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Epidemiological profile of infections in cardiac surgeries at a university hospital in Rio de Janeiro

Perfil epidemiológico de infecciones en cirugías cardíacas en un hospital universitario de Río de Janeiro

Perfil epidemiológico de infecções em cirurgias cardíacas de um hospital universitário do Rio de Janeiro

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Abstract

This study aimed to analyze the profile of surgical site infections in cardiac surgeries at a university hospital. This was a descriptive, retrospective, observational study of data obtained from the hospital infection control coordination database of a university hospital in the state of Rio de Janeiro from 2013 to 2019. Statistical analyses were performed, including descriptive and association measures, using the variables sex, age, ASA index, IRIC index, surgical time, and implant use. SPSS version 13.0 was used for calculations. In the sample of 524 surgeries, there was a predominance of males (270 - 51.5%), with a mean age of 57 years (20-83 / SD 12). Statistical analyses of patients with SSI showed no association with age, sex, ASA, or procedure duration; however, there was an association with IRIC and implants. Nursing can contribute to SSI prevention and improved patient safety through effective hand hygiene, adherence to aseptic practices, accurate recording and documentation of wounds and daily care provided, and educating patients and their families about wound care. The profile of patients undergoing cardiac surgery and SSI is like that found in the literature. These data underscore the importance of comprehensive postoperative surveillance of patients following cardiac surgery.

Descriptors: Nursing; Surgical Wound Infection; Risk Factors; Cardiovascular Surgical Procedures; Patient Safety.

Resumén

El objetivo de este estudio fue analizar el perfil de infecciones del sitio quirúrgico en cirugías cardíacas en un hospital universitario. Este fue un estudio descriptivo, retrospectivo y observacional de datos obtenidos de la base de datos de coordinación de control de infecciones hospitalarias de un hospital universitario en el estado de Río de Janeiro de 2013 a 2019. Se realizaron análisis estadísticos, incluyendo medidas descriptivas y de asociación, utilizando las variables sexo, edad, índice ASA, índice IRIC, tiempo quirúrgico y uso de implantes. Se utilizó SPSS versión 13.0 para los cálculos. En la muestra de 524 cirugías, hubo un predominio de hombres (270 - 51,5%), con una edad media de 57 años (20-83 / DE 12). Los análisis estadísticos de los pacientes con SSI no mostraron asociación con la edad, el sexo, el ASA o la duración del procedimiento; sin embargo, hubo una asociación con el IRIC y los implantes. La enfermería puede contribuir a la prevención de ISS y a la mejora de la seguridad del paciente mediante una higiene de manos eficaz, la adherencia a las prácticas asépticas, el registro y la descripción de la herida y los cuidados diarios, y la educación de los pacientes y sus familias sobre el cuidado de las heridas. El perfil de los pacientes sometidos a cirugía cardíaca e ISS es similar al descrito en la literatura. Estos datos refuerzan la necesidad de una vigilancia exhaustiva de los pacientes en el postoperatorio de la cirugía cardíaca.

Descriptores: Enfermería; Infección de Heridas Quirúrgicas; Factores de Riesgo; Procedimientos Quirúrgicos Cardiovasculares; Seguridad del Paciente.

Resumo

Objetivou-se analisar o perfil das infecções de sítio cirúrgico das cirurgias cardíacas em um hospital universitário. Estudo observacional descritivo e retrospectivo de dados obtidos do banco de dados da coordenação de controle de infecção hospitalar de um hospital universitário do estado do Rio de Janeiro de 2013 a 2019. Foram realizadas análises estatísticas, contendo medidas descritivas e de associação, utilizando as variáveis sexo, idade, índice ASA, índice IRIC, tempo cirúrgico e uso de implantes. Utilizou-se o programa SPSS versão 13.0 para os cálculos. Na amostra de 524 cirurgias, houve predominância do sexo masculino (270 – 51.5%), com a média de 57 anos (20-83/dp 12). As análises estatísticas dos pacientes com ISC não mostraram relação com idade, sexo, ASA e duração do procedimento, contudo houve associação com IRIC e implantes. A Enfermagem pode contribuir para prevenção de ISC e melhora de segurança do paciente através da: higienização das mãos com eficácia, adesão a práticas de assepsia, registro e descrição da ferida e cuidados realizados diariamente e educação com o paciente e familiares acerca dos cuidados com a ferida. O perfil de pacientes submetidos às cirurgias cardíacas e de ISC são equivalentes ao encontrado na literatura. Os dados reforçam a necessidade de se realizar uma vigilância ostensiva dos pacientes em pós-operatório de cirurgia cardíaca.

Descritores: Enfermagem; Infecção de Ferida Cirúrgica; Fatores de Risco; Procedimentos Cirúrgicos Cardiovasculares; Segurança do Paciente.

Introduction

The quality and safety of patients in healthcare services is an extremely important issue, especially concerning the bioethical principles of beneficence (doing good) and non-maleficence (avoiding harm)[1]. In Ancient Greece, there were already beginnings of these principles, as the philosopher Hippocrates postulated "Primum non nocere" - first do not harm -, an expression that is constantly recalled when talking about patient safety[2]. Over time, the concern with providing good health care remained present in medicine and permeated the postulates of other professions.

In nursing, the concern for harm-free care dates to the 19th century, with Florence Nightingale, a British nurse who gained great notoriety in the field by questioning what measures could contribute to reducing infectious cases. She observed that nursing should contribute to a safe and comfortable hospital environment, improving sanitary conditions and conducting epidemiological analyses to prevent and control these complications[3]. These ideals are still applied today, but healthcare-associated infections (HAIs) still occur due to flaws in this process. One example is surgical site infections, which rank third among HAIs in Brazil and are one of the objectives of the global safe surgery challenge[4].

Approximately 234 million surgeries are performed annually, seven million of which cause preventable complications. This makes it a public health issue that deserves attention to promote the best possible prognosis for patients undergoing this type of procedure[5]. In Brazil, a study carried out in 2019 shows that, between 2008 and 2016, approximately 37,565,785 surgical procedures took place within the SUS alone[6].

In developed countries, such as the United States of America, this problem is not very different when compared to the Brazilian reality, as per a recent study[7] conducted by the National Healthcare Safety Network (NHSN) of the Centers for Disease Control and Prevention (CDC) demonstrated that SSIs correspond to 20% of the main infections, with an increase of 4% in the year 2022, in all categories of procedures compared to the previous year.

Regarding SSIs, studies show a link with increased mortality, prolonged hospital stays, and the risk of rehospitalization. However, approximately 60% of these infections can be prevented through prevention and control measures. Furthermore, they can cause sepsis, more intense surgical pain, impede mobilization, distress, anxiety, and withdrawal from social life[8,9].

Because SSIs cause harm to patients, treatment costs increase, as demonstrated by a 2022 Italian study that highlighted the direct and indirect costs of these complications. Direct costs were all those related to prolonged hospitalization, hospital readmission, additional surgeries, and prolonged drug therapy, while indirect costs, which are more difficult to quantify, were related to lost patient productivity[10].

Perioperative nursing considers patient safety a key aspect of care. They play the role of educator with patients and staff, working with the entire multidisciplinary team to promote service quality, and coordinating the implementation of infection prevention measures and bundles. SSI prevention is extremely important and can be achieved through good adherence to existing clinical guidelines, with Booklet 4 - Healthcare-Associated Infection Prevention Measures from the National Health Surveillance Agency (ANVISA) serving as an example in Brazil. In this process, leadership and teamwork with good communication and collaboration are essential to reducing the occurrence of adverse events and promoting a culture of safety[11].

Nurses must apply technical and scientific knowledge, responsibility, and physical and emotional stability in their work. This enables them to organize and coordinate care, establish standard procedures, teach and monitor the work of nursing teams, and promote best practices during the perioperative period in hospital departments, ensuring safer patient care[12].

Quality of care and patient safety issues apply to all areas of healthcare, including surgical treatments for cardiovascular diseases. Cardiovascular diseases are highly prevalent in the population, making them the leading cause of death worldwide. The World Health Organization (WHO) estimates that more than 23 million people will die annually from cardiovascular disease by 2030[13]. In this context, heart failure caused by ischemia, closely related to coronary artery disease, and valvular heart disease are indications for coronary artery bypass grafting (CABG) and valve replacement, respectively.

It is estimated that the incidence of surgical wound infections related to cardiac surgeries in developed countries is lower than in Brazil, ranging from 0.15% to 5% and is named according to the layers of the site that were manipulated or traumatized at the time of the surgical procedure[14]. SSIs can be classified as superficial, deep, or intracavitary, which can also be classified as mediastinitis, endocarditis, pericarditis, or myocarditis[15]. Deep sternal wound infection (DSWI), also called poststernotomy mediastinitis, is less common than superficial sternal wound infection, but more serious. Among cardiac surgical infections, mediastinitis has a 23% in-hospital morbidity and mortality rate[16].

Thus, nursing is the category most frequently in close contact with patients and coordinates care, allowing early detection of changes in their health status throughout their postoperative hospitalization. This enables monitoring of the development of surgical site infections and monitoring their progression if they occur.

The issue of SSIs was addressed in the World Health Organization's second global challenge, "Safe Surgery Saves Lives," in 2009 and continues to be a challenge for patients and healthcare services. This problem increases hospital stays and costs, harms mental and physical health, and increases mortality rates. Therefore, it is essential that nursing contributes to providing the best care, reducing adverse events, and promoting patient safety[17].

In view of the above, this study aims to analyze the profile of surgical site infections in cardiac surgeries in a university hospital.

Methodology

This is a descriptive, retrospective, observational study conducted at a federal, public, quaternary care, teaching hospital. It currently has 200 active beds distributed across a medical and surgical clinic, a hematology center, nephrology, kidney transplant, and intensive care unit, with 21 operating rooms. Located on Fundão Island, Rio de Janeiro, the hospital has 3,000 employees dedicated to teaching, research, and care. It is a leading provider of treatment for a variety of highly complex pathologies, performing innovative procedures and pioneering studies. It is considered a center of excellence in teaching, research, and outreach.

The objectives of this institution include: acting as a quaternary-level hospital, inserted in the SUS referral and counter-referral system; serving as a training ground for undergraduate education in health professions regarding medium and high complexity care; enabling the implementation of postgraduate and specialization courses in teaching units, emphasizing the Medical Residency and Multiprofessional Residency programs, educational activities under the responsibility of the hospital; and providing an environment that stimulates research, emphasizing integration in the various sectors of health sciences.

In this location, the Hospital Infection Control Coordination (CCIH) database contains information inherent to the work process of epidemiological surveillance of SSI through the monthly monitoring of surgical procedures, carried out by the CCIH team based on national and international guidelines and Ordinance No. 2,616, of May 12, 1998, of the Ministry of Health.

Database with information on patients who underwent surgical procedures at a University Hospital in the state of Rio de Janeiro from 2013 to 2019, resulting in a sample of 524 surgeries.

The variables analyzed were age, sex, American Society of Anesthesiologists (ASA) index, surgical site infection risk index (SSI), patient destination, surgical component (coronary artery bypass grafting and valve replacement), contamination potential (clean, potentially contaminated, contaminated, and infected), type of surgery (elective or emergency), and surgical time.

Data that met the inclusion criteria were used: surgeries that met the criteria for defining surgical procedures determined by ANVISA; surgeries where the discharge date is different from the surgery date; surgeries in which the patient is 18 years of age or older. Exclusion criteria: surgeries that are reoperations of a first intervention that occurred in less than 30 days, surgeries performed in hemodynamics, and surgical indications included acute trauma.

CCIH retrospective database of all surgeries from 2013 to 2019, with cardiac surgeries extracted. Data collection and processing in the database were carried out from January to March 2024. The data were entered into Excel, and the variables of interest were selected.

After extraction from Excel, the data were statistically processed using the Statistical Package for Social Sciences for Windows (SPSS) version 13.0. Data analysis was performed using descriptive statistics, presenting measures of central tendency and dispersion (mean, median, and standard deviation) for continuous and discrete quantitative variables and absolute and relative frequencies for categorical variables.

Calculations were performed to individually assess whether the variables sex, age, ASA index, IRIC index, surgical time, and use of implants would be associated with the outcome of surgical wound infection. The distribution of superficial, deep, and intracavitary surgical site infections was analyzed between ASA index classifications and contamination potential classifications.

The study was approved by the Research Ethics Committee (CEP), under Opinion No. 6,231,690, in compliance with Resolution No. 466/2012 of the National Health Council[17]. As this is a retrospective study carried out using secondary sources inherent to the HAI surveillance and control process already carried out by the institution in question, the need to sign the Informed Consent Form was waived to carry out the study.

Results

During the study period, data from 524 cardiac surgeries were analyzed. Regarding the sociodemographic characteristics of the study population, the mean age was 59 years (20-83 / SD 12), of which 270 (51.5%) were male and 254 (48.5%) were female. Regarding the ASA index, the median was ASA 3 (SD 0.412), of which 21 (4%) were classified as ASA 2; 438 (83.6%) as ASA 3, 63 (12%) as ASA 4. Only 1 (0.2%) patient was classified as ASA 1 and ASA 5. Regarding the Surgical Infection Risk Index, the sample had as median IRIC 1 (sd 0.516) of which 385 (73.5%) had IRIC 1 as calculation, IRIC 0 configured 21 (4%), index 2 were 111 (21.2%) and index 3 were 7 (1.3%). Regarding the destination of the patients, 446 (85.1%) were discharged from the hospital, while 78 (14.9%) evolved to death. Of the procedures performed by the cardiac surgery service, 264 (50.4%) were coronary artery bypass grafting (CABG) and 260 (49.6%) were surgeries involving heart valve replacements. Regarding the classification of surgeries according to urgency, 515 (98.3%) were elective surgeries, while 9 (1.7%) were considered urgent. Regarding the potential for contamination, 430 (82%) were classified as clean, constituting most of the sample; 78 (14.8%) were potentially contaminated; 8 (1.5%) were contaminated; and 8 (1.5%) were infected. Regarding the issue of surgical time, 28 (5.3%) took up to 2 hours, 182 (34.7) lasted up to 4 hours, 127 (24.2%) lasted approximately up to 5 hours, 98 (18.7%) lasted up to 6 hours and 89 (17%) lasted over 6 hours, with an average of 278 minutes (40-705, SD 100.07), as shown in Table 1. Considering the sample of 524 cardiac surgeries, 63 (12%) presented infection. Of these total surgical wound infections, superficial infections corresponded to 27 (42.9%), deep to 19 (30.1%), and intracavitary to 17 (27%). Regarding the location of identification of the SSI, 53 (84.1%) were in the ward, still during the patient's hospitalization, and 10 (15.9%) in the outpatient clinic. Furthermore, 20 (32%) required reoperation, as shown in Table 2.

Table 1. Characteristics of the cardiac surgeries studied. Rio de Janeiro, RJ, Brazil, 2024 (n = 524)

Features	N	%
Surgical Component		
CABG (coronary artery bypass grafting)	264	50.4
CARD (heart valve replacements)	260	49.6
Contamination Potential		
Clean	430	82
Potentially Contaminated	78	14.8
Contaminated	8	1.5
Infected	8	1.5
Type of Surgery		
Elective	515	98.3
Urgency	9	1.7
Surgical Time (min)		
0-120	28	5.3
121-240	182	34.7
241-300	127	24.2
301-360	98	18.7
>=361	89	17

Table 2. Epidemiology of Surgical Site Infections of the study. Rio de Janeiro, RJ, Brazil, 2024 (n = 524)

Features	N	%
Infection		
YES	63	12
NO	461	87.9
Type of SSI		
Superficial	27	42.9
Deep	19	30.1
Intracavitary	17	27
Place of Identification		
Infirmary	53	84.1
Outpatient Clinic	10	15.9
Reoperation		
YES	20	32
NO	43	68

The data analyzed reveal the distribution of surgical site infections (SSIs) by the sex of the patients. Among patients with SSIs, 54% were female (n = 34) and 56% were male (n = 29). In patients without SSIs, 47.7% were female (n = 220) and 52.3% were male (n = 241). The calculated odds ratio (OR) was 0.779 (95% CI: 0.459 - 1.320), indicating that there was no statistically significant difference between the sexes in the risk of developing SSIs. The p-value = 0.352 also suggests that the association between sex and infection is not significant, since it is above the threshold of 0.05. Another data observed was the distribution of SSIs concerning the age group of the patients. Among patients with SSI, 42.9% were under 59 years of age (n = 27), while 57.1% were 60 years of age or older (n = 36). In patients without SSI, 54.2% were under 59 years of age (n = 250) and 45.8% were 60 years of age or older (n = 211), however, there is no clear association between age group and the risk of developing surgical site infection (p = 0.090).

Regarding ASA, the data show that, among patients with SSI, 4.8% had an ASA classification ≤ 2 (n = 3), while 95.2% had an ASA classification ≥ 3 (n = 60). In patients without SSI, 4.1% had an ASA ≤ 2 (n = 19) and 95.9% were classified as ASA ≥ 3 (n = 442), and that there is no relationship between the ASA classification and the occurrence of surgical site infection (p = 0.739). The odds ratio (OR) obtained was 0.860 (95% CI: 0.247 - 2.992), showing that there was also no such relationship, since the OR is very close to 1 and the confidence interval includes this value.

Regarding the IRIC, which assesses the risk of post-surgical infectious complications based on patient and surgical characteristics, 65.1% of patients with SSI had an IRIC ≤ 1 (n = 41), while 34.9% had an IRIC ≥ 2 (n = 22). In patients without SSI, 79.2% had an IRIC ≤ 1 (n = 365) and 20.8% had an IRIC ≥ 2 (n = 96). Unlike the other variables, the IRIC was statistically significant. Patients with an IRIC ≥ 2 were twice as likely to develop surgical site infection compared with those with IRIC ≤ 1 (OR 2.040; 95% CI: 1.160 - 3.588), and the p-value was 0.012, indicating that IRIC is a strong predictor of SSI development. This variable may be useful in risk stratification and in targeting specific preventive measures to reduce the occurrence of postoperative infections.

The data in this study show the distribution of surgical site infection (SSI) in relation to surgical time. Among patients with SSI, 47.6% had a surgical time ≤ 274 minutes (n = 30), while 52.4% had a surgical time ≥ 275 minutes (n = 33). In patients without SSI, 53.8% had a surgical time ≤ 274

minutes (n = 248) and 46.2% had a surgical time ≥ 275 minutes (n = 213). However, it did not reveal a significant association with the risk of SSI (p = 0.357), indicating that surgical time, per se, was not a relevant factor for the development of SSI. Regarding the presence of implants in patients with SSI, 28.6% received implants (n = 18), while 71.4% did not receive implants (n = 45). In patients without SSI, 47.1% received implants (n = 217) and 52.9% did not receive implants (n = 244). Data analysis suggests that the relationship between the presence of implants and the risk of infection is statistically significant (p = 0.006), i.e., less than 0.05, which indicates that patients without implants are approximately 50% less likely to develop SSI compared to those who received implants (OR 0.450; 95% CI: 0.253 - 0.800). The confidence interval (CI) obtained was 0.253 to 0.800 and does not include the value 1, which also shows the statistical significance of this association, as shown in Table 3. This reinforces the need for special care and preventive measures, such as antibiotic prophylaxis, for patients undergoing surgeries involving the placement of implants.

Table 3. Association of surgical characteristics and the occurrence of SSI. Rio de Janeiro, RJ, Brazil (n = 524)

	Surgical Site Infection					
	Yes		No			P
Features	N	%	N	%	OR (CI95%)	
Sex					**0.779 (0.459-1.320)**	**0.352**
Feminine	34	54	220	47.7		
Masculine	29	56	241	52.3		
Age					**0.90 (0.928 -2.688)**	**0.090**
<=59	27	42.9	250	54.2		
>=60	36	57.1	211	45.8		
ASA					**0.860 (0.247-2.992)**	**0.739***
<=2	3	4.8	19	4.1		
>=3	60	95.2	442	95.9		
IRIC					**2.040 (1.160-3.588)**	**0.012**
<=1	41	65.1	365	79.2		
>=2	22	34.9	96	20.8		
Surgical time					**1.281 (0.756-2.170)**	**0.357**
<=274	30	47.6	248	53.8		
>=275	33	52.4	213	46.2		
Implants					**0.450 (0.253-0.800)**	**0.006**
No	45	71.4	244	52.9		
Yes	18	28.6	217	47.1		

Among the 524 patients, 63 presented infections, 438 had an ASA index classification of 3, and 50 of these presented some type of infection (79.4%), of which 21 were superficial, 14 were deep, and 15 were intracavitary. Another 10 cases (15.8%) presented an ASA index of 4, and 3 cases (4.8%) were ASA 2. Of these 524 surgeries, 430 were classified as clean, and 50 (85.7%) presented infection, of which 24 were superficial, 17 were deep, and 13 were intracavitary. Another 78 met the criteria of potentially contaminated, and only 5 (7.9%) cases of infection were observed, of which 3 were superficial and 2 were deep. In the case of those infected, 1 (1.6%) out of 8 presented an infection classified as intracavitary, and, finally, of the 8 infected, 3 (4.8%) presented an infection, 2 of which were deep and 1 was intracavitary, as seen in Table 4.

Table 4. Relationship between ASA index classification and contamination potential with the incidence of some type of infection in the sample. Rio de Janeiro, RJ, Brazil, 2024 (N = 63)

Variables	Superficial Infection	Deep Infection	Intracavitary Infection
	N (%)	N (%)	N (%)
ASA			
1	0 (0)	0 (0)	0 (0)
2	2 (66.7)	1 (33.7)	0 (0)
3	21 (42)	14 (28)	15 (30)
4	4 (40)	4 (40)	2 (20)
5	0	0	0

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Contamination Potential			
Clean	24 (44.4)	17 (31.5)	13 (24.1)
Potentially contaminated	3 (60)	0 (0)	2 (40)
Contaminated	0 (0)	0 (0)	1 (100)
Infected	0 (0)	2 (66.7)	1 (33.3)
Total	27 (42.9)	19 (30.1)	17 (27)

Discussion

Considering all patients who underwent cardiac surgery, the majority were between 44 and 59 years old, and over 60 years old, and there was no significant difference between the sexes in most studies. ASA III and IRIC 1 were the most prevalent in these classifications. These characteristics were found in other studies on the same topic and are detailed below.

Regarding procedures, there is no considerable difference between the incidence of coronary artery bypass grafting (CABG) and heart valve replacement (CARD), with these types of surgeries being quite prevalent in the literature. Regarding surgical time, the predominant durations were 121 to 240 minutes (34.7%) plus 241 to 360 minutes (24.2%), corresponding to 58.9% of the sample, and most surgical site infections fall within these duration ranges. However, the literature shows that longer surgical time was commonly associated with an increase in SSI, which was not observed in the present study.

A study carried out in São Paulo[18] brings data from 2017 and 2018 about a sample of 117 patients for cardiac surgical procedures, with a mean age of 59.9 years (SD ± 13.4) and 60 (51.3%) females and 57 (48.7%) males. Regarding the surgical component, CABG accounts for 57 (48.7%); valve surgery 37 (31.6%); CABG and valve surgery 8 (6.8%), heart transplant 5 (4.3%); aortic surgery 4 (3.4%); aortic and valve surgery 1 (0.9%); other 5 (4.3%). In addition, 15 (12.8%) were reoperated; 57 (48.7%) were readmitted due to SSI, and 24 (20.5%) deaths occurred. Among the SSI cases, 88 (75.2%) were deep, 7 (23.1%) were intracavitary, and 2 (1.7%) were superficial. In the sample analyzed in the current study, there were 78 deaths, which corresponds to 14.9% of the total sample of 524, a value slightly lower than that of São Paulo.

The article by Roth et al.[19] was an observational study conducted at a hospital in Switzerland. Data were collected from June 2016 to October 2017, resulting in a final sample of 688 individuals and 24 SSI cases. The mean age was 68 years (59–74), with the uninfected sample aged 68 years (59–74), while the infected cases averaged 70 years (63–73). Females comprised 171 (24.9) individuals in the total sample, of which 161 (24.2) were uninfected and 10 (41.6) were infected. Among the procedures, 382 (55.5) were coronary artery bypass grafting procedures, of which 363 (54.7) were uninfected and 19 (79.2) were infected. 238 (34.6) any valve surgery, of which 231 (34.8) were without infection and 7 (29.2) were with infection; 58 (8.4) were ascending aorta replacement, of which 56 (8.4) were without infection and other types of procedures correspond to 184 (27.7), of which 186 (27.0) were without infection and 2 (8.3) were with infection. Regarding the duration of surgery in minutes, in 228 (191–269), 226 (190–267) without infection, and 256 (213–300) with infection. Regarding the National Nosocomial Infection Surveillance Risk Index (IRIC), most of the sample was classified as IRIC 1 (509–79.9), with 495 (80.5%) without infection and 14 (63.6) with infection.

This research shows that the sample of the hospital analyzed presented an ISC rate of 12%, thus, considering that Brazil is a developing country, it shows values like the study by Andrade et al.[20]. This retrospective study analyzed the medical records of patients who underwent cardiac surgery to assess the risk factors for clean cardiac surgeries in southern Brazil. The final sample consisted of 1,708 records. The surgical site infection rate was 8.3%, with the rate in developed countries ranging from 1.2% to 5.2%; in developing countries, it can reach 11.8%. In cardiac surgeries in developing countries, the SSI rate ranges from 3.5% to 21.0%.

Still on Andrade et al.[20], ff these procedures, 142 (8.3%) presented surgical site infection, 69 (48.0%) of which were thoracic site infections (13.3% superficial; 24.5% deep; 11.2% intracavitary). Others were: 58 (40.6%) saphenous vein infection; 9 (7.7%) thoracic site and saphenous vein infection; 4 (3.0%) endocarditis. Regarding the distribution of SSI types, it was slightly different from that found in the sample analyzed here, since the most frequent was superficial (42.9%), followed by deep (30.1%) and, finally, intracavitary (27%).

Andrade et al.[20] also provide sociodemographic data associated with surgical site infection. Among 1,149 male individuals, 92 presented SSI; among 1,008 coronary artery bypass grafts, 85 presented SSI; among 594 valve replacements, 49 presented SSI; and regarding ASA III, which was also the most frequent classification in this index among SSIs in the collected sample, 111 presented SSI. Furthermore, regarding the surgical risk index (SRI), the incidence of mediastinitis was 0% in patients with SRI 0; 1.2% in SRI 1; and 2.3% in SRI 2. In surgeries classified as clean, the ASA index, SRI, and procedure time were associated with a higher risk of infection. In the current study sample, SRI was shown to be a variable, statistically, more associated with SSI; however, the ASA index was not.

According to Cruz et al.[21], data were collected from January 2014 to December 2016 from a university hospital in Rio de Janeiro to evaluate the development of mediastinitis in patients undergoing cardiac surgery, resulting in a final sample of 192, 134 men (69.80%) and 58 women (30.20%). Regarding age, 8 (4.16%) were up to 39 years old; 28 (14.59%) were 40 to 49 years old; 57 (29.69%) were 50 to 59 years old; 68 (34.42%) were 60 to 69 years old; and 31 (16.14%) were 70 years old or older. Furthermore, the study shows that the most common surgery was CABG, followed by mitral, aortic, and tricuspid valve replacement, thoracic aneurysm repair, among others of less frequency. Within the

sample investigated, seven (3.64%) underwent reoperation, and four presented postoperative mediastinitis. Of these four, three were male and aged 50 to 59 years, while one was female and aged 70 years or older. When compared with the sample analyzed in this study, there was a greater need for 20 individuals (32%); however, it is worth remembering that the sample is also significantly larger (524 surgeries).

According to Damavandi et al.[22], data were collected from a cardiac hospital in Iran from 2013 to 2017 regarding 610 cardiac surgeries, of which 123 (20.16%) presented nosocomial infections, with SSI accounting for 22% of these. In this study, 80 (65%) of all infections were male, and the age range was 38 to 85 years. The mean age was 62.11 (SD ± 9.90), however, the majority were 51 to 70 years old (65.8%), with 51-60 years corresponding to 34.1% and 61 to 70 years to 31.7%. Regarding the distribution of sex and SSI in the study, in males, 15 (18.8%) had infection and 65 (81.3%) did not, while in females, 12 (27.9%) had infection and 31 (72.1%) did not. Mortality related to any type of postoperative nosocomial infection was 14 of 123 (11.4%).

A retrospective study carried out in 2015 at a university hospital in Bahia[23] provides data relating cases of surgical site infection to variables such as the age and sex of patients undergoing cardiac surgery. In the sample of 50 patients, 19 presented with infection, 12 of which occurred in individuals over 60 years of age. Regarding sex, 8 were in women and 11 in men, with no significant difference. Both variables present similar results in the sample of the present study, since there is a higher incidence of SSI in this same age group, and there is no significant difference between the sexes.

In this same study of Bahia[23], Analyses were also performed based on the duration (in hours) of the surgical procedure and ASA. According to the duration, there were the following cases: 1 in a procedure of up to 2 hours (120 minutes); 8 in 2 to 4 hours (121 to 240 minutes); 8 more than 4 to 6 hours (241 to 360 minutes); 2 more than 6 hours (>360 minutes). Regarding ASA, 6 SSIs were in patients with ASA II, 12 in ASA III, 1 in ASA IV. In the present study, regarding surgical time, 19 of the SSIs fell within the range of 4 to 6 hours/241 to 360 minutes, and patients with ASA III accounted for 50 of the 63 cases of some type of SSI.

Regarding the SSI classification, Braz et al.[24] show that, in a sample of 280 patients, 52 (18.6%) presented SSI, of which 34 (65.4%) were superficial incisional, 12 (23.1%) organ/cavity, and 6 (11.5%). In the case of cavitary SSIs, 9 were mediastinitis and 2 were endocarditis. Furthermore, the study also provides information that of those diagnosed with SSI (52), 34 (65.4%) underwent CABG, 12 (23.1%) prosthesis implantation, and 6 (11.5%) both surgeries concomitantly. In this study, the highest incidence was superficial SSI, while in other studies, there were variables regarding the type, and patients who received implants had a higher risk of SSI.

The nurse's work encompasses care from the preoperative to the postoperative period. Gaining information about post-surgical complications helps identify the infection profiles of a healthcare facility in the context of cardiac surgeries, which can guide strategic team activities to improve care failures. Regular discussions about these adverse events contribute to reducing hospital costs and improving the quality of care, as well as encouraging adherence to best practices[25,26]

Nursing staff comprise most hospital staff and are key to identifying risks of adverse events, thus occupying a leading role. Nurses are the professionals who dedicate the most time to patients, thus possessing a holistic perspective. They can identify and monitor potential future complications, as well as identify strategies that could help prevent them during the postoperative period[24].

Nursing can implement surgical wound infection prevention measures to reduce patient suffering and recovery, as well as reduce hospital stays and costs. Some possible strategies include effective hand hygiene, adherence to evidence-based antisepsis practices, recording and describing characteristics (e.g., color, odor, pain), daily postoperative wound care, educating and involving patients and families about wound care, and providing wound care documentation to professionals in case of questions[17,27,28].

Despite global and national advances in patient safety in recent years, it remains a challenge. Adverse events, such as SSIs, have negative impacts on patients and healthcare systems, making it essential to mitigate preventable failures in care[29]. Carrying out these practices, combined with periodic discussions as a form of continuing education and knowledge of the institutional profile of infections, can contribute to reducing these complications, promoting quality in healthcare, and patient safety.

Conclusion

Through these data, it is possible to gain insight into the epidemiological profile of surgical site infections in cardiac surgeries at this university hospital. These results indicate that surgical site infections remain a common complication when discussing patient safety and healthcare-associated infections (HAIs), and more specifically, postoperatively after cardiac surgeries. This impasse results in financial losses for the facilities and negatively impacts patient treatment and recovery.

Understanding surgical wound infection prevention measures and institutional profile information helps nursing, the category responsible for providing close and constant care to hospitalized patients, develop preventive measures that consider the institutional landscape. This means maintaining a vigilant eye on everyone, but especially a more refined approach to those with a clinical characteristic or surgical procedure that fits the profile of a higher risk for developing surgical wound infection. This reinforces the need for aseptic care, ongoing staff education, and health education for patients and their families, as well as for intensive surveillance of patients in the postoperative period of cardiac surgery.

Investments to ensure quality care, infection prevention, and early identification in situations where infections still occur must be priorities to improve healthcare quality and patient safety.

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