

# Sterilization Practices: Implications for the Prevention of Surgical Infection and Environmental Impacts

Práticas de Esterilização: Implicações na Prevenção de Infecção Cirúrgica e Impactos Ambientais

Prácticas de Esterilización: Implicaciones en la Prevención de Infecciones Quirúrgicas e Impactos Ambientales

## RESUMO

**Objetivo:** Analisar as práticas de esterilização e desinfecção, suas implicações na prevenção das Infecções de Sítio Cirúrgico (ISC) e seus impactos ambientais, discutindo a integração entre segurança do paciente e sustentabilidade hospitalar. **Método:** Revisão narrativa da literatura, baseada na análise crítica de estudos identificados nas bases PubMed/MEDLINE, LILACS, SciELO e Web of Science, por descritores DeCS e MeSH. **Resultados:** Os métodos de esterilização, associados à implementação de bundles, checklists e protocolos perioperatórios, reduziram as ISC. Entretanto, o processamento de produtos para saúde demanda elevado consumo de água, energia e agentes químicos, gerando impactos ambientais relevantes e desafios para conciliar segurança microbiológica e sustentabilidade. **Conclusão:** A esterilização permanece essencial para prevenir infecções cirúrgicas. Contudo, protocolos institucionais devem incorporar estratégias sustentáveis, tecnologias inovadoras e gestão ambiental, garantindo assistência segura, eficiente e comprometida com a redução dos impactos ecológicos.

**DESCRIPTORES:** Infecção da Ferida Cirúrgica. Esterilização. Segurança do Paciente. Sustentabilidade Ambiental.

## ABSTRACT

**Objective:** To analyze sterilization and disinfection practices, their implications for the prevention of Surgical Site Infections (SSI), and their environmental impacts, discussing the integration between patient safety and hospital sustainability. **Method:** Narrative literature review based on the critical analysis of studies identified in the PubMed/MEDLINE, LILACS, SciELO, and Web of Science databases using DeCS and MeSH descriptors. **Results:** Sterilization methods, combined with the implementation of bundles, checklists, and perioperative protocols, reduced the incidence of Surgical Site Infections. However, the processing of health products requires high consumption of water, energy, and chemical agents, resulting in significant environmental impacts and challenges in reconciling microbiological safety with sustainability. **Conclusion:** Sterilization remains essential for preventing surgical infections. However, institutional protocols should incorporate sustainable strategies, innovative technologies, and environmental management to ensure safe, efficient healthcare while reducing ecological impacts.

**DESCRIPTORS:** Surgical Wound Infection. Sterilization. Patient Safety. Environmental Sustainability.

## RESUMEN

**Objetivo:** Analizar las prácticas de esterilización y desinfección, sus implicaciones en la prevención de las Infecciones del Sitio Quirúrgico (ISQ) y sus impactos ambientales, abordando la integración entre la seguridad del paciente y la sostenibilidad hospitalaria. **Método:** Revisión narrativa de la literatura, basada en el análisis crítico de estudios identificados en las bases de datos PubMed/MEDLINE, LILACS, SciELO y Web of Science, mediante descriptores DeCS y MeSH. **Resultados:** Los métodos de esterilización, asociados con la implementación de bundles, listas de verificación y protocolos perioperatorios, redujeron las ISQ. Sin embargo, el procesamiento de productos para la salud requiere un elevado consumo de agua, energía y agentes químicos, generando impactos ambientales relevantes y desafíos para conciliar la seguridad microbiológica y la sostenibilidad. **Conclusión:** La esterilización sigue siendo esencial para prevenir las infecciones quirúrgicas. No obstante, los protocolos institucionales deben incorporar estrategias sostenibles, tecnologías innovadoras y gestión ambiental, garantizando una atención segura, eficiente y comprometida con la reducción de los impactos ecológicos.

**DESCRIPTORES:** Infección de la Herida Quirúrgica. Esterilización. Seguridad del Paciente. Sostenibilidad Ambiental.

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## INTRODUCTION

Surgical Site Infections (SSIs) represent one of the main challenges for patient safety and quality management in healthcare institutions, increasing morbidity and mortality rates as well as hospital costs<sup>1</sup>. In this context, rigorous infection control in surgical practice is a non-negotiable principle, requiring continuous advances in prevention techniques<sup>2</sup>. The epidemiological characterization of these infections shows that failures in perioperative processes—from patient preparation to instrument sterilization—are determining factors for clinical outcomes<sup>3</sup>.

The translation of scientific knowledge into clinical practice is essential for standardizing routines and bridging the gap between available evidence and the daily actions of healthcare professionals<sup>4,5</sup>. The Central Sterile Supply Department (CSSD) serves as the heart of the operating room. The effectiveness of sterilization methods and routine cleaning and disinfection procedures not only ensures the inactivation of microorganisms but also extends the useful life of materials<sup>6</sup>. However, there is growing concern about sustainability. The high demand for energy and water,

along with the use of harsh chemicals, generates significant environmental impacts, requiring that interventions—such as the use of special dressings and negative-pressure technologies—be combined with more efficient waste management<sup>7,8</sup>.

Thus, care management—led by the nursing team—becomes essential for balancing patient safety and environmental responsibility<sup>9</sup>. The implementation of surveillance protocols, especially in highly complex surgeries, has proven successful in mitigating risks<sup>10,11</sup>. This study aims to reflectively analyze sterilization and disinfection practices, their direct implications for the prevention of surgical site infections, and to discuss the environmental impacts associated with these routines, seeking to integrate safe and sustainable practices<sup>12,13</sup>.

## METHOD

This study is based on a narrative literature review. The search strategy was conducted in scientific databases—PubMed/MEDLINE, LILACS, SciELO, and Web of Science—using terms extracted from the Health Sciences Descriptors (DeCS) and *Medical Sub-*

*ject Headings* (MeSH), combined with Boolean operators: ("Surgical Wound Infection" OR "Infecção de Sítio Cirúrgico") AND ("Sterilization" OR "Esterilização") AND ("Patient Safety" OR "Segurança do Paciente") AND ("Environmental Sustainability" OR "Sustentabilidade Ambiental"). The following inclusion criteria were adopted: original articles, reviews, guidelines, and theoretical studies published between 2002 and 2025 in Portuguese, English, or Spanish that addressed the interface between sterilization practices, prevention of surgical site infections (SSIs), and/or environmental impacts in healthcare services. Editorials, letters to the editor, event summaries, and studies focusing exclusively on animals or *in vitro* research without clinical implications were excluded.<sup>4</sup>

The selection of studies followed an iterative and reflective process of reading, analysis, and thematic categorization. The articles were read in full and organized into interpretive synthesis matrices, considering variables such as year of publication, methodological approach, context of application, and main arguments related to the prevention of healthcare-associated infections and sustainability in healthcare

management. The construction of the theoretical synthesis was guided by the dialectical relationship between patient safety and environmental responsibility, seeking to map tensions, convergences,

and gaps in the field<sup>4,8</sup>.

## RESULTS AND DISCUSSION

To organize the data in a clear and

systematic manner, the following table was developed, presenting the main characteristics of the selected studies and allowing for a comparative analysis of the different works examined.

**Table 1. Summary of the studies included in the narrative review on sterilization practices, prevention of surgical site infections, and sustainability**

| No. | Author(s)               | Year | Journal                     | Methodological Design     | Main Objective/Focus                                                              |
|-----|-------------------------|------|-----------------------------|---------------------------|-----------------------------------------------------------------------------------|
| 1   | Alfa MJ                 | 2013 | Am J Infect Control         | Literature Review         | Assess the monitoring of the effectiveness of medical device cleaning.            |
| 2   | Alverdy JC, Knechtges D | 2016 | J Surg Res                  | Review                    | Discuss principles and advances in surgical infection control.                    |
| 3   | Anchieta DW, et al.     | 2019 | Vigil Sanit Debate          | Descriptive Study         | Characterize surgical site infections (SSIs) in a teaching hospital.              |
| 4   | Apóstolo JLA            | 2017 | ESEnC                       | Theoretical Study/Book    | Structure the synthesis of evidence and the translation of science into practice. |
| 5   | Ardesbna A, et al.      | 2023 | J Indian Orthod Soc         | Experimental Study        | Evaluate the effectiveness of different sterilization methods.                    |
| 6   | Assadian O, et al.      | 2021 | J Hosp Infect               | Narrative Review          | Provide practical recommendations for disinfection routines.                      |
| 7   | Atherton K, et al.      | 2025 | JAMA                        | Randomized Clinical Trial | Evaluate negative pressure dressings in emergency laparotomies.                   |
| 8   | Badia JM, et al.        | 2020 | Int J Surg                  | Qualitative Study         | Analyze the persistent gap between evidence and practice in SSI prevention.       |
| 9   | Borchhardt SVB, et al.  | 2022 | Res Soc Dev                 | Integrative Review        | Map care management and the contributions of nurses in the operating room.        |
| 10  | Canon M, et al.         | 2016 | Am J Crit Care              | Observational Study       | Improve surveillance and prevention of SSIs in pediatric cardiac surgery.         |
| 11  | Castellà L, et al.      | 2020 | Am J Infect Control         | Intervention Study        | Reduce the incidence of SSIs in spinal surgeries.                                 |
| 12  | Costa AC, et al.        | 2020 | Arq Bras Cir Dig            | Literature Review         | Present updates on SSIs and surgical antibiotic prophylaxis.                      |
| 13  | Dior UP, et al.         | 2020 | JAMA Surg                   | Randomized Clinical Trial | Evaluate the effects of skin antisepsis in laparoscopic surgery.                  |
| 14  | Dutra GG, et al.        | 2015 | Rev Pesqui Cuid Fundam      | Review Article            | Describe the role of nurses in hospital infection control.                        |
| 15  | Franco LMC, et al.      | 2017 | REME                        | Pilot Clinical Study      | Evaluate the effects of preoperative bathing on infection prevention.             |
| 16  | Gillespie BM, et al.    | 2015 | Surg Innov                  | Pilot RCT                 | Analyze negative pressure dressings in hip arthroplasty.                          |
| 17  | Gonçalves GN, et al.    | 2025 | Braz J Implantol Health Sci | Literature Review         | Develop updated strategies for the prevention of perioperative infections.        |
| 18  | Gonzalez EA, et al.     | 2015 | Am J Infect Control         | In vitro Study            | Test the ability of wet wipes to remove bacteria.                                 |
| 19  | Hancer AT, Yilmaz M     | 2023 | J Perianesth Nurs           | Randomized Clinical Trial | Evaluate the effect of a glycemic control checklist on SSI rates.                 |
| 20  | Jang X, et al.          | 2016 | Turk Neurosurg              | Retrospective Study       | Report interventions for infection prevention in neurosurgery.                    |
| 21  | Johnson MP, et al.      | 2016 | Obstet Gynecol              | Cohort Study              | Use bundles to reduce SSIs in gynecological surgery.                              |
| 22  | Jost MT, et al.         | 2018 | Rev Sobecc                  | Integrative Review        | Analyze the Systematization of Nursing Care (SAEP) in patient safety.             |
| 23  | Kakemam E, et al.       | 2022 | J Nurs Manag                | Modeling Study            | Correlate professionalism and systems thinking with patient safety.               |
| 24  | Khoury RK, et al.       | 2019 | Ann Surg                    | Retrospective Study       | Identify patient risk factors (nutrition and smoking) for SSIs.                   |

# Integrative Review

Silva BCC, Reis CB

Nursing Diagnoses for Bedridden Elderly: Proposal of a Terminological

|    |                        |      |                                  |                           |                                                                                          |
|----|------------------------|------|----------------------------------|---------------------------|------------------------------------------------------------------------------------------|
| 25 | Lakoh S, et al.        | 2022 | Antimicrob Resist Infect Control | Prospective Cohort        | Investigate the incidence of SSIs and associated antimicrobial resistance.               |
| 26 | Lee E, Kim Y           | 2020 | PLoS One                         | Cross-Sectional Study     | Evaluate moral sensitivity in the reporting of safety incidents.                         |
| 27 | Ling ML, et al.        | 2018 | Antimicrob Resist Infect Control | Clinical Guidelines       | Establish APSIC guidelines for hospital disinfection and sterilization.                  |
| 28 | Loftus RW, et al.      | 2020 | JAMA Netw Open                   | Randomized Clinical Trial | Evaluate basic preventive measures for perioperative transmission of <i>S. aureus</i> .  |
| 29 | Martins T, et al.      | 2020 | Rev Estima                       | Integrative Review        | Identify nursing interventions to reduce SSIs.                                           |
| 30 | Oliveira AC, et al.    | 2002 | Rev Saúde Pública                | Comparative Study         | Compare SSI diagnoses during and after patient hospitalization.                          |
| 31 | Patiño-Marín N, et al. | 2025 | Cureus                           | Literature Review         | Evaluate sterilization and disinfection practices in dental settings.                    |
| 32 | Prado MA               | 2016 | Enferm Global                    | Cross-Sectional Study     | Develop process indicators from a patient safety perspective.                            |
| 33 | Protano C, et al.      | 2019 | Ann Ig                           | Literature Review         | Discuss the hospital environment as a reservoir for cross-transmission.                  |
| 34 | Roscani ANCP, et al.   | 2015 | Acta Paul Enferm                 | Methodological Study      | Validate a surgical checklist specifically focused on SSI prevention.                    |
| 35 | Rutala WA, et al.      | 2023 | Am J Infect Control              | Narrative Review          | Update the global overview of disinfection, sterilization, and antisepsis.               |
| 36 | Song X, et al.         | 2019 | Antimicrob Resist Infect Control | Literature Review         | Analyze the effectiveness of disinfectant-impregnated wipes in the hospital environment. |

Source: Study authors, 2026.

A reflective analysis of Surgical Site Infections (SSIs) reveals a complex scenario in which failure in seemingly basic processes can result in serious clinical outcomes. The epidemiological study in teaching hospitals demonstrates that detailed characterization of infections constitutes the first step toward mapping institutional risks<sup>3</sup>. However, one of the greatest challenges for infection control committees relates to underdiagnosis, since the literature shows that a significant proportion of surgical infections only manifest or are diagnosed after hospital discharge, requiring active surveillance and

continuous monitoring to reflect the true incidence rate<sup>30</sup>. In this context,<sup>7</sup> the principles of infection control in surgical practice have had to evolve substantially, moving beyond a purely reactive approach to incorporate technologies for the continuous monitoring of the effectiveness of device and environmental cleaning<sup>1,2</sup>.

Despite theoretical and technological advances, there remains a persistent gap between the available scientific evidence and everyday clinical practice in operating rooms and sterilization centers<sup>8</sup>. Overcoming this barrier depends directly on structured methods for translating knowledge—a process in which scientific evidence is synthesized, adapted, and effectively implemented in clinical practice<sup>4</sup>. Without this rigorous translation, recommendations remain confined to institutional protocols, leading to a waste of resources, an increased hospital environmental footprint due to rework, and the perpetuation of preventable infection risks for surgical patients.

In this practical application scenario, the leadership and management of care exercised by the nursing team play an indispensable role in ensuring safety in the perioperative environment<sup>9</sup>. The nurse's role in hospital infection control extends beyond direct care, encompassing the coordination of care workflows, supervision of the Central

Sterile Supply Department (CSSD), and ensuring the maintenance of aseptic barriers<sup>14</sup>. The literature demonstrates that the systematic application of preventive nursing interventions significantly reduces contamination rates, including in surgeries classified as high-risk<sup>29</sup>. To ensure consistency and the ability to measure these interventions, the Systematization of Perioperative Nursing Care (SAEP) serves as the methodological foundation for care, promoting standardization from admission through anesthetic recovery<sup>22</sup>.

The effectiveness of the actions carried out by the nursing and medical staff depends on the implementation of risk management tools and the strengthening of a culture of safety. The use of process indicators allows institutions to monitor not only infection outcomes but also fundamental preventive steps, such as the appropriate timing of antibiotic prophylaxis and the maintenance of normal body temperature<sup>32</sup>. Validated tools, such

as surgical checklists specifically designed to prevent infections, reduce reliance solely on human memory<sup>34</sup>. Furthermore, the application of these 8 tools can be expanded to include perioperative metabolic control, especially in the rigorous management of hyperglycemia, a factor directly associated with impaired wound healing and increased bacterial colonization<sup>19</sup>. However, effective adherence to such strategies requires ethical sensitivity, professionalism, and systems thinking on the part of the teams—characteristics associated with a greater propensity to report incidents and near misses<sup>23–26</sup>.

Even before the patient enters the operating room, preoperative optimization strategies constitute the first line of defense against surgical site infections (SSIs). Studies show that intrinsic and behavioral factors, such as poor nutritional status and active smoking, significantly increase the risks of wound dehiscence and infection, requiring preoperative interventions<sup>24</sup>. In parallel with systemic approaches, physical preparation through preoperative bathing with antiseptics reduces the skin's microbial load, acting as an initial chemical barrier<sup>15</sup>. Immediately before the incision, the appropriate choice and correct technique for skin antisepsis in the operating room have proven effective in reducing local contamination, including in minimally invasive procedures such as laparoscopy<sup>13</sup>.

During and after the surgical procedure, the use of combined interventions—known as “bundles” or sets of measures—enhances prevention by requiring full adherence to the therapeutic protocol<sup>21</sup>. The incorporation of technologies applied to the surgical site has led to significant advances, notably negative-pressure wound therapy. Clinical trials demonstrate that the prophylactic use of this technology in major abdominal surgeries and orthopedic procedures, such as primary hip

arthroplasty, helps control exudate, reduce edema, and isolate the wound from the external environment, significantly reducing local complications<sup>7–16</sup>. In addition, the systematic reinforcement of basic perioperative measures has proven effective in containing the transmission of highly virulent pathogens, such as *Staphylococcus aureus*<sup>28</sup>.

The complexity and anatomical particularities of different surgical specialties require specific adaptations to preventive protocols. In pediatric cardiac surgery, for example, surveillance and control require extremely rigorous protocols due to the patients' high immunological vulnerability<sup>10</sup>. Similarly, neurosurgical procedures and surgeries for 9 Spinal surgery carries a high risk of deep infections or central nervous system involvement, justifying the adoption of targeted prophylaxis and institutional policies of zero tolerance for aseptic failures<sup>11,20</sup>. This scenario is exacerbated by the rise in antimicrobial resistance, a phenomenon that compromises the effectiveness of traditional prophylaxis and requires continuous updating of guidelines related to the use of perioperative antibiotics<sup>12,25</sup>.

When shifting the focus from the patient to the physical hospital environment, it becomes evident that the operating room acts as a dynamic reservoir for the cross-transmission of microorganisms<sup>33</sup>. Inanimate surfaces near the surgical field and areas with heavy staff traffic constitute silent vectors for the spread of infection. Thus, reducing this invisible risk depends on the implementation of robust environmental strategies that include airflow control, strict restrictions on personnel movement within the operating suite, and the adoption of disinfection technologies that complement human efforts<sup>17</sup>.

In the context of environmental control, the effectiveness of surface cleaning and disinfection methods is critical. International guidelines and

recommendations emphasize that the prior removal of organic matter and biofilm is an essential step before applying chemical disinfectants<sup>6</sup>. Among the innovations incorporated into hospital routines, disposable wipes impregnated with disinfectant stand out; their in vitro efficacy and that demonstrated in literature reviews show a high capacity for bacterial removal from medical devices and high-touch surfaces<sup>18,36</sup>. In addition to standardizing mechanical friction, this technology optimizes staff time and helps reduce human error.

Finally, the processing of healthcare products completes the cycle of

safety related to the prevention of healthcare-associated infections (HAIs). Global guidelines on disinfection, sterilization, and antisepsis identify the Central Sterile Supply Department as a critical unit where technological failures can directly result in patient infection<sup>27–35</sup>. In both highly complex hospital settings and dental and orthodontic contexts, rigorous evaluation of the effectiveness of physical and thermochemical sterilization methods is essential to ensure microbial lethality<sup>5,31</sup>. In this context, combining high safety standards with the principles of sustainability represents one of the main contemporary challenges in the science of sterilization, requiring processes capable of achieving levels of 10 microbiological safety while simultaneously reducing water consumption, energy costs, and the disposal of chemical waste harmful to the environment.

## FINAL CONSIDERATIONS

Sterilization and disinfection practices constitute the fundamental foundation for the prevention of Surgical Site Infections (SSIs), acting as a non-negotiable barrier to patient safety. The reviewed literature reinforces that rigorous control in the perioperative environment—which extends

from the initial preparation of the patient to the complex processing of surgical instruments—is the primary determinant for reducing morbidity and mortality rates as well as hospital costs. Failures in these critical stages, however minor, result in severe clinical outcomes, prolonged hospital stays, and systemic failures in patient care.

For this microbiological safety to be effective and continuous, the adoption of systematized preventive interventions has proven essential. The use of prevention *bundles*, validated surgical checklists, and the consolidation of the Systematization of Perioperative Nursing Care (SAEP) translate theoretical robustness into daily practice, mitigating human error and standardizing care. Furthermore, constant technological advancement—as

illustrated by the implementation of negative-pressure dressings, advanced antisepsis, and rigorous monitoring of cleanliness—demonstrates that active surveillance and the translation of knowledge are the most effective weapons for combating the growing threat of antimicrobial resistance.

However, this reflection highlights an urgent contemporary challenge that can no longer be ignored: the environmental impact associated with these clinical excellence practices. The traditional processing model at the Central Sterile Supply Department (CSSD) is characterized by extremely high energy and water consumption, as well as the intensive use and disposal of highly toxic chemicals. The relentless pursuit of guaranteed sterility has generated an ecological burden that is unsustainable in the long term, requiring

hospital administrators and infection control committees to rethink their protocols from the perspective of sustainability and resource optimization.

It can therefore be concluded that the future of operating room management requires a meticulous balance between maximum efficacy in microbial inactivation and socio-environmental responsibility. Scientific Advances in Infection Prevention 11 must go hand in hand with the adoption of green technologies and cleaner operational workflows in the surgical center. Only through ongoing staff education, innovation in ecologically efficient disinfection methods, and the application of rigorous, evidence-based guidelines will it be possible to safeguard patients' lives without irreparably compromising the health of the environment.

## REFERÊNCIAS

1. Alfa MJ. Monitoring and improving the effectiveness of cleaning medical and surgical devices. *Am J Infect Control*. 2013; 41:0-9.
2. Alverdy JC, Knechtges D. Infection control in surgical practice: principles and advances. *J Surg Res*. 2016;200(2):420-7.
3. Anchieta DW, et al. Caracterização das infecções de sítio cirúrgico em um hospital público de ensino na cidade de Cascavel, Paraná. *Vigil Sanit Debate*. 2019;7(3):31-6.
4. Apóstolo JLA. Síntese da evidência no contexto da translação da ciência. Coimbra, Portugal: ESEnC; 2017.
5. Ardesbna A, Chavan K, Prakasam A, Ardesbna D, Shah D, Velliyagounder K. Effectiveness of different sterilization methods on clinical orthodontic materials. *J Indian Orthod Soc*. 2023; 57:98-105.
6. Assadian O, Harbarth S, Vos M, Knobloch JK, Asensio A, Widmer AF. Practical recommendations for routine cleaning and disinfection procedures in healthcare institutions: a narrative review. *J Hosp Infect*. 2021; 113:104-14.
7. Atherton K, et al. Negative pressure dressings to prevent surgical site infection after emergency laparotomy: the SUN-RRISE randomized clinical trial. *JAMA*. 2025;333(10):853.
8. Badia JM, et al. The persistent breach between evidence and practice in the prevention of surgical site infection. Qualitative study. *Int J Surg*. 2020; 82:231-9.
9. Borchhardt SVB, et al. Gestão do cuidado para segurança do paciente no centro cirúrgico: contribuições do enfermeiro. *Res Soc Dev*. 2022;11(6):e25711629075.
10. Canon M, et al. Melhorando a vigilância e prevenção de infecção de sítio cirúrgico em cirurgia cardíaca pediátrica. *Am J Crit Care*. 2016;25(2):e30-7.
11. Castellà L, et al. Intervenção para reduzir a incidência de infecção de sítio cirúrgico em cirurgia de coluna. *Am J Infect Control*. 2020;48(5):550-4.
12. Costa AC, Santa-Cruz F, Ferraz ÁAB. What's new in infection on surgical site and antibiotic prophylaxis in surgery? *Arq Bras Cir Dig*. 2020;33(4).
13. Dior UP, et al. Effect of surgical skin antisepsis on surgical site infections in patients undergoing gynecological laparoscopic surgery: a double-blind randomized clinical trial. *JAMA Surg*. 2020;155(9):807-15.
14. Dutra GG, et al. Controle da infecção hospitalar: função do enfermeiro. *Rev Pesqui Cuid Fundam*. 2015;7(1):2159-68.
15. Franco LMC, et al. Efeitos do banho pré-operatório na prevenção de infecção cirúrgica: estudo clínico piloto. *REME*. 2017.
16. Gillespie BM, et al. Uso de curativos de pressão negativa para prevenir complicações no sítio cirúrgico após artroplastia primária do quadril: um ECR piloto. *Surg Innov*.

2015;22(5):488-95.

17. Gonçalves GN, et al. Estratégias para prevenção de infecções do centro cirúrgico. *Braz J Implantol Health Sci*. 2025;7(3):182-91.

18. Gonzalez EA, Nandy P, Lucas AD, Hitchins VM. Ability of cleaning-disinfecting wipes to remove bacteria from medical device surfaces. *Am J Infect Control*. 2015; 43:1331-5.

19. Hancer AT, Yilmaz M. The effect of a checklist for perioperative hyperglycemia management on surgical site infections: a randomized controlled trial. *J Perianesth Nurs*. 2023;38(1):108-17.

20. Jang X, et al. Prevenção de infecção do sítio neurocirúrgico: experiência de um único instituto. *Turk Neurosurg*. 2016;26(2):234-9.

21. Johnson MP, et al. Using bundled interventions to reduce surgical site infection after major gynecologic cancer surgery. *Obstet Gynecol*. 2016;127(6):1135-44.

22. Jost MT, Viegas K, Caregnato RCA. Sistematização da assistência de enfermagem perioperatória na segurança do paciente: revisão integrativa. *Rev Sobecc*. 2018;23(4):218-25.

23. Kakemam E, et al. The association of professionalism and systems thinking on patient safety competency: a structural equation model. *J Nurs Manag*. 2022;30(3):817-26.

24. Khouri RK, et al. Patient-related risk factors for surgical site infection: nutrition and smoking. *Ann Surg*. 2019;270(5):845-52.

25. Lakoh S, et al. Incidence and risk factors of surgical site infections and related antibiotic resistance in Freetown, Sierra Leone: a prospective cohort study. *Antimicrob Resist Infect Control*. 2022;11(1):39.

26. Lee E, Kim Y. The relationship of moral sensitivity and patient safety attitudes with nursing students' perceptions of disclosure of patient safety incidents: a cross-sectional

study. *PLoS One*. 2020;15(1): e0227585.

27. Ling ML, et al. APSIC guidelines for disinfection and sterilization of instruments in health care facilities. *Antimicrob Resist Infect Control*. 2018; 7:25.

28. Loftus RW, et al. The effect of improving basic preventive measures in the perioperative arena on *Staphylococcus aureus* transmission and surgical site infections: a randomized clinical trial. *JAMA Netw Open*. 2020;3(3):e201934.

29. Martins T, et al. Intervenções de enfermagem para reduzir infecção do sítio cirúrgico em cirurgias potencialmente contaminadas: revisão integrativa. *Rev Estima*. 2020;1-12.

30. Oliveira AC, et al. Estudo comparativo do diagnóstico da infecção do sítio cirúrgico durante e após a internação. *Rev Saúde Pública*. 2002;36(6):717-22.

31. Patiño-Marín N, et al. Sterilization and disinfection: ensuring infection control in dental practices. *Cureus*. 2025;17(2):e79041.

32. Prado MA. Indicadores de processo para prevenção da infecção do sítio cirúrgico sob a ótica da segurança do paciente. *Enferm Global*. 2016;15(4):264-87.

33. Protano C, et al. Hospital environment as a reservoir for cross transmission: cleaning and disinfection procedures. *Ann Ig*. 2019; 31:436-48.

34. Roscani ANCP, et al. Validação de checklist cirúrgico para prevenção de infecção de sítio cirúrgico. *Acta Paul Enferm*. 2015; 28:553-65.

35. Rutala WA, Boyce JM, Weber DJ. Disinfection, sterilization and antisepsis: an overview. *Am J Infect Control*. 2023; 51:0.

36. Song X, Vossebein L, Zille A. Efficacy of disinfectant-impregnated wipes used for surface disinfection in hospitals: a review. *Antimicrob Resist Infect Control*. 2019; 8:139.

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Research conception and design: Cássio JC; Sbampato CS; Fonseca JPS. Data collection: Cássio JC; Sbampato CS; Fonseca JPS. Data analysis and interpretation: Cássio JC; Sbampato CS; Fonseca JPS. Statistical analysis: Cássio JC; Sbampato CS; Fonseca JPS. Manuscript writing: Cássio JC; Sbampato CS; Fonseca JPS. Critical review of the manuscript for important intellectual content: Cássio JC; Sbampato CS; Fonseca JPS.

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Conflict of interest: The authors declare that there is no conflict of interest.

Data availability: The data supporting the findings of this study are available upon request from the corresponding author.