society and their relationship with women[14].

Psychological therapies specifically addressed to patients undergoing a PC treatment are important to help men how to recognize, express and accept the changes caused by the treatment. This will help them improve their communication with their partners and with the care team, and also to guide them in searching for adjustment solutions for urinary and sexual problems.

Caring for a patient with PC usually requires multidisciplinary efforts. The nurses play an essential role, as they are the professionals who communicate with the patients and their families in all stages of the disease, and in different contexts of the service. However, in order to provide qualified care, it is important to understand the biological, physiological and psychological dimensions of the disease, of the treatments, and of the impact they have on the lives of these patients and relatives.

It is important to mention that although the main goal of any treatment for PC is to maximize life expectancy, patients and the health team need to pay attention to the impact of therapies, since survival rates that are not accompanied by QoL may not be the best option for the patient, causing even more suffering.

CONCLUSION

The results obtained in this study allowed establishing the following conclusions:

Concerning sociodemographic characterization:

- Age ranged from 37 to 81 years old, with mean age of 65.5 (SD=8.4), and 77.8% aged 60 years old or more.

Concerning clinical-surgical characterization:

- They reported SAH (53.1%), DM (17.8%) and heart conditions (27.2%). Most patients looked for the urology service while asymptomatic (85.2%). According to D'Amico's classification, 76.6% of the localized tumors were high-risk. As to postoperative time, 76.5% had more than 1 year of surgery.
- Regarding ED, the mean score of IIEF (α=0.99) was 6.9 (SD=10.2). Most did not have sexual activity (74.1), did not try penetration in the postoperative period (75.3%), and had low confidence in relation to erection (69.1%). ED was present in 90.1%, being severe in 75.3%. Of the total patients with ED, 76.7% had tumors classified as high-risk;
- The ICIQ-SF (α=0.90) presented mean score of 3.26 (SD=5.37) and showed UI in 33.3% of the patients.
- SE was considered high considering the Rosenberg SE scores (α=0.95), which showed mean of 5.38 (SD=6.6);

- Most patients presented null to poor pattern of sexual performance (70,4%), considering the M-SQ (α=0.98). The mean score was 20.57 (SD=32.5).

Regarding the association of ED and UI with the age group and postoperative time:

- It was observed that, from the total number of patients with ED (73), 82.2% were elderly (p=0.01), and 78.1% had more than 1 year of surgery. Among those with UI (27), 81.5% were elders and 70.4% had been submitted to surgery more than one year before.

The comparison of SE, sexual satisfaction according to the presence of ED and UI measures:

- Regarding SE, patients with ED (p=-0.019) and patients with UI presented higher mean scores (worse SE);
- Better sexual performance was verified in patients without ED (p<0.001) and without UI.

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BODY TEMPERATURE OF THE ELDERLY PATIENT IN THE POSTOPERATIVE PERIOD

Temperatura corporal do paciente idoso no período pós-operatório

Temperatura corporal del paciente anciano en el período postoperatorio

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ABSTRACT: Objective: To identify fever in elderly patients submitted to orthopedic surgery during the postoperative period. **Method:** This is a retrospective cohort study. Two hundred and sixty-two medical records of elderly people submitted to orthopedic surgery in the period from January 2013 to December 2015 were analyzed. Medical records from 60-year-old patients or older, with complete registration of their body temperature between the first and fifth postoperative days, were included. **Results:** We found that only 1% of the patients had fever during the postoperative period (38.7°C), and most of them were female patients (58%), aged around 74 years; 52% underwent osteosynthesis of the proximal third of the femur – an orthopedic surgical procedure that had as its main cause the proximal femur fracture (52%). **Conclusion:** The results found in the research indicate a necessary care, by means of which temperature is controlled after surgical procedures.

Keywords: Aged. Fever. Postoperative care.

RESUMO: Objetivo: Identificar a febre no idoso submetido à cirurgia ortopédica no período pós-operatório (PO). **Método:** Trata-se de um estudo de coorte histórica. Foram analisados 262 prontuários de idosos submetidos à cirurgia ortopédica, no período de janeiro de 2013 a dezembro de 2015. Foram incluídos os prontuários dos pacientes com idade maior ou igual a 60 anos, com registro completo da temperatura corporal entre o 1° e o 5° dia de pós-operatório (DPO). **Resultados:** Identificou-se que apenas 1% dos pacientes apresentou febre no período pós-operatório (38,7°C), sendo a maioria do sexo feminino (58%), com idade média de 74 anos; 52% foram submetidos à osteossíntese de terço proximal de fêmur, procedimento cirúrgico ortopédico que teve como maior causa a fratura de fêmur proximal (52%). **Conclusão:** Os resultados encontrados na pesquisa apontam para o cuidado necessário com o controle da temperatura após procedimentos cirúrgicos.

Palavras-chave: Idoso. Febre. Cuidados pós-operatórios.

RESUMEN: Objetivo: Identificar la fiebre en el anciano sometido a cirugía ortopédica en el período postoperatorio (PP). **Método:** Se trata de un estudio de cohorte histórica. Fueron analizados 262 prontuarios de ancianos sometidos a la cirugía ortopédica, en el período de enero de 2013 a diciembre de 2015. Fueron incluidos los prontuarios de los pacientes con edad mayor o igual a 60 años, con registro completo de la temperatura corporal entre el 1° y el 5° día de postoperatorio (DPO). **Resultados:** Se identificó que apenas el1% de los pacientes presentó fiebre en el período postoperatorio (38,7°C), siendo la mayoría del sexo femenino (58%), con edad promedio de 74 años; un 52% fue sometido a la osteosíntesis de terco proximal de fémur, procedimiento quirúrgico ortopédico que tuvo como mayor causa la fractura de fémur proximal (52%). **Conclusión:** Los resultados encontrados en el estudio apuntan para el cuidado necesario con el control de la temperatura tras procedimientos quirúrgicos.

Palabras clave: Anciano. Fiebre. Cuidados posoperatorios.

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INTRODUCTION

Body temperature is one of the physiological parameters that the organism controls most. The hypothalamus is the thermoregulatory center responsible for the coordination of the functions that intervene in the production and loss of heat, thus maintaining the temperature within the desired limits[1]. Even though the organism is subject to thermal variations, oscillations between 0.2 and 0.4°C (Celsius) to 37°C are allowed for maintaining the metabolic functions.

During the aging process, the thermoregulatory center requires efficiency and therefore may cause temperature oscillations under normal conditions. Based on this fact, the elderly constitute an important group of risk, because their temperature regulation capacity before cold or heat exposure decreases with age[2].

The factors that may result in decrease of temperature perception include reduction in the number of sudoriferous and sebaceous glands in the skin, resulting in blood flow decrease; and reduction in the metabolism synthesis of the main neurotransmitters, which leads to a slower conduction of nervous impulses. Therewith, the elderly take longer to answer and react to extreme temperatures[1].

In the surgical context, not only the elderly patient is subject to physiological changes due to the aging process, but also to thermoregulatory changes induced by anesthesia, by the surgery itself and by the surgical environment[3].

Hypothermia is a frequent phenomenon in the Postanesthesia Care Unit (PACU), since there is inhibition of the physiological mechanism due to anesthesia, which can be attributed to age of the patient, temperature in the operation room, and action of anesthesia agents, which depress the thermoregulatory center[4].

On the other hand, high body temperature in the postoperative period (PO) has been associated with both infectious processes and organism's physiological response to orthopedic surgical procedures[5].

Temperature raise may be attributed to tissue injury caused by the surgical procedure, which develops the release of cytokines through tissue monocytes or macrophages, such as interleukin 1β (IL-1β), tumor necrosis factor-alpha (TNFα), and interferon-α, and all of them have a pyrogenic activity. These cytokines stimulate the production and secretion of interleukin-6 (IL-6), which is responsible for the acute inflammatory response. When this cytokine enters the blood flow and reaches the brain tissue, it synthesizes prostaglandin E_2, which is in charge of sending the signal to the pre-optical nucleus of the hypothalamus, thus raising the adjustment point of the body temperature[6].

Fever in the PO is not only a physiological response, but it is also considered a defense mechanism, as well as a stimulus to interferon production in the organism. There is evidence that fever, during the PO, is the result of physiological response of the body and is an important signal of defense mechanism. Increases in temperature of up to 39°C intensify the body's immune system; the production of leucocytes is stimulated during the feverish episode; the iron concentration in the plasma is decreased and therefore the growth of bacteria is suppressed. Fever also fights against viral infections through the stimulation of interferon production, which is a molecule of combat against the natural virus of the organism[7].

Therefore, temperature measurement becomes an important nursing care during the PO. Even though there are many places to perform this procedure in the Brazilian nursing practice, axillary temperature measurement is the most used due to its easy access and non-invasive advantages[8].

Hence, the nurse must recognize the importance of measuring the temperature of elderly patients in the PO. The results of this measurement may orient the elaboration and implementation of a care plan to elderly patients after their surgery.

Thus, the aim of this study was to identify the occurrence of fever in elderly subjects, who underwent orthopedic surgery, during the PO.

METHOD

A retrospective cohort study of quantitative approach was carried out based on the medical records of a patient admitted at a public hospital institution of traumatology reference teaching, located in the city of Belo Horizonte, State of Minas Gerais, in Brazil. The temperature records between the first and fifth postoperative days (PODs) of elderly patients who underwent orthopedic surgery, from January 2013 to December 2015, were analyzed, resulting in 262 medical records. The five-day period was chosen based on a review study in which the authors concluded that fever is manifested in the first 72 PO hours as a normal physiological response of the organism to the surgical trauma mediated by inflammatory cytokines[5].

The following items were adopted as eligibility criteria: patients aged 60 years or older[9], who were underwent

orthopedic surgery and received treatment between January 2013 and December 2015, and medical records with complete registration of body temperature during the first 5 PODs.

The list of patients was obtained from the database of the Information Technology Department of the hospital. Registered information from each patient was transferred and typed individually in an instrument structured with data regarding: subject's characterization, such as age, sex, and comorbidities; surgery (orthopedic surgery); and PO (patient's body temperature in the first five days).

The nursing team of the surgical hospitalization unit assessed the body temperature using a mercury-in-glass thermometer; the measurement was taken in axillary location and the result was registered in the patient's medical record according to the standard operational procedure (SOP) of the hospital institution. Temperature values corresponded to the first registration of the day, i.e. 6:00 in the morning. With regard to axillary body temperature, values above 37.8°C[7] were considered as fever.

Data were stored in the Microsoft Office Excel 2007 program and processed in the Statistical Package for the Social Sciences (SPSS) program, version 19.0. Results were described as relative and absolute frequencies; and the continuous variables were presented with mean, standard deviation, maximum and minimum values. The research followed the requirements of Resolution 466/12 from the Brazilian Health Council (CNS) and had the previous consent of the institution, as well as a favorable opinion of the Research Ethics Committee from *Universidade Federal de Minas Gerais* (UFMG), under protocol no. CAAE – 14274913.0.0000.5149.

RESULTS

A total of 262 elderly patients participated in the study. There was a higher prevalence of the female sex (58%). With regard to the age of the elderly, there was a mean of 74.4 years old, with variation between 61 and 95 years old. It is worth noting that 65.6% of them were between 60 and 79 years old. As to the kind of orthopedic surgeries, there was a predominance of femur osteosynthesis (52%), and the most common reason to perform the surgery was femur fracture (52%). Data can be verified in Table 1.

Table 2 results show that the mean temperature, throughout five days, did not present extreme variations between

Table 1. Frequency distribution of elderly patients according to sociodemographic and surgical variables. Belo Horizonte, MG, Brazil, 2015.

Variable	n	%	Mean (SD)
Sex			
Male	110	42.0	
Female	152	58.0	
Age (years)			
60–69	87	33.2	74.4 (9.79)
70–79	85	32.4	
80–89	67	25.6	
>90	23	8.8	
Type of surgery			
Proximal third of the femur osteosynthesis	137	52	
External fixation	24	9	
Total hip replacement	20	8	
Closed reduction	19	7	
Partial hip replacement	12	5	
Lower-extremity amputation	11	4	
Others	39	15	
Cause			
Proximal femur fracture	206	79	
Tibial fracture	18	7	
Hip fracture	11	4	
Ankle fracture	10	4	
Patellar fracture	9	3	
Ankle fracture	8	3	

SD: standard deviation.

Table 2. Distribution of elderly's body temperature values in the postoperative period. Belo Horizonte, MG, Brazil, 2015.

	First POD		Second POD		Third POD		Fourth POD		Fifth POD	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Mean temperature (°C)	36.4	36.1	36.5	36.5	36.4	36.2	36.5	36.3	36.4	36.4
Maximum temperature (°C)	37.5	38.7	37.9	38.2	38.2	38.0	37.9	37.3	38.2	37.9
Fever (%)	–	1	1	0.7	0.7	0.7	–	–	0.7	–

Source: Research data.
POD: postoperative day.

sexes. After categorizing the temperature values, we found that only three (1%) patients had fever.

DISCUSSION

The body physiological signals, such as temperature, heart rate, blood pressure, and respiratory rate, are accurate indicators of the individuals' health conditions. Therefore, body temperature measurement becomes part of the standard physical examination and is a decisive factor in many diagnostic deliberations[10].

There was higher prevalence of the female sex in this study. This result is in agreement with previous studies on fractures on the elderly. However, the mean age was 74 years, which is different from the results obtained in the cities of São Paulo[11] and São Sebastião do Paraíso (Minas Gerais State)[12] that found average ages of 79 and 80 years, respectively.

Among the orthopedic surgeries, osteosynthesis of the proximal third of the femur was more prevalent. Osteosynthesis is known as the most recommended treatment for patients with femur proximal fracture owing to its earlier provision of stability and functional return. Increase of these fractures in the elderly population occurs mainly due to the larger incidence of falls and is associated with different factors, such as advanced age, osteoporosis, decrease of muscle strength, hip geometry, and genetic predisposal[11].

The results from this study have showed that only three elderly patients (1%) developed fever in the first POD, which is different from data published in literature that varied between 8 and 36% during the first 72 hours of the PO period in hip and knee prosthetic surgeries. This explanation may be because fever is caused by cytokines (IL1–Il6) that work as endogenous pyrogens and are released in the presence of tissue damage. Therefore, fever cannot be considered a sign of infection[6,13].

It is worth noting that the mentioned studies included patients aged between 18 and 80 years. In this study, the population was composed of patients aged 60 years or older. Age influences not only the basal temperature, but also the febrile response. There is evidence that, during infectious processes, the maximum temperature achieved by the elderly patient may not satisfy the conventional standard of fever, i.e. temperature above 37.8°C[14,15].

This thermal irresponsiveness standard may be attributed to several causes, such as thermogenesis disorders, that is, decrease of basal metabolism, of the muscle tremor efficiency and peripheral vasoconstriction; reduction of production and sensitivity to IL-1, behavioral alterations and daily life activities[16].

Another aspect that possibly influenced temperature values in this study was the anatomic place of measurement, i.e. the axillary in this case. A study carried out including the elderly population in an emergency unit from a German university hospital identified lower axillary temperature values in this group of patients, if compared to other measurement places. However, another study carried out in the cities of Múrcia and Toledo, in Spain, shows that temperature measurement in distal locations is a noninvasive method that is reliable and comfortable for obtaining temperature data[16,17].

The measurement technique is associated with the temperature value result. The axillary measurement should be done as follows: place the patient in the supine position; guide him/her as to the movement of arm abduction and adduction; perform arm abduction until a 35° angle; dry the axilla of patient; put the thermometer parallel to the axilla medial wall of patient; touch his/her extremity in the axilla top and turn him/her by putting him/her perpendicularly to the medial wall; ask the patient to close the axillary cavity; inflect the forearm and place it on the thorax; loose it and note the time; remove the thermometer after 3 minutes and take the reading; finally, write down the result[18,19].

Studies carried out with adults have found that axillae humidity, weight loss, malnutrition, skin folds, and adipose layer thickness may make it difficult to fit correctly the thermometer in the axillae and, therefore, change the result of its reading, thus creating the risk of recording false temperatures[8-10,14].

Considering that information was obtained by means of electronic medical records in this study, it is hard to make conjectures about the technique used. It is assumed that the nursing team professionals followed the technique described in the SOP of the unit, which is not different from the previously described technique[18-20].

Another important observation refers to the basal temperature measurement registration of post-operated elderly patients. The body temperature of the patient is known to possibly suffer variations based on the influence of factors such as emotional alterations, changes in the room temperature, presence of comorbidities, infectious processes, daily life activities, and circadian rhythm[10].

The circadian rhythm of temperature usually presents oscillations during the day; then, in the morning, the temperature is lower if compared to that in the afternoon, when high temperature peaks are more evident. This variability may

be explained because, in the morning, the subject is found at a moment after his/her sleeping period and presents his/her basal temperature, and then the temperature increases when the subject returns to his/her routine activities[10,16,18].

With regard to sex, in the present study, the mean temperature value was similar in both groups – female and male. These findings are in agreement with a study carried out with the general population of the cities of Múrcia and Toledo, in Spain, which identified that the temperature difference between sexes disappears in the elderly population[16]. Another study conducted with subjects aged 59 years or older, in the city of São Paulo, justified the increased temperature in the female sex due to the highest amount of adipose tissue[21].

The results found in this research indicate the need of the nurse to pay attention to the proper technique for temperature measurement after surgical procedures. This implies recognizing the clinical signals and parameters that might contribute to the diagnosis of an infection or inflammation condition, not only considering the increase in temperature.

There is a need for a new research regarding temperature measurement in elderly patients, since there were only a few results of investigations published in the literature involving this group of patients.

The results of this study contribute to the nursing area, facilitating knowledge and understanding of the characteristics of the elderly population submitted to orthopedic surgeries, which is a necessary phase for the implementation of care strategies in the perioperative period.

A methodological limitation of the study was the fact that data collection was carried out only in one hospital institution, which limits the generalization of the result.

CONCLUSION

The sociodemographic profile of the elderly who underwent orthopedic surgical procedures was predominantly female. The mean age was 74 years old and the most conducted orthopedic surgical procedure was femur osteosynthesis. The most frequent etiology of the procedure was the proximal third of the femur.

Fever was found in the first POD – 38.7°C – in only 1% of the female patients. The basal axillary temperature of elderly patients who underwent orthopedic procedures presented mean values between 36.1 and 36.5°C in the first 5 PODs.

The results found in this research suggest that the values found in elderly patients require knowledge of the nursing team that go beyond the correct performance of the measurement technique. The nursing team should understand the aging process, the circadian cycle of the elderly's temperature and the factors that may change temperature at the time of measurement.

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PERSONAL PROTECTIVE EQUIPMENT USED BY NURSING PROFESSIONALS IN MATERIALS AND STERILIZATION CENTERS

Equipamentos de proteção individual utilizados por profissionais de enfermagem em centros de material e esterilização

Equipos de protección individual utilizados por profesionales de enfermería en centros de material y esterilización

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ABSTRACT: Objective: To verify the use of personal protective equipment (PPE) by Nursing professionals in Central Sterile Supply Department (CSSD). **Method:** Quantitative study conducted with 50 professionals in two hospitals of João Pessoa, Paraíba, with the application of a semi-structured questionnaire. This study was approved by the Research Ethics Committee, CAEE number 47355315.3.0000.5183. **Results:** Among the participants, 96% are female, 36% have technical nursing courses, and 58% report having more than 10 years of experience. As to the use of PPE, 74% use it frequently, 40% consider it to have low quality, 50% think it is unnecessary, and 68% do not adjust to the activities. Seventy-four percent of the professionals were exposed to occupational risk. The training reached 66% of the interviewees, and 98% recognized its importance. **Conclusion:** The results indicate that professionals do not use PPE regularly, and are therefore exposed to risk. It is important to emphasize the need to provide continuous education in order to increase the awareness regarding care.

Keywords: Personal protective equipment. Occupational risks. Health education.

RESUMO: Objetivo: Verificar o uso de equipamento de proteção individual (EPI) por profissionais de Enfermagem em Centros de Material e Esterilização (CME). **Método:** Estudo quantitativo, realizado com 50 profissionais em dois hospitais de João Pessoa, Paraíba, por meio da aplicação de um questionário semiestruturado. Este trabalho foi aprovado pelo Comitê de Ética e Pesquisa (CEP), sob CAEE número 47355315.3.0000.5183. **Resultados:** Constatou-se que, entre os participantes, 96% são do sexo feminino, 36% têm técnico de Enfermagem e 58% contam mais de 10 anos de experiência. Quanto ao uso de EPI, 74% os utilizam frequentemente, 40% consideram ter pouca qualidade, 50% acham desnecessário e 68% não se adaptam às atividades. Estiveram expostos a risco ocupacional 74% dos profissionais. Participaram de treinamento sobre o tema 66% dos entrevistados e 98% reconheceram a importância da capacitação. **Conclusão:** Resultados apontam que os profissionais não usam regularmente os EPI, expondo-se aos riscos. Ressalta-se a necessidade de realização de uma educação permanente a fim de sensibilizá-los quanto aos cuidados.

Palavras-chave: Equipamento de proteção individual. Riscos ocupacionais. Educação em saúde.

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RESUMEN: Objetivo: Verificar el uso de equipo de protección individual (EPI) por profesionales de Enfermería en Centros de Material y Esterilización (CME). **Método:** Estudio cuantitativo, realizado con 50 profesionales en dos hospitales de João Pessoa, Paraíba, por medio de la aplicación de un cuestionario semi-estructurado. Este trabajo fue aprobado por el Comité de Ética e Investigación (CEP), bajo CAEE número 47355315.3.0000.5183. **Resultados:** Se constató que, entre los participantes, el 96% es del sexo femenino, un 36% tiene técnico de Enfermería y un 58% cuenta más de 10 años de experiencia. Cuanto al uso de EPI, el 74% los utiliza frecuentemente, un 40% considera tener poca calidad, un 50% lo cree innecesario y un 68% no se adapta a las actividades. Estuvieron expuestos a riesgo ocupacional el 74% de los profesionales. Participaron de capacitación sobre el tema el 66% delos entrevistados y el 98% reconoció la importancia de la capacitación. **Conclusión:** Resultados apuntan que los profesionales no usan regularmente los EPI, exponiéndose a los riesgos. Se destaca la necesidad de realización de una educación permanente a fin de sensibilizarlos cuanto a los cuidados.

Palabras clave: Equipo de protección personal. Riesgo laborales. Educación en salud.

INTRODUCTION

The historical assumptions come to the conclusion that the starting point of occupational accidents is the person's need to fight for his or her survival. In Nursing, predisposing factors for these situations include the insufficient number of workers, work overload, long working hours, continuous care in night shifts, physical and emotional exhaustion, and deficient technical training[1]. In this sense, in order to provide qualified care to the human being, the Nursing professionals are exposed to a series of risks – physical, chemical, ergonomic, psychosocial, biological risks, among others – which may cause accidents during the shift, besides occupational diseases[2,3]. The occupational exposure to biological material presents higher risks due to the possibility of transmitting pathogens, such as the viruses of hepatitis B (HBV), hepatitis C, and acquired immunodeficiency (HIV), resulting from percutaneous lesions and/or contact with contaminated blood, mucosa or non-intact skin[3-5].

In this context, Resolution 15, from Anvisa's Collegiate Board, defines the Central Sterile Supply Department (CSSD) "as a set of elements addressed to the reception, purge, preparation, sterilization, storage and distribution of the material to consumer units in health institutions"[6]. Therefore, the activities in these environments involve several types of risks, especially biological risks, considering that workers are directly exposed to organic secretion by handling contaminated items. This is a warning for the constant adoption of biosafety measures.

Among the standard precautions, the personal protective equipment (PPE) is used to prevent work accidents, and its use is necessary in places characterized as being dangerous or unhealthy, besides those that require hygiene and safety for elaboration. The resistance of the Nursing professionals to use this equipment and its incorrect use are the main barriers for the prevention of risk of exposure to biological materials[7].

The low adherence to the use of PPE and its incorrect management result from factors such as discomfort, annoyance, lack of care, forgetfulness, lack of habit, inadequate equipment, insufficient quantity, disbelief regarding its protection, work overload, and physical tiredness. These conditions become worse due to the precarious infrastructure of health institutions, and other aspects related to the organization of work itself, such as the lack of update and the non-existing permanent education in material centers[8]. The adherence to the use of PPE is closely related to the perception of professionals about the risks to which they are exposed and the susceptibility to them. Because of the described context, the question is: are nursing professionals using PPE in CSSDs?

OBJECTIVE

This study aimed at verifying the use of PPE by Nursing professionals in the CSSD.

METHOD

This is an exploratory study, with a quantitative approach, conducted in the CSSD of two public hospitals, located in João Pessoa, Paraíba, from January to March 2016. The two sectors have similar physical characteristics and activities; however, they are different because one of them is Federal, and the other one is from the State instance.

The research universe is constituted of nursing professionals – nurses, nursing assistants, and technicians – in the CSSD of the aforementioned hospitals, dimensioned as 100%, accounting for 50 interviewees: 30 from University Hospital Lauro Wanderley (HULW), and 20 from Hospital da Polícia Militar General Edson Ramalho (HPMGER).

Data collection used the following inclusion criteria: Nursing professionals who were working at the time the questionnaire was applied and who agreed to participate in the study. Professionals who were not working or were on leave for some reason, during the study period, were excluded from the procedure.

Participants received an informed consent form, and a copy was delivered to each collaborator, with an explanation about the objectives of the analysis. The ethical precepts that guide research involving human beings were followed, according to Resolution n. 466/2012, CAAE number 47355315.3.0000.5183.

After the professional's acceptance, a semi-structured questionnaire including multiple-choice questions was applied. Some of them allowed the selection of more than one option. In the first part, the instrument contained data regarding the characteristics of the professionals, such as gender, schooling, time of work in the institution, time of work exclusively in the CSSD, existence of another work connection. The second part approached data like the use of PPE and its frequency, types of most used PPE, knowledge about the number and quality of equipment available in the sector. It also asked about reasons that can lead professionals to be exposed to occupational risks, types of occupational risks, tendency to the occurrence of work accidents, and training about accident prevention, besides the importance of continuous training.

The findings were organized and presented in tables, transcribed based on the collected data. Processing was made with Windows Excel, using simple statistics, and presented in absolute and percentage numbers. Therefore, the researchers could understand the findings better.

RESULTS

The study identified 48 (96%) female interviewees, and 2 (4%) male interviewees, and observed that 13 (26%) are nurses, 18 (36%) are nursing technicians, and 19 (38%) are nursing assistants.

According to the time of work in the institutions, 16 (32%) have been working from 1 to 5 years; 5 (10%) from 6 to 10 years, and 29 (58%) for more than 10 years. As for the time of work in the CSSD specifically, 17 (34%) have been working from 1 to 5 years; 7 (14%) from 6 to 10 years; and 26 (52%) for more than 10 years. Among the interviewees, 32 (64%) reported having only one job.

Regarding the frequency of use of PPE, 37 (74%) mentioned they use it every time they perform their activities; 11 (22%) mentioned using it sometimes; and 2 (4%) did not answer this question. About the most used PPE, the most prevalent ones were globes, for 48 participants (96%), and masks, for 42 (84%), whereas scrubs were little mentioned by the interviewees: 15 people (30%) (Table 1).

According to the opinion about the available PPE, 20 (40%) participants consider its quality as low; 13 (26%) think it is insufficient; 11 (22%) think it is sufficient; and 6 (12%) consider it to have good quality.

The data also indicated that 34 (68%) professionals believe that the available PPE is not adequate for the procedures carried out in the CSSD. Thirty-one (62%) interviewees reported

Table 1. Personal Protective Equipment used by nursing professionals in Central Sterile Supply Departments in two public hospitals. João Pessoa, Paraíba. Brazil, 2016.

Personal Protective Equipment	N	%
Gloves	48	96
Mask	42	84
Goggles	35	70
Coat	25	50
Cap	35	70
Scrubs	15	30
Closed shoes	38	76

n: number of professionals interviewed.

the exposure to occupational risks resulting from inadequate PPE, and 4 (8%) mentioned it was caused by the lack of knowledge of the professional (Table 2).

About the experience regarding some type of exposure to occupational risks in the CSSD, 37 (74%) interviewees claimed to be at risk, whereas 13 (26%) did not answer.

It was shown that 38 (76%) professionals were not involved in any work accident, whereas 12 (24%) said the opposite, reporting their involvement in some sort of accident. Regarding the tendency to types of accidents to which they consider to be exposed, 29 (58%) pointed out accidents with sharp-edged materials; 10 (20%) mentioned burns; 4 (8%) reported chemical solutions; and 7 (14%) did not answer.

It was also observed that 33 (66%) claimed to have attended trainings for the prevention of accidents; 12 (24%) informed they did not participate in any; and 5 (10%) did not answer this question. Concerning the need for trainings about the prevention of occupational accidents, 49 (98%) considered the permanent training to be very important in order to clarify the adequate use of PPE.

DISCUSSION

The study indicated the prevalence of the female gender among the interviewees, and a similar observation was made with 37 Nursing professionals working in two reference hospitals – one public and one private hospital, both located in the city of Caruaru, in Pernambuco. Besides, this prevalence is a characteristic of this profession[9,10].

According to the time of work in the institutions, the study showed professionals who have been working in the hospital environment for a long period, as well as in the CSSD. So, the dimension of knowledge acquired, along the years, on technical experience in the field is a positive aspect, ensuring the effective service provided by the nursing team. The symmetry in this study corroborates a study conducted in a hospital in Goiás, in which 28 (10.4%) interviewees indicated the importance of specific knowledge, and the experience of the professional to obtain satisfactory and efficient results in the work activities[11].

It is a known fact that the use of PPE such as cap, goggles, mask, thick rubber gloves, impermeable coat, and closed shoes is important to reduce the risks to which workers are exposed, such as contamination by blood or other body secretions, or percutaneous accidents, which often affect Nursing workers, as well as those working in the CSSD[8,9,12]. However, it is sad to know that some professionals do not use it frequently, and are therefore exposed to occupational risks.

In a hospital in the Center-West region, researchers revealed that self-confidence leads professionals to neglect the use of PPE, reinforced by the experience that its use interferes in the professional's skills, making it more difficult to conduct the procedure. Therefore, the professional chooses not to wear it, underestimating its protective role[8]. This result is similar to that observed in the assessed CSSDs, in which 14 professionals recognized being negligent about the non-use of PPE.

This makes us think about the indifference toward biosafety measures, which are simple, however, protective concepts that eliminate or minimize the existing risks. The objective is to protect the health of men, women, and animals, and the preservation of the environment[13]. Therefore, it is essential to use PPE, which should be provided for free, according to the Regulation of the Ministry of Work (NR), to ensure the safety of those exposed to risks of perforation or cuts, and thereby preventing occupational accidents or occupational diseases[4].

The result of a study conducted in a hospital in Londrina, Paraná, stands out. It observed that workers used the PPE because of the rules required by the institutions in which they work. Therefore, it is possible to assume that, if they could choose, these professionals would not wear the PPE. Still, the same workers (100%) do not have the power to choose the type/model of PPE that is well adjusted to their activities, since the PPE to be used in the places where they work is already

Table 2. Motivation for the exposure of nursing professionals to occupational risks in the Central Sterile Supply Department. João Pessoa, Paraíba. Brazil, 2016.

Causes of Exposure	%
Inadequate PPE	62
Considering its use unnecessary	50
Lack of training	46
Lack of PPE	32
Professional's negligence	28
Unawareness about its use	8

PPE: Personal Protective Equipment.

established[14]. Therefore, such a discovery is similar to the data in this study, in which more than half of the interviewees mentioned the existence of inadequate PPE for the procedures. This fact brings out the risk situation to which professionals might be exposed, because once the equipment is not adequate for the activities, it possibly will not provide the required safety.

Therefore, the material resources should provide the worker with safety during the activities, considering the aspects of sufficient quality and quantity. This is a way, not to disqualify the work carried out, so that other professionals may be harmed by some occupational risk[5]. The occupational exposure to accidents among health professionals is frequent due to the exaggerated number of manipulations, representing damage to the health of workers, and the institutions[15]. So, the causes of work accidents indicated similarities to the reality found in another study about the same subject, conducted in two hospitals in the Northeast, in which 83.3% of the accidents occurred due to sharp-edged materials, and 57.1% were caused by burns in autoclave[9].

Concerning trainings, and considering that most professionals claimed to have been trained on the prevention of accidents, the idea that this is one of the most used strategies to face the challenges of health services becomes stronger. Permanent education has been used as a way to develop competences and skills among the workers. Considering the comprehension and importance of the CSSD in the hospital context, the need for continuous educational practices for those working in this field becomes clearer[14].

Differently from this study, an analysis carried out with 38 Nursing professionals from 6 cities in the State of Ceará, aiming at showing the need for training, revealed significant problems regarding update and courses. These situations are easily reversible with the proper training[16]. The availability of access to information for professionals, regarding themes about the work process, allows the necessary technical evolution in health services, so that these professionals may perform their role in a competent and efficient manner, free of risks.

Still in that context, this need for training, qualification, and update of professionals working in the CSSD may lead to qualified work, as long as the aspects of professional practice are investigated and show the identified problems, which are often connected to the "habits" of the routine. This situation is related to the time of work in the sector with professionals who have been working for over 10 years, as have more than half of the interviewees.

A study conducted in three public hospitals in Rio de Janeiro, about the importance of the worker's participation in continuous education programs, showed that, because of the peculiarities in the activities carried out in the CSSD, it is difficult to maintain a stable group in synchronization with the service. So, it is necessary to change or prevent this situation by carrying out continuous training and improvement programs[17]. The result, in this case, is different from this study, since most professionals working in the CSSD of both hospitals have been working in the field for a long time, which demonstrates a permanent group in this service.

CONCLUSION

This study identified the professional profile in the CSSD sector of the analyzed hospitals. The female gender was prevalent, the Nursing technician was the most frequent category, and most interviewees had more than 10 years of experience and only one job.

It was proven that most professionals frequently use the PPE, especially gloves; however, they consider the materials to have low quality and, sometimes, not adequate to the activities carried out in the sector.

The study also showed that many professionals have been exposed to some type of occupational risk, and recognized that they do not always use the equipment properly, since they consider it to be unnecessary or for mere personal negligence.

There are some courses in the field; however, they acknowledge the need for permanent education about the subject during the work shift as a way to acquire knowledge.

In the face of exposure, the results point to the need for continuous and permanent education as a strategy of preventive measures, in order to sensitize the professionals as to the required care, and the importance of using PPE in order to prevent accidents in the CSSD.

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QUALITY INDICATORS IN NURSING WITH EMPHASIS IN THE SURGICAL CENTER: INTEGRATIVE LITERATURE REVIEW

Indicadores de qualidade em enfermagem com ênfase no centro cirúrgico: revisão integrativa da literatura

Indicadores de calidad en enfermería con énfasis en el quirófano: revisión integrativa de la literatura

Juliana Aparecida Baldo Amaral[1], Wilza Carla Spiri[2], Silvia Cristina Mangini Bocchi[3]

ABSTRACT: Objective: To analyze the national and international scientific work concerning quality indicators in nursing in the surgical center. **Method:** This is an integrative review of the literature from 2009 to 2016 of articles indexed in the databases Latin American and Caribbean Literature in Health Sciences, Scientific Electronic Library Online, and US National Library of Medicine. The final sample included 17 articles. **Results:** In 2013, scientific studies carried out by master nurses with a quantitative approach were predominant. The themes of these studies were importance, reliability, and benefits of the quality indicators for the management of nursing care; difficulties in using the indicators; computerized system for data collection of indicators; and nurses' perspective on the use of this tool for the quality assessment. **Conclusion:** Benefits and main difficulties on the use of quality indicators for the surgical centers were observed. However, the surgical center performance assessment by means of indicators is still poorly used.

Keywords: Quality indicators, health care. Nursing. Surgicenters. Practice management.

RESUMO: Objetivo: Analisar as produções nacional e internacional dos indicadores de qualidade em Enfermagem no Centro Cirúrgico. **Método:** Revisão integrativa da literatura de 2009 a 2016 de artigos indexados nas bases de dados: Literatura Latino-Americana e do Caribe em Ciências da Saúde, Scientific Electronic Library Online e US National Library of Medicine. A amostra final foi composta por 17 artigos. **Resultados:** Houve predominância das publicações nacionais, em 2013, realizadas por enfermeiros mestres, com abordagem quantitativa. Os temas dessas foram: importância, confiabilidade e benefícios dos indicadores de qualidade para o gerenciamento da assistência de Enfermagem; principais dificuldades quanto ao uso dos indicadores; sistema informatizado para coleta de dados dos indicadores e visão dos enfermeiros a respeito do uso dessa ferramenta de qualidade. **Conclusão:** Foram observados os benefícios e as principais dificuldades referentes à utilização dos indicadores de qualidade para o Centro Cirúrgico. No entanto, a avaliação de desempenho do Centro Cirúrgico por meio de indicadores ainda é pouco utilizada.

Palavras-chave: Indicadores de qualidade em assistência à saúde. Enfermagem. Centros cirúrgicos. Gerenciamento da prática profissional.

RESUMEN: Objetivo: Analizar las producciones nacionales e internacionales de los indicadores de calidad en Enfermería en el Quirófano. **Método:** Revisión integrativa de la literatura de 2009 a 2016 de artículos indexados en las bases de datos: Literatura Latinoamericana y del Caribe en Ciencias de la Salud, Scientific Electronic Library Online y US National Library of Medicine. La muestra final fue compuesta por 17 artículos. **Resultados:** Hubo predominancia de las publicaciones nacionales, en 2013, realizadas por enfermeros maestros, con abordaje cuantitativo. Los temas de esas publicaciones fueron: importancia, confiabilidad y beneficios de los indicadores de calidad para la gestión de la asistencia de Enfermería; principales dificultades con relación al uso de los indicadores; sistema informatizado para colecta de datos de los indicadores y visión de los enfermeros al respecto del uso de esa herramienta de calidad. **Conclusión:** Fueron observados los beneficios y las principales dificultades referentes a la utilización de los indicadores de calidad para el Quirófano. Sin embargo, la evaluación de desempeño del Quirófano por medio de indicadores aún es poco utilizada.

Palabras clave: Indicadores de calidad de la atención de salud. Enfermería. Centros quirúrgicos. Gestión de la práctica profesional.

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INTRODUCTION

The globalization process has promoted a substantial increase in the importance of productivity, which raises the level of demand for both people and organizations, transforming the quality into an applied matter[1].

The quality of health processes has been discussed among health professionals, whose main challenges are pursuing a service of excellence designed to meet the demands efficiently[2]. In this context, the quality should generally be considered a collective attitude, as it is a necessary technical and social differential, which involves not only the patient, but also health system managers[3].

Nurses should consider improving quality of care as a dynamic and comprehensive process of identifying factors that interfere in the work process, requiring the implementation of actions and the development of tools that enable the systematic assessment of quality levels of the care provided. Therefore, nurses need to analyze the results of the care to redefine management strategies[4].

However, for such professionals to develop tools for assessing the results of their actions, to be based on information that directly or indirectly reflects the reality of care is required[5].

Although the use of indicators is extremely important for the management of health services, it is still deficient in Brazil with respect to the indicators that represent the quality of nursing care in hospitals. In the 1990s, the indicators used in US hospitals were adopted in Brazil; however, those indicators were not consistent with the reality of that moment. Subsequently, initiatives have emerged, aiming the adequacy of indicators to the Brazilian reality. The manual of the Program "Commitment to Hospital Quality" (in Portuguese, *Compromisso com a Qualidade Hospitalar* – CQH) can be cited as an important publication of references for nursing indicators[3].

The surgical center (SC) is considered one of the most important, complex, and specific hospital unit, in which numerous processes and sub-processes, directly or indirectly associated with the execution of surgical procedures, are shared. Such surgical procedures are sometimes stressful, and those processes and sub-processes may affect the quality of the care provided[6].

Therefore, there is an increasing concern among the professionals working in SC in understanding the complexity involving nurses' work and the construction and validation of quality indicators that guide their actions[3,7].

OBJECTIVES

This study aimed at understanding, characterizing, and analyzing the main themes in national and international literature related to quality indicators in nursing, with emphasis on SC.

METHODS

This is an integrative review, considered as a valuable part of the process of creating and organizing the reading with the same level of clarity, accuracy, and replication of primary research[8].

This method consists of several steps recommended by subject matter experts[8,9]. In this review, we intended to identify the problem (defining the subject of the review by means of a guiding question); to select the sample (after the establishment of the inclusion/exclusion criteria); to define the characteristics of the research (by means of the categorization of studies and data collection); to evaluate/examine the studies included in the review, identifying similarities and conflicts; to discuss and interpret the results; and to present the review/knowledge synthesis[8,9].

The guiding question was the following: What was the knowledge produced and published on the use and the importance of quality indicators in nursing with emphasis on SC?

The search for articles and sample selection occurred in May 2016, and the main method was searching in online databases of health: Latin American and Caribbean Health Sciences (LILACS), Scientific Electronic Library Online (SciELO), and US National Library of Medicine (PubMed). The following descriptors were used: in Portuguese for Brazilian databases – *indicadores de qualidade em assistência à saúde* AND *enfermagem* AND *gerenciamento da prática profissional*; and in English for international databases – quality indicators AND nursing AND surgical center.

The definition of the descriptors enabled the selection of the initial survey sample, which adopted the following inclusion criteria: full articles that were found in national and international literature and were published from January 2009 to May 2016.

The initial sample consisted of 87 articles, of which 35 articles were found in LILACS database, 24 articles in SciELO, and 28 articles in PubMed.

After the selection of articles, a carefully reading of the title and abstract was carried out. Those articles that did not respond to the guiding question and those repeated in more than one database were consequently excluded.

A tool for data collection was elaborated for the analysis and subsequent synthesis of the articles that met the inclusion criteria. This tool was elaborated on the basis of relevant literature[10], and was adapted to the context of the research. The tool included information on the main researcher; the publication (type of study, source, year, and country of origin); host institution; database; goal; methodological framework; and the main conclusions.

RESULTS

From the systematic reading of the searched theme, a final sample of 17 scientific articles was obtained, 9 articles of which were found in LILACS, 2 articles were found in SciELO, and 6 articles were found in PubMed. The articles were published from 2009 to 2016, and 2013 had the greatest number of publications (four articles), followed by 2011 and 2015 (three publications each). Nurses were responsible for the largest number of publications (15 articles). Among those nurses, 6 of them were masters, 4 PhDs, 3 had postdoctoral degree, 1 was a specialist, and 3 did not inform institutional titles. All of those authors were working in different areas of SC.

The main sites of the studies were hospitals, including nine public and one private hospitals, as well as six hospitals that did not specify the type of administration. One of the articles was based on data provided by the National Database of Nursing Quality Indicators (NDNQI).

The reading of the articles facilitated the categorization of the main issues addressed in the articles, among which the importance, reliability, and benefits of quality indicators for the management of nursing care should be highlighted. In addition, it facilitated the categorization of the most relevant quality indicators for nursing care in SC; of the main difficulties related to the use of quality indicators; of the importance of using computer-based systems for the implementation of quality indicators, as well as provided evidence on experiences with quality indicators by the health organizations, and clarified the view of nurses on the use of this quality tool.

Although specific SC quality indicators had been poorly addressed in the articles found, their significant importance for SC work processes is clear. Among the most relevant indicators of nursing care in this scenario, this study revealed those related to systematization of perioperative nursing care (SPNC), preoperative visit by nurse (PVN), skin lesions (SL), falls, surgical site infection (SSI), and nursing records.

Several factors were identified as obstacles to the use of quality indicators, including the overload among nurses from the institution; the lack of theoretical and practical knowledge on the theme; the poor knowledge of process management; the poor engagement of the team in data collection, and the lack of follow-up from managers during the implementation, and use of indicators[11].

The studies highlighted the concern with verifying opinion of nurses on the use of indicators to assess the quality of care processes, as they are the main responsible for the development of tools for the data collection, implementation, and analysis of the results.

Chart 1[2,4,6-7,12,13-24] presents quantitative and qualitative data related to the articles in the sample.

Chart 1. Quantitative and qualitative data related to articles selected for the survey sample.

Title (Country)	Authors, study type, and Journal	Objectives	Conclusions
"Indicadores de qualidade na assistência de terapia intravenosa em um hospital universitário: uma contribuição da Enfermagem" (Brazil)[2]	Barbosa MT, Alves VH, Rodrigues DP, Branco MB, Souza RM, Bonazzi VC Quantitative study Journal of Research Fundamental Care Online	To understand the quality of indicators of intravenous therapy care in the neonatal intensive care unit of a university hospital.	Health professionals should facilitate and promote patient safety for their well-being and quality of life, avoiding risks and adverse effects.

Continue...

Chart 1. Continuation.

Title (Country)	Authors, study type, and Journal	Objectives	Conclusions
"Opinião dos enfermeiros sobre a utilização dos indicadores de qualidade na assistência de Enfermagem" (Brazil)[12]	Silveira TV, Prado Junior PP, Siman AG, Amaro MO Qualitative study *Revista Gaúcha de Enfermagem*	To investigate the opinion of nurses from hospitals on the use of quality indicators of nursing care.	Difficulties in using indicators: no time available, inadequate number of professionals, and lack of knowledge on the subject. Nurses understand the indicators as tools for assessment and improvement; however, they have incomplete and fragmented information on its use.
"Improving patient safety by optimizing the use of Nursing human resources" (Canada)[16]	Rochefort CM, Buckeridge DL, Abrahamowicz M Cohort Study Implementation Science	To determine whether the educational levels of the nursing staff are associated with an increased risk of adverse events; whether the risk of adverse events in relation to the educational level of nursing staff is modified by the complexity of patient needs; and the possibility of establishing an optimal nursing workforce size.	Pioneer study in describing the effect of the nursing team strategies on the risk of adverse events such as changes in exposures over time, allowing to determine whether those risks change according to the duration of exposure of personnel (extensive use of overtime) or intensity of exposure (low number of hours of nursing per patient). These data facilitated the identification of nursing personnel standards, creating evidence-based information capable of assisting managers in making decisions concerning the effective use of scarce human resources in nursing and identifying personal standards that minimize the risk of adverse events.
"Changes in patient and nurse outcomes associated with magnet hospital recognition" (United States of America)[17]	KutneyLee A, Stimpfel AW, Sloane DM, Cimiotti JP, Quinn LW, Aiken LH Quantitative study Medical Care	To compare the quality of the outcomes presented by surgical patients in hospitals which have obtained the recognition of magnet hospitals between 1999 and 2007, with those who remained without the title.	In general, the magnet recognition is associated with significant improvements over time related to the quality of the work environment and focused on the patient and nursing, surpassing the achievements of nonmagnetic hospitals.
"Fidedignidade de indicadores de qualidade do cuidado de Enfermagem: testando a concordância e confiabilidade inter avaliadores" (Brazil)[18]	Vituri DW, Évora YD Quantitative study *Revista LatinoAmericana de Enfermagem*	To test agreement and reliability of 15 indicators of quality in nursing care and validate such tools.	The indicators show excellent reliability and reproducibility, showing that the development of valid and reliable assessment tools is possible, as well as essential for the management of nursing care.
"Nurse staffing and education and hospital mortality in nine European countries: a retrospective observational study" (Belgium, England, Finland, Ireland, Netherlands, Norway, Spain, Sweden, and Switzerland)[19]	Aiken LH, Sloane DM, Bruyneel L, Heede KV, Griffiths P, Busse R, et al. Quantitative study The Lancet	To evaluate the hospital mortality rates after surgical procedures in relation to the workload and the level of training of nursing professionals.	The workload of the nursing professionals increased to 7% the risk of death of hospitalized patients within 30 days of hospitalization. The increase in the educational level of nurses was associated with a decrease in that rate. Therefore, reduction of the nursing team for cost savings may influence the outcomes of patient care. Higher educational level can reduce stable hospital deaths.

Continue...

Chart 1. Continuation.

Title (Country)	Authors, study type, and Journal	Objectives	Conclusions
"Indicadores de qualidade da assistência de Enfermagem em centro cirúrgico: revisão integrativa de literatura" (Brazil)[7]	Santos MC, Rennó CS Integrative review of the literature *Revista de Administração em Saúde*	To identify indicators of the quality of care in Surgical Center.	The most relevant indicators found in the review related to the SPNC, PVN, SL, falls, SSI, and complete records.
"Dificuldades vivenciadas pelo enfermeiro na utilização de indicadores de processo" (Brazil)[13]	Menezes PI, D 'Innocenzo M Quantitative study *Revista Brasileira de Enfermagem*	To identify the difficulties experienced by nurses of the Santa Casa de Montes Claros in the use of care processes indicators (in any phase or stage of the process).	Among the difficulties found, accumulation of personal activities (61.5%); lack of theoretical and practical knowledge on the subject (46.2%); poor knowledge on the process management (43.6%); poor involvement of the staff in data collection (30.8%) stood out, among others. The study concluded that to analyze the personal activities of nurses within the health facilities is important, as well as to reorganize their work processes, in addition to the inclusion of the theme in undergraduate courses in nursing.
"Falls among adult patients hospitalized in the United States: prevalence and trends" (United States of America)[20]	Bouldin ED, Andresen EM, Dunton NE, Simon M, Waters TM, Liu M, et al. Quantitative study Journal of Patient Safety	To provide data on the prevalence of falls in medical, surgical, and medical-surgical units in the US acute care hospitals, as well as determine the occurrence of falls during the 27 months preceding the implementation of the new limitation of reimbursement to Medical Service centers in accordance with the conditions acquired in the hospital.	The study provides the first national evaluation of falls, including those which resulted in losses to the respective units. The medical units showed higher number of falls owing to complex diagnoses and patients' walking.
"Associations between rates of unassisted inpatient falls and levels of registered and non-registered nurse staffing" (United States of America)[21]	Staggs VS, Dunton N Quantitative study International Journal for Quality in Health Care	To improve nurses' understanding of unassisted falls, exploring nonlinear associations of unassisted falls rates and categories of nursing, enabling managers to improve patient safety.	The increase of technical professionals has proven ineffective in preventing unassisted falls. The increase of nurses may be effective, depending on the type of unit.
"Nurse reported quality of care: a measure of hospital quality" (United States of America)[22]	McHugh MD, Stimpfel AW Quantitative study Research in Nursing & Health	To evaluate the nurses' perspective on quality of care.	10.0% of nurses reported that the highest quality of care was associated with a lower chance of mortality and inability to recover; patient satisfaction; and greater consideration of acute myocardial infarction, pneumonia, and surgical patients; consequently, the quality of care is an important indicator of hospital performance.

Continue...

Chart 1. Continuation.

Title (Country)	Authors, study type, and Journal	Objectives	Conclusions
"Mensuração de indicadores de qualidade em centro cirúrgico: tempo de limpeza e intervalo entre cirurgias" (Brazil)[6]	Jericó MC, Perroca MG, Penha VC Quantitative study *Revista LatinoAmericana de Enfermagem*	To measure the time spent on concurrent cleaning carried out by the hygiene service and cleaning in operating room, and the interval between surgery, as well as to investigate the association between cleaning time, size and specialty surgery, period of occurrence and size of the room.	The operating room clean-up time was 7.1 minutes, and the interval between surgeries was 35.6 minutes. No correlation was found between cleaning time and other variables. These findings instrumentalize the nurses in the efficient use of resources, accelerating the work process in Surgical Centers.
"Sistema informatizado para gerenciamento de indicadores da assistência de Enfermagem do Hospital São Paulo" (Brazil)[14]	Labbadia LL, D' Innocenzo M, Fogliano RR, Silva GE, Queiroz RM, Carmagnani MI, et al. Case report *Revista Escola de Enfermagem da USP*	To describe the experience of a group of nurses in creating a computerized system developed at the Hospital São Paulo to manage the indicators of nursing care.	The computerized system enables to store relevant data on the nursing care processes, being available for the evaluation of the results of nursing care, which can be viewed and printed at the required time.
"Utilização de indicadores de desempenho em serviço de enfermagem de hospital público" (Brazil)[4]	Gabriel CS, Melo MR, Rocha FL, Bernardes A, Miguelaci T, Silva ML Quantitative study *Revista LatinoAmericana de Enfermagem*	To identify performance indicators adopted the nursing service of a public hospital, and analyze the opinion of nurses regarding the use of these indicators to assess the quality of care.	This institution uses the indicators for monitoring results, and the use of process indicators for nurses to evaluate the performance of nursing is valued; consequently, to extend the analysis to multidisciplinary indicators is necessary.
"Percepção dos enfermeiros sobre os resultados dos indicadores de qualidade na melhoria da prática assistencial" (Brazil)[15]	Franco JN, Barros BP, Vaidotas M, D'Innocenzo M Qualitative and quantitative study *Revista Brasileira de Enfermagem*	To investigate the perception of nurses in a private hospital about the quality processes in nursing applied to improve care.	Nurses considered the use of performance indicators as a strategic tool. This perception supports healthcare improvement by the use of tools and indicators with an emphasis on processes failures registration, which may be used as possible quality improvement suggestions.
"Validação de conteúdo de indicadores de qualidade para avaliação do cuidado de Enfermagem" (Brazil)[23]	Vituri DW, Matsuda LM Quantitative study *Revista Escola de Enfermagem da USP*	To validate the content of an assessment instrument of nursing care composed of quality indicators on nursing care in the prevention of adverse effects – instrument validation.	On the basis of the results, the authors believe that the content validation procedure is indispensable for the development of evaluative measures.
"La utilización de herramientas de investigación cualitativa en la construcción y diseño de indicadores de la práctica de enfermería" (Chile)[24]	Jara PC, Valenzuela SS Qualitative study *Ciencia y Enfermería*	To describe the process of indicators in the practice of nursing in intensive care unit using qualitative approaches.	Enabled more reliable description of nursing practice and identification of specific indicators.

SPNC: systematization of perioperative nursing care; PVN: preoperative visit by nurse; SL: skin lesions; SSI: surgical site infection.

DISCUSSION

This study shows that the nurse stands out not only in number of publications, but also in activities related to the management of work processes. The nurse is a qualified professional to manage the needs involving anesthetic and surgical procedures in all of their stages. Therefore, activities involving the operation of the unit, as well as technical, administrative, care, and people management activities are assigned to them[25].

Thus, the participation of the nurse manager in the quality and productivity assessment in SC is important to detect and redesign activities that are not in compliance with standards and requirements aimed at protecting the individual and collective health, as well as to continuously monitor and compare their results with those found in best practices[6].

The hospital sector, main scenario of the studies, is characterized as one of the most complex and difficult to manage, involving high risks inherent in the activities, which requires constant and varied measurements from managers, influencing them to implement quality indicators in various areas[11].

The quantitative research used in most of the studies included in the sample "comprises a systematic collection of numerical information, maintaining the conditions of control, as well as the analysis of this information applying statistical procedures[26]."

Among the main issues addressed in the analyzed studies, the awareness of the importance of reliability and benefits of the quality indicators usage for nursing care management stands out, as the use of these data enables the establishment of standards and monitoring of their evolution over the years. Although the use of a single indicator does not raise the awareness of the complex social reality, the combination of diverse indicators, and also the comparison of different indicators from different locations facilitate its understanding[27]. Quality indicators are based on the compliance with established standards to monitor the processes and outcomes[28].

Owing to the broad scope of quality indicators, the need, the concern, and the commitment of nursing professionals to build and validate tools around indicators, which may guide their actions and decision-making, are clear. This represents a constant pursuit of quality in their work processes, reflecting the different contexts of their professional practice.

Although publications on quality indicators in SC are scarce, the importance given to the systematization process, which is represented by the SPNC, is clear, as it enables the quantification of the assistance provided by the nursing team[27].

The SPNC includes PNV, which enables nurses from SC to know their patients in advance, to elaborate the care plan, and to provide the necessary information, consequently reducing stress and anxiety related to the procedure to be performed[29]. This monitoring of patient outcomes and early detection of possible failures in nursing care facilitates holistic patient care[7], because the SPNC is an approach to care without interruption, respecting the individual and their experiences, problems, and expectations[29].

Another indicator identified as relevant and pertinent to assess the quality of nursing care was the incidence of SL[30]. SL prevention has a fundamental participation of the nurse, who must act assertively and beware of the risk of SL to which these patients are exposed, owing to the condition of physical dependence and fragility of the patient[7].

The use of electrosurgery also offers risks to patients in this environment, as it may cause burns, explosions of combustible mixtures, including anesthetic and intestinal gases, stimulation of excitable tissues, and interference with instruments and pacemakers. However, burn is the most common complication[31]. Chemical risks are also present in the perioperative period, which represents a risk for both the patient and the professionals who work in this sector[32].

Positioning of patient in a surgical procedure also has a significant impact on the quality of care. The main purpose of surgical positioning is to enable access to the surgical site; therefore, it must be done correctly to ensure safety of the patient and to avoid complications[33].

Incidence of patient falls in the SC is considered a serious event, which may be due to inadequate monitoring of the patient who is unable to walk, unattended or nonadherence to guidelines provided by the nursing team[34].

SSI is considered an indicator of technical failure in surgical procedures if its incidence is high in clean surgeries, which compromises patient's recovery. It is worth mentioning that preventive measures are the responsibility of those involved in the care to the patient[7].

Owing to the various risks inherent in the SC, nurses and the surgical team should constantly monitor the anesthetic and surgical procedures, acting preventively and planning actions to ensure patient safety in all stages of the procedures. The "Second global patient safety challenge: safe surgery saves lives" is a protocol that promotes actions for the prevention of adverse events in order to ensure a care which do not cause harm[7].

For nurses, a means of assessing the quality of nursing care in SC is the proper registration of all activities performed by the team; consequently, an indicator to evaluate the effectiveness of these records is necessary[7]. In this context, the health team should consider nursing records a written and effective means of communication, which facilitates the coordination and continuity of planning of health activities. Consequently, such records should be consistent and complete.

One of the analyses performed in a study, concerning the difficulties of the use of quality indicators, corroborates the elements that compose the difficulties described in the literature, such as no time available, inadequate number of professionals, and lack of knowledge on the subject. This same study showed that only 54.0% of the nurses used indicators of nursing care to guide their actions, that is, 46.0% of them collected and analyzed the indicators, but did not use the analysis of results to implement improvement actions in their work sectors. In other words, they used the metric, but did not qualitatively approach the phenomena investigated[12].

Another study, which also corroborates the data presented, indicated that many professionals mentioned that there are no meetings to present and discuss the results of the indicators assessment[30].

The discussion on indicators has taken a prominent role in the management of nursing services[35]. Therefore, it is expected that the nursing team adopt this discussion as a strategy to identify weaknesses and set goals to improve the assistance provided. This should be a joint effort between managers and workers involved in the patient care[30].

Another fact revealed by the survey is that nurses do not learn such theme theoretically and/or practically during graduation, as its content is not included in the curricula of most schools. Therefore, the lack of information is one of the reasons for the difficulty of nurses with the use of indicators. Consequently, there is an urgent need for this content to be reviewed and taken into account by educational institutions for undergraduate courses[13].

Another reason for the difficulties with the use of quality indicators that nurses reported is unawareness of its application. Therefore, understanding of the indicators by the users of information is important. They need to be generated and managed regularly and systemically, becoming a valuable assessment and management tool[13].

With regard to the accumulation of activities assigned to nurses in the hospital and, consequently, to work overload, both identified as main causes of difficulties with the use of indicators, a critical analysis of these activities is necessary to reorganize the working process involving these professionals in their units[13].

Given the evidence, the reduced number of nursing professionals visibly prevents the implementation of quality and safety actions. The administration of the institutions should necessarily be sensitive to this demand, promoting positive changes to the institution, the professional, and the patient[12].

The use of computerized systems is a mean to standardize and facilitate the deployment, collection, and analysis of indicators. These systems have interactive databases and intuitive interfaces, which are user-friendly and attractive from a pedagogical perspective. Moreover, the nurse may work with a modern tool, which is able to measure and contribute to the quality of their assistance[14].

Even tough nurses face many difficulties related to the use of indicators, they consider them important resources for the development of the work and consider that using the results as a strategic tool leads to improvements in healthcare practice, allowing the evaluation of nursing performance[4,13,15].

Nurses from SC are responsible for reviewing and monitoring the necessary indicators to qualify the nursing care, and to promote interaction between the professionals involved in the anesthetic and surgical procedures, in order to prevent risks and control complications[29].

The involvement of all members of an institution in the implementation process and in the use of quality indicators is strength, and enables the achievement of satisfactory results of work processes. More importantly, it ensures the provision of a safe, quality, and evidence-based nursing care.

Therefore, we consider as an advancement of this study the presentation of knowledge produced on this subject, reducing the gap in the literature.

However, the limitation of this study consists on the fact that literature analysis was limited to full articles published and available, consequently excluding other existing data sources.

CONCLUSION

Performance evaluation of SC activities using indicators paves the way for the critical review of the main processes, enabling intervention in the weaknesses and the development of improvements focused on patient care.

Owing to the gap in the literature on the quality indicators with an emphasis on SC, which was observed during this integrative review, the use of articles that addressed general indicators was necessary. This situation evidences the importance of broadening the culture of quality in nursing assistance, developing nurses to the elaboration and analysis of indicators, and enabling a dynamic analysis of the service to achieve care excellence.

The effort to develop new studies on the theme will provide evidences and practical background to nursing professionals, mainly on measurement of the quality of the work processes. This measurement scores successes and failures that interfere in care, whether directly or indirectly (related to management). This may lead to the improvement of quality of the care provided in SC.

It is worth noting that this integrative review of the quality indicators in nursing with emphasis on SC prompted the development of a research conducted by the lead author in her Master Program.

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IMPLEMENTATION AND USE OF AUTOMATED TRACEABILITY SYSTEM IN THE CENTRAL STERILE SUPPLY DEPARTMENT

Implantação e uso de sistema de rastreabilidade automatizado em central de materiais e esterilização

Implantación y uso de sistema de rastreabilidad automatizado en central de materiales y esterilización

Flávia de Oliveira e Silva Martins[1], Mara Lucia Leite Ribeiro[2]

ABSTRACT: Objective: To describe the implementation of the automated traceability system in Central Sterile Supply Department (CSSD). **Method:** Experiment report developed between 2011 and 2014. The traceability system best suited to the profile of the institution was chosen, and its basic license was purchased. The proper infrastructure and training were also adapted. **Results:** We decided to trace cases with barcodes. We began with the database; the cases were registered, and the labels printed. After one month, three cases were registered and 81 traceable units were created; in the third month, 698 units were created; after nine months, 7,669 units were created. Of the total number of stages, 5.0% are omitted; 4.2% are corrected; and 0.8% loose traceability owing to human error. Management is performed through reports and the discussion of results. Total implementation lasted nine months. **Conclusion:** Even with the incipience of the method, this study demonstrates that the automated traceability system benefits the hospital's CSSD.
Keywords: Database management systems; Sterilization; Sterilization center.

RESUMO: Objetivo: Descrever a implantação do sistema de rastreabilidade automatizada no Centro de Material e Esterilização (CME). **Método:** Relato de experiência desenvolvido entre 2011 e 2014. Foi escolhido o sistema de rastreabilidade mais adequado ao perfil da instituição e adquiridas as licenças básicas. Necessária adaptação da infraestrutura e treinamento. **Resultados:** Optou-se por rastrear a caixa por meio de código de barras. Iniciou-se pelo banco de dados. Realizou-se cadastro das caixas e impressão da etiqueta. Após um mês, 3 caixas estavam cadastradas e 81 unidades com rastreabilidade criadas; no terceiro mês, 698 unidades; e após 9 meses, 7.669 unidades foram criadas. São esquecidas 5,0% das etapas; 4,2% são corrigidas; e 0,8% perdem a rastreabilidade por erro humano. A gestão é realizada por meio de relatórios e discussão dos resultados. A implantação total durou nove meses. **Conclusão:** Mesmo com a incipiência do método, este estudo demonstra que o sistema de rastreabilidade automatizado trouxe benefícios ao CME do hospital.
Palavras-chave: Sistema de gerenciamento de base de dados; Esterilização; Centro de esterilização.

RESUMEN: Objetivo: Describir la implantación del sistema de rastreabilidad automatizada en el Centro de Material y Esterilización (CME). **Método:** Relato de experiencia desarrollada entre 2011 y 2014. Fue escogido el sistema de rastreabilidad más adecuado al perfil de la institución y adquiridas las licencias básicas. Necesaria adaptación de la infraestructura y capacitación. **Resultados:** Se optó por rastrear la caja por medio de código de barras. Se empezó por el banco de datos. Se realizó el registro de las cajas e impresión de la etiqueta. Tras un mes, 3 cajas estaban registradas y 81 unidades con rastreabilidad creadas; en el tercer mes, 698 unidades; y tras 9 meses, 7.669 unidades fueron creadas. Son olvidadas un 5,0% de las etapas; un 4,2% son corregidas; y un 0,8% pierden la rastreabilidad por error humano. La gestión es realizada por medio de informes y discusión de los resultados. La implantación total duro nueve meses. **Conclusión:** Incluso con la insipiencia del método, este estudio demuestra que el sistema de rastreabilidad automatizado trajo beneficios al CME del hospital.
Palabras clave: Sistema de administración de base de datos; Esterilización; Central de esterilización.

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INTRODUCTION

Central Sterile Supply Department (CSSD) is the location at the hospital where health products are processed[1]. It is a complex and extremely important process, carried out by a sequence of stages (cleaning, disinfection, preparation, packaging, sterilization, and distribution), which requires both operational and technological capacity to attribute quality to the services provided and ensure patient safety[2,3].

Owing to the need for well-established and validated protocols that comprise all the steps conducted in CSSD, on March 15, 2012, the Brazilian Health Surveillance Agency (ANVISA) published the ANVISA Board Resolution (RDC) No. 15[4], which establishes the requirements for best practices in the processing of health products. Article 26 provides that:

> CSSD must have a manual or automated information system that monitors and controls the records of the cleaning and disinfection or sterilization steps determined in this Resolution as well as of equipment maintenance and monitoring. Records must be archived to ensure traceability for a minimum of five years.

Traceability is defined as the ability to trace and identify the processing of health products and their use through previously recorded information, establishing the requirements for best practices in product processing[5].

The technology advancement, diversity of surgical materials, and growing concern with information management contributed to the development of automated traceability systems that have gained significant importance in recent times[5-7]. By combining technology with quality procedures, automated systems enable rapid information identification and increased productivity[6-8].

Automated traceability is a concept that arose from the need to know where a product is located and which raw materials were used in its production[6]. Widely used in industries and agriculture, these systems have been developed to encompass the processes conducted in CSSD[9]. They provide a multitude of functions and benefits – such as the insertion of results of biological control, preventive maintenance scheduling, and clamp control and productivity reports – which, if fully used, improve quality, streamline work, and reduce the possibilities of human error. Connectivity with other applications in the operating room (OR), which may or may not be purchased, increases operational efficiency by identifying patient or procedure and avoid scheduling conflicts, which brings significant improvements for all the people involved[9].

Six systems that allow automated traceability in CSSD are available in the Brazilian market. It is the responsibility of manager to know the product, its functions and possibilities as well as the necessary infrastructure to choose a supplier.

We chose an easy-to-use automated traceability system that enables access to information on cleaning, preparation, sterilization, and distribution of the health products dispensed by CSSD, which produced quality, safety, productivity, autonomy, and control to the processes performed.

Considering the low number of CSSD Departments that use an automated traceability system, the time required for implementation, the lack of reports in Brazil and the authors' involvement in the process, we share our experience in this article.

OBJECTIVE

To describe the implementation of an automated traceability system for health products in CSSD.

METHOD

This is a descriptive experiment report developed in the CSSD of a large private hospital that specializes in cardiology and heart surgery in the City of São Paulo.

To comply with RDC No. 15, the CSSD purchased an automated traceability system in November 2011.

Three suppliers were selected to present their systems. The retention of traceability applied by system, available tools, usability, possibility of reports, electronic storage of information, necessary infrastructure and connectivity with the available equipment, thermo-disinfectors, and autoclaves were evaluated by the authors (nurse and nurse manager), the information technology (IT) manager, and the clinical engineering manager.

The chosen system, same as the one used in Denmark, enables traceability and control of all process stages by barcode. We decided to track the surgical case, not on a piece-by-piece basis, assessing the possibility of employee's autonomy to replace broken or defective instruments, without the need to record it or interrupt the workflow.

Available features and functions depend on the purchased licenses (modules)[5,6]. The modules acquired by the hospital were administration (item and case registration), batch registration for washing machines and autoclaves, packaging on the screen (list opening on the computer screen at the workstation during preparation), multimedia (inclusion of images and videos), default report (management), and scanner (barcode scanning).

The amount invested in the acquisition of the system and necessary equipment was US$234,000.00 (two hundred and thirty-four thousand U.S. dollars).

After the purchase was completed, there was integration between the supplier and the hospital clinical engineering and IT to verify the physical space in CSSD, necessary adaptations and setup of servers, network, computers, and software. This period of infrastructure adaptation occurred in parallel with the work carried out between January and August 2012, for the renovation and modernization of the CSSD technology park.

The system implementation process is described in Figure 1.

The supplier was monitored during the development of the database and item registration, correcting errors at this stage.

The creation of the database and product database (surgical cases) is the longest stage and is specific to the administrator module, being the responsibility of the CSSD nurse at the institution. Thus, it took about four months, ending in April 2013.

Operational training was started with a few surgical cases registered (simpler in composition and with higher turnover, such as small surgical cases). Training happened between May and July 2013, guided by the IT specialist of the supplier. Only two nurses from CSSD participated in the first stage, which discussed system operation, inclusion of new items, creation of new cases, increase of serial number, label printing, and report issuance. In the second stage, practical training was conducted with the entire staff of nurses, technicians, and nursing assistants in CSSD. All steps (cleaning, preparation, reduction of items on the list, label printing, sterilization, distribution, and reentry) were simulated. Staffs trained during their respective shifts (morning, afternoon, and night) are divided into groups of up to three people so that everyone could participate in and understand this new process.

In July 2013, the use of the system commenced with the entire CSSD staff.

With trained employees and conducting stages correctly, new cases and trays were gradually added.

The inclusion of a new case depends on the assembly of the list and the addition of photos and alerts when necessary. It is a long process that requires the nurse's time and full attention, taking nine months to be completed.

RESULTS

Tracing of surgical cases starts during cleaning. Using a scanner, the employee is identified by the user code affixed to the badge. Through a model (Figure 2), the type of cleaning (manual or automated), equipment, cycle, and included products are selected.

Each barcode affixed to the case or container (Figures 3 and 4) must be scanned individually. At the end, a batch number is generated, and the cleaning cycle starts as per routine.

In the preparation area, the barcode of the case is scanned again, and the list of items that comprise the case is opened on the computer screen so the employee checks it and assembles it. Images, videos, and alerts, when previously inserted in the database, appear at this time. If the instruments are mixed, they are manually separated and identified by colored marking tapes. At the end of the verification, the "OK" button is pressed, and a label with information on packing date, expiration date, employee in charge of assembly and number of pieces is automatically printed (Figure 5).

At this stage, the system automatically generates a unique sequential number, called "unit number," in which it is possible to identify the product and trace the entire process in the administration module. This unit number is also printed on the detachable label, enabling affixation to the patient's medical chart and proper registration on it (Figure 6).

After the preparation stage, the case is released to the sterilization process which, as cleaning, is carried out by selecting the autoclave and the type of cycle using a model; through the label generated in preparation, the cases that will be inserted in the load generate a batch number.

We decided to automatically approve all sterilization batches whose processes were successfully completed. The equipment available at CSSD has all the documents required by current legislation, such as calibration, installation, and performance qualification as well as quarterly preventive maintenance. Parameters can be viewed in real time and are indefinitely stored in the database, enabling automatic approval reliability.

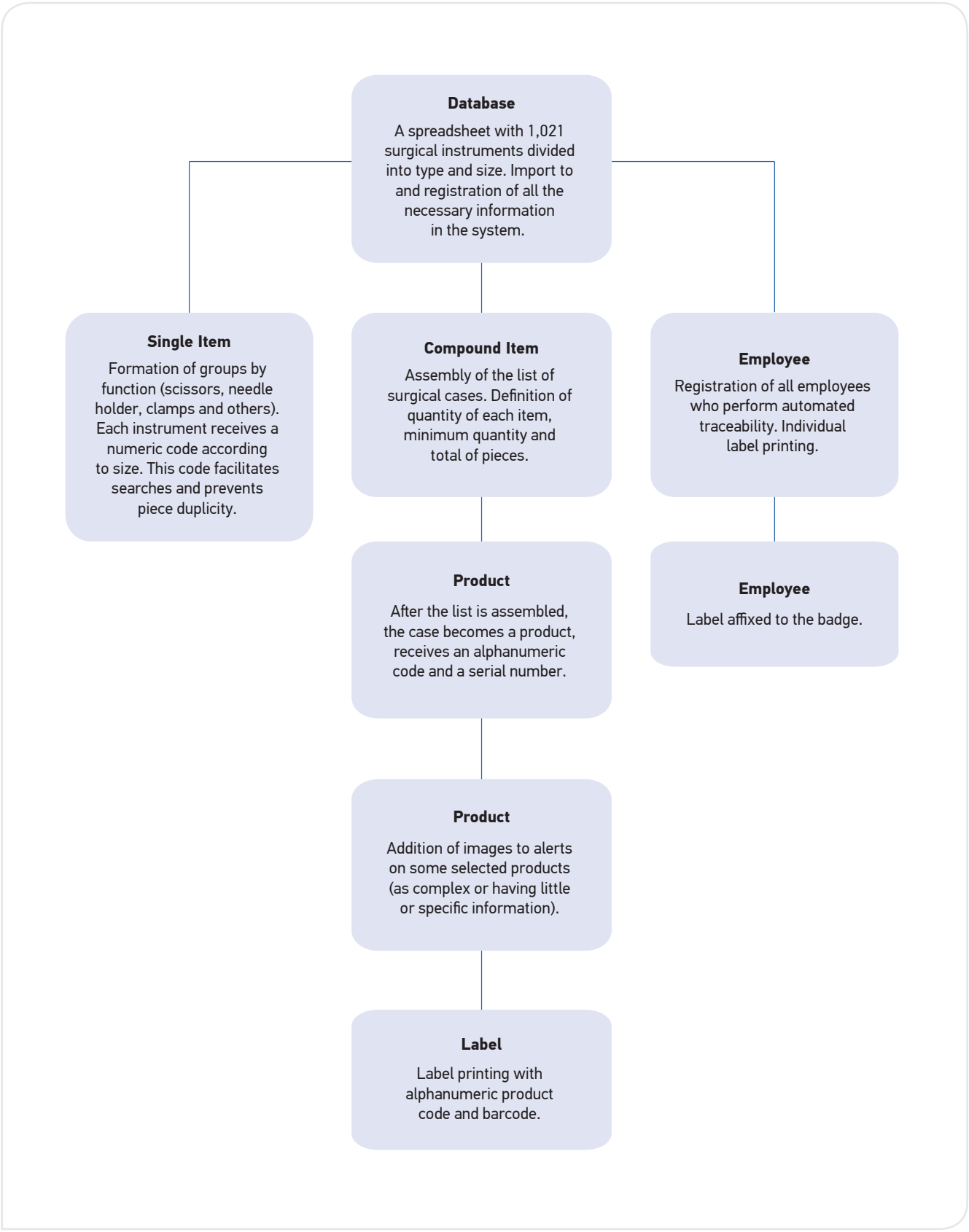

Figure 1. Implementation process for the automated traceability system.

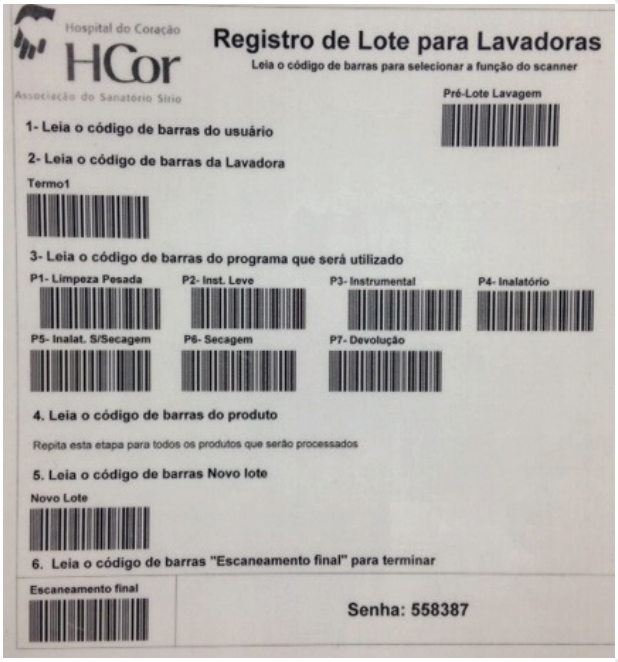

Figure 2. Model used in the automated traceability in the cleaning area.

Figure 3. Barcode affixed to the surgical case.

Figure 4. Barcode affixed to the container.

The case then becomes available in stock for distribution.

CSSD is responsible for the preparation of instrumentation carts for surgeries, according to the daily schedule. By dispensing surgical cases, a new reading is performed (also by scanner), in which the receiving client is selected, for example, the OR. New clients can be inserted at any time, expanding dispensing possibilities for all hospital units.

If the case dispensed is not used and returns to CSSD in perfect storage conditions, that is, with the full package, in a sealed and intact container, with its identification label, without humidity or visible dirtiness and dispensed to a clean OR, it reentries stock.

Figure 5. Model printed label.

Figure 6. Barcodes affixed to the patient's medical chart, ensuring traceability.

In case they are opened and/or used, the case is returned to the sluice room, also by means of a model and barcode scanning. Therefore, a case cycle ends. In preparation, a new cycle is started with a new unit number and a new history.

If there is any error in or out-of-sequence scanning, the user is notified by a sound and an alert, which are triggered on the scanner and the computer to prevent failure or skipped stages.

After one month of training and use of the system in CSSD, three minor surgery cases were registered, and 81 units were created, that is, 81 histories traced by the automated system. In the third month, 13 cases were registered, and 698 new units with the possibility of history were traced. In the sixth month, 52 cases were registered, and 3,031 units were traced; in the ninth month, 112 cases were registered, and 7,669 units were traced.

In May 2014, all the cases, containers, urethral catheterization trays, central venous accesses, phlebotomies and asepses as well as critical independent items (such as saws, optics, and batteries) were registered in the system.

There are operational failures related to the nursing staff. Approximately 5.0% of cleaning, sterilization, and dispatch stages are not performed by the automated system. Of these, 4.2% are corrected in the administration module by the nurse, who adds the missing information, enabling process continuity. Only 0.8% loose automated traceability due to human error. Consequently, manual traceability was maintained.

Management is carried out monthly by the head nurse, using general productivity reports, both on individuals and the equipment, failure reports, and cause analyses as well as result discussions and presentations with the nursing and clinical engineering staffs.

Support is performed by the supplier's IT specialist, either in person or from a distance, whenever necessary.

Thus far, there have been no failures of any kind in the system.

DISCUSSION

Resolution No. 15, from March 15, 2012, on the requirements for best practices in the processing of health products, establishes traceability as the ability to trace the processing history of health products and its use through previously registered information, using a manual or automated information system, with a monitoring record and control of the cleaning and disinfection or sterilization stages[4].

The application of traceability systems is very common in the food, pharmaceutical, automotive, aviation, and aerospace industries[11].

In the Brazilian literature, there are no reports on the use of automated systems in CSSD. In the international literature, few authors describe it, all of them emphasizing their benefits in comparison to manual traceability. Rapid information, reduction in instrument loss, maintenance signs, employee productivity monitoring, inventory control, and report issuance are some of the benefits found that support the literature[5,7,9].

The implementation time is not mentioned in any reference. As the second hospital to install this system in Brazil, there is insufficient comparative data to assess whether the nine-month period was good, regular, or bad. According to the supplier's installation checklist, one week is required for technical installation and setup, in addition to one week for staff training. The database varies according to each institution.

We observed implementation depends on the purchased modules and required resources. The most important factor is completing and detailing the database. The more people available to execute this stage, the faster the process is. We conducted the assessment during nine months, including installation, database, registration of all surgical cases, and training; this is a good period considering only one nurse was available, who was also responsible for CSSD.

Training is also not an issue addressed in any of the cited references. We noted that the application of the traceability system was easy. The stages with the greatest difficulty of assimilation and, therefore, errors refer to cleaning and sterilization batches, in which the case barcode is not read, thus not being available for the next stage. To minimize these failures, new trainings were requested and performed.

The involvement of the CSSD nursing staff is paramount to the implementation process and the use of the automated system. Knowledge is vital so that no steps are skipped, ensuring the authenticity of the recorded information. The OR nursing staff also plays a key role as it is responsible for affixing the barcode to the patient's medical chart.

National and international visits are constantly conducted to present and preview the practical use of the system, making CSSD a reference.

CONCLUSION

Even with the incipience of the method, this study demonstrates that the automated traceability system benefits the hospital's CSSD.

It is a gradual and thorough process that requires time and adjustments even after implementation.

Investment cost is high, but the automated traceability system adds quality and standardization to the processes performed, enabling more active management.

This article is expected to open the way for new reports that promote the inclusion of this technology for the benefit of CSSD.

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