INTEGRATIVE REVIEW
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Prophylactic negative pressure wound therapy in patients with closed surgical wound: An integrative review

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ABSTRACT

Surgical site infection is the leading healthcare-associated infection and a major contributor to rising healthcare costs. Implementation of measures to reduce this problem, particularly the prophylactic use of negative pressure wound therapy, may be an effective and promising method to reduce the risk of surgical site infection in patients with closed surgical wounds. The aim of the study was to identify the effectiveness of negative pressure wound therapy as a prophylactic measure in reducing the risk of surgical site infection in patients with a closed surgical wound. Whittemore and Knafl's five-step integrative review framework was carried out using three electronic databases. MEDLINE with Full-text, CINAHL with Full-text and Academic Search Complete were searched through the EBSCOhost Web platform. Articles search publication date was between 2018 and 2022. Nine studies were identified that addressed the effectiveness of prophylactic negative pressure wound therapy in reducing the risk of surgical site infection in the patient with a closed surgical wound. There was also evidence of effectiveness in reducing surgical wound dehiscence, drainage output and drainage time, as well as reducing the incidence of hospital readmissions and the need for wound debridement. Prophylactic negative pressure wound therapy can be an effective treatment option, among others, in reducing the risk of surgical site infection in patients with a closed surgical wound. This evidence promotes improved clinical practice regarding the management of the closed surgical wound, promoting health gains for patients.

Keywords: Negative-pressure wound therapy, nursing, prevention and control, surgical wound infection

INTRODUCTION

Surgical site infection (SSI) is an infection that arises at or near the surgical site or surgical incision during the first 30 days after surgery, or for one year if a non-human device (prosthesis) has been implemented (1). It is the leading healthcare-associated infection (HAI) reported in developing countries and among the most common at the European level (2). The European Centre for Disease Prevention and Control (ECDC) revealed that, out of 15.000 HAI's reported in Europe, the most frequent was SSI, accounting for 19.6% (3). Economic costs associated with SSI at the European level are thought to be between €1.47-19.1 billion.

It increases the length of stay by approximately 6.5 days and it costs three times as much to treat a patient with SSI, making it clear that it is essential to reduce this risk as much as possible (2,4).

The measures to prevent/reduce SSI should be implemented as early as possible and maintained throughout the perioperative period (consisting of three distinct periods: pre, intra and postoperative), aiming to improve the quality and safety of the care provided to patients (5,6). In this sense, international organizations have developed measures that should be respected and implemented. These are divided into the preoperative period (e.g., glycemic control, preoperative bath with antiseptic solutions, treatment of pre-existing infections, trichotomy only if strictly necessary, antiseptic preparation of the surgical team members, antimicrobial prophylaxis), intraoperative period (e.g., oxygenation, maintenance of normothermia, sterilization of surgical instruments, clothing of surgical team members, asepsis and surgical technique) and postoperative (e.g. surgical wound care) (2,4,7).

More recently, negative pressure wound therapy (NPWT) has begun to be used as

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a prophylactic measure in closed surgical wounds to reduce the risk of SSI and other possible associated complications (2,8,9). Until relatively recently, it has been mainly used for the treatment of complex, difficult-to-heal wounds, such as pressure ulcers, diabetic ulcers, burns, surgical wound dehiscence's, wounds with high amounts of exudate, among others. This therapy was initially tested prophylactically in orthopedic surgery and due to its success in reducing SSI in this specialty, NPWT began to be tested in other surgical specialties, increasing exponentially (9,10). Although several studies have reported a significant reduction in the rate of SSI after the use of prophylactic NPWT, its overall benefit is still under debate as its use is not fully consensual. This is because some studies, although in a minority part, do not prove its efficacy or do not find significant differences between it and traditional treatment (9,10).

Considering that NPWT is per se a therapy with a high monetary cost (11), and despite evidence showing its overall cost-saving potential versus control therapies to be effective (12), it is important that its efficacy is irrefutably proven, leading to the need for further studies to corroborate and demonstrate its cost-effectiveness (2,11,12).

Thus, to contribute to the increase of knowledge based on scientific evidence and improve the clinical practice of health professionals, particularly nurses, regarding its prophylactic use in reducing the risk of SSI in patients with closed surgical wound, this integrative literature review was developed to address this issue.

MATERIAL and METHODS

Integrative literature review design has an international reputation in nursing research and evidence-based practice, and this one summarizes empirical literature about the effectiveness of NPWT as a prophylactic measure in reducing the risk of SSI in patient with a closed surgical wound (13).

Integrative literature reviews have the potential to advance nursing science, enabling future research, clinical practice, and health policy initiatives, as well as the inclusion of several methodologies with direct applicability to practice and health policies. The methods used are based on Whittemore and Knafl's five stages, which are problem identification, literature search, data evaluation, data analysis and data presentation (14).

Problem Identification

The research problem emerged during the academic and clinical training of health professionals working in medical-surgical nursing. In the search for the best evidence related to nursing care, specifically for surgical patients, the aim was to improve quality, efficiency, and effectiveness, to obtain health gains and progressively improve the level of health indicators. To this end, the authors used the available literature and formulated the research question using the PICOD methodology [population (P), intervention (I), comparison (C), outcomes (O) and study design (D)]. Thus, the guiding question was as follows: "What is the effectiveness of prophylactic NPWT (outcomes) in reducing the risk of surgical site infection (intervention) in people with a closed surgical wound (population)?".

Literature Search

The electronic platform EBSCOhost Web was used to search for articles using the MEDLINE with Full-Text, CINAHL with Full-Text and Academic Search Complete databases during the month of April 2022. Thus, articles' search publication date was between 2018 and April of 2022.

First, the descriptors to be used during the search were validated in the Medical Subject Headings (MeSH). The following descriptors were used: "negative wound pressure therapy"; "surgical wound"; "surgical wound infection"; "surgical procedures, operative"; "laparotomy". They were organized using the Boolean operators "OR" and "AND", according to the following search strategy:

[(Negative Wound Pressure Therapy)] AND

[(Surgical Wound) OR (Surgical Wound Infection)] AND

[(Surgical Procedures, Operative) OR (Laparotomy)].

As a result of the search, a total of 67 articles were obtained, which were exported to Mendeley Reference Manager: Twenty-seven articles were available in MEDLINE with Full Text; 14 articles in CINAHL with Full Text; and 26 articles in Academic Search Complete. After the removal of duplicates, manually and through Mendeley, 49 articles remained, which were submitted to title and abstract analysis to determine whether they met the remaining inclusion and exclusion criteria. After this selection phase, 27 articles were excluded for being Opinion studies and literature reviews (n= 10), studies addressing postoperative measures (n= 8), and studies without prophylactic NPWT (n= 9). The remaining 20 articles were read in full and assessed regarding the methodological design and objectives, and 11 articles were excluded. Thus, nine articles were selected to be included in this review.

To make the selection process more understandable, a flowchart (Figure 1) was developed based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow 2020 diagram (15).

Data Evaluation

Articles were assessed for their authenticity, methodological design, and informational value. The level of evidence of each article was analyzed through the contributions of the Joanna Briggs Institute (JBI) (16). JBI's approach considers the best available evidence, the context in which care is delivered, the individual patient and the professional judgement and expertise of the health professional (17).

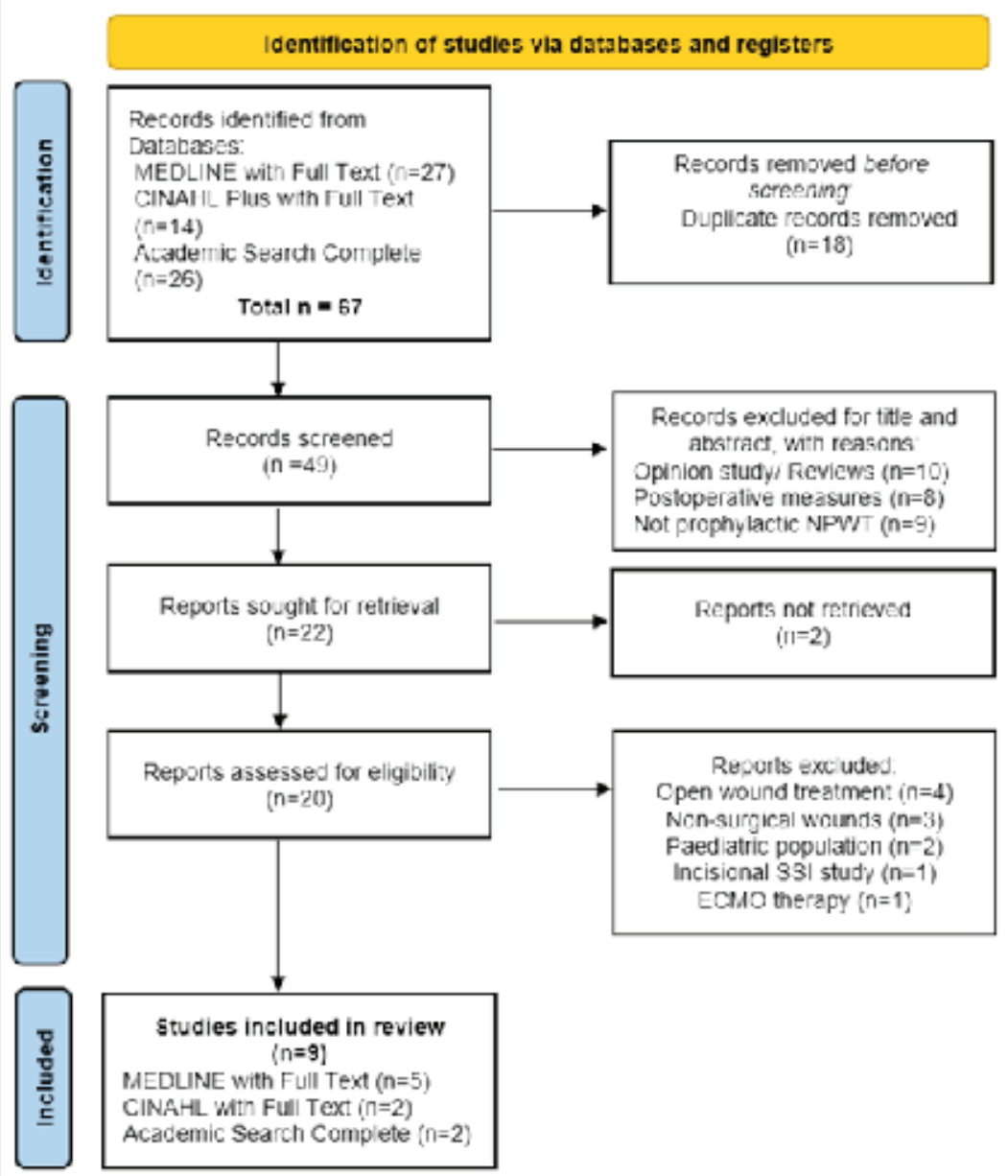

Figure 1. Identification, selection, and inclusion of the articles based on the PRISMA flow 2020 diagram.

Preference was given to experimental and observational studies, in full-text, and written in Portuguese or English. In addition, editorials, opinion studies and literature reviews were excluded. Articles that did not answer the research question, that may present ambiguous methodology, that had participants from the paediatric population and that were duplicated in the databases used were excluded.

Articles that validated the reduction of surgical wound complications, more specifically the association of NPWT with the reduction of SSI, were only advanced from abstract reading to full-text review.

Full-text records that did not comply with the assessment process were excluded from the review. Also, the relevant references of the selected articles were reviewed.

Data Analysis

The selection and analysis process were performed by two independent blinded-review researchers. For data extraction and analysis, an excel sheet was created by the authors of this study with the following information: authors, year, country of origin, level of evidence, objectives, participants/sample and main results/conclusions.

The authors individually analyzed the articles regarding the type of associated surgery (e.g., elective or emergency, contaminated, clean); the incidence of SSI in the postoperative period; several postoperative complications (e.g., seroma, surgical wound dehiscence); and the inherent technique, only NPWT or its comparison with other treatments.

RESULTS

Of the analyzed studies, four articles were developed in the United States of America, two studies were produced in Australia, one study was conducted in the United Kingdom, one was achieved in India and one in Europe, more specifically in the Netherlands.

Regarding the number of participants, 718 patients underwent prophylactic NPWT on the closed surgical wound and 1080 patients received standard or conventional surgical dressing/treatment/techniques, making a total of 1798 participants studied. The year with the most publications was 2021, 2020 and 2018 (n= 2), and regarding the levels of evidence, most were level 3.c: Cohort study with control group (n= 5) and level 1.c: Randomized controlled trial (n= 2).

To answer the above-mentioned research question, we began the content analysis of the selected articles. The results of this analysis are shown below (Table 1) to facilitate the reader's reading and understanding. The table presents the results corresponding to all articles, where the information mentioned in the "Data Analysis" chapter is explained.

DISCUSSION

Given the results explained above, it is possible to observe that the articles have quite similar objectives. Somehow, they verify the effectiveness of prophylactic NPWT in reducing the risk of SSI, and other wound complications, when applied to the patient with closed surgical wound. Thus, it is found that all studies can answer the previously formulated research question and bring relevant contributions to clinical practice regarding the treatment of closed surgical wound.

Addressing the results obtained, regarding SSI, the results of the studies are mostly unanimous. In the study by Chung et al., which involved 474 patients undergoing emergency laparotomy, the incidence of SSI was approximately ¼, with a higher rate in the group receiving standard surgical dressing compared to the group undergoing NPWT, observed both the rate of superficial and deep infections (18). Despite this, organ/space infection rates were higher in the group submitted to NPWT, because it is directed to the abdominal wall, having no effect beyond the fascial layer, so it is not expected to have influence at this level. The use of standard surgical dressing and emergency colorectal surgery were associated with a higher risk of developing SSI. In the results of Mondal et al., the group that received NPWT also had fewer patients developing SSI than the control group (19). However, in this study, where participants were intervened due to presenting incisional hernia, all documented SSIs were considered superficial. Similarly, in the study of De Rooij et al. 28.0% of the patients in the NPWT group developed postoperative wound complications, compared to only 18.9% in the control group [OR= 1.67 (95% CI= 0.77-3.63), p= 0.199] (26). However, these wound complications involved surgical site infections, which showed a higher SSI with the use of NPWT in the study of De Rooij et al. (Control group 18.0% vs. NPWT 26.0%) (26). Previous studies demonstrate that these results are relatively high when compared to the SSI rate found in other research using closed-incision negative pressure therapy (8.6-16.9%) (18,21,22,24).

In the study developed by Schurtz et al., the results indicate that 14 patients developed SSI after exploratory laparotomy in the context of trauma (20). Only three belonged to the group that received NPWT, which goes against the results mentioned by the aforementioned authors. Curran et al., who in their study included patients at high risk of infection who underwent open abdominal colorectal surgery, revealed that, of the 315 participants, 41 developed SSI and, like the articles already mentioned, its incidence was higher in the control group (21). This study also observed the time elapsed until the diagnosis of SSI. However, this proved to be superior in the experimental group, which enjoyed NPWT, highlighting the need for greater surveillance of the surgical wound. In addition to this, the authors also mention that patients were associated with increased SSI the longest operative time, the fact that they depend on dialysis in the preoperative period and present a stoma in the preoperative or postoperative period. Conversely, the use of NPWT was associated with a decrease in SSI. In the study by Liu et al., regarding the time elapsed until the diagnosis of SSI, the results were different from those found by Curran et al., which was similar in both groups (21,22). Regarding the development of SSI, it corroborates the results of the studies already mentioned, and the rate of this was higher in the control group compared to the experimental group (33 patients in the control group, versus six patients in the NPWT group). The same authors also report that in all patients undergoing emergency laparotomy, NPWT obtained greater benefit in wounds classified as clean-contaminated, contaminated, and dirty.

Hall et al., observed that all SSI occurred in wounds classified as contaminated, making this event interesting, since in it there are also wounds classified as dirty (23). However, it should be noted that this presents a difference in relation to all others included in the literature review: 18 of the 20 patients with wound classified as dirty received first NPWT on the open surgical wound, with subsequent closure of the same, before receiving prophylactic NPWT on the closed surgical wound. That is, the wounds had the opportunity to form granulation tissue before being closed.

Table 1. Summary of the articles included in the literature review

Authors	Year	Country	Level of Evidence (15)	Objective	Study Population/ Sample	Main Results/Conclusions
Chung, Ali, Hawthornthwaite, Watkinson, Blyth, McKigney, Harji & Griffiths (18)	2021	United Kingdom	Level 3.c: Cohort study with control group	To compare the SSI rates in patients who underwent prophylactic NPWT on the closed surgical wound and those who received the standard dressing following emergency laparotomy.	n= 474 patients (n= 237 with NPWT and n= 237 standard dressing)	The incidence of SSI was 25.3%. In the group with NPWT it was 16.9%, while in the group receiving standard surgical dressing it was 33.8%. The use of a standard surgical dressing and the fact that the patient had undergone emergency colorectal surgery were associated with a higher risk of developing SSI.
Mondal, Ali, Galidevara & Arumugam (19)	2022	India	Level 1.c: Randomized controlled trial	To compare the effectiveness of prophylactic NPWT on the closed surgical wound with conventional gauze dressing in reducing postoperative complications after mesh placement in incisional hernia repair.	n= 64 patients (n= 30 with NPWT and n= 34 conventional dressing)	In both groups, SSI were considered superficial. As for the mean drained output, the group that received NPWT showed a statistically significant reduction in drained volume compared to the group that received conventional gauze dressing and the mean duration of wound drainage.
Schurtz, Differding, Jacobson, Maki & Ahmeti (20)	2018	United States of America	Level 3.d: Case - controlled study	To compare the complication rate of postoperative wounds following laparotomies performed in a trauma and acute care setting between prophylactic NPWT on closed surgical wound, provided by a Surgical Incision Management System (SIMS), and conventional wound care.	n= 96 patients (n= 48 with NPWT and n= 48 conventional dressing)	A lower rate of SSI was recorded in the group receiving SIMS compared to the control group. The same occurred regarding hospital readmissions, with only one readmission in the SIMS group and seven readmissions in the control group.
Curran, Alvarez, Valle, Cataldo, Poylin & Nagle (21)	2018	United States of America	Level 3.c: Cohort study with control group	To evaluate the impact of prophylactic NPWT on the closed surgical wound on the incidence of SSI in a group of high-risk patients undergoing open colorectal surgery.	n= 315 patients (n= 77 with NPWT and n= 238 standard dressing)	Overall, the incidence of SSI was 13%. In the group receiving NPWT, the rate of SSI was lower. Preoperative dialysis dependence, longer operative time, and the presence of pre or postoperative stoma were associated with increased SSI. Regarding hospital readmissions, their frequency was half in the experimental group 8%, and in the control group 16%.
Liu, Cheng, Islam, Tacey, Sidhu, Lam & Strugnell (22)	2020	Australia	Level 3.c: Cohort study with control group	To verify whether the use of prophylactic NPWT on the closed surgical wound reduces wound complications following emergency laparotomies.	n= 227 patients (n= 70 with NPWT and n= 238 standard dressing)	Around 17.2% patients developed SSI after emergency laparotomy: 8.6% of the group receiving NPWT and 21% of the control group. The usefulness of NPWT was most evident in clean and contaminated wounds. The group that received NPWT had a shorter length of stay and no surgical wound related readmissions. Increasing age, body weight above 75 kg and wound contamination were observed to be independent predictors associated with wound complications. Contrary to these, the use of NPWT reduced SSI and surgical wound dehiscence.

Table 1. Summary of the articles included in the literature review (continue)

Authors	Year	Country	Level of Evidence (15)	Objective	Study Population/ Sample	Main Results/Conclusions
Hall, Regner, Abernathy, Isbell, Isbell, Kurek, Smith & Frazee (23)	2019	United States of America	Level 3.e: Observational study without a control group	To verify if the use of prophylactic NPWT on the closed surgical wound in emergency general surgery patients would result in low rates of superficial SSI.	n= 81 patients with NPWT	In 7.4% of patients, superficial SSI occurred, requiring antibiotherapy or wound reopening. All SSI occurred in wounds classified as contaminated. The application of NPWT resulted in acceptable rates of SSI in patients undergoing emergency general surgery.
Di Re, Wright, Toh, El-Khoury, Pathmanathan, Gosselink, Khanijaun, Raman & Ctercteko (24)	2021	Australia	Level 1.c: Randomized controlled trial	To assess the incidence of post-laparotomy SSI by comparing the use of prophylactic NPWT on the closed surgical wound with a standard surgical dressing.	n= 124 patients (n= 61 with NPWT and n= 63 specialized wound dressings)	A higher percentage of superficial SSI was observed in the control group (20.6%). NPWT group of 9.8%. Superficial wound dehiscence was 9.5% in the control group and did not occur in the experimental group. The use of standard postoperative surgical dressing (Cutiplast Dressing: Smith & Nephew, Watford, UK; or Comfeel Dressing: Coloplast, Humlebaek, Denmark) was associated with increased risk of superficial SSI. NPWT was not associated with a decrease in superficial SSI.
Chambers, Morton, Lampert, Yao, Debernardo, Rose & Vargas (25)	2020	United States of America	Level 3.c: Cohort study with control group	To determine whether prophylactic NPWT on the closed surgical wound is associated with reduced SSI in gynecological cancer patients undergoing laparotomy compared with standard surgical dressing.	n= 256 patients (n= 64 with NPWT and n= 192 standard dressing)	The group that received NPWT was associated with a significant reduction of any complication with the surgical wound (20.3% NPWT group and 40.1% control group). Of these complications, the lower rate of superficial (9.4% NPWT group and 29.7% control group) and deep (0% NPWT group and 6.8% control group) SSI stands out. The use of NPWT was associated to a lower probability of superficial and deep SSI.
De Rooij, van Kuijk, van Haaren, Janssen, Vissers, Beets & van Bastelaar (26)	2021	Netherlands	Level 3.c: Cohort study with control group	To estimate the incidence post-operative complications following the use of the NPWT, in non-high risk closed incisions in patients undergoing mastectomy.	n= 161 patients (n= 50 with NPWT and n= 111 control group with a conventional wound dressing)	28.0% of the patients in the NPWT group developed postoperative wound complications, compared to 18.9% in the control group (OR= 1.67 (95% CI= 0.77-3.63), p= 0.199). This research indicates that using Avelle negative pressure wound therapy for mastectomy wounds doesn't result in a reduction in postoperative wound complications. It also doesn't lead to fewer patients requiring unplanned visits or fewer patients developing clinically significant seromas.

NPWT: Negative pressure wound therapy, SIMS: Surgical Incision Management System, SSI: Surgical site infection.

In this study, where all patients were submitted to emergency surgery and NPWT, of 81 patients, only six had superficial SSI, requiring antibiotic therapy, or reopening the wound. It is reported that the development of enterocutaneous fistula was the cause of SSI in a patient. The authors claim that they included ostomies in the same, because they were associated with a higher risk of developing SSI. However, 16 of the wounds classified as clean-contaminated presented stoma closures, but SSI was not observed in none.

Among the articles analyzed, only Di Re et al. and De Rooij et al. did not corroborate the same results (24,26). The De Rooij et al. study showed that one patient in the control group developed wound necrosis that required surgical debridement (26).

Di Re et al. included 124 patients undergoing open abdominal surgery and reported that after 30 days there was a higher rate of superficial SSI in the control group, compared to the group undergoing NPWT (24). However, they clarify that their percentage value was not statistically significant (20.6% versus 9.8%). On days five and seven, the incidence of superficial SSI was also higher in the control group but, again, it was not statistically significant (13.1% versus 7.9%). In this study, the use of standard surgical dressing was associated with a higher risk of developing superficial SSI and, once again, the authors do not consider it to be statistically relevant. Thus, the study by Di Re et al. considers that NPWT was not associated with a decrease in superficial SSI (24). It should be noted that, despite the information described, the authors admit that the study has several limitations.

In the same line of evidence, Chambers et al. supported the remaining studies, explaining that the group that was subjected to NPWT was associated with a significant reduction of any complication associated with the surgical wound, the lower rate of superficial and deep SSI, which shows once again the effectiveness of NPWT in this context (25). Regarding organ/space SSI, the difference between the groups was not significant, being 0% in the group subject to NPWT. In this study, which included 256 patients who underwent laparotomy due to diagnosis or suspicion of gynecological neoplasm, the use of NPWT was associated with a reduction in the incidence of superficial SSI and a lower probability of superficial and deep SSI.

In addition to SSI, the studies highlight the dehiscence of the surgical wound as a postoperative complication, being addressed in four studies (22,24-26). In the study by Liu et al., NPWT reduced wound dehiscence because, of the 24 patients where it was observed, only three patients belonged to the NPWT group (22). Di Re et al. share the same opinion since in their study superficial wound dehiscence was only found in the group that did not enjoy NPWT (24). The study by Chambers et al. revealed that, although there was a decrease in dehiscence in the group submitted to NPWT, this was not considered significant (25). Furthermore, De Rooij et al. displayed that 10% of the patients in the NPWT group, compared to 3.6% of the patients in the control group, developed wound dehiscence requiring wound treatment with vacuum assisted closure [OR= 2.97 (95% CI= 0.76-11.58), p=0.116] (26). However, no beneficial effect of NPWT was found regarding wound necrosis and wound dehiscence.

Another of the conclusions found when analyzing the articles was the formation of seroma. Regarding this postoperative complication, Mondal et al. and Chambers et al. agree since both studies showed that the difference was not statistically significant between the two groups (19,25). In De Rooij et al. study, during NPWT, the mastectomy wound surface was under external nominal negative pressure of 80 mmHg by the NPWT pump during seven days, and the results should point to a favorable effect on seroma formation. However, there was a higher proportion of patients with clinically significant seroma in the NPWT group than in the control group, 24.0% versus 14.0%. This difference was not statistically significant, but a difference of this magnitude could be clinically relevant, as well as, the lower mean total drain output in the NPWT group (26).

Regarding hematoma associated with surgical wound, two studies addressed this complication (22,25). The study by Liu et al. reported that this was observed in two patients in the experimental group (undergoing NPWT) and four patients in the control group (22). The study by Chambers et al. did not find a statistically significant difference between the two groups (25).

Duration of surgery was also addressed in the article by Mondal et al. and by Chambers et al. (19,25). Both studies consider that the differences between the two groups are not statistically important or not significant. Mondal et al. also refer to the average drain rate and the average duration of wound drainage, being the only ones to address these results (19). Regarding the average drained flow, the authors indicate that the group submitted to NPWT revealed a statistically significant reduction in the drained volume, compared to the control group, with conventional gauze dressing. Regarding the average duration of wound drainage, this was also statistically significant, being 5.6 days in the NPWT group and 6.5 days in the control group.

The average length of stay was one of the most discussed results and was mentioned in six of the nine articles analyzed. In most studies, the authors reveal that the difference between the two groups studied was similar: it was not verified or statistically significant, except for Liu et al., where the group submitted to NPWT had a shorter hospitalization time when compared to the control group (22). Di Re et al., despite agreeing with most of the authors, add that, comparing patients undergoing elective or emergency surgery, those who underwent emergency surgery had a longer hospitalization period (24). In relation to hospital readmission, Schurtz et al. and Curran et al. stated that this was lower in the group subject to NPWT, and in the

first study mentioned there was only a hospital readmission in the experimental group and in the second study, readmission was double in the control group compared to the experimental group (20,21). Liu et al. reported that there was no hospital readmission related to the surgical wound in the experimental group (22). For Chambers et al. no significant differences were observed between both groups (25). Another result found in three of the articles analyzed was the need for surgical reintervention. Both studies, Chung et al. and Chambers et al. stated that they did not identify significant differences between both groups (18,25). However, the study by Liu et al. stated that the four patients who presented dehiscence of the surgical wound needed to be re-intervened and in the study by De Rooij et al., one patient required surgical reintervention, as a result of wound dehiscence (22,26).

Morbidity and mortality were also reported. In the study by Chung et al., no significant differences were identified between the groups (18). For Hall et al., these were 38% and 6%, respectively (23). Curran et al., referred only to the mortality rate, however, stated that this was similar between both groups studied (21).

Finally, the need for debridement of the surgical wound was addressed only by two articles. Chambers et al. found that this decreased significantly in the group submitted to NPWT, compared to the control group (25). In the other study, by De Rooij et al. the results showed that in the control group, there was a single patient who experienced wound necrosis necessitating surgical debridement (26).

CONCLUSION

Given the results presented above, it is concluded that prophylactic NPWT is one of a wide range of treatment options in reducing the risk of SSI in the person with closed surgical wound since the major control groups of the studies obtained a higher SSI rate in relation to the groups undergoing NPWT.

It was found that NPWT was associated with a reduction in dehiscence of the surgical wound and regarding seroma formation and hematoma associated with the wound, there is no evidence of the benefit of NPWT. It was verified that the NPWT obtained benefits in the considerable reduction of the drained flow and the duration of the drainage, respectively. Regarding the length of hospitalization, morbidity and mortality, the effect of NPWT was not proven.

As for a possible hospital readmission associated with the surgical context, it can also be concluded that participants undergoing NPWT were associated with a lower incidence, compared to participants undergoing conventional treatment. In this context, data on the need for surgical reintervention were inconclusive.

Finally, regarding the need for debridement of the wound, the NPWT is associated with its significant decrease.

After this, we can conclude that prophylactic NPWT, in addition to reducing the risk of SSI in patients with closed surgical wound, also has efficacy in reducing the risk of several other complications associated, directly or indirectly, to the surgical wound. Economically NPWT is inherent in a higher cost than surgical dressing/treatment/standard or conventional techniques. However, since it can have several benefits as demonstrated, its use will compensate on a large scale, as it will reduce the costs associated with health care. In addition to this, it will increase the quality of life of the patient, following an elective or emergency surgical intervention.

It should be noted that, for the use of prophylactic NPWT to be effective, it is necessary that its benefits are consolidated in the body of knowledge and professional experience of health professionals in clinical practice, who apply and handle it. In this sense, training and professional updating should be a prerequisite for its implementation, particularly nurses, who provide care to patients with this therapy can maximize the efficiency of such procedure in line with scientific evidence.

Relevance to Clinical Practice

The results of the current study indicate that the prophylactic use of NPWT in patients with closed surgical wound is effective in reducing SSI, perhaps is necessary to consider other variables in clinical practice which were not addressed in this review.

The NPWT, in the form of several devices with differences in size, weight, type of therapy available, interface material, reservoir, technology and, more recently, the type of installation, allows its use not only in the hospital context, but also in the outpatient, being relevant in the average reduction of hospitalization time.

This review can guide the practice of care for the surgical patient with closed wound, for nurses or other health professionals, especially in the context of hospitalization.

Limitations

Although the search was conducted in credible electronic databases, studies in other databases may have been neglected. In addition, the full use of studies in English (the only alternative to the Portuguese language) and their divergent design were considered as limitations.

Since SSI is a multifactorial event, the timely identification of its potential risk factors is a fundamental necessity for the prevention of its occurrence. In the included studies, (internal and external) risk factors associated with their development were not addressed, thus it may have been another of the limitations that influenced the results.

Nevertheless, we want to emphasize that most of the studies included in this revision are in the emergency context and colorectal surgery, and only a few in clean surgeries. However, we do not have enough information to assess if there are benefits regarding in terms of infection risk.

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BÜTÜNLEYİCİ DERLEME-ÖZET
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Kapalı cerrahi yarası olan hastalarda profilaktik negatif basınçlı yara tedavisi: Bütünleştirici bir inceleme

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ÖZET

Cerrahi alan enfeksiyonu, sağlık hizmeti ile ilişkili enfeksiyonların başında gelmekte ve artan sağlık hizmeti maliyetlerine önemli bir katkıda bulunmaktadır. Bu sorunu azaltmaya yönelik önlemlerin uygulanması, özellikle de negatif basınçlı yara tedavisinin profilaktik kullanımı, kapalı cerrahi yaraları olan hastalarda cerrahi alan enfeksiyonu riskini azaltmak için etkili ve umut verici bir yöntem olabilir. Bu çalışmanın amacı, kapalı cerrahi yarası olan hastalarda cerrahi alan enfeksiyonu riskini azaltmada profilaktik bir önlem olarak negatif basınçlı yara tedavisinin etkinliğini belirlemekti. Whittemore ve Knafl'ın beş adımlı bütünleştirici incelemesi üç elektronik veri tabanı kullanılarak gerçekleştirildi. MEDLINE with Full-text, CINAHL with Full-text ve Academic Search Complete EBSCOhost Web platformu üzerinden taranmıştır. Makale arama yayın tarihi 2018 ile 2022 yılları arasındaydı. Kapalı cerrahi yarası olan hastalarda cerrahi alan enfeksiyonu riskini azaltmada profilaktik negatif basınçlı yara tedavisinin etkinliğini ele alan dokuz çalışma tespit edildi. Ayrıca, cerrahi yara açılmasını, drenaj çıkışını ve drenaj süresini azaltmanın yanı sıra hastaneye tekrar yatış insidansını ve yara debridmanı ihtiyacını azaltmada etkili olduğuna dair kanıtlar vardı. Profilaktik negatif basınçlı yara tedavisi, kapalı cerrahi yarası olan hastalarda cerrahi alan enfeksiyonu riskini azaltmada diğerlerinin yanı sıra etkili bir tedavi seçeneği olabilir. Bu kanıt, kapalı cerrahi yaraların yönetimine ilişkin klinik uygulamaların iyileştirilmesini teşvik ederek hastalar için sağlık kazanımlarını desteklemektedir.

Anahtar Kelimeler: Negatif basınçlı yara tedavisi, hemşirelik, önleme ve kontrol, cerrahi yara enfeksiyonu

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