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Adherence to measures to prevent surgical site infection in the perioperative period: a cohort study

Adesão às medidas para prevenção de infecção do sítio cirúrgico no perioperatório: estudo de coorte

Adhesión a medidas de prevención de infección de la zona quirúrgica en el perioperatorio: estudio de cohorte

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ABSTRACT

Objective: to evaluate adherence to recommended measures for preventing surgical site infections during the perioperative period in patients undergoing clean surgeries. **Method:** this prospective, observational, cohort study was conducted in 2019 with 287 patients at a general teaching hospital, after approval by the research ethics committee. Data were collected using two instruments for sociodemographic and clinical particulars and for assessing adherence to recommendations. Descriptive analysis and multiple linear regression were used. **Results:** adherence to surgical site infection prevention measures averaged 59.5 overall. Anesthetic-surgical time ($p < 0.001$) and the American Society of Anesthesiologists score ($p = 0.045$) influenced overall adherence. **Conclusion:** greater adherence to recommended surgical site infection prevention measures was observed in the preoperative period, but there were weaknesses in adherence to measures strongly recommended by the guidelines in the intra- and postoperative periods.

Descriptors: Patient Safety; Elective Surgical Procedures; Perioperative Period; Infection Control; Surgical Wound Infection.

RESUMO

Objetivo: avaliar a adesão às medidas recomendadas para prevenção de infecção do sítio cirúrgico no período perioperatório em pacientes submetidos às cirurgias limpas. **Método:** estudo observacional e de coorte prospectivo realizado em 2019 em um hospital geral de ensino com 287 pacientes, após aprovação por Comitê de Ética em Pesquisa. Os dados foram coletados por meio de dois instrumentos: caracterização sociodemográfica e clínica e verificação da adesão às recomendações. Empregaram-se análises descritiva e regressão linear múltipla. **Resultados:** a adesão geral às medidas de prevenção de infecção do sítio cirúrgico obteve média de 59,5. O tempo anestésico-cirúrgico ($p<0,001$) e o escore da *American Society of Anesthesiologists* ($p=0,045$) influenciaram na adesão geral. **Conclusão:** foi observada maior adesão às medidas recomendadas para prevenção de infecção do sítio cirúrgico no período pré-operatório, porém há fragilidades quanto a adesão às medidas fortemente recomendadas pelos *guidelines* nos períodos intra e pós-operatório.

Descritores: Segurança do Paciente; Procedimentos Cirúrgicos Eletivos; Período Perioperatório; Controle de Infecções; Infecção da Ferida Cirúrgica.

RESUMEN

Objetivo: evaluar el cumplimiento de las medidas recomendadas para prevenir la infección de la zona quirúrgica en el período perioperatorio en pacientes sometidos a cirugías limpias. **Método:** estudio observacional y de cohorte prospectivo realizado en 2019, en un hospital general de enseñanza junto a 287 pacientes, previa aprobación del Comité de Ética en Investigación. La recolección de datos se realizó mediante dos instrumentos: caracterización sociodemográfica y clínica y verificación del cumplimiento de las recomendaciones. Se utilizó el análisis descriptivo y la regresión lineal múltiple. **Resultados:** la adherencia general a las medidas de prevención de infecciones de la zona quirúrgica obtuvo el promedio de 59,5. El tiempo anestésico-quirúrgico ($p <0,001$) y el puntaje de la *American Society of Anesthesiologists* ($p = 0,045$) influyeron en la adherencia general. **Conclusión:** se observó una mayor adherencia a las medidas recomendadas para prevenir la infección de la zona quirúrgica en el período preoperatorio, sin embargo, existen debilidades en cuanto a la adherencia a las medidas fuertemente recomendadas por los *guidelines* en los periodos intra y posoperatorio.

Descriptores: Seguridad del paciente; Procedimientos Quirúrgicos Electivos; Atención Perioperativa; Control de Infecciones; Infección de la Herida Quirúrgica.

INTRODUCTION

Surgical Site Infections (SSIs) are serious surgical adverse events that delay patient recovery, contribute to prolonged hospital stay, exert significant impacts on quality of life and result in increased morbidity and mortality[1,2].

In Brazil, SSI is one of the main Healthcare-Associated Infections (HAIs), ranking third among all the infections when compared to other HAIs. Comprising one of the main complications in the postoperative period, it affects

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approximately 3% to 20% of the patients subjected to surgeries[3]. Its incidence can vary across surgical procedures and specialties with a range from 0% to 71.1%, as evidenced in a systematic review[4].

In 2018, there were a total of 14.4 million surgical procedures in hospitals in the United States of America[5]. A report involving 3,654 hospitals evidenced that 20,916 patients developed SSI among 2,417,933 surgical procedures performed, pointing out that SSI is the second most frequent complication and that it burdens the health services, resulting in an expenditure of 10 billion dollars per year for its treatment[6,7].

In this scenario, SSI represents one of the main risks to patient safety in the health services[3]. In order to reduce the adverse consequences of unsafe healthcare, in 2004 the World Health Organization (WHO) launched the World Alliance for Patient Safety, with the objective of promoting safety standards and practices. To promote surgical patient safety, the area of concentration chosen for the second Global Challenge was safe surgery, whose main objective is to reduce morbidity and mortality due to surgeries[8]. The SSI adds a segment to the "Safe Surgeries Save Lives" program with the introduction of standardized measures for its prevention and control.

SSIs are largely preventable. However, prevention strategies are complex and require the integration of a series of measures to be implemented in the perioperative period[9].

In a study whose objective was to evaluate the pre- and intraoperative practices adopted by the medical and nursing teams aiming at the prevention of SSI, partial adherence to some measures for the prevention of SSI recommended by guidelines was identified. Among others, the main reason for non-adherence to these guidelines is the professionals' lack of knowledge or negligence regarding the importance of adhering to the preventive measures[10].

Although the recommended measures for the prevention of SSIs are well described in the literature by national and international guidelines, few studies address the implementation and adherence to these measures in the scenario of perioperative surgical care[10-12]. In this sense, studies that assess adherence to the SSI prevention measures can help identify gaps in surgical care that lack intervention and team training.

Thus, this study aimed at assessing adherence to the recommended measures for preventing surgical site infection in the perioperative period in patients undergoing clean surgeries.

METHOD

This is an observational and prospective cohort study carried out in the Surgical Center Unit of a large-size general teaching hospital, with Level Two certification by the National Accreditation Organization (*Organização Nacional de Acreditação*, ONA). The study was conducted from May to August 2019, in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) recommendations.

The patients included in the research were those aged 18 years old or over, of both genders, who underwent elective surgeries classified as clean according to the potential for contamination and from all surgical specialties performed in the field of study. And the patients excluded were those who presented a record of a previous infectious focus, surgical procedures with insertion of prostheses and/or implantable materials and occurrence of surgical complications, determining a change in the surgery classification regarding the potential for contamination.

For sample calculation, the following parameters were adopted: 17.2% incidence of surgical site infection in clean surgeries[13], 4% precision and 95% confidence interval, for a finite population of 2,068 surgeries, reaching a sample of n=294 participants. The recruitment process was of the non-probabilistic sequential type.

To verify adherence to the recommended measures for SSI prevention, an instrument was developed based on the recommendations of the guidelines proposed by the Centers for Disease Control and Prevention (CDC)[14] and by the WHO[6], and submitted to face and content validation by six nurses, five PhDs and one post-PhD, all with expertise in the theme. The instrument consisted of 24 items and was elaborated in a checklist format with the No, Yes and Not applicable options, scored with 0 (non-adherence), 1 (adherence) and 2 (not applicable), respectively.

Prior to data collection, a pilot test was performed with thirty-six patients undergoing clean surgeries and one item of the instrument needed to be adjusted, changing "normothermia maintenance" to "temperature measurement". These data were not included in the analysis or in the study results and were discarded.

For data collection, a validated instrument was used, containing sociodemographic and clinical variables (gender, age, comorbidities, weight, height, Body Mass Index, use of immunosuppressive drugs, blood transfusion, leukopenia, surgery performed, anesthetic-surgical time and the American Society Anesthesiologists [ASA] score). An instrument was also used to verify adherence to the recommended measures to prevent surgical site infection, consisting of variables related to the pre- (Bath; Hair removal; Glycemic control; Temperature measurement; Antibiotic prophylaxis; Surgical hand

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preparation; Cleaning of surfaces); intra- (Preparation of the surgical site with antiseptic agent; Glycemic control; Temperature measurement; Inspiratory oxygen fraction; Surgical gowning; Surgical field; Changing clothes; Ventilation, Temperature and Humidity of the operating room; Sterilization indicators; Sterile technique); and postoperative (Oxygen therapy; Antibiotic prophylaxis; Glycemic control; Temperature measurement; Sterile dressing) periods.

Data collection took place at three moments in the perioperative (pre-, intra- and post-) period. In the immediate preoperative period, the sociodemographic and clinical variables were obtained from medical records and through information reported by the patients in a reserved room at the reception of the Surgical Center Unit (*Unidade de Centro Cirúrgico*, UCC). The variables related to the SSI prevention measures in the immediate preoperative period were obtained through observation from the patient's entry into the UCC and verification of the notes in the patient's medical record. The intraoperative variables were obtained through observation during the anesthetic-surgical procedure, from the patient's entry into the Operating Room (OR) until transfer to the post-anesthetic care unit (PACU). The variables related to the postoperative period were obtained from the PACU until the patient was discharged from this unit through observation.

To investigate the incidence of SSI in the postoperative period, its occurrence was verified in the notification form of the Hospital Infection Control Commission (HICC). It is noteworthy that the HICC adopts telephone contacts as a tracking and monitoring strategy for these patients in order to identify SSI cases, up to thirty days from the surgery date. In cases where the record was not available, the researcher made a telephone contact with the patient, asking about aspects of the surgical wound (color, presence or absence of secretion, use of antimicrobials, drug used and time of use), according to data used by the institution for this search.

The data were analyzed with the aid of the Statistical Package for Social Science software (SPSS) for Windows, version 22, and analyzed using absolute and percentage frequency distributions for the categorical variables and measures of central tendency and variability for the quantitative variables. To assess adherence to the recommended measures, the positive answers were counted (items that adhered to the recommendation, receiving a score of 1), dividing this result by the total number of valid items corresponding to each surgical stage (pre-, intra-, post- and general) multiplied by 100%. The following formula was adopted to determine the incidence of patients with SSI: Total number of SSIs related to the surgical procedure in the period / Total number of surgical procedures performed in the period x 100^3. Multiple linear regression was used to identify the influence of the clinical variables on adherence. The inferential analyses considered a 5% (α=0.05) significance level.

This study was approved by the Research Ethics Committee of the institution involved, and the Free and Informed Consent Form (FICF) was signed by all the research participants.

RESULTS

A total of 294 patients subjected to elective and clean surgical procedures were observed. Of these, six were excluded due to unsuccessful telephone contacts during post-discharge surveillance and one due to withdrawal from participating in the research. Thus, the final sample (n) of this research consisted of 287 patients.

The participants were mostly female (184; 64.1%), with a mean age of 52.1 years old, minimum of 18 and maximum of 97. As for comorbidities, 134 (46.7%) patients presented Systemic Arterial Hypertension (SAH) and diabetes, while 153 (53.3%) had no comorbidities. There was predominance of patients with SAH (97; 3.8%) and normal weight (119; 41.5%). As for the ASA score, most (160; 55.7%) were classified as ASA I - clinically stable, followed by ASA II - patient with mild or moderate systemic alteration (122; 42.5%).

The anesthetic-surgical procedure lasted a mean of 81 minutes (SD=± 61.6), varying from ten to 315 minutes. Dermatology was the predominant surgical specialty in 114 (39.7%) patients, followed by head and neck surgery (63; 21.9%), general surgery (60; 21%), mastology (17; 5.9%), gynecology (14; 4.9%), urology (10; 3.5%), orthopedics (7; 2.4%) and otorhinolaryngology (2; 0.7%).

The mean overall adherence to the SSI prevention measures was 59.5, while the mean adherence values by periods were as follows: preoperative (70.0); intraoperative (58.9); and postoperative (46.6), respectively.

Table 1 shows the results referring to the SSI prevention measures in the pre- and intraoperative periods.

As for the SSI prevention measures in the preoperative period, the following was observed: full adherence to the "Bath with antimicrobial or non-antimicrobial soap" item (287; 100.0%), 99% adherence (284) to the "Cleaning and disinfection of environmental surfaces" item and 95.1% adherence (273) for the "The team performs surgical hand preparation" item (273; 95.1%). However, the "Glycemic control <200 mg/dL for all individuals" and "Temperature measurement" items presented lower adherence percentages with 16% (46) and 31.4% (90), respectively.

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TABLE 1: Surgical Site Infection prevention measures observed in the pre- and intraoperative periods. Uberaba, MG, Brazil, 2019.

Items	Non-adherence		Adherence		Not applicable	
	n	%	N	%	n	%
Preoperative						
Bath with antimicrobial or non-antimicrobial soap	0	0.0	287	100.0	0	0.0
No hair removal or, if necessary, removal only with an electric trimmer	23	8.0	13	4.5	251	87.5
Glycemic control <200 mg/dL for all individuals	241	84.0	46	16.0	0	0.0
Temperature measurement	197	68.6	90	31.4	0	0.0
Administration of antibiotic prophylaxis 60 minutes before incision	03	1.0	164	57.1	120	41.8
The team performs surgical hand preparation	14	4.9	273	95.1	0	0.0
Cleaning and disinfection of environmental surfaces	03	1.0	284	99.0	0	0.0
Intraoperative						
Surgical site preparation with an alcohol-based antiseptic agent on intact skin	54	18.8	191	66.6	42	14.6
Glycemic control <200 mg/dL for all individuals	265	92.3	22	7.7	0	0.0
Temperature measurement	253	88.2	34	11.8	0	0.0
Increased fraction of inspired oxygen (FiO_2) in patients with normal pulmonary function subjected to endotracheal intubation	87	30.3	0	0	200	69.7
Proper surgical gowning (gloves, mask, cap and surgical gown)	111	38.7	176	61.3	0	0.0
Use of waterproof surgical field	171	59.6	03	1.0	113	39.4
Changing clothes when visibly dirty, contaminated and/or penetrated by blood or other potentially infectious materials	04	1.4	18	6.3	265	92.3
Operating room ventilation with positive pressure	0	0.0	287	100.0	0	0.0
Operating room temperature between 18°C and 22°C	39	13.6	248	86.4	0	0.0
Relative air humidity between 45% and 55%	180	62.7	107	37.3	0	0.0
Surgical material sterilization indicators	0	0.0	287	100	0	0.0
Sterile and surgical technique	0	0.0	287	100	0	0.0

In turn, regarding the intraoperative measures, full adherence (287; 100.0%) to the "Operating room ventilation with positive pressure", "Surgical material sterilization indicators" and "Sterile surgical technique" items was identified. On the other hand, the "Use of waterproof surgical field"; "Glycemic control <200 mg/dL for all individuals" and "Temperature measurement" items presented low adherence percentages with 1.0% (03), 7.7% (22) and 11.8% (34), respectively. In the study field of this research, glycemic control was only performed for patients diagnosed with diabetes or pre-diabetes. The "Increased fraction of inspired oxygen (FiO_2) in patients with normal pulmonary function subjected to endotracheal intubation" item also stands out, which was not adhered to, evidencing that it is not a practice adopted in the setting evaluated.

With regard to the SSI prevention measures in the postoperative period (Table 2), there was 95.5% adherence (274) for the "Protection of closed incisions with sterile dressing for 24-48 hours after the surgery" item. The items that presented low adherence percentages were as follows: "Glycemic control <200 mg/dL for all individuals" with 5.6% adherence (16) and "Temperature measurement" with 20.2% adherence (58) in the surgeries observed.

It was evidenced that the post-discharge surveillance percentage among the patients subjected to clean surgeries was 97.6% (n=287). As for SSI occurrence, five patients acquired infections, resulting in 1.7% incidence. As for those who presented SSIs, all reported pain and had visible secretions at the incision site; in addition, antibiotic therapy was used in four (1.4%) patients.

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TABLE 2: Surgical Site Infection prevention measures observed in the postoperative period. Uberaba, MG, Brazil, 2019.

Items	Non-adherence		Adherence		Not applicable	
Postoperative	**n**	**%**	**N**	**%**	**n**	**%**
Maintenance of oxygen therapy after extubation	38	13.2	44	15.3	205	71.4
Not administering surgical antibiotic prophylaxis for longer than the recommended time (24 hours)	103	35.9	184	64.1	0	0.0
Glycemic control <200 mg/dL for all individuals	271	94.4	16	5.6	0	0.0
Temperature measurement	229	79.8	58	20.2	0	0.0
Protection of closed incisions with sterile dressing for 24-48 hours after the surgery	05	1.7	274	95.5	08	2.8

It was observed that the longer the anesthetic-surgical procedure and the higher the ASA classification, the greater the health professionals' adherence to the SSI prevention measures (Table 3).

TABLE 3: Multiple linear regression of clinical variables associated with overall adherence. Uberaba, MG, Brazil, 2019.

	Overall adherence	
Variables	**β***	**p†**
Anesthetic-surgical procedure time in minutes	0.224	<0.001
ASA‡	0.132	0.045
Age group	0.050	0.448

***β**: Regression coefficient; †p: Significance level: ≤ 0.05; ‡ASA: American Society of Anesthesiologists

DISCUSSION

In the preoperative period, full adherence to the preoperative bath was verified, a fact that differed from another study that found a bath frequency of 83.33% among the patients evaluated[10]. The preoperative bath can be performed with antimicrobial or non-antimicrobial soap, the night before the day of the surgery[14]. This procedure is considered as a good clinical practice to ensure that the skin is as clean as possible before the surgery and to reduce the bacterial load, mainly at the incision site[15].

The CDC recommends cleaning and disinfection of environmental surfaces in the operating rooms[14]. A study that evaluated different methods for monitoring surface cleaning in the operating room evidenced that the cleaning and disinfection process of the room surfaces reduced the microbial load and organic matter of the surfaces evaluated[16].

Preoperative hand preparation must include brushing the hands and forearms with antimicrobial soap and water or an alcohol-based product for the period recommended by the manufacturer, generally from 2 to 5 minutes, before putting on sterile gloves[6]. When properly performed in terms of recommended duration and technique, surgical hand antisepsis promotes a reduction in the bacterial load on the professionals' hands[17].

The operating room ventilation system aims at creating thermal comfort for patients and professionals, in order to maintain constant air quality by eliminating aerosols and particles inside the room[6]. In the study field of this research, all rooms had an adequate ventilation system, meeting the CDC recommendation[14].

In a scoping review of current methods, policies and barriers to surgical instrument reprocessing in low- and middle-income countries, gaps were identified between the surgical instrument reprocessing practices and the recommended guidelines. The need for improvement in the cleaning, decontamination and sterilization processes of surgical instruments was evidenced, as inadequately reprocessed surgical instruments can be a vector for pathogen agents[18]. Sterilization of all surgical instruments and adoption of a sterile surgical technique are recommended practices by the CDC[14].

The use of a waterproof surgical field to protect the surgical incision from microorganisms that may be present around the skin during the surgery is a strategy used to prevent SSIs[19]. During surgical procedures, the risk of transmitting

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microorganisms increases if the surgical fields become wet. Consequently, the surgical field must be resistant to penetration of liquids[20]. In this regard, the CDC recommends the use of waterproof surgical fields in surgical procedures[14].

The results show that increasing FiO_2 in patients with normal lung function subjected to endotracheal intubation is not a constant practice in the setting observed. The guidelines recommend that the patient receive 80% FiO_2 intraoperatively and, if possible, in the immediate postoperative period for 2-6 hours to reduce the risk of SSIs[6,14]. In contrast, a systematic review by the Cochrane group assessed the benefits and harms of FiO_2 equal to or greater than 60% when compared to a control FiO_2 equal to or less than 40% in the perioperative setting, and concluded that there is no robust evidence to support routine use of high FiO_2 during anesthesia and surgery[21].

Care with closed incisions involves wearing a sterile dressing for 24-48 hours in the postoperative period[14]. A randomized controlled study compared the impact of using a transparent semipermeable dressing with a conventional occlusive gauze dressing in clean and contaminated surgeries on the SSI rate and concluded that the use of a transparent semipermeable dressing was effective in reducing SSIs[22].

It is noteworthy that, in the perioperative period, there were low percentages of adherence to the "glycemic control <200 mg/dL for all individuals" and "temperature measurement" items. Perioperative glycemic control is a strongly recommended preventive measure for SSIs[6,14]. High glucose levels are associated with perioperative complications in diabetic and non-diabetic patients[23]. Thus, it is considered that maintenance of perioperative normoglycemia is one of the crucial factors to prevent the occurrence of SSIs[24]. The implementation of strategies for glycemic control of the patient in the perioperative period is decisive and can be attributed to the Nursing team, which can work together with the anesthesiologist to intervene preventively on the SSI risk[11].

In this study, in all the surgeries observed, blankets were used as heating devices, during the intraoperative and postoperative periods. The current guidelines recommend maintaining perioperative normothermia and using heating devices as a strategy for preventing SSIs[6,14]. Contrary to the current recommendations, a systematic review with meta-analysis evidenced that perioperative hypothermia is not associated with SSI in surgical patients, but that is rather related to other adverse outcomes[25]. The use of active warming methods can help maintain body temperature, but there is insufficient evidence to determine whether this method is effective in preventing SSIs[26]. The need for investments by the health services in heating devices and temperature monitoring techniques is highlighted, in order to improve adherence to the recommendations for the maintenance of perioperative normothermia[27].

The SSI rates increase with the adoption of post-discharge surveillance strategies, as the absence of patient follow-up after hospital discharge leads to underreporting of cases and, consequently, to underestimation of the actual incidence, impact and relevance of SSIs[28]. A research study carried out in Ghana found 10% incidence of SSI, which increased to 49% after the implementation of post-discharge surveillance strategies[29]. Nurses play a key role in conducting SSI surveillance actions during and after discharge of patients subjected to surgeries[30].

In this study, five patients subjected to different surgical specialties presented SSI values corresponding to 1.7%, a result that meets the acceptable levels in the literature from 1% to 5% for clean surgeries[31]. However, a study that described the incidence of complications in mastectomy identified an SSI incidence rate of 6.40/100 procedures-day[32]. It is noteworthy that up to 60% of the SSI cases can be avoided when evidence-based strategies and hospital infection prevention and control measures are adopted[15].

Low or non-adherence to some internationally standardized recommendations signals the need for training of the surgical teams on the importance of adherence to the recommended prevention measures and of adopting checklists for compliance with critical safety stages in the surgical environment, in order to prevent or minimize occurrence of SSIs. It is noteworthy that the implementation of a checklist in perioperative care contributes to SSI reduction and, consequently, to patient safety[31].

The results of the multiple linear regression analysis allowed evidencing that the longer the anesthetic-surgical procedure and the higher the ASA classification, the greater the adherence to the SSI prevention measures. In this scenario, it is important to early recognize the risk factors for the occurrence of SSI so that prevention measures can be implemented in order to reduce the infection rates[33].

Prolonged surgery time and an ASA score above II are pointed out in the literature as risk factors for the occurrence of SSI[33-36]. A systematic review evidenced that the probability of SSI increased with increasing time increments, so that there are 13%, 17% and 37% increases in the probability for each additional 15, 30 and 60 minutes of surgery time, respectively. In addition, the review showed that patients who developed SSI, when compared to those who did not, presented a mean surgery time greater than 30 minutes[34].

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The ASA classification corresponds to the clinical condition of the patient evaluated in the preoperative period, being a risk factor that can hardly be modified by the surgical team. In this sense, patients classified as ASA above II need more surveillance during the perioperative period[35].

Study limitations

Among the study limitations, the heterogeneity of the surgical specialties stands out; in addition to that, it is understood that external validity is limited due to the fact that the study was conducted in only one hospital. It is also highlighted that, for decision-making purposes in the clinical practice, not establishing a cutoff point for adherence scores would be a limitation.

CONCLUSION

This study allowed evidencing adherence to the recommended measures for the prevention of SSI in the perioperative period. It was observed that adherence to the SSI prevention measures was greater in the preoperative period, although there are weaknesses regarding adherence to the measures strongly recommended by the guidelines in the intra- and postoperative periods.

In the perioperative period of clean surgeries, the recommended measures that presented the highest adherence percentages were as follows: preoperative bath, surgical hand preparation, cleaning and disinfection of environmental surfaces, operating room ventilation with positive pressure, sterilization indicators of surgical materials available, sterile and surgical technique, and protection of incisions with sterile dressing after the surgery. However, other measures strongly recommended by the CDC and the WHO for SSI prevention, such as glycemic control and normothermia for all individuals, presented weaknesses in terms of adherence, a fact that puts patient safety at risk.

This study contributed relevant evidence related to SSI prevention; however, further research is needed to understand the barriers to adherence to the recommended SSI prevention measures. Investments in education are indispensable for health professionals to recognize SSI prevention measures to guide clinical decision-making, mitigating the risks of surgical wound contamination and strengthening safety results in the health services and the quality of surgical patient care.

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