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Original Article

Surgical site infection incidence rate related to quality indicators

Taxa de incidência de infecção de sítio cirúrgico relacionada a indicadores de qualidade
Tasa de incidencia de infección del sitio quirúrgico relacionada con indicadores de calidad

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Corresponding author:
E-mail: beatriz.zago.lupepsa@uel.br
Address: Health Sciences Center. Robert Koch Avenue, 60 - Operária, Londrina, Paraná, Brazil.

Beatriz Zago Lupepsa[1]
Gabriela Encarnação Leandro[1]
Helenize Ferreira Lima Leachi[1]
Marília Ferrari Conchon[1]
Cibele Cristina Tramontini[1]

[1]*Universidade Estadual de Londrina*. Londrina, Paraná, Brazil.

ABSTRACT

Background and Objectives: it is important to measure and relate theory and practice applied in the workplace through health quality indicators such as adequate care for surgical patients and prevention of future infections. This study aimed to analyze quality indicators related to the prevention of surgical site infections in a teaching hospital. **Methods:** a cross-sectional, analytical, prospective and quantitative study, with a theoretical basis in triad structure, process and outcome. It was carried out in the surgical center of a public, university hospital in southern Brazil, linked to the Brazilian Health System. The study sample included the surgical teams and the surgical center of the study hospital, and its composition was given based on the inclusion criteria, such as surgery performed during the daytime period (from 07:00 to 19:00), from Monday to Friday, on an elective basis, during a period of three months, in 2022 (September to November). **Results:** there were 283 elective surgical procedures, with emphasis on procedures performed without breaking the aseptic technique of the surgical field reported in the transoperative record (97.53%; 276). The surgical center studied presented an operational structure that was incomplete in accordance with the recommended safe practice standards. The sample identified 22.30% (63) of patients with surgical site infection. **Conclusion:** the analysis of indicators demonstrated the need to adapt items related to structure and process (adequate antiseptic dispenser and taps operated without manual contact), in addition to reviewing standard operational protocols.

Keywords: *Surgical Wound Infection. Quality Indicators, Health Care. Perioperative Nursing. Patient Safety.*

RESUMO

Justificativa e Objetivos: é importante mensurar e relacionar a teoria e a prática aplicada no ambiente de trabalho através de indicadores de qualidade em saúde como uma assistência adequada ao paciente cirúrgico e prevenção de futuras infecções. O objetivo deste estudo foi analisar os indicadores de qualidade relacionados à prevenção da infecção de sítio cirúrgico de um hospital de ensino. **Métodos:** estudo transversal, analítico, prospectivo e quantitativo, com embasamento teórico na tríade de estrutura, processo e resultado. Foi realizado no centro cirúrgico de um hospital público, universitário, do Sul do Brasil, vinculado ao Sistema Único de Saúde. A amostra do estudo incluiu as equipes cirúrgicas e o centro cirúrgico do hospital de estudo, e sua composição foi dada com base nos critérios de inclusão, como cirurgia realizada durante o período diurno (das 07:00 às 19:00), de segunda a sexta-feira, com caráter eletivo, durante um período de três meses, no ano de 2022 (setembro a novembro). **Resultados:** foram 283 procedimentos cirúrgicos eletivos, com destaque para procedimentos realizados sem quebra de técnica asséptica do campo operatório relatada em ficha transoperatória (97,53%; 276). O centro cirúrgico estudado apresentou uma estrutura operacional incompleta aos padrões de práticas seguras recomendadas. A amostra identificou 22,30% (63) dos pacientes com infecção de sítio cirúrgico. **Conclusão:** a análise dos indicadores demonstrou a necessidade de adequação de itens relacionados à estrutura e processo (dispensador de antisséptico adequado e torneiras acionadas sem contato manual), além da revisão de protocolos operacionais padrão.

Descritores: *Infecção de Ferida Operatória. Indicadores de Qualidade em Assistência à Saúde. Enfermagem Perioperatória. Segurança do Paciente.*

RESUMEN

Justificación y Objetivos: es importante medir y relacionar la teoría y la práctica aplicadas en el lugar de trabajo a través de indicadores de calidad de la salud como la atención adecuada a los pacientes quirúrgicos y la prevención de futuras infecciones. El objetivo de este estudio fue analizar los indicadores de calidad relacionados con la prevención de infecciones del sitio quirúrgico en un hospital universitario. **Métodos:** estudio transversal, analítico, prospectivo y cuantitativo, con fundamento teórico en la tríada de estructura, proceso y resultado. Se realizó en el centro quirúrgico de un hospital universitario público del Sur de Brasil, vinculado al Sistema Único de Salud. La muestra del estudio incluyó a los equipos quirúrgicos y al centro quirúrgico del hospital del estudio, y su composición se basó en criterios de inclusión, como cirugía realizada en el período diurno (de 7:00 a 19:00 horas), de lunes a viernes, con carácter electivo, durante un período de tres meses, en 2022 (septiembre a noviembre). **Resultados:** hubo 283 procedimientos quirúrgicos electivos, con énfasis en los procedimientos realizados sin romper la técnica aséptica en el campo operatorio reportados en el registro intraoperatorio (97,53%; 276). El centro quirúrgico estudiado presentó una estructura operativa incompleta con los estándares de prácticas seguras recomendados. La muestra identificó el 22,30% (63) de pacientes con infecciones del sitio quirúrgico. **Conclusiones:** el análisis de los indicadores demostró la necesidad de adecuar elementos relacionados con la estructura y el proceso (dispensador de antiséptico adecuado y grifos operados sin contacto manual), además de revisar los protocolos operativos estándar.

Palabras Clave: *Infección de la Herida Quirúrgica. Indicadores de Calidad de la Atención de Salud. Enfermería Perioperatoria. Seguridad del Paciente.*

INTRODUCTION

The surgical center (SC) is a complex hospital sector that is susceptible to the occurrence of several adverse events, where low tolerance for these errors will influence the safety and satisfaction of patients and employees and the sector's cost-benefit. In this regard, the relevance of efficient management and administration is essential for the development of the work process.[1]

Quality indicators (QIs) are tools for measuring the classification of service quality, and involve the application of actions to the quality of care provided to surgical patients.[2] These tools can be analyzed based on the theory that defends quality components in healthcare, supported by three pillars, such as structure, process and outcome. Structure is related to the facilities of the hospital building and the attributes of the professionals involved in the care analyzed; process is linked to the workflow, decontamination of materials and how the professionals themselves are acting; thus, both are directly proportional to the third pillar: outcome. The third pillar expresses the measures implemented based on the reflection and profile of the population studied.[3]

QIs are quantitative measures to reassess, replan and reorganize service activities, contributing to control and decision-making, in addition to sustaining the quality of the service provided and understanding complex phenomena in the work process.[4] Within the management tools that guide the path to excellence in care, QIs comprise the way in which healthcare professionals analyze an activity, monitor aspects related to a given reality and assess what happens to patients, indicating the efficiency and effectiveness of processes and organizational outcomes.[5]

One of the key indicators linked to the SC flow is surgical site infections (SSIs). SSIs are infections related to surgical procedures, with or without implant placement, in inpatients and outpatients.[6] Infections can be characterized by incision, tissue, organ or manipulated space, with diagnosis up to 30 days after the surgical procedure, or up to one year, in the case of prosthesis implantation.[7] Furthermore, SSIs can also be caused by individuals' own microbiota, due to the incidence of antimicrobial use that patients undergo, bacterial selection, local colonization and fungi present.[6]

SSI is identified through the depth reached, being classified as superficial infection, that which reaches subcutaneous tissue from the first day to the 30th day after the procedure, presenting purulent drainage, positive culture and phlogistic sign, and deep infection, identified up to 90 days after the surgical act, having purulent drainage, fever greater than 38 ºC, abscess or dehiscence of the surgical wound and infection of cavities or organs, resulting in positive culture, abscess, possible reoperation and anatomopathological examination.[8]

Each year, SSIs threaten the lives of millions of patients around the world and are a major contributor to the spread of bacterial resistance. In low- and middle-income countries, about 11% of patients develop infections after surgical procedures. In Africa, up to 20% of women who undergo cesarean sections develop wound infections, which harm their health and make it difficult to care for their newborns. However, SSIs do not only affect developing countries; in the United States, for example, these infections result in more than 400,000 extra days of hospitalization and an additional cost of about $900 million per year.[9]

In Brazil, SSIs account for approximately 14% to 16% of infections found in hospitalized patients.[6] Of all healthcare-associated infections, SSIs account for 31% and are associated with a mortality rate of 3%, with 75% of deaths resulting from surgical procedures. Even with such percentages, these infections can be avoided in up to 60% of cases through the application of preventive and control interventions.[10]

The present study is justified by the importance of assessing and analyzing the context of where and how SSI occurs, broadening the focus of the discussion of the topic. The triad of QIs helps in the analysis of the relationship between theory and practice applied in the work environment through health indicators, creating more precise parameters for the prevention of infections.[3] This study aimed to analyze the QIs related to the prevention of SSI in a teaching hospital, presented by the Brazilian National Health Regulatory Agency (In Portuguese, *Agência Nacional de Vigilância Sanitária* - ANVISA), based on the triad structure, process and outcome.

METHODS

The research is a cross-sectional, prospective study with a quantitative approach. It was carried out in the SC of a large public university hospital in southern Brazil, linked to the Brazilian Health System (In Portuguese, *Sistema Único de Saúde* - SUS). This hospital is a reference center for trauma and orthopedics, emergency care, organ harvesting and removal center, and video-assisted surgeries, among others.

The SC has seven operating rooms, one of which is specifically for urgent and emergency surgeries. It serves several specialties, operating 24 hours a day, performing an average of 500 surgeries per month at the time the data was collected. Its staff consists of nurses, nursing technicians and assistants as well as operational assistants and administrative technicians.

The convenience sample included patient surgeries performed at the teaching hospital, and its composition

was based on the following inclusion criteria: primary surgical procedure; surgeries of various surgical specialties, with open and videolaparoscopic techniques performed at the institution; and surgeries performed during the daytime (from 7:00 am to 7:00 pm), from Monday to Friday, on an elective basis, during a three-month period in 2022 (September, October and November). Exclusion criteria were emergency surgeries, surgical re-intervention and patients who died after the surgical procedure. To assess the structure and process QIs related to the development of SSIs, the surgical team components were assessed: medical team (surgeon and anesthesiologist) and nursing team (nursing technician or nurse with the role of SC circulator and scrub nurse). Inclusion criteria for these groups are being scheduled to work in the operating room selected for the study or being part of the team that will perform patients' procedure.

The data collected and analyzed refer to general characteristics of surgical anesthetic procedures, such as surgical specialty, classification of surgery according to contamination potential (clean, potentially contaminated, contaminated and infected), size of surgery (size I, II, III, IV) and type of anesthesia (general and regional).

The variables defined in structure and process indicators were based on criteria presented in an ANVISA manual.[6] The criteria presented in the manual are based on the structure, process and outcome triad, as detailed below:

The variables of structure indicators were one circulating staff for each room, adequate provision of antiseptic for surgical hand antisepsis, and an autonomous mechanism for keeping doors closed.

The process indicator variables were preoperative risk factors, such as preoperative hospitalization time, surgical field antisepsis with appropriate solution and administration of antibiotic prophylaxis up to one hour before surgical incision. Intraoperative risk factors were number of surgical boxes with inspection record (zebra-striped tape and integrators according to the type of box and packaging, presence of dirt, residues, humidity and expiration date), correct aseptic technique, disinfection time and donning of professionals. Postoperative risk factor was duration of antibiotic prophylaxis.

The outcome indicator variable was the incidence rate calculation performed per procedure for reporting purposes.

Dependent variables were structure, process and outcome indicators. Independent variables were anesthetic-surgical data.

For data collection, based on the daily surgical schedule, patients with surgery scheduled as the first in the morning and the first in the afternoon who were waiting for the procedure in the pre-anesthesia room were approached. Daily quantity was verified according to the demand for the times (from 07:00 to 09:00 and from 13:00 to 15:00). These times were selected for large procedures that used the entire period, and in order to have significant demand for data collection and full observation of the procedure, this process was stipulated. The researcher presented the objective of the research to patients and their companions, in order to clarify the study and request the signing of the Informed Consent Form, which was submitted to the Research Ethics Committee linked to the institution where data collection took place, in accordance with Resolution 466/2012 of the Brazilian National Health Council, under registration Certificate of Presentation for Ethical Consideration 03477018.2.0000.5231 and favorable Opinion 5,069,973, with approval date on October 28, 2021. After acceptance, clinical and surgical information was collected from these patients using a pre-structured script, with part of the information provided by the patients themselves and part through their medical records.

The assessment of the structure and process QIs related to SSI was carried out through observation and recording of the surgical environment, surgical team and their work process during the procedures of patients mentioned above. The outcome indicator assessment was carried out after tabulating the data and calculating the incidence rate of SSI.

The data collection instrument consisted of two sections. In the first, data characterizing the surgical procedures were recorded. In the second section, data for analysis of structure and process indicators were recorded. The data were entered, standardized and analyzed using IBM SPSS software. A simple descriptive frequency analysis was performed for the categorical variables, and an analysis of central tendency (mean and median) and variability (standard deviation) was performed for the numerical variables. Frequencies are presented in contingency tables, and to verify whether the assumptions of association and dependence between QI variables and the result of the development of the SSI rate are met, the chi-square test was used.

To identify frequencies greater than five in each row of the table and the presence of violated assumptions (more than 20% of values less than 5) in the chi-square test, Fisher's exact test was performed. For ordinal categorical variables (preoperative hospitalization time), the Mann-Whitney test was used, in which it was possible to assess whether there is a difference in the parameters between individuals who had and did not have infection.

To calculate the compliance indexes of selected practices, formulas recommended in the operational constructs of these indicators were used, through their arrangement in numerators and denominators. Denominators correspond to the total of practices

assessed, and numerators, to the total of practices assessed that obtained compliance. To calculate compliance indexes, the equations of general compliance and of each assessed component were used. For the significance, a significance interval of 5% was adopted in this work. The results presented p-values less than 5%, considered significant, and p-value less than 0.1% (<0.001***).

RESULTS

A total of 283 elective surgical anesthetic procedures were assessed, classified according to surgical specialty: clinical, contamination potential, surgical size and type of anesthesia. The sample characteristics are presented below (Table 1).

Table 1. Distribution of sample characteristics according to the development of surgical site infection. Londrina, Paraná, Brazil, 2022.

Characteristic	General N	With infection N (%)	Without infection N (%)	p-value
Surgical-clinical specialty (n=283)				
Bucomaxillofacial	19	5 (26.32)	14 (73.68)	0.567b
Head and neck surgery	10	2 (20)	8 (80)	
Digestive system surgery	26	5 (19.23)	21 (80.77)	
Ophthalmic surgery	18	4 (22.22)	14 (77.78)	
Plastic surgery	3	2 (66.67)	1 (33.33)	
Thoracic surgery	5	-	5 (100)	
Vascular surgery	13	1 (7.69)	12 (92.31)	
Gynecology and obstetrics	13	4 (30.77)	9 (69.23)	
Neurosurgery	13	2 (15.38)	11 (84.62)	
Orthopedics	91	18 (19.78)	73 (80.22)	
ENT	17	3 (17.65)	14 (82.35)	
General surgery	2	-	2 (100)	
Urology	53	17 (32.08)	36 (67.92)	
Potential of contamination (n=283)				
Clean	135	27 (20)	108 (80)	0.449b
Potentially contaminated	142	36 (25.35)	106 (74.65)	
Contaminated	1	-	1 (100)	
Infected	5	-	5 (100)	
Size of surgery (n=283)				
Size I	140	33 (52.38)	107 (48.64)	0.361d (r=-0.05)
Size II	110	26 (41.27)	84 (38.18)	
Size III	22	3 (4.76)	19 (8.64)	
Size IV	11	1 (1.59)	10 (4.55)	
Anesthesia (n=283)				
Regional	176	45 (25.57)	131 (74.43)	
General	107	18 (16.82)	89 (83.18)	0.117a (v=0.1)
Preoperative hospitalization time (n=283)				
Not reported	115	-	-	0.540d (r=-0.04)
Up to one day	101	40 (64.52)	61 (57.55)	
One day	15	3 (4.84)	12 (11.32)	
One day to three days	11	4 (6.45)	7 (6.6)	
More than three days	41	15 (24.19)	26 (24.53)	
Surgical field antisepsis with appropriate solution (n=283)				
Adequate	281	61 (21.71)	220 (78.29)	0.049b
Inadequate	2	2 (100)	-	
Antibiotic prophylaxis performed up to 1 hour before incision (n=283)				
Adequate	12	6 (50)	6 (50)	
Inadequate	271	57 (21.03)	214 (78.97)	0.029b
Number of surgical boxes with inspection record (n=283)				
Adequate	283	63 (22.3)	220 (77.7)	
Inadequate	-	-	-	
Correct aseptic technique of the surgical field (n=283)				
Yes	276	61 (22.1)	215 (77.9)	0.654b
No	7	2 (28.57)	5 (71.43)	
Hand disinfection time for professionals (n=283)				
More than 60 seconds	228	32 (14.04)	196 (85.96)	<0.001***a (v=0.4)
From 40 to 60 seconds	55	31 (56.36)	24 (43.64)	
Complete donning of professionals (private, disposable cap, mask, closed shoes, goggles) (n=283)				
Adequate	11	7 (63.64)	4 (36.36)	0.003b
Inadequate	272	45 (24.19)	141 (75.81)	

Tests performed to achieve the result: chi-square (marked by the letter "a"); Fisher's exact test (marked by the letter "b"); Mann-Whitney (marked by the letter "d"); Odds Ratio (OR - marked by the letter "r"); Cramer's V (marked by the letter "v").

It was identified that 22.30% (63) of patients presented SSI, being detailed according to the distribution of characteristics (Table 1).

To identify the p-value between the variables (clinical, surgical classification, surgical field antisepsis with appropriate solution, antibiotic prophylaxis performed up to 1 hour before incision and correct aseptic

technique of the surgical field), Fisher's exact test (marked by the letter "b") in the table was used. This test was selected because it is the most appropriate for calculating the probability of independence between the variables. The association between SSI and such variables accepts evidence of the hypothesis of association from the test. Also, statistically, no evidence was found through the Mann-Whitney test (marked by the letter "d") in the table, to reject differences between the distributions of preoperative hospitalization time in relation to the development of SSI, thus reporting an effect size in which, the further from 0, the greater the association effect.

As for complete donning (private, disposable cap, mask, closed shoes and goggles), it was observed that the choice of clothing was linked to professionals' preference and not to a standard operational protocol of the institution. The result presented of 96.11% (272), inadequate, shows that the professionals paid attention to the minimum donning (apron and sterile gloves, mask and cap) for the execution of the surgical procedure.

For the p-value of the anesthesia and donning variables, the chi-square test of independence (marked by the letter "a") was performed, which followed the calculations (x^2 (1) = 2.46 p = 0.117), (x^2 (1) = 0.87 p = 0.352) and (x^2 (1) = 0 p = 1). No evidence of an association between any of them and SSIs was found. The variable hand disinfection time for professionals was also calculated by the chi-square test of independence, which showed an association with infection (x2 (1) = 43.46 p = <0.001***). With this, the Odds Ratio (OR) was calculated, which compares the chance of infection in operations with a degerming time of 40 to 60 seconds (31/24 = 1.29) and the chance of the same outcome in the group in which degerming was performed for more than 60 seconds (32/196 = 0.16). Thus, OR = 7.91 (95% CI = (4.13; 15.17)) indicates a 7.91 times greater chance of infection in the 40 to 60 seconds group than in the more than 60 seconds group.

In relation to the effect size in part of variables in SSIs, Cramer's V was calculated, which is classified as negligible, small, medium and large. In the anesthesia variable (v=0.1), the effect is considered small, and in the hand disinfection time for professionals variable (v=0.4), the effect is considered medium.

The SC assessment revealed an operational structure that partially meets the recommended standards for surgical practices. Each surgical room is attended by a dedicated circulating nurse and an anesthetist, who are checked according to the daily schedule. In addition, there is one washing station for every two surgical rooms, but the adequate provision of antiseptic for surgical antisepsis was identified as a failure, as there are no taps that can be operated without contact with the hands. The existence of a written cleaning routine for the sector and environmental signage standards for restricting the movement of people in the sector were also observed as points for preventing SSI. However, aspects that require adjustments were highlighted for both structure and process indicators, to adapt to current contamination prevention compliance standards, which require attention and possible improvements (Tables 2 and 3).

Table 2. Compliance of structure indicators related to infection according to the Brazilian National Health Regulatory Agency manual. Londrina, Paraná, Brazil, 2022.

Indicator	Situation
One circulating person for each room	Adequate
Adequate provision of antiseptic for surgical hand antisepsis	Inadequate
Antiseptic dispensers and taps operated without contact with hands	Inadequate
Autonomous mechanism for keeping doors closed	Inadequate

Table 3. Compliance of process indicators related to infection according to the Brazilian National Health Regulatory Agency manual. Londrina, Paraná, Brazil, 2022.

Variable	N (%)
Surgical field antisepsis (n=283)	
Adequate	281 (99.29)
Inadequate	2 (0.71)
Antibiotic prophylaxis performed up to 1 hour before incision (n=283)	
Adequate	12 (4.24)
Inadequate	271 (95.76)
Surgical box inspection (n=283)	
Adequate	283 (100)
Inadequate	-
Correct aseptic technique of the surgical field (n=283)	
Adequate (yes)	276 (97.53)
Inadequate (no)	7 (2.47)
Hand disinfection time for professionals (n=283)	
Adequate (more than 60 seconds)	228 (80.57)
Inadequate (from 40 to 60 seconds)	55 (19.43)
Complete donning (private, disposable cap, mask, closed shoes, goggles) (n=283)	
Adequate	11 (3.89)
Inadequate	272 (96.11)

DISCUSSION

The assessment of indicators is a daily challenge, and the triad focuses on these three pillars (structure, process and outcome) for good service management. The influence of the quality of healthcare integrates central concepts to measure and improve quality in health, classifying important types of information that can be obtained in order to infer whether quality of care is adequate and provides ideal assistance in patient care.[11,12]

The results of structure indicators revealed an operational structure partially adequate for resolving the quality work process, highlighting the need for improvements within the sector, such as switching to taps operated without contact with the hands and adequate dispensing of antiseptic for surgical hand antisepsis. A study in Pernambuco presented the use of indicators as a measure of quality in patient care, in addition to showing that adequate physical structure allows for patient isolation, adequate location and a sufficient number of sinks for hand hygiene. The

institution must provide adequate and sufficient personal protective equipment, and offer a good quality environment to professionals. In the current research, it was observed that the physical structure has a probability of spreading the infection, does not contribute to good practices according to the ANVISA manual and favors the spread of infection from person to person.[6-13]

In relation to the autonomous mechanism for keeping doors closed, it was observed that, in the institution where this study was conducted, the reality is that doors swing in the internal corridors and sliding doors in the external corridors of the surgical sector, without the existence of automatic technologies. In other studies, it is pointed out that the building infrastructure is essential for the spread or not of infectious agents and the relationship between the flow of people in the sector influences cross-contamination. The exchange of air flow from the opening and closing of a door and the number of times this occurs during the procedure drive the transport of infectious agents by the movement of air.[14,15]

The process QIs identified in the study focus on professionals' preparation to perform the surgical procedure. The outcomes observed through the environment at the study institution present the profile of a teaching hospital, where the occurrence of students, interns and residents is constant, and the assiduous preparation to work in the SC requires updated standard operating protocols.[16] Two significant variables observed in the study were the correct performance of the aseptic technique of the surgical field and the hand disinfection time for professionals. The first showed that the transfer of how to perform the correct asepsis technique is between chief surgeons and their resident assistants. This method is in accordance with the culture of daily practice and with what was seen in the undergraduate course. The recognition of a documented manual to perform the standard correct technique within the institution was observed in an absence.[12]

The second variable also identified an essential result regarding the disinfection of professionals' hands, showing that there is a 7.91 times greater chance of infection in the 40 to 60 seconds group than in the more than 60 seconds group. A study conducted in Porto Alegre, RS, in a public teaching hospital, showed similar results regarding time. This study shows a general average of professionals with 72 seconds of disinfection, which is significant for the institution's infection rate. The outcome impacts the discussion on the reduction of bacterial counts of professionals' own microbiota, arguing that if the longer time is followed, there is a greater probability of bacterial reduction during the surgical procedure compared to degerming in a shorter time and influences it as a method of preventing SSI.[17]

The current study also presents results regarding the classification of the potential for contamination of surgeries in relation to the risk factors for the development of SSI, due to the profile of the institution and the convenience sample observed. The procedures classified as potentially contaminated surgeries and clean surgeries resulted in a higher prevalence of SSI. The average of the two scored approximately 80% of classifications with development of SSI. In comparison with two other recent studies with profiles similar to this research, of university teaching and with full service to the SUS, the incidence of SSI rates, this being the outcome indicator in the triad, are close to that found in outcomes, ranging from 18% to 20%.[16,17]

Another point observed in the institution's surgical block that complements quality management and that was identified in the study variables is the number of surgical boxes with inspection record with a result of 100% in the sample. This demonstrated the consequence of traceability coming from the sterilization material center and how its connection in the surgical process is essential, mainly in the prevention of SSI. It was analyzed that the registration and monitoring of materials are done with computerized barcode technology, and all the inspected tests that come inside the boxes by professionals during surgery are recorded in the sector's system that contributes to quality traceability.[12-18]

The application of packages of measures measured by QIs to prevent post-surgical infections brings positive results for both the institution and the patients, resulting in reduced length of hospital stay and cost of stay for these patients.[19,20] The analysis of QIs in this research demonstrated the weaknesses and need to redefine goals of adequacy for items related to both the structure and the process, and also drew attention to the review of standard operating protocols for the prevention of SSI development, identification of previous adverse events, attention to the importance of qualified care and safety of surgical patients.

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AUTHORS' CONTRIBUTIONS

Beatriz Zago Lupepsa, Gabriela Encarnação Leandro and Cibele Cristina Tramontini contributed to the conception, bibliographic research, article design, manuscript writing, statistics, data analysis and interpretation, description of results, preparation of tables and conclusions. **Helenize Ferreira Lima Leachi and Marília Ferrari Conchon** contributed to manuscript writing, article planning and design, article review and final approval.

All authors approved the final version to be published and are responsible for all aspects of the work, including ensuring its accuracy and integrity.

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