

# Nursing care technologies in intensive care units in the context of surgical site infection

## Tecnologias de cuidados de enfermagem em unidade de terapia intensiva no contexto da infecção de sítio cirúrgico

## Tecnologías de cuidados de enfermería en unidades de cuidados intensivos en el contexto de la infección del sitio quirúrgico

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# REVISA

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### RESUMO

**Objetivo:** explicar as tecnologias de cuidados utilizadas pelos enfermeiros intensivistas na prevenção de ISC e no tratamento de feridas operatórias infectadas. **Método:** revisão integrativa da literatura com abordagem descritiva exploratória e natureza qualitativa. Os descritores “Tecnologias em saúde”, “Tecnologias de cuidado em Enfermagem”, “Enfermagem”, “Enfermeiro intensivista”, “Unidade de Terapia Intensiva”, “Infecção de Sítio Cirúrgico”, “Ferida operatória infectada” e “Infecção de ferida cirúrgica”, foram explorados em bancos de dados virtuais. A partir da análise dos dados foram criadas duas categorias para realização da análise temática. **Resultados:** Após a análise, doze artigos foram selecionados. Ressaltou-se a relevância da lista de verificação de cirurgia segura, classificada como tecnologia em saúde leve – dura, ser atendida pelos profissionais de enfermagem, a fim de prevenir as ISC. O estudo apresentou dados corroborando a redução do número de ocorrências diante da observância do checklist de segurança cirúrgica ao constatar, portanto, a eficiência preventiva dessa tecnologia. **Conclusão:** destaca-se a necessidade de pesquisas voltadas a atuação do enfermeiro intensivista na utilização de tecnologias de cuidados em saúde classificadas como dura, junto a metodologias de pesquisas mais confiáveis.

**Descritores:** Enfermagem; Infecção da Ferida Cirúrgica; Unidade de Terapia Intensiva.

### ABSTRACT

**Objective:** to explain the care technologies used by intensive care nurses in the prevention of SSI and in the treatment of infected surgical wounds. **Method:** integrative literature review with exploratory descriptive approach and qualitative nature. The descriptors "Health Technologies", "Nursing Care Technologies", "Nursing", "Intensive Care Nurse", "Intensive Care Unit", "Surgical Site Infection", "Infected Surgical Wound" and "Surgical Wound Infection", were explored in virtual databases. From the data analysis, two categories were created to perform the thematic analysis. **Results:** After the analysis, twelve articles were selected. The relevance of the safe surgery checklist, classified as light health technology – hard, was emphasized, being attentive by nursing professionals, in order to prevent SAIs. The study presented data corroborating the reduction in the number of occurrences in view of the observance of the surgical safety checklist, thus verifying the preventive efficiency of this technology. **Conclusion:** we highlight the need for research focused on the role of intensive care nurses in the use of health care technologies classified as harsh, together with more reliable research methodologies.

**Descriptors:** Nursing; Surgical Wound Infection; Intensive Care Unit.

### RESUMEN

**Objetivo:** explicar las tecnologías de cuidado utilizadas por las enfermeras de cuidados intensivos en la prevención de la ISQ y en el tratamiento de heridas quirúrgicas infectadas. **Método:** revisión integradora de la literatura con enfoque descriptivo exploratorio y de naturaleza cualitativa. Los descriptores "Tecnologías de la Salud", "Tecnologías de Cuidados de Enfermería", "Enfermería", "Enfermera de Cuidados Intensivos", "Unidad de Cuidados Intensivos", "Infección del Sitio Quirúrgico", "Herida Quirúrgica Infectada" e "Infección de herida quirúrgica", fueron explorados en bases de datos virtuales. A partir del análisis de los datos, se crearon dos categorías para realizar el análisis temático. **Resultados:** Tras el análisis, se seleccionaron doce artículos. Se enfatizó la relevancia de la lista de verificación de cirugía segura, clasificada como tecnología de salud ligera – dura, siendo atenta por los profesionales de enfermería, con el fin de prevenir las EFS. El estudio presentó datos que corroboran la reducción en el número de ocorrências en vista de la observancia de la lista de verificación de seguridad quirúrgica, verificando así la eficiencia preventiva de esta tecnología. **Conclusión:** destacamos la necesidad de investigación centrada en el papel de las enfermeras de cuidados intensivos en el uso de tecnologías de atención médica clasificadas como duras, junto con metodologías de investigación más confiables.

**Descriptores:** Enfermería; Infección de la herida quirúrgica; Unidad de Cuidados Intensivos.

## Introduction

It is common knowledge that Health Care-Related Infections (ARs) correspond to a public health problem, since their incidence in Brazil is 3.4%<sup>1</sup> and still because they are adverse events, whose frequency is related to patient care and is associated with high morbidity and mortality, increased hospitalization period and increased hospital costs.<sup>2</sup>

Among the AIs, surgical site infection (SSI) stands out, which can manifest after surgical procedures, often invasive. In this context, it is understood that in intensive care units (ICU) patients submitted to these procedures are treated and assisted, requiring the nursing team to know about health care technologies, especially in cases involving SSI.<sup>3</sup>

Many risk factors are known in the literature as predisposing to the development of SSI, namely, body mass index (BMI), smoking, video procedures, blood transfusion, non-performing preoperative bath, preexisting chronic disease and the use of alloplastic materials, including the suture, since it has the potential to produce an area of adherence for microorganisms to enter the wound and cause possible infections, the care and attention of the entire multidisciplinary team is necessary in order to avoid or adequately treat surgical wounds affected by infection.<sup>4</sup>

These factors compose the risk index of surgical infection, such as the American Society of Anesthesiologists index (ASA) that classifies patients according to: clinical picture, potential for surgical wound contamination (PCFO), which represents the classification by the surgical team of the surgical wound in relation to the potential presence of microorganisms and the duration of surgery.<sup>5</sup>

For the care of patients with infected surgical wounds, intensive care nurses can appropriate some health technologies such as surgical debridement, antibiotic therapy and dressings, medication administration, the use of Negative Pressure Therapy, ozone therapy and humanized follow-up regarding patient care by nursing professionals.<sup>6</sup>

In the context of Ordinance No. 2,510/GM of December 19, 2010, health technologies (TS) are considered medicines, materials, equipment and procedures, organizational, educational, information and support systems, and care programs and protocols, through which health care and care are provided to the population. These technologies focus on the prevention and treatment of diseases and clinical complications and are categorized as light, light - hard and hard. Light technologies are those that serve as support and education in patient health and also for the training of the nursing team; the mild - hard ones are the ones that refer to the management of care, patient reception, nursing processes and preparation of protocols; and hard technologies are information systems, technological equipment such as machinery, standards and organizational structures.<sup>7</sup>

Thus, The ST can also be classified: 1) managerial, which are a set of theoretical-practical actions to manage health actions and services, whose objective is to intervene in professional practices in order to improve their quality. Examples are manuals, institutional routines, welcoming and bonding; 2) educational, which is understood as a systematic set of scientific knowledge

that allows planning, executing, controlling and monitoring the formal or informal educational process, and favors the construction and reconstruction of knowledge, such as booklets, brochures, videos; 3) care technologies (AT), which represent a set of technical-scientific and systematized, procedural and instrumental knowledge, which enables the promotion of the quality of patient health care (theories and scales).<sup>8</sup>

Assuming that surgical site infection can have repercussions for the patient, which involve the possibility of necrosis, ischemia, increased hospital stay, increased cost, and that the use of health technologies can contribute to nursing care in the ICU5 directed to this public, the question is: what are the care technologies adopted by intensive care nurses that relate to infected surgical wounds?

Considering the importance of health technologies in the prevention and treatment of SAIs, which generate surgical wounds, the study aims to contribute to the dissemination of knowledge about the use of these technologies by assisting intensive care nurses in planning care for these patients, as well as supporting these professionals in interventions for this health problem still frequent in hospital practice, since it has an overall incidence of 1.9%<sup>2</sup> and, in Brazil, an incidence ranging from 1.4% to 38.8% in general and specific surgeries.<sup>1</sup>

In this sense, the aim of the study was to explain the care technologies used by intensive care nurses in the prevention of SSI and in the treatment of infected surgical wounds.

## Method

The research is a bibliographic study of the integrative literature review (IR) with exploratory descriptive approach and qualitative nature, which was carried out during June, July, August and September 2022, whose methodological path was composed of six stages, extracted from the article entitled "Integrative review: research method for the incorporation of evidence in health and nursing", which was elected by the Health Education Center to guide this project, i.e.: (1) Identification of the theme and elaboration of the research question; (2) Establishment of criteria for inclusion and exclusion of studies/sampling or search in the literature; (3) Definition of the information to be extracted from the selected studies (Categorization of the studies); (4) Evaluation of the studies included in the integrative review; (5) Interpretation of the results; (6) Presentation of the review (Synthesis of knowledge).<sup>10</sup> In summary, it is understood that IR is a method, whose purpose is to synthesize results obtained in research on a given theme in an orderly and comprehensive manner.<sup>10</sup>

The research question was elaborated with the application of the ICP strategy (population or problem, phenomenon of interest and context) and had as its main axis the following problematization: what are the health care technologies adopted by the intensive nurse that are related to surgical wounds resulting from surgical site infections? Thus, "P" Technologies were conferred on Health, the "I" Surgical Site Infection and the "co" intensive nurse.

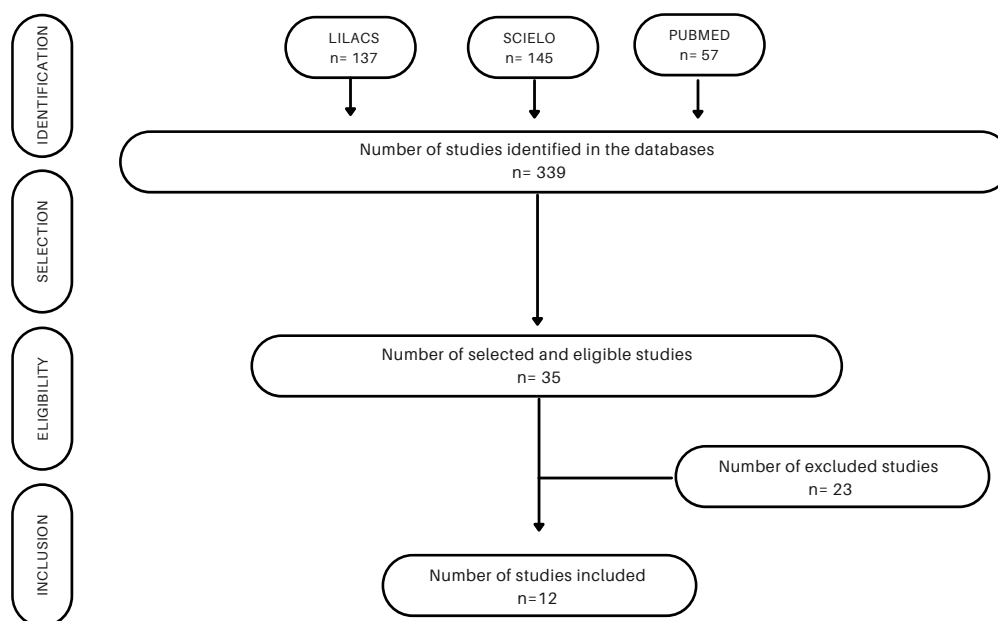
Scientific sources were extracted from the National Library of Medicine and National Institutes of Health (MEDLINE) via Pubmed, Latin American and Caribbean Literature in Health Sciences (LILACS) and the Scientific Electronic

Library Online (SciELO). Advanced search filters were used to select texts published from 2017 to 2021, available in full free of charge, in Portuguese, Spanish and English, with application of controlled descriptors correlating synonyms with the Boolean operator "OR" and/or interconnected by the Boolean operator "AND". The descriptors were selected from the DeCS system (Health Sciences Descriptors), including: "Health Technologies", "Nursing Care Technologies", "Nursing", "Intensive Care Nurse", "Intensive Care Unit", "Surgical Site Infection", "Infected Surgical Wound", "Surgical Wound Infection", which were placed in the database of BIREME Virtual Health Library (VHL). The result of the number of articles found after the combinations of the descriptors was presented.

The inclusion criteria of the sources, in the results and in the discussion, were: original articles published electronically in full, free, in an indexed journal, in the Portuguese, Spanish and English languages, with a time frame of the last 5 years (2017/2021). The results and theoretical discussion, duplicate articles, experience reports, letters, editorials, theses, dissertations, monographs, books and studies not related to the scope were excluded from the results and theoretical discussion.

It was carefully read the titles, keywords and abstracts of the articles found in the databases, evaluating their adequacies within the inclusion criteria for the pre-selection of scientific sources. The selection followed the recommendations of PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses)<sup>10</sup>, as can be seen in Figure 1.

**Figure 1-** Prism diagram concerning the number of articles found, selected, excluded and included in the research.



**Source:** Own elaboration (2022) based on prisma recommendations<sup>10</sup>.

Based on Figure 1, it is observed that, of the 339 articles found in the databases, 35 were selected and eligible, of which 23 were excluded (because they were duplicated or were outside the theme) and 12 were included in the research.

In the Decs Mesh platform, when performing the active search with the interterms, five articles related to the scope of the research for the composition of the present study were selected, which were also available on the VHL platform.

The search strategy involved the presentation of these descriptors, the number of sources found, selected and included in the search, the filters applied and the eligibility criteria, as can be seen in Table 1:

**Table 1-** Search strategies presenting the descriptors, manuscripts found and included, as well as the filters and eligibility criteria applied.

SEARCH STRATEGIES			
Correlated and/or interconnected descriptors	Manuscripts found total	Applying filters + eligibility criteria	Manuscripts included in the review (after full reading)
Health Technologies; Nursing Care Technologies; Nursing; Intensive nurse; Intensive Care Unit; Surgical Site Infection; Surgical wound; Surgical wound; Health Technologies; Nursing care technologies; Nursing; intensive care nurse; Intensive Care Unit; Surgical Infection Site; Operative wound; Surgical wound.	339	Scientific papers. Last five years. Portuguese, Spanish and English. Free full text.	12

The data of the included studies were presented in a word table. The extraction, organization and synthesis of the data were carried out with the aid of its own instrument elaborated for the present research, consisting of: database where the article is indexed; author and year of publication; research objectives; type of study, sample and/or interventions (method); main results; and level of scientific evidence.

For the categorization of the level of evidence, the type of study was considered and the classification of evidence levels according to the Joanna Briggs Institute was used: level I: Evidence of experimental studies – systematic reviews and clinical trials; level II: Evidence of near-experimental studies; III: Evidence of analytical observational studies - cohort and case studies - control; IV: Evidence of descriptive observational studies - cross-sectional studies, case series and case studies; V: Evidence of expert opinion and research bank.<sup>11</sup>

The presentation and discussion of the results was carried out descriptively. For interpretation and analysis, we opted for content analysis associated with thematic categorization. It is understood that the thematic-category analysis of content is divided into three stages: a) pre-analysis, which consists in the election of scientific sources that will be analyzed; b) exploration of the material or codification, step in which the aggregation of the data takes place in smaller units by allowing an accurate description of the characteristics expressed in the sources; c) Treatment of the results - inference and interpretation, which highlights the information contained in the analysis through frequency verification, by enabling the theoretical reconstruction of the data analyzed within elaborated categories.<sup>12</sup>

The articles selected and included in the research after analysis of the content obtained through the search for the descriptors dealt with surgical site

infection and infected surgical wounds in hospitalized patients as well as the related technologies and actions related to nursing care in the Intensive Care Unit.

Based on the analysis performed, it was appropriate to elaborate two categories for theoretical discussion: a) Nursing care technologies in the Intensive Care Unit in the prevention of surgical site infection; b) Nursing care technologies in the Intensive Care Unit in the treatment of infected surgical wounds.

According to the ethical precepts that govern good practices in scientific research, because it is an integrative literature review, the study will not be submitted to the Research Ethics Committee, however, it is noteworthy that all the ideas of the authors contained in the included articles were maintained, being duly referenced.

## Results and Discussion

In this research topic, it is pertinent to present a table describing the sources of the scientific articles selected for the subsequent theoretical discussion and their corresponding objectives, methods, results and level of evidence (Table 2):

**Table 2-** Description of the selected sources for theoretical discussion.

Reference	Objective	Method	Main Results	Evidence	Base
Abbott TEF et al. (2017) <sup>13</sup>	To analyze the surgical safety checklist and the results of icu patients after surgery.	Prospective analysis of data from the International Surgical Outcomes Study (ISOS). This is an international observational study of elective surgery in hospitalized patients, accompanied by meta-analysis of the published literature.	They included 44,814 patients from 497 hospitals in 27 countries in the ISOS analysis. There were 40,245 (89.8%) patients exposed to the checklist, while 7,508 (16.8%) suffered $\geq 1$ postoperative complications and 207 (0.5%) died before hospital discharge. Exposure to the checklist was associated with a reduction in mortality ratio (OR) 0.49 (0.32–0.77); $P < 0.01$ , but with no difference in complication rates [OR 1.02 (0.88–1.19); $P = 0.75$ ]. Exposure to the checklist was associated with reduced postoperative mortality [OR 0.75 (0.62–0.92); $P < 0.01$ ; $I^2 = 87\%$ ] and reduced complication rates [OR 0.73 (0.61–0.88); $P < 0.01$ ; $I^2 = 89\%$ ].	IV	BVS MEDLINE
Freitas OS et al. (2021) <sup>14</sup>	Identify the benefits of using Dialquil Carbamoil for the treatment of biofilms in surgical wounds.	Evaluation of the benefits of the use of Carbamoil Alquilate Chloride in the treatment of infected surgical	It showed that Dialquil chloride has no adverse effects, making it viable and safe for chronic, acute and mainly infected complications.	I	BVS LILACS BDENF

		injuries in surgical patients.			
Chini LR et. Al. (2017) <sup>15</sup>	Analyze the use of Aloe vera in the healing of acute and chronic wounds.	Integrative review carried out in lilacs, pubmed and scopus databases, from February to March 2015. The search resulted in 178 publications.	It was evidenced that Aloe vera promotes wound healing, in addition to reducing pain in chronic fissures and burns. Aloe vera represents a new therapy in the treatment of wounds, however the available evidence on its efficacy and safety is insufficient to legitimize its use in the healing of acute and chronic wounds; therefore, they cannot be generalized.	I	BVS SCIELO BDENF
Silva MMP et al. (2017) <sup>16</sup>	To analyze the effects of nanoparticle-based dressings on the treatment of surgical wounds.	Systematic review through the selection and evaluation of sources regarding the level of evidence by the application of STROBE.	The research pointed out that the dressings based on nanoparticles increased the healing speed, had good antibacterial capacity and were not cytotoxic, and were therefore very promising, since it is a great therapeutic option in the treatment of infected surgical wounds and in their healing	I	BVS LILACS
Gomes IT et al. (2020) <sup>17</sup>	To analyze the nursing interventions useful for the prevention of dehiscence shrecesing in surgical wounds.	Meta-analysis of nursing actions aimed at preventing Dehiscences in Surgical Wounds.	The research found that the main nursing actions to prevent dehiscence in surgical wounds are associated with the prevention of surgical site infections and the indication and use of vacuum coverage therapy.	I	BVS SCIELO BDENF
Spira JA et al. (2019) <sup>18</sup>	To analyze the clinical configurations of the complex surgical wound in the breast and abdomen in hospitalized patients.	Observational case-control study involving 327 patients, 160 cases (complex surgical wound) and 167 controls (simple surgical wound).	The factors associated with a higher chance of occurrence of the complex surgical wound were age range 18 to 59 years ( $p = 0.003$ ), $< 8$ years ( $p = 0.049$ ), radiotherapy ( $p < 0.001$ ), hysterectomy ( $p = 0.017$ ), hernioplasty ( $p = 0.003$ ), laparotomy ( $p = 0.004$ ), glycemia $\leq 99$ mg/dL ( $p = 0.007$ ) and arterial hypertension ( $p = 0.033$ ), while quadrantectomy ( $p = 0.025$ ) acted as a protective	III	BVS LILACS

			factor. Conclusion: radiotherapy was the factor with greater significance for surgical wound complications. Glycemic alteration was an unexpected result, which shows the need for further studies related to this theme.		
Orth K et al. (2018) <sup>19</sup>	Prevention of surgical site infections related to abdominal drains in the Intensive Care Unit	Observational study related to drainage management in intensive care unit patients who are at risk of infection because of their immunocompromised state.	The study found that nursing interventions have reduced the incidence of infections at the surgical site, especially with regard to the management of post-surgical abdominal drains in the ICU.	IV	BVS MEDLINE
Caruso T et al. (2019) <sup>20</sup>	Develop a pediatric SSI reduction care package with the aim of reducing cardiac surgical wounds by 50%.	This project was carried out in a pediatric quaternary academic center with a 20-bed CVICU. Historical control data were recorded from January 2013 to May 2015 and intervention/support data from June 2015 to March 2017. A multidisciplinary SSI reduction team developed five key drivers that led to the implementation of 11 elements to assist the reduction of postoperative SSI. Statistical process control charts were used to measure process compliance, and Pearson's chi-square test was used to determine differences in SSI rates.	Prior to implantation, there were 27 SSIs in 799 pediatric cardiac surgeries (3.4 SSIs per 100 surgeries). After the intervention, SSIs decreased significantly to 5 out of 570 procedures (0.9 SSIs per 100 surgeries; p = 0.0045).	II	BVS MEDLINE
	Develop a diagnostic evaluation and describe the follow-up and	Study developed at the Antônio Pedro University Hospital, where we analyzed the fundamental	The effective effect of Neomycin + bacitracin, Biguanide Polyhexamethylene Solution (PHMB) and hydrogel in the treatment of surgical		BVS



Guitton et al. (2017) <sup>21</sup>	treatment of patients with surgical wounds	nursing care in the ICU for patients who developed surgical wounds.	wounds has been demonstrated, which were as a rule washed with saline solution at 0.9%.	V	SCIELO
Braz et al. (2018) <sup>22</sup>	Describe the occurrence of surgical site infection in patients undergoing myocardial revascularization and/or cardiac valve implantation.	Retrospective study done in a large hospital. Data were collected from the medical records of 280 surgery patients between 2011 and 2015. Descriptive statistics and bivariate analysis were performed by Epi-info 6.4.	Fifty-two surgical site infections were diagnosed. Superficial incisional infections were prevalent.	IV	BVS BDENF LILACS
Chetter et al. (2018) <sup>23</sup>	Estimate the prevalence of surgical wound healing by secondary intention (SWHSI) and characterize its etiology, duration and management.	Data were collected from patients with surgical wounds. Over a period of two weeks, data were collected on patients, their SWHSI, clinical and treatment details. Data were collected from 187 patients with a median age of 58.0 years (95% CI = 55 to 61 years).	The prevalence of SWHSI was 0.41 (95% CI = 0.35 to 0.47) per 1000 inhabitants. Most patients (164/187, 87.7%) had an SWHSI and the median wound duration was 28.0 (95% CI = 21 to 35) days. The most common surgical specialties associated with SWHSI were colorectal (80/187, 42.8%), plastics (24/187, 12.8%) and vascular (22/187, 11.8%) surgery.	III	BVS MEDLIN E
Borges et al. (2017). <sup>24</sup>	Estimate the healing rate of complex surgical wounds and their associated factors.	Cohort study with 60 outpatients of a Brazilian university hospital. Data were obtained through consultation of medical records. The function of life method was estimated by the Cox cycle risk model for healing cycle.	The complex wound healing rate was 67.8%95% CI. The factors associated with a higher risk of wound healing were sectorectomy/quadrantectomy surgery; wound extension smaller than 17.3 cm <sup>2</sup> .	III	BVS SCIELO MEDLIN E

### Nursing care technologies in intensive care units in the prevention of surgical site infection

In the search for health care technologies, it was faced with numerous technologies that fit the categories mild, light - hard and hard, which can be used by intensive nurses in the prevention and treatment of infected surgical wounds.

A study conducted in several hospitals around the world encompassing the entire multidisciplinary team in the Intensive Care Unit was highlighted. In this article, the safe surgery checklist was cited as a tool to reduce the risk of surgical site infection (SSI) and surgical wound complications.<sup>13</sup>

Classified in the light-hard category according to health care technologies, the World Health Organization (WHO) surgical safety checklist is the most used list. Actions include checks on various items, including patient identity, presentation of all team members, and antibiotic prophylaxis. Checklists are a simple and reproducible way to standardize selected aspects of patient care.<sup>13</sup>

The Safe Surgery Checklist reduces complications and saves lives. A study conducted in eight countries found a reduction from 11% to 7% in the occurrence of complications in surgical patients and a decrease in mortality from 1.5% to 0.8% with the adoption of the checklist.<sup>21</sup>

The protocol for safe surgery is applied in all places of health facilities where procedures are performed, therapeutic or diagnostic, involving incision in the human body or in the introduction of endoscope equipment, inside or outside the operating room, by any health professional.<sup>20</sup>

Regarding the performance of intensive care nurses regarding the preoperative phase, it is recognized that the use of an instrument to assess the risk of surgical site infection and surgical wound dehiscence should be considered, as well as guidance to the patient on postoperative care with drains, wound, cough and effort, guidelines that should not be trivialized by the nursing service, impact on the prevention of SSI. It is appropriate to mention that, in the intraoperative period, the nurse, as a supervisor of surgical steps with the correct use of aseptic techniques and the change of gloves for the closure of the surgical wound, ensures that there is no breakage of procedures ensuring the reduction of risk for SAIs and the quality of care.<sup>17</sup>

The main nursing actions to prevent dehiscence in surgical wounds are associated with the prevention of surgical site infections and the indication and use of negative pressure therapy.<sup>22</sup> Evidence shows that negative pressure therapy (PNT) has a benefit in reducing the risk of SSI in patients with primarily closed surgical incision, after high-risk wounds (e.g., in case of tissue perfusion due to damage to surrounding soft tissues/skin, decreased blood flow, bleeding/hematoma, dead space, intraoperative contamination) when in postoperative dressings.<sup>22</sup>

It is emphasized, however, that the devices used for TPN are expensive and may not be available in low-resource configurations. Thus, the prioritization of this intervention should be carefully considered according to the available resources and other priority measures for the prevention of SSI.

Surgical site infections are significant contributors to healthcare-related infections. In view of this reality, it should be

observed that nursing interventions have reduced the incidence of SSI especially with regard to the management of post-surgical abdominal drains.<sup>19</sup>

It is recognized that the role of nursing professionals is essential in the prevention of SAIs, since these professionals, because they are constantly with the patient, should be aware of the issues that can lead to the emergence of infected surgical wounds, as they are the main responsible for their prevention. In this context, the importance of investing in infection prevention measures, which involve care teams, infection control teams and safety centers, is emphasized, in order to enable best practices related to the provision of health care in the ICU.

### **Nursing care technologies in the Intensive Care Unit in the treatment of infected surgical wounds**

Surgical infection can be understood as any inflammatory process of the wound or surgical cavity that drains purulent secretion, with or without positive culture, and can be circumscribed to the incision or involve structures adjacent to the wound, that is, other tissues that have been exposed or manipulated during the surgical procedure.<sup>18</sup> The healing process of the surgical wound is complex, since it includes vascular and cellular changes, in addition to epithelial proliferation and fibroblasts.<sup>20</sup>

Fitting into the classification of hard health technology, Dialquil Carbamoil chloride attenuates colonization symptoms such as odor, pain complaints, and exudation. In addition, it assists in the prophylactic management of wound biofilm. Evidence indicates that coverage with this principle has no adverse effects, making it viable and safe options for chronic, acute and mainly infected lesions.<sup>14</sup>

It was also evidenced that Aloe vera promotes wound healing, in addition to reducing pain in chronic fissures and burns. Aloe vera represents a new therapy in the treatment of wounds, however the available evidence on its efficacy and safety is insufficient to legitimize its use in the healing of acute and chronic wounds; therefore, they cannot be generalized.<sup>15</sup>

In the in vitro analysis of nanoparticles, there was an increase in calcium absorption by fibroblasts and their increased proliferation rate. Thus, it is noted that dressings containing nanocompounds are very promising and are shown to be an excellent therapeutic option in wound healing. Higher healing speed, wound reduction by contraction, hemostatic effect, bactericidal action, low cytotoxicity were the results confirmed in the research by corroborating that nanoparticle-based products have relevant advantages in wound treatment.<sup>16</sup>

In the in vitro analysis of nanoparticles, there was an increase in calcium absorption by fibroblasts and their increased proliferation rate. Thus, it is noted that dressings containing nanocompounds are very promising and are shown to be an excellent

therapeutic option in wound healing. Higher healing speed, wound reduction by contraction, hemostatic effect, bactericidal action, low cytotoxicity were the results confirmed in the research by corroborating that nanoparticle-based products have relevant advantages in wound treatment.<sup>23</sup>

In the face of clinical cases involving surgical wounds, the health team should seek to promote surgical debridement, initiate oral antibiotic therapy and install negative pressure therapy (PNT), when necessary, which, in a sterile and closed environment, pressures below normal atmospheric pressure are performed, providing a wet healing environment, increasing local blood flow, the reduction of edema and bacterial load, the stimulation of granulation tissue formation and the approximation to the edges of the wound.<sup>23</sup>

The literature is extensive in demonstrating the efficacy of Biguanide Polyhexameylene Solution (PHMB) in the treatment of wounds under discussion, given that it has a wide spectrum of action in the face of microorganisms when indicated in view of its effective antimicrobial, antifungal and anti-inflammatory action, even more so that its effects are sustained in the post-application by reducing biofilms and fibrin; not to enable the development of resistance; not present toxic and resorption risks; in addition to having an excellent biocompatibility index and, in particular, promoting wound healing.<sup>21</sup> Similarly, the satisfactory action of Hydrogel has been scientifically evidenced in the treatment of screen wounds, since it favors angiogenesis and promotes autolytic debridement, in addition to maintaining adequate moisture regarding hydration, which enables the effectiveness of the healing process and, consequently, the resolution of the treatment.<sup>21</sup>

It is common knowledge that the conduct of the health team in the treatment of these wounds has involved their washing with 0.9% saline solution, the use of Biguanide Polyhexameylene Solution (PHMB) and Hydrogel.

Commonly, the use of antibiotic therapy in the treatment of surgical infections has been used because adequate serum levels in the fight against infection have been achieved. In addition, it has slowed bacterial resistance. Cephalexin, ciprofloxacin and neomycin have been considered antibiotic efficient in the treatment of wound infections and therefore used in the ICU.<sup>21</sup>

We emphasize the relevance of intensive care nurses to understand the treatment measures in the face of the manifestation of infected surgical wounds when performing the proper procedures, in addition to understanding the operationalization of available resources, by improving their technical-professional aptitude, which reflects positively in decision-making and follow-up of surgical patients hospitalized in the ICU, even more than, as seen, these wounds may result from inadequate care to the bedridden subject, which may be wrongly provided in the hospital setting.

It is believed that the treatment of infection of surgical wounds corresponds to one of the foundations supporting health care related, especially, to nursing care, being also considered a challenge for these professionals during the exercise of their duties in health practice.

A study was developed analyzing the risk factors for the development of infected surgical wounds. The research involved 60 adult patients. The researchers identified ten risk factors, which were associated with the manifestation of these wounds. The researchers also found the imprescindibility of being created and validated protocols aimed at care regarding the treatment of infected surgical wounds and the quality of health care delivery to these patients based on evidence and scientific recommendations, which can be consulted by health professionals regarding the manifestation of these infections.<sup>24</sup>

It is the responsibility of the health professional to evaluate and prescribe skin care, but it is important for the multidisciplinary team to evaluate the prescription and participate in the planning of care aimed at patients with infected surgical wound.<sup>29</sup>

Researchers suggest the development of research evidencing the general incidence and prevalence of infections in surgical wounds in ICU, since the literature only presents, in an incipient way, data related to very specific procedures, such as the incidence of infections in sutures of myocardial revascularization surgeries<sup>18</sup> and abdominal surgical wounds.<sup>22</sup>

Based on the literature consulted, it was observed that the determination of intensive care nurses should be focused on the etiological factors of infected surgical wounds and care related to their hygiene in ICU beds, and it is necessary to standardize medications and products from preventive actions to treatment, in addition to the use of a flowchart of care aimed at the patient.

It is also important to program continuing education actions and develop instruments aimed at categorizing infected surgical wounds with the purpose of contributing to a practice based on scientific evidence. Thus, it is believed that the continuing education program is considerably important regarding the treatment of these wounds, since it can contribute to the control of surgical infection and with the appropriate use of protective products.<sup>17</sup> In this context, it is considered that the positions presented and discussed in the present study can help continuing education programs with the purpose of disseminating knowledge on this theme to health team professionals, in favor of surgical patients hospitalized in ICU.

## **Final Considerations**

Although the difficulty in health practice regarding the treatment of infected surgical wounds and the prevention of SSI is recognized, in view of its high incidence, it was possible to observe, in the scientific sources consulted, the presentation of preventive

recommendations and guidance to intensive care nurses on the treatment of infected surgical wounds.

We pointed out that the health service inadequately provided influence on the manifestation of these wounds. Thus, health professionals should be aware of the issues that can provoke their emergence, as they are the main responsible for its prevention. It was also recognized the importance of the entire health team being responsible in the issue of care, being necessary the understanding and knowledge about the manifestations of surgical infections, in order to be treated properly and, mainly, avoided.

It was recommended that the studies be directed to the validation of care technologies able to promote the management of surgical wounds with the possibility of providing patients with humanized, safe and quality care, in addition to the standardization of medications and products from preventive actions to the treatment and use of a flowchart of care aimed at surgical patients.

The importance of the surgical safety checklist and the need for studies aimed at the treatment of surgical wounds infected with hard-class health care technologies, with scientific evidence produced along with randomized research methodologies that characterize more credibility in the study, were highlighted. Moreover, it is pointed out that more studies are needed on health care technology aimed at intensive nurses, since this professional can act with complex wounds using hard technologies such as ozone, PNT, among others.

Based on all the above, emphasizing the importance of surgical debridement, oral antibiotic therapy and the installation of negative pressure therapy (PNT), when necessary, among the care practices used by icu nurses for the treatment of infected surgical wounds, the use of Biguanide Polyhexameynone solution (PHMB) and Hydrogel solution in combination with antibiotic administration involving cephalexin was identified, ciprofloxacin and/or neomycin. It was possible to notice that the best care plan for the patient would first be to urgently initiate intravenous or oral antibiotic therapy and surgical reapproach, with the aim of cleaning and reducing the local microbial load.

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