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Review Article

Measures and contributions of literature to the prevention of surgical site infection: scope review

Medidas e contribuições da literatura para prevenção de infecção de sítio cirúrgico: revisão de escopo
Medidas y contribuciones de la literatura para la prevención de infecciones del sitio quirúrgico: revisión del alcance

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ABSTRACT

Background and Objectives: Despite advances in surgical techniques and preventive measures, surgical site infection remains prevalent, impacting patient recovery and generating substantial costs. Therefore, it is important to develop a study that identifies the most significant gaps in knowledge. This is justified by the high morbidity and mortality associated with postoperative infections, as reported in the literature, which represent a challenge for hospital systems. Its objective is to map the most effective measures in the literature and the areas in which scientific production is still insufficient, contributing to the improvement of institutional protocols and policies. **Contents:** A scoping review was conducted using the MEDLINE, Web of Science, SCOPUS, SciELO, and CINAHL databases, conducted in accordance with the methodology imposed by the Joanna Briggs Institute for scoping reviews and guided by the ten-step Preferred Reporting Items for Systematic reviews and Meta-analyses Scoping Review checklist. The data were analyzed in a double-blind process, considering the inclusion criteria as observational studies, both cross-sectional and longitudinal and primary, in addition to systematic reviews, available in full. **Conclusion:** Evidence-based strategies, combined with advanced technology and multidisciplinary approaches, have been shown to significantly reduce mortality rates, length of hospital stay, and the impact of long-term complications. In addition, the articles in the final sample highlighted important gaps that need to be studied over a longer period of time, focusing on studies in underdeveloped countries, post-discharge monitoring for the detection of late infections, and measurement of staff adherence to institutional protocols.

Keywords: Surgical Wound Infection. Infection Control. Perioperative Care.

RESUMO

Justificativa e Objetivos: Apesar dos avanços em técnicas cirúrgicas e medidas preventivas, a infecção de sítio cirúrgico continua prevalente, trazendo impactos em relação à recuperação do paciente e gerando custos substanciais. Portanto, é relevante desenvolver um estudo que possibilite encontrar as lacunas de conhecimento mais significativas. Logo, justifica-se pela elevada morbimortalidade associada às infecções no pós-operatório, presentes na literatura, que representam um desafio para os sistemas hospitalares. Tem como objetivo mapear na literatura as medidas mais eficientes e as áreas em que a produção científica ainda é insuficiente, contribuindo para aperfeiçoar protocolos e políticas institucionais. **Métodos:** Revisão de escopo realizada com banco de dados MEDLINE, Web of Science, SCOPUS, SciELO e CINAHL, conduzida de acordo com a metodologia imposta pelo Joanna Briggs Institute para revisões de escopo e orientada pelo checklist Preferred Reporting Items for Systematic reviews and Meta-analyses Scoping Review em dez etapas. Os dados foram analisados em processo duplo-cego, considerando os critérios de inclusão como estudos observacionais, tanto transversais quanto longitudinais e primários, além de revisões sistemáticas, disponíveis na íntegra. **Conclusão:** Estratégias baseadas em evidências, combinadas com tecnologia avançada e abordagens multidisciplinares, demonstraram reduzir significativamente as taxas de mortalidade, o tempo de internação e o impacto das complicações em longo prazo. Além disso, os artigos da amostra final destacaram importantes lacunas que precisam ser estudadas por um período de tempo maior, focando em estudos nos países subdesenvolvidos, no monitoramento pós-alta ainda para detecção de infecções tardias e na mensuração da adesão de equipe aos protocolos institucionais.

Descritores: Infecção do Sítio Cirúrgico. Controle de Infecções. Assistência Perioperatória.

RESUMEN

Justificación y Objetivos: A pesar de los avances en las técnicas quirúrgicas y las medidas preventivas, la infección del sitio quirúrgico sigue siendo frecuente, lo que repercute en la recuperación del paciente y genera costes sustanciales. Por lo tanto, es importante desarrollar un estudio que permita identificar las lagunas de conocimiento más significativas. Esto se justifica por la elevada morbilidad y mortalidad asociadas a las infecciones postoperatorias, presentes en la literatura, que representan un reto para los sistemas hospitalarios. Su objetivo es identificar en la literatura las medidas más eficaces y las áreas en las que la producción científica aún es insuficiente, contribuyendo a mejorar los protocolos y las políticas institucionales. **Contenidos:** Revisión de alcance realizada con las bases de datos MEDLINE, Web of Science, SCOPUS, SciELO y CINAHL, llevada a cabo de acuerdo con la metodología impuesta por el Joanna Briggs Institute para revisiones de alcance y guiada por la lista de verificación Preferred Reporting Items for Systematic reviews and Meta-analyses Scoping Review en diez etapas. Los datos se analizaron en un proceso doble ciego, teniendo en cuenta los criterios de inclusión como estudios observacionales, tanto transversales como longitudinales y primarios, además de revisiones sistemáticas, disponibles en su totalidad. **Conclusiones:** Las estrategias basadas en la evidencia, combinadas con tecnología avanzada y enfoques multidisciplinarios, han demostrado reducir significativamente las tasas de mortalidad, la duración de la hospitalización y el impacto de las complicaciones a largo plazo. Además, los artículos de la muestra final destacaron importantes lagunas que deben estudiarse durante un período de tiempo más largo, centrándose en estudios en países subdesarrollados, en el seguimiento posterior al alta para detectar infecciones tardías y en la medición del cumplimiento de los protocolos institucionales por parte del personal.

Palabras Clave: Infección de la herida quirúrgica. Control de infecciones. Asistencia perioperatoria.

INTRODUCTION

Surgical site infection is an adverse event related to healthcare failure that is considered a risk to patient safety in the presence of risk factors, and is associated with prolonged hospital stays, an increased likelihood of readmission, and the need for additional interventions, all of which impact the cost of healthcare.¹

Guidelines from the Centers for Disease Control and Prevention (CDC), the World Health Organization (WHO), the Institute for Healthcare Improvement (IHI), and the National Institute for Health and Care Excellence incorporate evidence-based components to prevent this adverse event and ensure the quality of care provided.²⁻⁴

Although there has been continuous progress, significant knowledge gaps remain that warrant a review of the scope: the numerous areas of uncertainty surrounding interventions, the lack of specific risk protocols, the limited evidence base to inform staff adherence to prevention protocols and how this could be improved, as well as the current limitations in surveillance systems, particularly after discharge.⁵⁻⁶

The prevention of surgical site infections is therefore directly related to SDG 3, Good Health and Well-being, Target 3.8, which aims to: “Achieve universal health coverage, including access to quality essential health services and to safe, effective, quality, and affordable essential medicines and vaccines for all.” It is therefore of great importance to conduct a study that identifies the most significant knowledge gaps, where guidelines are unclear and evidence is of low quality, determines which cost-effective tools are best, and pinpoints areas lacking scientific research to optimize protocols, operational instructions, and institutional policies.⁷

This study is justified by the high morbidity and mortality associated with postoperative infections, as documented in the literature and in the literature review conducted by the author of this publication, which pose a challenge to hospital systems. Despite advances in surgical techniques and preventive measures, surgical site infections remain the most prevalent type of healthcare-associated infection, affecting patient recovery and generating substantial costs.

The objective of this review is to identify, through a review of the literature, the most effective measures and areas where scientific research is still insufficient, thereby contributing to the improvement of protocols and institutional policies.

METHODS

This is a scoping review, with data collected from January through August 2025, conducted in accordance with the methodology established by the Joanna Briggs

Institute (JBI).⁸ for scoping reviews, which consists of ten steps and is guided by the Preferred Reporting Items for Systematic Reviews and Meta-analyses: Scoping Review (PRISMA-ScR) checklist.⁹ It was registered with the Open Science Framework (OSF) (DOI 10.17605/OSF.IO/8MS97).

The population of interest in the review included individuals hospitalized within the timeframe specified by the Brazilian Health Surveillance Agency (ANVISA), during the preoperative and intraoperative periods, and from 30 days after the procedure up to three months, depending on the presence or absence of a prosthesis.¹⁰

We included primary studies, systematic reviews summarizing preventive measures, guidelines, or institutional protocols with a clear methodological description, and grey literature containing relevant data. We excluded conference abstracts, qualitative studies, and articles without a full text available.

The research question was formulated using the “PCC” strategy, with the population defined as “Individuals in the perioperative period of any age (preoperative, intraoperative, and postoperative)”; concept “Measures to prevent surgical site infection” and context “Any level of hospital care (public, private, or university), provided it relates to the perioperative period.”

Thus, we were able to formulate the following research question: “What measures have proven effective in preventing surgical site infections in patients during the perioperative period, and what gaps remain?” The search was conducted in the following databases: Medical Literature Analysis and Retrieval Online System (MEDLINE) via PubMed; Web of Science; SCOPUS; Scientific Electronic Library Online (SCIELO); and Cumulative Index to Nursing & Allied Health Literature (CINAHL). In addition, the reference lists of eligible articles were manually searched for additional studies, and snowball searches were conducted on Google Scholar. There were no restrictions regarding the publication period.

Health Sciences Descriptors/Medical Subject Headings (DeCS/MeSH), CINAHL Subject Headings, and Emtree were used to select the articles. To ensure consistency in the searches and avoid potential biases, the subject headings were used individually and combined using the Boolean operators AND and OR, in accordance with the characteristics of each search portal, as outlined in the search strategies described below (Table 1).

Table 1. Search strategies used. Teresina, PI, Brazil, 2026.

Database	Search Strategy
MEDLINE	(((((("surgical wound infection")) OR ("postoperative wound infection")) AND ("infection control")) OR ("infection prevention")) AND ("Perioperative Care")) OR ("Assistance in the Perioperative Phase"))
Web of Science	(((((ALL=("Surgical Wound Infection")) OR ALL=("postoperative wound infection")) AND ALL=("infection control")) OR ALL=("infection prevention")) AND ALL=("Perioperative Care")) OR ALL=("Assistance in the Perioperative Phase"))
SCOPUS	(ALL ("surgical wound infection")) OR (ALL ("postoperative wound infection")) AND (ALL("infection control")) OR (ALL ("infection prevention")) AND (ALL ("Perioperative Care")) OR (ALL ("Assistance in the Perioperative Phase"))
SCIELO	("Infecção da Ferida Cirúrgica") OR ("Surgical Wound Infection") AND ("Controle de Infecções") OR ("Infection Control") AND ("Assistência perioperatória") OR ("Perioperative Care")
CINAHL (EBSCOhost)	("surgical wound infection" OR "postoperative wound infection") AND ("infection control" OR "infection prevention") AND ("perioperative care" OR "nursing care")

Access to the databases was obtained through the Journal Portal of the Coordination for the Improvement of Higher Education Personnel (CAPES), by logging in via the Federated Academic Community (CAFe) of the Federal University of Piauí. Due to the flexibility to incorporate grey literature into the scope reviews, information from four additional sources was considered at this stage: Google Scholar, OpenGrey, ProQuest Dissertations and Theses, and the Institutional Repository for Information Sharing.

All duplicate articles were removed using Rayyan and manually by the reviewers. The full text was consulted whenever necessary for additional clarification during the eligibility and data extraction stages. In cases where the full text of an article was not available in the databases initially accessed, additional attempts were made to obtain it through the CAPES Journal Portal, searches in other indexing databases and institutional repositories, as well as by contacting university libraries and/or corresponding authors, when possible. When, even after these attempts, the full text remained inaccessible, the study was excluded from the review due to the impossibility of conducting a methodological

evaluation and adequately extracting the necessary information.

Data extraction was performed using a Microsoft Excel® spreadsheet. The information extracted included: year of publication, country, population, study size, the most effective measures for preventing surgical site infections, temporal analysis, and identified gaps.

RESULTS AND DISCUSSION

Database searches yielded 4,297 articles, of which 3,273 were included in the sample after removing 1,024 duplicate publications. After reviewing the titles and abstracts, 3,120 publications that did not address the research question were excluded. Thus, 154 studies were eligible for full-text review. After a thorough review, 135 studies were excluded: 103 because they did not address the research question and 32 because the full text was inaccessible. At the end of the process, 18 studies comprised the final sample. The complete selection process is described below.

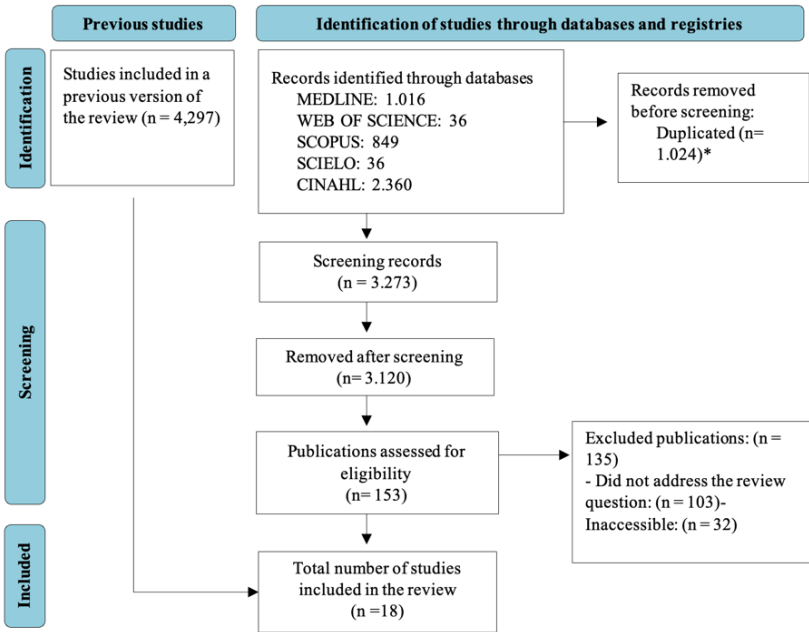


Figure 1. Flowchart based on the criteria of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews, 2020. Teresina, PI, Brazil, 2026.

The table below presents the distribution and summary of the included studies by year of publication, database, study population and sample size, instruments

used in perioperative care, and other variables that identified which measures have become more effective in preventing surgical site infections.

Table 2. Characteristics of the studies included in the review. Teresina, PI, Brazil, 2026.

Code /year /country	Study Design/Population and Sample	Effective measures identified
A4 ¹¹ 2000 USA	A randomized (double-blind) clinical trial involving 500 randomly selected patients, who received either 30% or 80% oxygen during surgery and for two hours afterward.	Administering supplemental oxygen during the perioperative period.
A8 ¹² 2005 Brazil	A retrospective study of 468 patients who underwent coronary artery bypass grafting with cardiopulmonary bypass.	Appropriate timing for hair removal; antimicrobial prophylaxis; no jewelry; proper use of surgical masks; and professional training and education.
A1 ¹³ 2006 United States of America (USA)	Case Study / Institutional Intervention ("Save 100,000 Lives" Campaign). Hospitals in the state of Wyoming (8 hospitals currently participating in the campaign).	Administration of prophylactic antibiotics up to 1 hour before the incision and discontinuation within 24 hours after surgery; Proper hair removal; Glycemic control; Maintenance of normothermia during the perioperative period (warming with forced-air blankets, warmed fluids, and the use of conductive caps and boots); and adherence to international guidelines.
A9 ¹⁴ 2011 Brazil	A total of 29 healthcare professionals were evaluated using the glove swab method to collect microorganisms before and after each tested procedure.	Wash hands with soap and water and an antiseptic, and then apply alcohol-based chlorhexidine.
A2 ¹⁵ 2018 USA	Letter to the Editor (institutional report); no sample size is reported.	Proper drainage management, skin antisepsis, prophylactic antibiotics, hand hygiene, and the use of hydrocolloid dressings for drains in high-risk patients.
A7 ¹⁶ 2018 Brazil	An observational, retrospective study conducted at a general hospital. Sample consisting of 15,319 records of clean surgeries in the specialties of trauma and orthopedics, cardiovascular surgery, plastic surgery, general surgery, and urology.	Implementation of the checklist proposed by the World Health Organization.
A17 ¹⁷ 2019 England	Reflective Lifeworld Research approach, which is grounded in phenomenology. Involving operating room nurses with at least one year of clinical experience. 15 participants from seven hospitals.	Adherence to aseptic techniques, active monitoring of the sterile field, attention to detail, and proper team conduct.
A5 ¹⁸ 2020 USA	A randomized clinical trial used 2%/70% chlorhexidine isopropyl alcohol or alcohol-free ZuraGard on the abdominal and groin areas.	ZuraGard was effective in significantly reducing the microbial load at the abdominal and inguinal test sites, outperforming Chloraprep.
A15 ¹⁹ 2020 England	A Delphi study identified and prioritized topics for the development of international guidelines.	Full-body wash with soap and water before surgery; antibiotic prophylaxis based on the pathogen and surgical site; IV administration of antibiotics ≤ 60 min before the incision; intraoperative re-dosing if the duration exceeds the drug's half-life; do not continue prophylactic antibiotics for more than 24 hours after surgery; hand antisepsis with an appropriate solution; skin preparation with an antiseptic before the incision; intraoperative oxygen supplementation.
A16 ²⁰ 2020 USA	A quasi-experimental study of patients undergoing spinal surgery. 139 patients (62 in the pre-intervention group and 77 in the post-intervention group).	OPSITE Post-Op Visible dressing; antisepsis with alcohol-based chlorhexidine; hair removal with clippers; antibiotics as per protocol; glycemic control, normothermia, early mobilization (24–48 hours); education and ongoing feedback to the team.
A3 ²¹ 2021 USA	A pragmatic, multicenter, randomized clinical trial involving 3,000 patients undergoing elective abdominal surgery.	Inclusion of an intraoperative care package consisting of oxygen; fluid therapy; warming during the perioperative period; glycemic control; and wound irrigation with an aqueous antiseptic prior to closure.
A13 ²² 2021 USA	204 patients undergoing elective colorectal resection (100 in the OIVA group—oral antibiotic plus IV; 104 in the IVA group—IV only).	OIVA: Neomycin + Bacitracin 24, 16, and 8 hours before surgery + IV Amoxicillin/Clavulanate at induction; IVA: IV antibiotics only; clinical follow-up for up to 30 days with in-person and outpatient evaluations.
A14 ²³ 2021 USA	A systematic review of guidelines for the prevention, detection, and management of surgical site gastrointestinal infections.	Use of sutures with an antimicrobial coating; avoid mechanical preparation of the colon alone; combine with oral antibiotics; use alcohol-based chlorhexidine for skin antisepsis; avoid the use of drains after gastrectomy, cholecystectomy, and hepatectomy without biliary reconstruction.
A12 ²⁴ 2022 England	An institutional intervention using infection prevention bundles involving seven English hospitals. The surgical site infection rate was recorded from November 2019 to May 2020, within 30 days of the infection, using the Public Health England questionnaire.	A 50% reduction in the infection rate following the implementation of a specialized care package.
A6 ²⁵ 2023 Brazil	A cross-sectional observational study conducted at 30 large hospitals in the state of Minas Gerais.	Staff training; institutional protocols; antibiotic therapy administered within the recommended timeframe; and the use of an electric trichotome.
A11 ²⁶ 2023 USA	A prospective, multicenter, pre- and post-intervention study conducted at eight Swiss acute-care hospitals between 2013 and 2020. 10,151 patients (>18 years of age) who underwent cardiac surgery, colon surgery, or hip/knee arthroplasty.	Proper skin antisepsis (three applications); perioperative antimicrobial prophylaxis; compliance checklist; on-site visits; continuous national surveillance; statistical models adjusted for risk factors.
A10 ²⁷ 2024 USA	Retrospective cohort study of 6,059 surgical procedures (2017–2020): Pre-bundle: 2,010; Post-bundle: 4,049.	Full adherence to the four-component bundle: prophylactic antibiotics, glycemic control (<180 mg/dL), preoperative skin preparation, and maintenance of body temperature ≥36°C.
A18 ²⁸ 2024 USA	No study population or sample—experts in the field were consulted to translate guidelines for reducing surgical site infections.	Antibiotic therapy; treatment of nasal Staphylococcus aureus infection; maintenance of the glycemic index and maintenance of normal body temperature.

The 18 included studies revealed a diverse set of strategies employed by multidisciplinary teams during the perioperative period, with a focus on preventing surgical site infections. Analysis of the final sample revealed that the effectiveness of preventive measures is not uniform, varying substantially depending on the type of procedure, the surgical site, and the potential for contamination during surgery. The evidence focused primarily on three areas: (1) aseptic practices and environmental control; (2) rational use of antimicrobials; and (3) educational interventions and standardized protocols.

The first topic highlights the importance of proper hand hygiene, patient skin antisepsis, and trichotomy using the appropriate technique, which is particularly emphasized in the preoperative period.^{14–15,17} Therefore, ensuring that healthcare professionals practice hand hygiene at the five key moments, as recommended by the World Health Organization, is a key measure for reducing the incidence of healthcare-associated infections, since these account for 80% of hospital-acquired infections.^{15,29}

In the intraoperative setting, adherence to aseptic technique is strict and varies depending on the surgery's potential for contamination. All professionals working in the operating room must perform hand disinfection prior to the anesthetic-surgical procedure, with the aim of eliminating transient microbiota and reducing resident microbiota.¹⁴ For surgical site preparation, the results reinforce that alcohol-based solutions are highly effective in reducing the microbial load. However, since alcohol alone lacks a residual effect, its combination with chlorhexidine gluconate is the strategy that offers the greatest efficacy and antimicrobial persistence.^{19,23}

There is also a difference in appropriate management depending on the contamination risk and type of surgery. In clean surgeries (cardiac and orthopedic), the primary focus is on preoperative decolonization with up to five days of intranasal mupirocin (twice daily) and chlorhexidine baths, due to the risk associated with *Staphylococcus aureus*.^{28,30} For potentially contaminated surgeries (gastrointestinal/colorectal), the key strategy is the combination of oral and intravenous antibiotics, in addition to avoiding the unnecessary use of drains and isolated mechanical preparations.^{21,23}

With regard to the surgical site, there is a difference in management between spinal surgeries (use of special dressings and early mobilization) and elective abdominal surgeries (focus on oxygen therapy and fluid therapy).^{21–23} Nevertheless, the surgical team must follow biosafety protocols regarding the proper use of personal protective equipment and the preparation of the sterile surgical field to prevent cross-contamination.¹² For environmental control, consideration should be given to surface cleaning, air monitoring, restricting the movement of people in critical and semi-critical areas,

as well as scheduling disinfection days for equipment and operating rooms.^{12,16}

In accordance with aseptic principles, the operating room must operate under positive pressure relative to adjacent areas, which prevents the entry of contaminated air from outside. The efficiency of this system depends on high-efficiency filters, with a recommended filtration efficiency of 90% or higher, which are essential for removing airborne particles and pathogens. However, the effectiveness of these physical barriers must be complemented by measures that vary according to the complexity and contamination potential of the surgery, such as strict restrictions on the movement of people and ongoing staff training in biosafety.^{13,17} Added to this are strategies to optimize the patient's tissue oxygenation, such as maintaining an adequate fraction of inspired oxygen (FiO₂), which works in synergy with the controlled environment to mitigate the risk of postoperative infection.¹⁹

The second topic highlights that surgical antibiotic prophylaxis is an essential measure for preventing surgical site infections, which hinges on drug selection, including the correct timing of administration and the appropriate duration of therapy.^{19,22} According to international guidelines, in clean surgeries, such as cardiac and orthopedic procedures, the focus is on preventing *Staphylococcus aureus* infections, often using first- or second-generation cephalosporins.¹⁶ In spinal procedures, however, antimicrobial prophylaxis should be integrated into a comprehensive care package that includes glycemic control and normothermia to ensure the effectiveness of the chemical barrier established by the drug.^{20,23}

For potentially contaminated or contaminated procedures, such as colorectal resections and gastroenterological surgeries, the literature recommends a combined approach to cover the gut microbiota. In these cases, the most effective strategy demonstrated involves the combination of oral antibiotics (such as neomycin and bacitracin) administered beforehand, along with intravenous antibiotic therapy (such as amoxicillin/clavulanate) during anesthetic induction.^{21–22} Regardless of the type of surgery, administration must occur without fail between 30 and 60 minutes before the incision to ensure therapeutic serum levels, with discontinuation within 24 hours to prevent the development of antimicrobial resistance.^{24,34}

Despite the clarity of the evidence, adherence to safe practices for the rational use of antimicrobials remains a challenge for healthcare institutions due to communication breakdowns among teams and the absence of standardized processes.^{27,31} To address this gap, the use of tools such as the Safe Surgery Checklist proposed by the WHO is a high-impact strategy,¹⁶ since it has been associated with a reduction in the surgical site infection rate in clean surgeries from 4.17% to

1.10%. This is because it requires that, during the safety pause before the incision, the team verbally confirm whether “antimicrobial prophylaxis was administered within the last 60 minutes,” creating a safety net that minimizes the chance of omission.¹³

Although antibiotic prophylaxis is the cornerstone, perioperative physiological measures are crucial. Glycemic control (maintaining blood glucose levels <180 mg/dL) and maintaining normothermia ($\geq 36^{\circ}\text{C}$ using warming blankets and warmed fluids) are essential components of care bundles that reduce the inflammatory response and optimize healing.^{21,27} Additionally, optimizing the inspired fraction of supplemental oxygen during the perioperative period and for the subsequent two hours has been shown to be an effective intervention for reducing infections in abdominal procedures and revascularization surgeries.^{26–28}

The third topic shows that most studies identified shortcomings related to partial adherence or inconsistency in the application of protocols, and the involvement of teams, particularly nursing staff, in preventive practices is crucial, given that nursing staff were mentioned in 78% of the analyzed studies, making them key players in the early detection of signs of infection.^{24–26}

Strategies such as continuous monitoring of indicators, internal audits, and periodic training have been recognized as effective interventions for improving care.³² Despite advances in technology and guidelines, Brazilian institutions still face difficulties in adhering to the recommendations. International studies tend to present more structured and integrated protocols, whereas national studies show greater variability in practices and a lack of systematic monitoring.^{33–35}

Regarding the temporal analysis, the timeline was defined based on the evolution in the complexity and scope of the interventions identified: between 2000 and 2006, the focus was on isolated measures and one-off interventions, such as supplemental oxygen therapy, antimicrobial prophylaxis, and proper hair removal. Clinical trials and initial institutional reports predominated during this period. Between 2011 and 2018, there was an expansion toward organizational practices (checklists, bundles, and training) and the evaluation of the effectiveness of specific methods, such as hand antisepsis and specialized dressings.^{11–16}

Starting in 2019–2021, these measures were consolidated through care bundles to achieve measurable clinical outcomes and increase productivity in studies with high methodological quality. During the years 2022–2024, emphasis was placed on multicenter programs, internal and external institutional audits, large-scale impact assessments, and the adaptation of international guidelines to specific contexts.^{17–28}

Regarding the identified gaps, based on a full-text analysis of the final sample, there are few published Latin American studies, with a predominance of research from the U.S. and Europe, demonstrating a lack of data from developing countries. Within the search strategy employed, no study presented a detailed economic analysis of the interventions. Some studies show better outcomes in certain surgeries without exploring the reasons for these variations in depth.

Post-discharge monitoring remains insufficient, as most studies do not describe in detail postoperative surveillance strategies for the late detection of surgical site infections. Although institutions have protocols and bundles in place, few articles systematically and comparatively measure adherence. Finally, studies with short follow-up periods predominate.

A temporal analysis of studies covering the period from 2000 to 2024 reveals the evolution of strategies for preventing surgical site infections, which shifted from isolated, ad hoc measures, such as supplemental oxygen therapy and antimicrobial prophylaxis in the early 2000s, to comprehensive care approaches and structured protocols beginning in 2011, such as proper hand hygiene, disinfection of the surgical environment, and specialized dressings.^{11–15}

In Brazil, efforts to control and prevent hospital-acquired infections began to be regulated by a 1983 Ministry of Health ordinance, which established guidelines for the control of hospital-acquired infections, and the National Program for the Control of Hospital Infections was transferred from the Ministry of Health to the National Health Surveillance Agency, which was created in 2004 to work through guidelines and protocols in hospitals to ensure patient safety.^{6,10}

Between 2019 and 2021, complex care bundles were implemented, with a focus on measurable clinical outcomes.²¹ In more recent years, from 2022 to 2024, key developments included the implementation of standardized strategies in hospital networks, systematic compliance audits, and the adaptation of international guidelines to specific contexts, leading to greater integration between scientific evidence and clinical practice.^{24,26}

In Brazil, these practices are adapted to local realities, always in line with national and international guidelines,^{2–4} as they require adherence to rigorous protocols, such as hand hygiene, the use of personal protective equipment, the disinfection of surfaces and devices, and constant epidemiological surveillance, in addition to investing in continuing education for staff, fostering a culture of safety with zero tolerance for noncompliance, and utilizing technologies for monitoring and data analysis.^{6,10}

Regarding the identified gaps, despite advances in the prevention of surgical site infections, weaknesses in the literature persist. The scarcity of Brazilian studies in the

final sample, despite searches in regional databases such as SciELO, reflects a methodological gap in national scientific output. While international studies (from the U.S. and the U.K.) focus on multicenter programs and systematic audits, Brazilian publications still show a high degree of variability in practices and lack systematic long-term monitoring that meets the rigorous inclusion criteria for systematic reviews. Furthermore, low institutional adherence to standardized protocols in Brazil hinders the generation of robust data suitable for publication in high-impact journals.

Few studies explore the cost-effectiveness of interventions, making it difficult to make decisions based on economic impact. Post-discharge monitoring remains insufficiently detailed, limiting the detection of late-onset infections. Furthermore, although protocols and bundles are widely cited, the measurement of actual staff adherence to preventive measures is rare, and when present, it is not analyzed comparatively. Finally, there is a lack of longitudinal studies evaluating the sustainability of outcomes over longer periods.

The analysis of the articles prompted reflection on the care being provided both internationally and nationally; however, when viewed comparatively, there are still many shortcomings in the care process in Brazil. Furthermore, it is relevant to patient care as it highlights the main measures and strategies for preventing surgical site infections through the development of collaborative practices, with the aim of ensuring that patients receive more personalized and patient-centered care, thereby meeting the patient safety indicator for safe surgery.

Among the limitations, there were 1,024 duplicate articles, which considerably reduced the number of articles to be analyzed, in addition to original articles containing manipulated peer-reviewed data and data inconsistencies. Another limiting factor was the inclusion of studies available via open access on the CAPES journal portal, as full access to these required payment. Furthermore, there are few original articles that provide concrete evidence of effective measures being implemented across an entire hospital setting; rather, they focus on specific medical specialties. Given this, it is important to conduct in-depth research on an entire hospital and explore methods for preventing surgical site infections.

CONCLUSION

The results indicate that evidence-based strategies, combined with advanced technology and multidisciplinary approaches, have been shown to significantly reduce mortality rates, length of hospital stay, and the impact of long-term complications related to surgical site infections. In addition, another key factor in prevention is linked to continuing education and the

challenge of adhering to institutional protocols and specialty-specific care for each surgical specialty.

Furthermore, the articles in the final sample highlighted important gaps that need to be studied over a longer period of time, with a focus on studies in developing countries, post-discharge monitoring to detect late-onset infections, and measuring staff adherence to institutional protocols.

REFERENCES

1. Brasil. Ministério da Saúde (BR). Agência Nacional de Vigilância Sanitária. Orientações para a notificação dos indicadores nacionais das infecções relacionadas à assistência à saúde e resistência aos antimicrobianos [Internet]. Brasília (DF): Agência Nacional de Vigilância Sanitária; 2025. Available from: <https://www.gov.br/anvisa/pt-br/centraisdeconteudo/publicacoes/servicosdesaude/notas-tecnicas/notas-tecnicas-vigentes/nota-tecnica-gvims-ggtes-dire3-anvisa-no-02-2025>.
2. World Health Organization (WHO). Global Guidelines for the Prevention of Surgical Site Infection [Internet]. 2ª ed. Geneva: WHO; 2018. Available from: https://wkc.who.int/resources/publications/i/item/global-guidelines-for-the-prevention-of-surgical-site-infection-2nd-ed?utm_source.
3. Berrios-Torres SI, Umscheid CA, Bratzler DW et al. Centers for Disease Control and Prevention Guideline for the Prevention of Surgical Site Infection, 2017. *JAMA Surg.* 2017;152(8):784–791. doi: <https://doi.org/10.1001/jamasurg.2017.0904>.
4. National Institute for Health and Care Excellence (NICE). Surgical site infections: prevention and treatment. NICE guideline NG125. London: NICE; 11 April 2019. Available from: https://www.nice.org.uk/guidance/NG125?utm_source.
5. Santos EV, Souza MJ, Lima AP et al. Infecções de feridas pós-cesáreas e os cuidados de enfermagem: uma revisão da literatura. *Rev Ibero-Am Humanid Ciênc Educ.* 2023;9(11):3764-73. doi: <https://doi.org/10.36489/nursing.2022v25i290p8207-8220>.
6. Brasil. Ministério da Saúde (BR). Agência Nacional de Vigilância Sanitária. Programa Nacional de Prevenção e Controle de Infecções Relacionadas à Assistência à Saúde (PNPCIRAS) 2021-2025 [Internet]. Brasília: ANVISA; 2021. Available from: https://www.gov.br/anvisa/pt-br/centraisdeconteudo/publicacoes/servicosdesaude/publicacoes/pnpciras_2021_2025.pdf.
7. United Nations. Transforming our world: the 2030 Agenda for Sustainable Development [Internet]. New York: UN; 2015. Available from: <https://sdgs.un.org/2030agenda>.
8. Aromataris E, Lockwood C, Porritt K et al. editors. JBI Manual for Evidence Synthesis. JBI; 2024. Available from: <https://jbi-global-wiki.refined.site/space/MANUAL>.
9. Page MJ, McKenzie JE, Bossuyt PM et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews *BMJ* 2021; 372. n71 doi: <https://doi.org/10.1136/bmj.n71>.
10. Brasil. Ministério da Saúde (BR). Agência Nacional de Vigilância Sanitária. Medidas de prevenção de infecção relacionada à assistência à saúde [Internet]. 2017. Available from: <https://www.gov.br/anvisa/pt-br/centraisdeconteudo/publicacoes/servicosdesaude/publicacoes/cader-no-4-medidas-de-prevencao-de-infeccao-relacionada-a-assistencia-a-saude.pdf/view>.
11. Greif R, Akça O, Horn EP et al. Outcomes Research Group. Supplemental perioperative oxygen to reduce the incidence of surgical-wound infection. *N Engl J Med.* 2000;342(3):161-7. doi: <https://www.nejm.org/doi/full/10.1056/NEJM200001203420303>.
12. Antoniali F, Costa CE, Tarelho LS et al. The impact of new preventive measures and treatment of surgical site infections after coronary artery bypass graft surgery. *Braz J Cardiovasc Surg.*

2005;20(4):382-91. doi: <https://doi.org/10.1590/S0102-76382005000400006>.

13. Gilson D. Prevention of surgical site infections: "Save 100,000 Lives Campaign". Wyoming Nurse. 2006;6:6. doi: [https://doi.org/10.1016/S1553-7250\(06\)32080-6](https://doi.org/10.1016/S1553-7250(06)32080-6).

14. Cunha ER, Matos FGOA, Silva A et al. The efficacy of three hand asepsis techniques using chlorhexidine gluconate (GCH 2%). Rev Esc Enferm USP. 2011;45(6):1440-5. doi: <https://doi.org/10.1590/s0080-62342011000600023>.

15. Orth K. Preventing surgical site infections related to abdominal drains in the intensive care unit. Crit Care Nurse. 2018;38(4):20-6. Doi: <https://doi.org/10.4037/ccn2018254>.

16. Prates CG, Stadnik CMB, Bagatini A et al. Comparison of surgical infection rates after implementation of a safety checklist. Acta Paul Enferm. 2018;31(2):116-22. doi: <https://doi.org/10.1590/1982-0194201800018>.

17. Qvistgaard M, Lovebo J, Almerud-Österberg S. Intraoperative prevention of surgical site infections as experienced by operating room nurses. Int J Qual Stud Health Well-being. 2019;14(1):1632109. doi: <https://doi.org/10.1080/17482631.2019.1632109>.

18. Edmiston CE Jr, Lavin P, Spencer M et al. Antiseptic efficacy of an innovative perioperative surgical skin preparation: a confirmatory FDA phase 3 analysis. Infect Control Hosp Epidemiol. 2020;41(6):653-9. doi: <https://doi.org/10.1017/ice.2020.27>.

19. National Institute for Health Research Global Research Health Unit on Global Surgery. Delphi prioritization and development of global surgery guidelines for the prevention of surgical-site infection. Br J Surg. 2020;107(8):970-7. doi: <https://doi.org/10.1002/bjs.11530>.

20. Castellà L, Sopena N, Rodriguez-Montserrat D et al. Intervention to reduce the incidence of surgical site infection in spine surgery. Am J Infect Control. 2020;48(5):550-4. doi: <https://doi.org/10.1016/j.ajic.2019.09.007>.

21. Jonge SW, Wolfhagen N, Zwinderman AH et al. Enhanced perioperative care and health protection programme for the prevention of surgical site infections after elective abdominal surgery (EPO2CH): statistical analysis plan of a randomised controlled multicentre superiority trial. Trials. 2021;22(1):297. doi: <https://doi.org/10.1186/s13063-021-05202-y>.

22. Arezzo A, Mistrangelo M, Bonino MA et al. Oral neomycin and bacitracin are effective in preventing surgical site infections in elective colorectal surgery: a multicentre, randomized, parallel, single-blinded trial (COLORAL-1). Updates Surg. 2021;73:1775-86. doi: <https://doi.org/10.1007/s13304-021-01112-5>.

23. Ohge H, Mayumi T, Haji S et al. The Japan Society for Surgical Infection: guidelines for the prevention, detection, and management of gastroenterological surgical site infection, 2018. Surg Today. 2021;51:1-31. doi: <https://doi.org/10.1007/s00595-020-02181-6>.

24. Clayphan B, Dixon L, Biggs S et al. PreciSSIon Collaborators. PreciSSIon: a collaborative initiative to reduce surgical infections after elective colorectal surgery. J Hosp Infect. 2022;130:131-7. doi: <https://doi.org/10.1016/j.jhin.2022.08.012>.

25. Araújo BS, Oliveira AC. Compliance with surgical site infection prevention measures in hospitals. Acta Paul Enferm. 2023;36:eAPE01714. doi: <https://doi.org/10.37689/actaape/2023AO017134>.

26. Eder M, Sommerstein R, Szelecsenyi A et al. Association between the introduction of a national targeted intervention program and the incidence of surgical site infections in Swiss acute care hospitals. Antimicrob Resist Infect Control. 2023;12(1):134. doi: <https://doi.org/10.1186/s13756-023-01336-7>.

27. Chien Y, Lin J, Yeh C et al. Effect of standardized bundle care and bundle compliance on reducing surgical site infections: a pragmatic retrospective cohort study. Med Sci Monit. 2024;30:e943493-1. doi: <https://doi.org/10.12659/msm.943493>.

28. Crisafí C, Grant MC, Rea A et al. Enhanced recovery after surgery cardiac society turnkey order set for surgical-site infection prevention: Proceedings from the American Association for Thoracic Surgery ERAS Conclave 2023. J Thorac Cardiovasc Surg. 2024;168(5):1500-9. doi: <https://doi.org/10.1016/j.jtcvs.2024.03.027>.

29. Brasil. Ministério da Saúde (BR). Agência Nacional de Vigilância Sanitária. Higiene das mãos. [Internet]. 2024. Available from: <https://www.gov.br/anvisa/pt-br/centraisdeconteudo/publicacoes/servicosdesaude/manuais/cadernos-de-seguranca-do-paciente-e-qualidade-em-servicos-de-saude-2024-versoes-preliminares-nao-finalizadas-aguardando-o-envio-de-sugestoes/caderno-12-higiene-das-maos-nov-2024-assistencia-segura-nov-2024-versao-preliminar-nao-finalizada-aguardando-o-envio-de-sugestoes/view>.

30. Pop-Vicas A, Safdar N. Preoperative decolonization as a strategy to reduce surgical site infection. Curr Infect Dis Rep. 2019;21:35. doi: <https://doi.org/10.1007/s11908-019-0692-7>.

31. Agodi A. Principles of infection prevention and control in surgery. In: Bartoli S, Cortese F, Sartelli M, Sganga G, editors. Infections in Surgery. Cham: Springer; 2025. p. 37-46. doi: https://doi.org/10.1007/978-3-031-60462-1_5.

32. Oliveira MC, Dalcól C, Carvalho REFL et al. Patient participation in surgical site infection prevention: perceptions of nurses, physicians and patients. Rev Esc Enferm USP. 2023;57:e20220459. doi: <https://doi.org/10.1590/1980-220X-REEUSP-2022-0459en>.

33. Wolfhagen N, Boldingh QJJ, Boormeester MA et al. Perioperative care bundles for the prevention of surgical-site infections: meta-analysis. Br J Surg. 2022;109(10):933-42. doi: <https://doi.org/10.1093/bjs/znac196>.

34. Seidelman JL, Mantyh CR, Anderson DJ. Surgical site infection prevention: a review. JAMA. 2023;329(3):244-52. doi: <https://doi.org/10.1001/jama.2022.24075>.

35. Sara CC, Andrew JJ, Galen P, Peter N. Surgical care bundles for surgical site infection prevention in high-income and low-to-middle-income countries: A comparative review, Perioperative Care and Operating Room Management. 2024;35-100406, ISSN 2405-6030. Doi: <https://doi.org/10.1016/j.pcorm>.

AUTHORS' CONTRIBUTIONS

Mayara Callado Silva Moura contributed to the contextualization of the problem and the method. **Mayara Callado Silva Moura; Andressa Maria de Sousa Moura; Ana Carolina de Macêdo Lima; Olga Maria Castro de Sousa; Sannya Paes Landim Brito Alves; Luana Bastos Araújo** contributed to the interpretation of the data; critical review of the intellectual content and discussion. **Mayara Callado Silva Moura; Odineá Maria Amorim Batista** contributed to ensuring the accuracy and completeness of any part of the manuscript and reviewed it for final approval of the version to be published.

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

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