PRACTICE OF SURGICAL ANTIBIOTIC PROPHYLAXIS AND PATIENT SAFETY FACTOR

Prática da profilaxia antimicrobiana cirúrgica como fator de segurança do paciente

La práctica de la profilaxis antimicrobiana quirúrgica como un factor de la seguridad del paciente

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ABSTRACT: Objective: To identify the practice of surgical antimicrobial prophylaxis adopted by professionals working in the operating room. **Method:** A descriptive study with a quantitative approach was conducted in 30 surgical center professionals located in the Northwest of Paraná, Brazil. Data collection occurred in 2012 by direct observation. For analysis, we used descriptive statistics. **Results:** It was found that, in 81 (81%) surgeries, clean, potentially contaminated, and contaminated, surgical antibiotic prophylaxis was performed. However, in most of them (54/66.6%), the antibiotic was administered within 1 hour before the surgical incision. In addition, in six (18.1%) potentially contaminated surgery and one (33%) contaminated, where its use was necessary, the antimicrobial was not used. **Conclusion:** It was evident that this practice violates the current recommendations, which affects their effectiveness in preventing surgical site infection and compromises patient safety.

Keywords: Patient safety. Antibiotic prophylaxis. Perioperative nursing.

RESUMO: Objetivo: Identificar a prática da profilaxia antimicrobiana cirúrgica adotada pelos profissionais atuantes em centro cirúrgico. **Método:** Estudo descritivo com abordagem quantitativa. Participaram 30 profissionais de centro cirúrgico localizado na região Noroeste do Paraná, Brasil. A coleta de dados ocorreu em 2012 por observação direta. Para análise, utilizou-se a estatística descritiva. **Resultados:** Constatou-se que em 81 (81%) das cirurgias, limpas, potencialmente contaminadas e contaminadas, a profilaxia antimicrobiana cirúrgica foi realizada. Entretanto, na maioria delas (54/66,6%), o antimicrobiano não foi administrado dentro de uma hora antes da incisão cirúrgica. Adicionalmente, em seis (18,1%) cirurgias potencialmente contaminadas e em uma (33%) contaminada, em que seu uso é indispensável, o antimicrobiano não foi utilizado. **Conclusão:** Evidenciou-se que esta prática descumpre as recomendações vigentes, o que afeta a sua eficácia em prevenir infecção de sítio cirúrgico e compromete a segurança do paciente.

Palavras-chave: Segurança do paciente. Antibioticoprofilaxia. Enfermagem perioperatória.

RESUMEN: Objetivo: Identificar la práctica de la profilaxis antimicrobiana quirúrgica adoptada por los profesionales que trabajan en un quirúrgico. **Método:** Estudio descriptivo con un enfoque cuantitativo. Participaron 30 profesionales del centro quirúrgico situado en el Noroeste de Paraná, en Brasil. La recolección de datos se produjo en 2012 por medio de la observación directa. Para el análisis, se utilizó la estadística descriptiva. **Resultados:** Se encontró que en 81 de las cirugías (81%) limpias, posiblemente contaminadas y contaminadas, se realizó la profilaxis antimicrobiana quirúrgica. Sin embargo, en la mayoría de ellas (54/66,6%), el antimicrobiano no fue administrado en una hora antes de la incisión quirúrgica. Además, en seis (18,1%) cirugías potencialmente contaminadas y en una (33%) contaminada, en el que es necesario su aplicación, no se utilizó el agente antimicrobiano. **Conclusión:** Se evidenció que esta práctica viola las recomendaciones actuales, lo que afecta a su eficacia en la prevención de la infección del sitio quirúrgico y pone en peligro la seguridad del paciente.

Palabras clave: Seguridad del paciente. Profilaxis antibiótica. Enfermería perioperatoria.

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INTRODUCTION

The surgical adverse events are defined as injury or unintentional complication, owing to an event or omissions, related to the surgical procedure, which result in disability, prolonged hospitalization, or mortality of the patient[1].

The surgical site infection (SSI) is considered a surgical adverse event by the considerable impact on patient's health, by its economic repercussion, and for being a factor to evaluate the quality of care. In Brazil, it is one of the main infections related to health assistance and comprises from 14 to 16% of those found in hospitalized patients[2,3].

The risks of SSI are multifactorial, related to the condition of the patient and the existing practices in health services, such as duration and quality of preoperative hand antisepsis, patient's skin antisepsis, sterilization of materials and instruments, and surgical antimicrobial prophylaxis[2,3].

Several measures are proposed in order to prevent SSI, among which stands out the surgical antimicrobial prophylaxis (SAP), essential in many surgical procedures. It is characterized by the intravenous administration of a prophylaxis antimicrobial agent, so that its bactericidal concentration reaches serum and tissue levels when the incision is performed and during the surgery. This is done in order to reduce the microbial load of intraoperative contamination, and for fulfilling their function successfully, it should be administered up to 1 hour before the surgical incision[2].

This recommendation is on the worldwide agenda of the World Health Organization (WHO) in order to strengthen patient's safety. Concerned with the matter of safety and in order to mitigate adverse events associated to assistance, in 2007, the WHO launched the Global Patient Safety Challenge, aimed at the safety of surgical assistance, with special attention to the prevention of SSI. These standards should be operationalized by a checklist in a surgical room, which establishes that the SAP should be carried out at anesthetic induction[2].

Despite the evidences showing that the appropriate SAP is one of the most effective prevention measures of the SSI[2,4,5], the adherence to this practice remains excessively below the ideal in many hospitals[6-8]. On the national context, this is a scarcely investigated subject[9,10]. Another important fact to highlight is publications describing successful interventions in order to increase the adherence to the SAP; however, the SSI remains a significant problem[11].

In the perspective of nursing, the safety of the patient is an essential component in the quality of nursing care[12]. The issue of safety in the clinical practice of nursing is not only related to the tasks to be performed by the professionals but also encompasses the commitment of these professionals with their code of ethics in order to provide safe, competent, and ethical care[13].

Thus, performing the proper care, at the right time, the right way, to the right person and, therefore, safely in order to achieve the best results possible is the principle that should support the quality of care and direct the practice of perioperative nurses, who excel in providing care in an ethical manner, based on clinical excellence and in the best scientific evidence available[14].

Therefore, this study aimed at filling out this gap of knowledge related to the practice of the SAP adopted by health services in the country. This study also aimed at identifying the practice of SAP adopted by the professionals working in the operating room.

METHOD

A descriptive study with a quantitative approach including 30 health professionals, 5 anesthesiologists and 25 nursing technicians (circulating nurses), was conducted, once any of them could manage the SAP at the moment of observations. It is noteworthy that, in this location, in order to administer the SAP, there is no standardization regarding the professional category responsible for this function. Thus, it was considered as an inclusion criterion to be the subject responsible for the administration of the antimicrobial prophylaxis of surgical patients in the operation room, at the time of observations.

Besides, patients' charts were used as a source of information to verify the medical prescription of the SAP. This is because, in this service, there is no medical or institutionalized conduct regarding this prescription. Thus, the following variations were observed:

1. in patient's chart, the surgeon prescribes the preferred antimicrobial in the preoperative medical prescription indicating the time it should be administered (whether in the pre- or intraoperative period);
2. the surgeon, in the operation room, verbalizes the prescription of the drug and requests the circulating nurse to administer it, without necessarily prescribing them in the patient chart.

Considering these variations of conduct, in addition to the direct observation of professionals in relation to the SAP in

the surgical room, the following information were obtained regarding preoperative medical prescription: name of the antimicrobial and dose and time prescribed for administration of the SAP, in case it was performed in the preoperative period.

The study site was a surgical center with seven operation rooms in the general hospital of Northwestern Paraná, Brazil.

For the construction of the data collection structured instrument, the following variables were collected:

1. characterization of the procedure: surgical specialty, surgery performed, and classification in relation to the potential for contamination; and
2. data regarding the SAP: use of the SAP, professional who administered the SAP, and time of the surgical incision.

For each surgery observed, we considered the appropriateness of the SAP in relation to time according to the international guidelines, endorsed by the Brazilian Ministry of Health, according to the following criteria:

1. antimicrobial administered up to 1 hour before the surgical incision; and
2. antimicrobial administered after umbilical cord clamping in obstetric surgeries[2,3].

An observer was afterwards trained for data collection by means of the direct observation[15] in an operation room. In order to avoid the Hawthorne effect, an incognito observer, student of nursing, would perform the observation during the curriculum practices activities in the surgical center. The student in the operating room monitored the surgical procedure from the moment of the admission of the patient to its end and should consult patient charts, in order to obtain information to fill out of the structured tool of data collection. After the collection of the data, the purpose of this study was explained to the subjects and those who accepted participating had to sign the informed consent form.

Data was collected during the months of August and September 2012, on weekdays, in mornings and afternoons, during two daily hours, totaling 80 hours of observation and 100 procedures observed.

For the storage of the data, *Excel*® software was used. For the analysis, a descriptive analysis was applied. Data were expressed in distribution of absolute and relative frequencies and presented in tables.

This study complied with ethical principles of Resolution No. 466/2012 of the National Health Council and it was approved by the Research Ethics Committee, endorsement 41863 of 2012, CAAE 02835912.2.0000.0104.

RESULTS

In relation to the characterization of the surgical procedures, it was verified the predominance of orthopedics and traumatology surgeries in 38 (38%) cases, followed by gynecology and obstetrics accounting for 23 cases (23%); gastrointestinal surgeries in 12 cases (12%); head and neck, mastology, and otorhinolaryngology surgeries accounting for 5 (5%) cases each; and plastic, nephrology, pulmonology, proctology, urology, and vascular surgeries with 2 (2%) cases each.

With regard to the practice of the SAP adopted by the professionals working in the surgical center, in most procedures observed, the professional responsible for the administration of the SAP in an operation room was the circulating nurse in 54 of them (66.6%), and the anesthesiologist in 27 (33.4%) of the surgeries. In most of the cases, the professionals applied the procedure only after surgeon's request. In some cases observed, the SAP was performed in the preoperative period, according to the medical prescription, which evidences the lack of a standardized practice.

SAP was performed in 81 (81%) surgical procedures. With regard to the classification of the surgeries as for their potential for contamination and use of the SAP, most surgeries were classified as a clean surgery [64 (64%)]. It was observed that the SAP was used in most surgeries observed, meaning, in 49 (76.6%) of the clean surgeries, 27 (81.9%) of the potentially contaminated surgeries, and 2 (66.7%) of the contaminated surgeries. However, it is striking that in 6 surgeries classified as potentially contaminated (18.1%) and in 1 surgery classified as contaminated (33.3%), on which the use of the SAP is imperative, the procedure was not performed, as demonstrated in Table 1.

Table 1. Distribution of surgical procedures in relation to their potential of contamination and use of surgical antimicrobial prophylaxis. PR, 2012.

Potencial of Contamination* (nº of procedures)	Surgical antimicrobial prophylaxis	
	Performed n (%)	Not performed n (%)
Clean (64)	49 (76.6)	15 (23.4)
Potentially contaminated (33)	27 (81.9)	6 (18.1)
Contaminated (3)	2 (66.7)	1 (33.3)
Total (100)	81	19

*No surgical procedures classified as infected was observed.

With regard to the antimicrobial used, the cephalosporins were predominant [73 (90.1%) surgeries], as follows: cefazolin in 56 (69.1%) surgeries, cephalothin in 15 (18.6%) surgeries, metronidazole in 7 (8.7%) surgeries, cefotaxina in 2 (2.4%) surgeries, and gentamicin in 1 (1.2%) surgery.

Regarding the moment of administration of the SAP, in most procedures [54 (66.6%)], it was performed in an inappropriate time, especially for 4 (4.9%) observed surgeries, in which the SAP was administered more than 2 hours before the surgical incision. Besides, a low adhesion to the correct time of administration of the SAP was evident; in a total of 27 (33.4%) surgeries only in 17 (21.0%), the antimicrobials were administered within 1 hour before the surgical incision; or in cases of 10 (12.4%) cesarean sections, the antimicrobials were administered after clamping of the umbilical cord, according to Table 2.

DISCUSSION

It is estimated that around 63 million people are subjected to surgical treatment owing to traumatic injuries (38%), malignancies (19%), and obstetric complications (6%)[16]. These data corroborate to the results found, as there was a predominance of procedures in the specialties of orthopedics and traumatology and gynecology and obstetrics, with 38% and 23%, respectively. The specialty of oncologic surgery was an exception, as the service surveyed is not a reference in these procedures.

Table 2. Distribution of the moment of administration of the antimicrobial prophylaxis in surgical procedures. PR, 2012.

Moment of the administration	n	%
Before performing the surgical incision		
Up to 1 hour	17	21.0
From 1 hour to 2 hours*	1	1.2
More than 2 hours*	4	4.9
After performing the incision		
Up to 1 hour	53**	65.5
More than 1 hour	6	7.4
Appropriateness of the SAP		
Appropriate***	27	33.4
Inappropriate	54	66.6
Total	81	100

*Data observed in the chart of the patient in the operation room; **Of these procedures, 10 (12.4%) were obstetrics, where the antimicrobial prophylaxis was conducted at the correct time, after the clamping of the umbilical cord; ***It was considered appropriate: up to 1 hour before the incision (n=17) and after the clamping of the umbilical cord (n=10).

Regarding the predominant use of cephalosporins, in the international and national contexts, the practice of antimicrobial selection also followed this trend of use, being the prophylactic agent widely used and recommended. They are effective against many gram-positive and gram-negative microorganisms, safe, and of low cost[9,10].

Regarding the contamination potential, there was a predominance of clean and potentially contaminated surgeries. The SSI should be analyzed according to the potential of contamination of the surgical wound, understood as the number of microorganisms present in the tissue to be operated. The risk of infection is higher the greater is the contamination potential. This is why the use of antimicrobials is imperative[3]. There was higher agreement and good evidence supporting the use of prophylactic antimicrobials before all gastrointestinal (including appendicitis), oropharyngeal, vascular (including abdominals and legs), obstetrics and gynecologic procedures, open cardiac surgery, orthopedic prosthetics adaptation, spinal surgery, craniotomies, and even some "clean" procedures. Although there is controversy about the use of prophylactic antimicrobials for clean surgeries, it is well accepted for open cardiac surgery, joint replacement, vascular prosthetics, and craniotomy in which the absolute number of infections is low, but the consequences of any infection are severe[2]. SAP is one of the fundamental measures for the prevention of the SSI[2,3], and the lack of its administration in the cases indicated is unacceptable and may contribute to the increased incidence of infection, considered one of the main avoidable surgical adverse events and extremely harmful to both patients and hospitals, as they impair the safety of the patient and the quality of care[2]. Equally important is the attention for the indiscriminate use of the SAP in the absence of indication, in the cases of clean surgeries, which may contribute for the growth of antimicrobial resistance that is considered to be a global public health problem[17].

In relation to the low adherence to the correct time of administration, in the global context and, regardless the socioeconomic condition of the countries, similar results were observed, in which the adherence to the correct time varies widely and is below the ideal in many hospitals[6-8]. It is noteworthy that an intervention study carried out in Canada, which is a developed country and with more favorable economic conditions than in Brazil, presented a rate of 5.9% of adherence at the correct time of the SAP, in the

preintervention period[6]. Similarly, in Brazil, a variation in the appropriateness of the time of administration of the SAP was also verified [9,10].

As a consequence of the administration of the antimicrobial in inappropriate time, a pioneer study of the association between SSI and the moment of the administration of the SAP demonstrated that a interval longer than 2 hours between the SAP and the skin incisions has been associated with an increase of 6.7 times in the rate of SSI[4].

The availability and accessibility of guidelines for the consultation are important elements to promote the adherence to the practices based on evidences[10,11]. These protocols should share the following recommendations: selection of antimicrobials according to the type of surgery, administration within 1 hour before the surgical incision, discontinuation within 24 hours after surgery, removal of body hair only if necessary by shaving or by the use of shaving creams, and maintenance of the levels of body temperature and glucose within the normality parameters[3,11]. In this study, the Hospital Infection Control Service (HICS) of the investigated institution elaborated a recommendation about the SAP; however, it was unavailable for information and consultation by the professionals in the surgical room, which may be a limiting factor to the use of the SAP at the time recommended.

In addition to that, there are multiple factors that influence the adherence to the SAP, which may be grouped into: individual factors, such as knowledge, attitudes, and beliefs; characteristics of the work team, such as communication, allocation of responsibilities, and clinical resistance for a change; factors that involve the context of care, owing to a level of surgical activity, number of specialties and medical teams working at the same unit; and institutional limitations, such as limited financing and characteristics of the processes or technologies to be implemented[6-8,11,18].

The reflection of these factors, considering their potential modification and future opportunities, may allow a more sensible approach in future opportunities, meaning, the planning of more assertive strategies for the improvement of the adherence to the recommendation of the SAP for the prevention and reduction of the SSI rates[11], as discussed further.

It is noteworthy that the implementation of a practice based on scientific evidence, such as the SAP, requires a movement, by the health services, which is opposite to the naive and simplistic belief that changes and interventions in the work process are immediate and uncomplicated. This movement should incorporate the following premise: changes in the process of health work, as shown in interventions in the work process of a surgical center, are multifaceted, many times intricate and challenging. From this acceptance, the health services may mitigate the deleterious effect of unsuccessful approaches, which result at an end itself, and promote holistic approaches, which result in the improvement of the processes of planning and decision making for the benefit of best practices for the prevention and control of infections related to health care.

Thus, in relation to the strategies to improve the use of the SAP by health services based on the available scientific evidences, it is clear that an integrated approach, which involves institutional aspects in the surgical center context and the process of working, planning, execution, evaluation, and feedback, is more promising and recommended to be adopted in these health services[6,7,9].

It is worth mentioning a prospective study that compared the adherence to antimicrobial prophylaxis both before and after the introduction of a personalized surgical antimicrobial kit. After its introduction in surgeries, there was a significant increase in the administration of the SAP at the appropriate time from 12 to 24%, $p=0.003$. It is emphasized that this kit was standardized by the HICS, prepared in the pharmacy of the hospital and distributed in the operation rooms according to the daily schedule of the surgeries. It consists in a plastic bag containing the antimicrobial agent and an institutional script with the following specifications: dose, moment of the administration, and duration of the postoperative antimicrobial therapy. Externally, there was the identification of the patient[8].

Regarding the surgical center context, a preliminary study is essential in order to determine the appropriate moment of administration of this SAP by the health professionals, regarding the instruction of up to 60 minutes before the surgical incision. For that, the most opportune moment may be determined when observing the mean time from the admittance of the patient in the operation room until the act of surgical incision. Studies show that the variation of this mean time comprises from 20 to 30 minutes. Thus, this would be the most recommended time in order to ensure the SAP in the correct time regarding the current recommendations[2].

In addition to that, the responsibility delegation of the administration of the SAP for a specific member of the team is essential, as this measure reduced the variability of the professionals involved directly in the administration, defined responsibility, and optimized the educational process, by monitoring the use pattern and the performance feedback of the involved people[9,18].

As for the location of the administration of the SAP, variability in the adherence to the SAP related to the place of its administration was observed. This is because it is often performed in one of the hospitalization units, without a clear definition of the responsibility of health professionals who administer it. Thus, the definition and standardization of the place of administration of the SAP are encouraged, namely: in the operation room or anesthetic induction area[6].

In planning, execution, and evaluation, a series of measures are appropriate. The stage of planning must begin with the definition of a multidisciplinary leadership team. The leaders should meet in multidisciplinary teams in order to study and test initiatives, define goals, and establish performance measures, being continuously committed to the improvement of the prevention processes of the SSI[18].

As for the promotion of communication culture, it is important to stimulate the team to perform a succinct and informal conversation in the operation room in order to discuss prevention measures of specific SSI to be adopted for the patient. This initiative of the members of the perioperative team may stimulate them to verbalize worries and suggestions, to create an environment of collective responsibility, and to improve the quality of care[18].

Although the promotion of the communication culture in the process of work in the surgical center is challenging, it may be a rewarding and stimulating experience to the perioperative nurse, as it contributes for the rupture of the dominant practice in surgical centers, which characterizes by the hierarchy, rigidity, and resistance of the processes[19].

All perioperative professionals must be engaged with the culture of communication, which favors the dissemination of everyday discussions about the current strategies of prevention of SSI, as new evidence arises everyday. However, it is recognized the lack of a culture of communication in the Brazilian perioperative scenario. Thus, this is an invitation to overcome the culture of silence, as addressing and verbalizing situations — such as forgetting to hand hygiene, identifying a rupture in a sterile technique, or informing surgical instruments were not properly cleaned — may seem embarrassing or irrelevant, but not expressing them may represent the difference between life and death for a patient[18].

Regarding the SAP protocols, evidences show that elaborated and approved protocols involving the multidisciplinary team increase the appropriate use of the SAP, as they reduce the variability of practice among surgeons and allow an environment of collective cooperation, necessary to ensure the success and sustainability of the implementation[6,18].

In order to meet the strict deadline for the administration of the SAP, the responsible for its administration should have easy access to it; in this way, there are dispensing mechanisms that fulfill this function: storage of standardized antimicrobials in the area of use, by automated distribution system, and personalized kits for each procedure distributed by the pharmacy[7,8].

In order to ensure the proper documentation of the SAP, in places where the registration of surgical assistance is printed out, the inclusion of a specific field for the filling out of these data is recommended. In addition, a printed recommendation with highlight color to be fixed in the patient chart may be a beneficial notification to avoid forgetness or delay in administration. The checklist of surgical safety also fulfills this function, once it is a visual or oral subsidy, which allows the surgical team to exceed the limitations imposed by short-term memory[2].

Before the incorporation of evidence in practice, the promotion of educational actions and training of the SAP and all the professionals involved in this process is stimulated[2]; this includes the professionals working in the surgical center who administer the SAP, surgeons who prescribe the SAP, pharmacists and pharmacy technicians who dispense these drugs, and nurses who manage the nursing care in the surgical center.

The monitoring process is essential to minimize the consequences of misuse. Therefore, the establishment of an intensive surveillance system, analysis of variation, analysis of interventions, promotion of feedback, support to the ones involved, and continued education are necessary[6,9,11].

Regarding the performance feedback, it is suggested that the monthly performance disclosure for working professionals in surgical centers may raise awareness in the involved professionals on their practice and help leading the promotion of strategies for the adaptation of attitudes toward the adherence to the SAP. It is recommended the provision of individualized indicators to the surgeons, anesthesiologists, and circulating nurses involved in the SAP[6,9].

In relation to the professional components, which includes a look into the multidisciplinary team and individually, an important aspect is to ensure medical education[19]. Some doctors may be reluctant owing to their misperception that the protocol rivals their expertise[19].

It is recognized that the recommendations based on robust scientific evidences, many times, are insufficient to transform practice. This is because, in certain health services, what prevails is the control regime, where the institution or professionals say what to be done (implement the protocol)

and expect to have results (adherence). These strategies are inclined to fail, because the members of the team find the mechanisms to neutralize or subvert instructions, which discredit or are seen as a threat to their interests. Thus, it is essential to understand the influence of sociocultural barriers and the subjectiveness of the present in the process of care production, in order to combine strategies that reject a control regime[19].

Implementing strategies for the safety of surgical patients is a task for all those involved in the process: professionals, educators, researches, patients, and managers. In order to verify how much we are collaborating for this process, it is suggested a simple questioning "in case I need an anesthetic-surgical procedure, how safe would I feel in being submitted to a surgery in my own workplace?"[20].

In order to overcome the challenges imposed to the incorporation of practice based on the SAP and to ensure the surgical safety, we cast a look on the following point: we have advanced in scientific production and standard-setting and regulatory aspects regarding the safety of the patient. However, in this study, it is observed that there are inadequacies of their application in the practice, evidencing that the safe SAP is a practice to be consolidated in health services.

For the consolidation of safety practices of patients in health services, it is important to recognize that ensuring the safe and free-of-damage assistance is a responsibility to be shared by all the interested parties, namely: the general society; the patients; clinical nurses, nursing management, and teaching nurses; researchers; managers; doctors; governments and legislative authorities; professional association; and accrediting agencies[12].

However, it is believed that nursing has an immense potential to exercise this role in the implementation and enforcement of the best practices on patient safety, as nurses are involved in health caring of patients in all areas of the health system, 24 hours a day, 7 days a week. Through their surveillance, nurses act out and maintain patients' safety, identifying risk situations that need improvement. Therefore, their "presence" and their knowledge allow performing an essential role in the safety of the patient[13].

Thus, in the perspective of the role of perioperative nurses, it is opportune to make some considerations in relation to the following question: How can the perioperative nurse contribute to strengthen the practices of patient's safety? In order to reflect on this matter, it is proposed a discussion about the nurse and their assisting, managerial, and educational functions.

From the assisting point of view of a nurse, strengthening the practices of safety implies in a wide commitment to the assumptions in the nursing code of ethics, as a professional practice guided by the respect to ethical conducts is a safe practice. In addition, it should commit to the guidelines, guides, recommendations, rules, and resolutions based on current evidences. It is also important to improve their technical–scientific knowledge on patient's safety and other necessary issues, which will support their professional practice, which includes searching for expertise in their area through complementary formation and certification of associations specialized in nursing[12,13,21].

In the general perspective, nurses in leadership positions also have the responsibility to promote a safe assistance. For that, it should stimulate, promote, and create the conditions for the personal and educational development of the nursing professionals under their guidance and supervision, in addition to providing an environment in which the nurse may identify the threats to the patient and have professional autonomy and support for decision-making for the sake of patient safety[12,13,21].

Regarding the educational aspect, nursing teachers should encourage the inclusion of the theme of patient safety in the technical education, undergraduation, and graduation programs according to the order of the Ministry of Health of No. 529 from 2013 in order to develop the skills of critical thinking necessary to the formation of the nurse and nursing teams that are committed to patient safety[22]. Moreover, from the perspective of education in service, the teaching nurses should create opportunities for the education of nurses and other health professionals based on institutional policies and on procedures related to patient safety[12,13,21].

It stands out as a limitation to this study that the present analysis is focused on the practice regarding the specific SAP of a health service. Thus, these results reveal a local problem and, therefore, owing to the sample and being performed in a single surgical center, the data cannot be generalized. In addition, the object of analysis is focused only in some aspects of the SAP, namely: antimicrobial chosen, its use in relation to the contamination potential, professional categories involved, and administration within 1 hour before the surgical incision. The discontinuity within 24 hours after the surgery, duration of the SAP, ideal dose, intervals between doses, and adequacy of the antimicrobials according to the type of surgery were not observed. Furthermore, the adherence to the remaining suitable perioperative measures for the prevention of the SSI, such as removal of body hair,

maintenance of body temperature levels, and glucose within the normality parameters, was not observed.

In addition, another limitation was the non-observance of the effect of the SAP that were administered in inappropriate times in the rates of SSI of the patients who undergone the observed surgeries. It is recommended that the implementation of the SAP as a preventive measure for infections should be related to the measuring of the SSI rates periodically. These analysis and frequent dissemination of the data promote the adherence to the best practices among the professionals working in the surgical center, as they expand the understanding that the prevention of the SSI requires systematic attention, in addition to the antimicrobial agents[11].

There are the important aspects to be considered in national future researches and in the dissemination of national experiences of implementations of strategies for the improvement of the SAP and their impact on the SSI rate. This may stimulate health services, HICS, perioperative nurses, and other professionals involved in the assistance to adopt similar procedures that support the decision-making by the practice based on evidence, in order to qualify the practice of surgical care and patient safety.

CONCLUSION

In this study, in relation to the SAP, it was found that, in most surgeries observed, the professional responsible for its administration in the operation room was the circulating nurse of the room, followed by the anesthesiologist. They, for most of the times, wait for the request of the surgeon to perform the procedure. In addition, as observed in some cases, the SAP was performed in the preoperative period, according to the medical prescription, which shows that there is no standardized practice.

In relation to the choice of the antimicrobial, there was a predominance of cephalosporins. The SAP was carried out in most observed, clean, potentially contaminated, and contaminated surgeries. However, in some surgeries classified as potentially contaminates and contaminated, in which the use of the SAP is essential, this was not performed.

There was inadequacy in relation to the moment of administration of the SAP, occurring well before or after the performing of the surgical incision and not within 1 hour before the surgical incision.

Thus, it is evident that the practice regarding the SAP adopted by the professionals working at the surgical center is not complying with the current recommendations about the prevention and control measures of the SSI, which affects their effectiveness in preventing infection of the surgical site and compromises the safety of the patient.

Knowing the practice regarding the SAP adopted by the working professionals in the surgical center is the first step to be taken by the health services to identify the interfering factors in the implementations and adherence to a practice based on evidences. Besides, this study discussed integrated strategies for the promotion of the use of the SAP by health services, which includes approaching the institutional components, of the context and working process in the surgical center, of the multidisciplinary team, and individually. In relation to the implications for nursing in the interest of patient's safety, it is expected that perioperative nurses recognize themselves as protagonists of this process and may reinvent the praxis in health in a more qualified, compromised, ethical, humane, and safe way.

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