Review Article

Prophylactic Negative Pressure Wound Therapy in Reducing Surgical Site Infections: An Evidence-Based Literature Review

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Abstract

Background: Surgical site infections (SSIs) are a frequent postoperative complication that nurses commonly need to provide asepsis-specific meticulous care for. The application of a closed-incisional negative pressure wound therapy (iNPWT) device is regarded as a novel technique that aims to lower the risk of external wound contamination.

Aim: The purpose of this review was to evaluate the effectiveness of iNPWT on high-risk closed laparotomy incisions with the aim to inform nursing practitioners and physicians engaged in multieffort wound care practices. Nursing professionals play a crucial role in mitigating the incidence of SSIs, from the time of application, through ongoing assessment tissue condition, and ensuring asepsis, thereby enhancing patient care and safety.

The Research Question: Is prophylactic negative pressure wound therapy effective in reducing the incidence of (closed) surgical site wound infections postlaparotomy?

PICO Elements: The population studied included patients undergoing laparotomy surgery. The intervention under review included the application of iNPWT, compared to the use of standard gauze dressing. The expected outcome was SSI reduction.

Methods and Results: A systematized literature search was conducted using various databases to identify published studies that address the PICO question. The PRISMA checklist and Critical Appraisal Skills Programme tools allowed to exclude irrelevant articles and to critically appraise the evidence, respectively. Eleven key articles were retrieved including four RCTs and seven systematic reviews and meta-analysis. The results indicated an overall positive association between iNPWT and a reduction in SSI in laparotomy surgeries when compared to standard dressings.

Linking Evidence to Action: Data across most studies reviewed support the benefits with the use of iNPWT as a preventive strategy to lower the rates of SSI, with some claiming no difference. Although heterogeneity in the studies precludes a definite conclusion, nurses may make a more informed decision when navigating the demands of SSI prevention targeted nursing care.

Keywords

postoperative nursing care, wound care, surgical site infections, negative pressure wound therapy, evidence-based nursing, high-risk incisions

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Introduction

The Pervasiveness of Surgical Site Infections

Surgical site infections (SSIs) are a major cause of significant concern in healthcare, represent a staggering 20% of all healthcare-associated infections (HAIs) and elevate mortality risk by 2 to 11 times, with 75% of SSI-related deaths directly linked to the infection (Ban et al., 2017; Zimlichman et al., 2013). An SSI is defined by the Centre for Disease Control and Prevention (CDC) as an infection at or around the surgical incision site that evolves within 30 days of the surgery, or within 90 days if prosthetic items are implanted (Borchardt & Tzizik, 2018; Dellinger et al., 2021). SSIs can be classified into three types: Superficial incisional SSI which affects the

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skin and subcutaneous tissues; deep incisional SSI which involves deeper soft tissue such as fascia and muscle; and organ/space which includes implanted prosthetics (Alkaaki et al., 2019; CDC, 2024). For an SSI diagnosis, the infection must meet standards by the National Healthcare Safety Network, including the presence of purulent drainage or positive wound culture results (CDC, 2024).

World Health Organisation estimates 234 million major surgeries annually globally, with approximately 25% developing complications (Willy et al., 2016). While superficial wounds are easier to address, deep SSI are more complex, often leading to prolonged hospital stays or re-operation (Lawson et al., 2013). SSI represent the most costly HAI type with estimated additional annual cost of $3.3–$10 billion in the United States and £700 million in the United Kingdom (Money et al., 2018; Totty et al., 2021; Zimlichman et al., 2013). Hospitalization costs increase by $7,000–$25,000 and £3776 per patient in the United States and the United Kingdom respectively (Ban et al., 2017; Totty et al., 2021) with an average hospital extension of 9.7 days. Besides increased financial burden, SSI worsen patient outcomes, reducing quality of life, and significantly impacting morbidity and mortality (Haque et al., 2018).

Aim of the Review

Nurses play a pivotal role in both preventing and providing care for patients affected by SSI. This critical task involves the implementation of rigorous infection control protocols, ongoing patient monitoring, addressing risk factors, and ensuring proper wound care (Khanal & Thapa, 2017). By adhering to best practices, nurses contribute significantly to reduce the risk of SSIs, ultimately improving patient outcomes and promoting recovery (Tegegn et al., 2023; Vaismoradi et al., 2020).

Standard SSI prevention strategies include prophylactic antibiotics, 4% chlorohexidine preoperative wash, using clippers for hair removal, normothermia maintenance, and pre-to-post-op habitual prevention nursing care routines (Fuglestad et al., 2021; Seidelman et al., 2022). Despite these golden standards, enduring high rates of SSIs warrant efficient prevention strategies to improve outcomes, hence, this review aimed to assess if iNPWT is more effective than conventional dressings in preventing SSIs. The goal was to specifically determine this on closed laparotomy incisions in moderate-to-high and high-risk patients. With moderate to high-risk patients there is an increased probability of poor, delayed healing outcomes and infections due to underlying comorbidities, lifestyle factors, nutritional status, and age, among other risk indicators (Sankar et al., 2015). A PICO research question was set: in moderate-to-high-risk patients (P), is closed-incision prophylactic negative pressure wound therapy (I), compared to standard wound dressing (C) effective in reducing closed surgical site wound infections postlaparotomy (O)?

The Importance of the Review

This evidence review will provide nurses and physicians with more informed insights crucial for considerations they make during patient care delivery, especially SSI prevention strategies. Nurses help identify the right candidates for this treatment, assess the treatment's effectiveness during postoperative care, and closely monitor for early detection of infection signs and symptoms. Moreover, considering the potential impact of altered body image on patient acceptance to NPWT—with effective planning and communication strategies, there is improved compliance and adherence to treatment, thereby more effective to reduce SSIs (Moffatt et al., 2019).

iNPWT is a sealed, noninvasive, portable device that delivers continuous negative pressure of −50 to −125 mm Hg via a compact dressing. This allows exudate removal, improves blood flow, promoting perfusion, and reduces shear stress speeding up incision healing process thereby lowering SSI risk (Hyldig et al., 2016; Willy et al., 2016). Moreover, tissue granulation promotes wound edge closure, reduces external contamination, creates an optimal moist healing environment, and thus reduces SSI risk by preventing microorganism entry (Gillespie et al., 2021). Silver is incorporated in the dressing for its antimicrobial properties, to inhibit the growth of pathogens at the wound site. Additionally, the porous structure of the polyurethane foam is essential to allow efficient exudate removal (Willy et al., 2016). Adequate nursing assessment and implementation are required, especially for patients with heightened silver sensitization, who are prone to skin irritation, redness, and pressure sores from the polyurethane foam. This may be addressed by applying a nonadherent layer between the foam and the skin using a clean technique (Hermans & Cutting, 2014).

Method

Search Strategy

A comprehensive search was conducted incrementally between 22nd October 2021 and 4th August 2022. Registration with PROSPERO/INSPLAY was not pursued because this paper started off as a project type that typically does not require registration. Also, at the time, institutional guidelines did not mandate registering this type of review. Multiple databases were accessed to ensure a thorough literature review. Initially, the Hybrid Discovery (HyDi) interface was used to simultaneously search articles in 10 different databases under the category of "Health Sciences" and subcategory "Nursing" (Academic Search Complete, Cochrane Central Register of Control Trials, Cochrane Database of

Systematic Reviews, CINAHL plus, JAMA Network, MEDLINE, BioMed Central). The search was repeated in SAGE Journals, PubMed, EBSCO, and Google Scholar. The advanced search enabled to narrow the scope of the search and to find the most accurate information. The keywords pertaining to the PICO elements including alternative terms are outlined in Supplemental Table S1.

Boolean operators were used to attain more relevant hits (Grewal et al., 2016). Limiters allowed to further rectify and focus the search (Spurlock, 2019). "Peer reviewed articles" was applied as this ensures more reliable hits. Years of publication was set to the last 5 years (2017–2021), ensuring the most recent evidence is identified. This search was also complemented by a review of the reference list of the initial 95 articles.

The population of interest included both elective and emergency cases of laparotomy, having patients with moderate to high risk of acquiring an infection. The intervention under investigation was iNPWT specifically applied to closed-surgical incisions. The data included studies that define SSI according to the CDC criteria. Eligible studies were meta-analysis (MA), systematic reviews (SRs) or RCTs. Studies with patients undergoing nonabdominal surgeries, and those receiving NPWT on open wounds were excluded. Those including only emergency surgeries were excluded because these often involve different complexities and unpredictable factors that deviate from routine surgical and hygienic practices, complicating the comparison of outcomes, particularly SSIs. Additionally, studies lacking reported data on laparotomy wound outcomes and noncomparative study designs were also excluded. This filtering ensures the consideration of the best available evidence and reduces bias (De Chesnay, 2015). A summary of the inclusion and exclusion criteria applied in this review is provided in Supplemental Table S2.

Data Extraction and Appraisal Tools

Data extracted included study design, population characteristics, interventions conducted along with their outcomes, potential confounders, and authors' identified strengths and limitations. Additionally, the review process also considered future recommendations and the literature gaps identified.

Two Critical Appraisal Skills Programme (CASP) checklists were used to appraise the RCTs and the SRs respectively, by CASP UK (2018). These instruments were employed because they are specifically crafted to help evaluate a body of evidence on a topic, bolstering the evidence base, thereby improving practice (Al-Jundi & Sakka, 2017; Buccheri & Sharifi, 2017). More specifically, CASP tools enable to methodologically distinguish the relevance, quality and trustworthiness in the study's methodology, methods, strengths and limitations, transparency, and reporting standards (Long et al., 2020). This allows the concentration of the studies with relevance to the research question and can reliably support high quality evidence relevant to the search (Al-Jundi & Sakka, 2017). Compared to other appraisal methods, the CASP tool was found to effectively indicate the procedural aspects of a study and the details that should be reported (Long et al., 2020). Both authors independently conducted the search strategy and discussed which papers and variables to be included. Any inconsistencies were to be discussed with an independent verifier, but this step proved unnecessary.

Results

The database search yielded 95 articles and these were screened for inclusion and exclusion criteria and the PICO elements set, and were reduced to 37 studies. These were further manually evaluated by reading the papers' contents, and were further reduced to 11 key articles for appraisal; including four RCTs and seven SRs and MA. The complete audit trail undertaken during this literature search is outlined in the PRISMA flow diagram, Figure 1.

Critical Appraisal

In this review, the primary focus was on evaluating the efficacy of prophylactic iNPWT compared to SSI incidence postlaparotomy surgery. The studies compared outcomes between two research arms: those individuals receiving iNPWT treatment (intervention) and those treated with standard dressing (control). While certain articles presented data within slightly different ranges, the evidence considered in this review adhered to a diagnosis based 30-day follow-up period congruent with the guidelines recommended by CDC defined earlier (Di Re et al., 2021; Murphy et al., 2018; Wells et al., 2019). Such standardization decreases the risk of bias (Anwar et al., 2018).

Association in the RCTs

A summary of the study's main characteristics are presented in Supplemental Table S3. A sample of the appraisal process for each article using the CASP tool is presented in Table 1.

The study by Di Re et al. (2021) was statistically insignificant ($p = .1$) and more superficial SSIs were present in the control group than in the NPWT group. A two group X^2 test was used to have 80% power in order to detect the difference between the two study arms. The small sample size of 127 patients may have diminished the power of the study which in turn led to nonstatistically significant results. Patients were randomly allocated to either of the two groups and the sealed envelopes only opened just before skin closure intraoperatively. To reduce the risk of performance bias, the surgeon was unaware of the group assignments; however, the patients and investigators were not blinded and aware of the intervention.

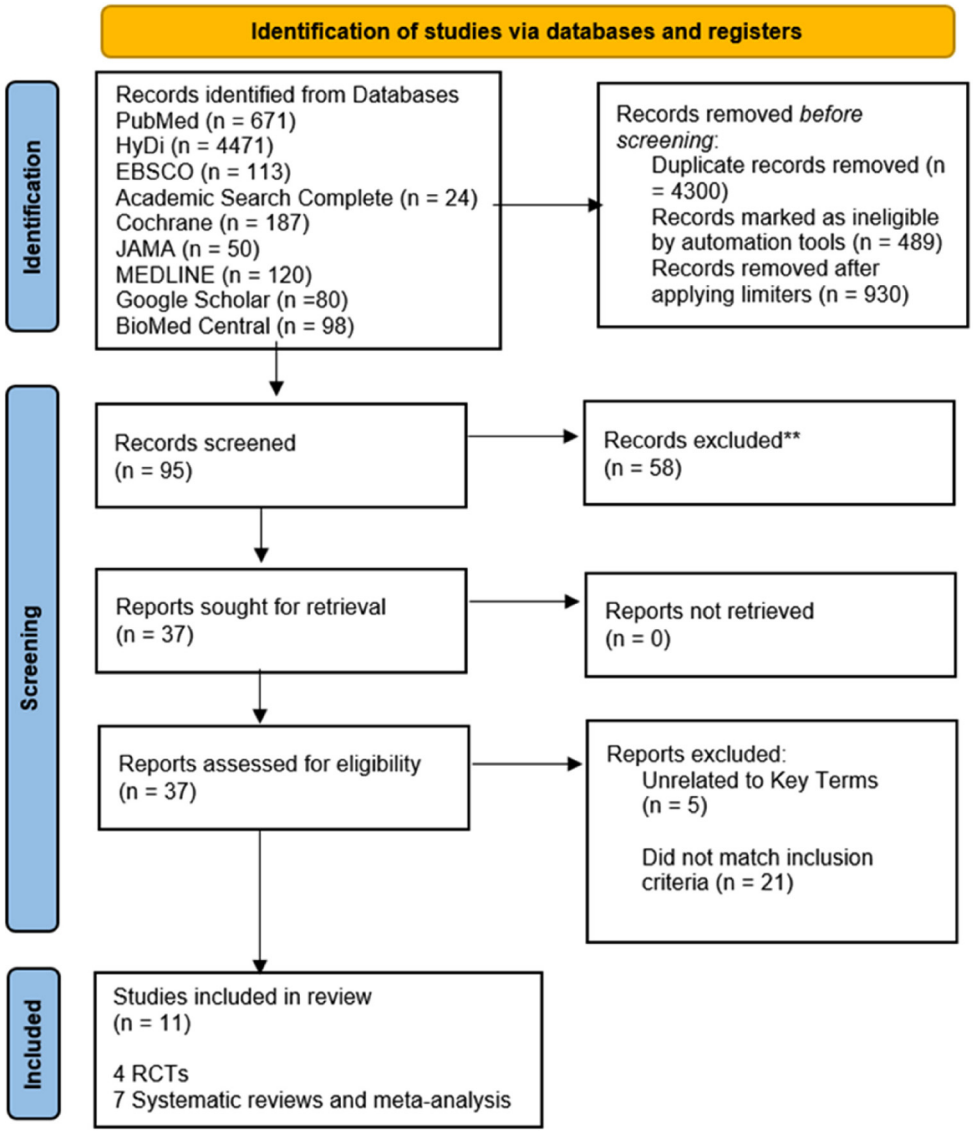

Figure 1. PRISMA Flow Chart of the Search Strategy and Identified Studies.
Source. Adapted from Page et al. (2021).

In Murphy et al. (2018) the prospective, randomized, open-label, blind-endpoint trial involved a sample of 284 patients. The study revealed no statistically significant difference ($p = .68$) between iNPWT (32%) and the standard dressing (34%). Despite a sizable sample, the study acknowledged a risk of Type II error, suggesting that the chosen statistical power might have affected the detection of smaller yet clinically significant SSI reduction. Variations noted in postoperative protocols (dressing removal timing and antibiotic administration) create challenges in direct comparisons with other studies. A multivariable regression analysis aimed to adjust for baseline variations and potential confounding variables ensuring a more accurate comparison between both research groups. Despite a high-risk patient population, the study concluded that iNPWT demonstrated no discernible impact on preventing SSIs although participants potentially garnered microscopic level benefits and clinical outcomes.

O'Leary et al. (2017) RCT involves a relatively modest yet adequately randomized sample of 50 participants. The prophylactic use of iNPWT dressings exhibited a significant lower SSI rate compared to the control group (8.3% vs. 32.0%) signifying a statistically significant result ($p = .043$). The study's rigorous randomization on a 1:1 basis, a closed envelope method, contributed to the reliability of the results. Patient characteristics were similar comparable across groups, ensuring the trial maintained high internal validity. Although there was a lack of blinding and the sample size was low, the

Table 1. Appraisal of the RCTs.

Appraisal criteria	Di Re et al. (2021)	Murphy et al. (2018)	O'Leary et al. (2017)	Flynn et al. (2019)
1. Did the study address a clearly focused research question?	Yes	Yes	Yes	Yes
2. Was the assignment of participants to interventions randomized?	Yes	Yes	Yes	Yes
3. Were all participants who entered the study accounted for at its conclusion?	Yes	Yes	Yes	Yes
4. Were the participants "blind" to intervention they were given? Were the investigators "blind" to the intervention they were giving to participants? Were the people assessing/analyzing outcome/s "blinded"?	Yes	Yes	No The surgeon was not blinded to the dressing being applied	No The study was not blinded
5. Were the study groups similar at the start of the randomized controlled trial?	Yes	Yes	Yes	Yes
6. Apart from the experimental intervention, did each study group receive the same level of care (that is, were they treated equally)?	Yes	Yes	Yes	Yes
7. Were the effects of intervention reported comprehensively?	Yes	Yes	Yes	Yes
8. Was the precision of the estimate of the intervention or treatment effect reported?	Yes 95% CI 0.81–7.17	No Confidence intervals are not reported	No Confidence intervals are not reported	No Confidence intervals are not reported
9. Do the benefits of the experimental intervention outweigh the harms and costs?	Yes	Yes	Yes	Yes
10. Can the results be applied to your local population/in your context?	Yes	Yes	Yes	Yes
11. Would the experimental intervention provide greater value to the people in your care than any of the existing interventions?	Can't tell	Can't tell	Can't tell	Can't tell

RCT demonstrates that iNPWT is associated with significantly lower SSI rates.

The RCT by Flynn et al. (2019) involved 188 patients with a 1-week postoperative assessment for infection. The study revealed no statistically significant difference ($p = .73$) between the two groups; out of 27 patients (14%) who developed SSI, 13 were in the iNPWT group and 14 in the standard dressing group (odds ratio [OR] = 1.1). Blinding was lacking in the study, potentially introducing bias. Following the initial assessment one week post-op, postdischarge infections may have been overlooked due to patients treated elsewhere. To mitigate this limitation a questionnaire was sent to all patients; however, a poor response rate of 19% hinders SSIs identification postdischarge. The lack of robust follow-up and the low response rate introduce significant bias, impacting the study's robustness and reliability. While the study did not identify a statistically significant difference, it highlights the importance of exercising caution when interpreting the findings and underscores the need for improvements in future research design.

Association in the Systematic Reviews and Meta-Analysis

Seven SRs and MA were identified, all of which addressed a clearly focused question as they addressed all the elements in the PICO question, conducted in accordance with the PRISMA statement. In addition, they all include an inclusion and exclusion criterion that stratifies the search and gives more accurate results. A summary of the main components and results of SRs and MAs is provided in Supplemental Table S4, while Table 2 presents the appraisal process undertaken.

Wells et al. (2019) concluded that the use of iNPWT prophylactically is associated with a reduction in overall SSI development ($p = .02$), that is mostly attributed to superficial infections (95% CI [0.48–0.95]). A key limitation was the inclusion of various iNPWT devices in the studies, potentially biasing results due to variations in technical specifications among devices. Similarly, the inclusion of different laparotomy approaches considered collectively (midline,

Table 2. Appraisal of the Systematic Reviews Meta Analyses.

Appraisal criteria	Meyer et al., 2021	Kuper et al. (2019)	Fowler & Barry (2020)	Almansa-Saura et al. (2020)	Sahebally et al. (2018)	Wells et al. (2019)	Boland et al. (2021)
1. Did the review address a clearly focused question?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2. Did the authors look for the right type of papers?	Yes	Yes	Yes	Yes	Yes	Yes	yes
3. Do you think all the important, relevant studies were included?	Yes	No Only English language studies were used	No Only English language studies were used	Yes	Yes	No Only English language studies were used	No Only English language studies were used
4. Did the review's authors do enough to assess quality of the included studies?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5. If the results of the review have been combined, was it reasonable to do so?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6. What are the overall results of the review?	Statistically significant $p = .03$	Not statistically significant $p = .064$	9/13 studies were significant	Significant heterogeneity reported caused a p-value of .07	Statistically significant $p < .001$	Statistically significant $p = .02$	Statistically significant $p = .04$
7. How precise are the results?	95% CI	0.30–1.03 95% CI	CI not recorded	−0.4–1.04 95% CI	0.12–0.52 95% CI	0.48–0.95 95% CI	0.52–0.99 95% CI
8. Can the results be applied to the local population?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
9. Were all important outcomes considered?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
10. Are the benefits worth the harms and costs?	Yes	Yes	Recent RCT failed to show overall benefit of NPWT use.	Yes	Yes	Yes	Yes

Note. NPWT = negative pressure wound therapy.

paramedian, and transverse) complicates the evidence as each approach has location-specific distinct SSI risks. Thus, specific laparotomy evidence could be limited (Joober et al., 2012). To minimize bias, the Cochrane risk of bias tool was used in order to assess the quality of the included studies. The results were contradictory when taking into consideration the differences and heterogeneity present between the internal studies. Reporting the overall rate of SSI moderate heterogeneity was achieved ($I^2 = 47\%$). Although the results are constrained by heterogeneity and publication bias, the overall quality of evidence was moderate. The majority of research indicated that the use of iNPWT decreases the incidence of SSI, although evidence remains elusive regarding allocation of individuals to which of the groups.

Boland et al. (2021) found a higher risk of SSI in the standard dressing group compared to iNPWT. Prophylactic iNPWT significantly lowers SSI rates (95%

CI [0.52–0.99], ($p = .04$)), particularly in closed abdominal incisions. Only PubMed database was used for the search, which can be considered as a limitation in the accessed evidence (Zhao, 2016). Limitations were acknowledged in this MA. Since the patients included are exclusively from RCT data only, intrinsic selection bias can be noted. The resulting CI were narrow, indicating that the effect size is precise and there is a greater risk between the exposed individuals. Heterogeneity was noted, partly due to an RCT that included both open- and closed-incisions. Although iNPWT has shown significant benefits for open wounds, the heterogeneity in this context might have affected the reliability of the results, potentially skewing them in favoring iNPWT use.

Sahebally et al. (2018) MA study revealed a statistical significant reduction in SSI rates ($p = .001$) with iNPWT compared to conventional dressings (pooled OR, 0.25; 95% CI [0.12–0.52]; $p < .001$). Studies included diverse laparotomy approaches collectively (midline, supraumbilical, and infraumbilical), which limits validity and accuracy due to varying site-specific risk differences (RDs). Despite this, all patients received the same pre- and postoperative care with identical −125 mm Hg. In six studies a 30 day follow-up period was used; in the other three (Bonds et al., 2013; Pellino et al., 2014; Selvaggi et al., 2014) this was not specified, causing heterogeneity ($I^2 = 66\%$). Random effects analysis pooled the results of the nine studies to offset human error and provided the pooled RR calculation (Bell et al., 2019). A sensitivity analysis test excluded studies individually, targeting colorectal laparotomies to identify heterogeneity sources attributed to study variability and assess the impact of studies with low methodological quality on treatment effect estimates. Multiple iNPWT devices were used across the studies each with different instructions and reliability, potentially influencing statistical outcomes (Sahebally et al., 2018).

Almansa-Saura et al. (2020) pooled analysis of data showed that prophylactic use of iNPWT is associated with lower SSI rates when compared to conventional dressings. However, the observed considerable heterogeneity, mostly present due to the small sample sizes among the studies and bias, sheds lights on this beneficial impact and as a result hindered the confirmation of the effect of iNPWT ($I^2 = 59\%$). To compensate, potential bias was tested by assessing the funnel plots and concluded that there is no difference in the use of iNPWT when compared to standard dressing ($p = .1$).

In Fowler and Barry (2020), the majority of the studies demonstrated a decrease in SSI with nine out of 13 studies identified a positive association between iNPWT and SSI prevention and four studies were deemed to be statistically insignificant ($p \geq .05$). Heterogeneity increased due to differing primary aims across trials, compounded by a comparison of various abdominal surgeries rather than a specific intervention. The variation in inclusion and exclusion criteria among studies further hindered the ability to critically appraise the studies effectively.

MA of 21 studies highlighted the statistically significant protective role of prophylactic iNPWT (60/485 incisions [12.4%]) against incidence of SSIs, compared to conventional dressing (191/704 incisions [27.1%]) (pooled OR, 0.25; 95% CI [0.12–0.52]; $p < .001$; Meyer et al., 2021). Stratifying the data further, the preventive impact of iNPWT was more pronounced in studies where the control arm exhibited 20% SSI incidence or higher. Moreover, the preventive effect persisted after correcting for potential publication bias, emphasizing the robustness of the findings. A limitation was noted in the pooling of the high-quality studies, revealing a reduced overall impact of iNPWT. However, an analysis of RDs in all RCTs and high-quality RCTs independently sustained the statistically significant preventive effect, providing additional insight into the nuanced impact of iNPWT. The random-effects test evaluated heterogeneity across the studies ($I^2 = 66\%$), further enhancing the validity of the MA. Heterogeneity arose from variations in surgical procedures, in iNPWT protocols, and within patient populations across the studies. Recognizing these differences, the study advocates the use of prophylactic iNPWT, particularly in countries where patients undergoing gastrointestinal surgeries face a higher risk of SSI.

The MA by Kuper et al. (2019) found no statistically significant reduction in the risk of postoperative SSI identified among those patients with iNPWT compared to standard dressings ($p = .064$). Despite a nonstatistically significant pooled estimate, the relative risk (RR = 0.56; 95% CI [0.30–1.03]) in favor of iNPWT approached significance association. This observation of the effect was attributed to suspected publication bias favoring iNPWT and the study acknowledged conflicting results from prior trials. The analysis encountered significant heterogeneity among the studies ($I^2 = 67.4\%$; $p = .015$). The Cochrane Collaboration's tool assessed for individual study bias, evaluating random sequence generation, allocation concealment, blinding, attrition bias, and reporting bias. A recognized limitation was the pooling of unadjusted observational data with RCTs and the inclusion of an inappropriate study, due to nonmatching criteria. The study acknowledged limitations in evidence quality, including the absence of blinding to study interventions and potential bias introduced by nonblinded outcome assessors in some RCTs. One trial, Shen et al. (2017), provided randomization and allocation concealment details, cautioning interpretation of association strength in this MA. Other measures aimed at SSI reduction, such as antibiotic use and bowel preparation, lacked consistency and standardization among the studies, further highlighting cautious result interpretation.

Studies receiving industry funding require special consideration due to potential bias, raising concerns about objectivity of the reported outcomes (Fabbri et al., 2018).

Specifically, in this case, there is a risk of bias favoring benefits of iNPWT. Crucially, when disclosed, such funding aligns with ethical research principles. In Flynn et al. (2019), Murphy et al. (2018), and various studies in the SR and MA, iNPWT companies provided useful resources, without editorial power or involvement in data collection and outcome dissemination.

Linking Evidence to Action

The studies addressed the effectiveness of iNPWT in comparison to conventional dressings on closed-incisions following laparotomy surgery. Overall, statistical significance is noted in one RCT (O'Leary et al., 2017) and five SR and MA (Boland et al., 2021; Fowler & Barry, 2020; Meyer et al., 2021; Sahebally et al., 2018; Wells et al., 2019). Three RCTs (Di Re et al., 2021; Flynn et al., 2019; Murphy et al., 2018) did not show statistically significant results, as two SR and MA (Almansa-Saura et al., 2020; Kuper et al., 2019).

Based on current evidence, it may be deduced that the routine prophylactic adoption of iNPWT in clinical situations aimed to reduce the occurrence SSI is reasonably supported and warrants clinical consideration. Therefore, on completion of the review process, a definite answer to the initial review question has been achieved.

Recommendations for Nursing Practice

Providing informative resources and education to both patients and their significant others bolster their understanding and encourage active participation in informed decision-making. This approach attempts to apply a person-centered approach, and in so doing, creating a strong nurse–patient therapeutic relationship (Pushparajah, 2018), enabling the nursing assessment of, and management of mental and psychosocial factors. This will ensure treatment adherence and the recognition of an altered body image reality (Vahdat et al., 2014). Even further, the role of the tissue viability nurse becomes crucial in monitoring and seamless documentation and communication, ensuring treatment delivery and sustained continuation of care (Ndoro, 2014).

Nursing management should support continuous educational programs to acquaint nurses (and possibly other clinicians) with iNPWT products and technology (Goldberg et al., 2021). Knowledgeable nurses adeptly recognize indications, benefits, contraindications, and risks, optimizing outcomes in areas like safe dressing changes, managing treatment side effects, pain control and reacting to abnormal changes faster and more accurately (Goldberg et al., 2021; Tegegn et al., 2023).

Nurses should advocate with hospital leadership to develop an iNPWT assessment tool, considering comorbidities and an individualized approach, through which high-risk patients are identified who stand to benefit most from SSI preventive measures (Stamps et al., 2021). Nurses' involvement as part of interdisciplinary teamwork approach in SSI prevention for surgical patients has shown to yield positive outcomes (Money et al., 2018). This assessment may be done collaboratively between surgeons and nurses working at different perioperative stages.

Recommendations for Further Research

The evidence in this review indicates a positive correlation between iNPWT and a reduction in SSI. Despite significant results, this review of the extant literature indicates the need for further research to address the highlighted limitations and in turn improve EBP. Further research can provide better evidence in regards to this treatment's use, its importance, and benefits (Johnson et al., 2012).

A limitation outlined emerged in the studies evaluated was the inclusion of the different laparotomy sites, which require different length of recovery and surgical site care. Conducting more specific studies by categorizing the different sites may provide more accurate results (Majid et al., 2011).

Also, more robust research that considers different confounding factors such as, smoking, diabetes, hypertension, other medical comorbidities, past surgery in the area as these may contribute to skewed results (Lawson et al., 2013). Future research should consider using the same brand within a study, or results are categorized according to brand use, for consistency in case of different level of effectiveness.

Given the volume of research that has suggested benefits from NPWT including PICO, there may be a place for further research to define more clearly which patients will benefit most from negative pressure dressings (Flynn et al., 2019). Also, multicenter RCTs, and RCTs with larger sample sizes possibility yield more credible results while improving the reliability of the findings and address current limitations (Spieth et al., 2016).

Moreover, currently, cost-effectiveness research is scarce. Such an approach can be beneficial to present evidence with robust statistical realities that allow practitioners and decision-makers to determine the benefits of investing, applying this treatment to potential candidates.

Strengths and Limitations of the Review

A comprehensive approach including keywords, Boolean operators, and the use of PRISMA guidelines and the inclusion/exclusion criteria, identified the most relevant articles to the PICO question (Connelly, 2020). Also, accessing a combination of multiple databases sought to provide a greater coverage of possible citations on the elements searched (Bramer et al., 2017). Additionally, the studies considered were high-ranking in the hierarchy of evidence while methodological evaluation using CASP tools ensured reliability.

Limitations included the exclusion of non-English studies and the appraisal of several studies using different regimes,

methodologies, and NPWT brands apparatus. This could potentially have constrained data comparability.

Conclusion

Addressing incidents of SSIs continue to be burdensome in health and medical care worldwide. The findings of this review reveal the overall trends favored the application of prophylactic iNPWT over conventional dressing in achieving palpable SSIs reduction, particularly postlaparotomy. Specifically, six studies demonstrated statistically significant effectiveness of iNPWT in this context. These insights are important for nurse practitioners involved in surgical care, and anyone having to do with these wounds, who play a significant role in the prevention and management of SSIs. Despite some methodological limitations, the overall evidence suggests that the routine prophylactic adoption of iNPWT in clinical settings aimed at reducing the occurrence of SSIs is strongly supported and warrants clinical consideration. Recommendations for nurses include continuous professional education, proactive patient assessment and right identification of moderate to high-risk patients who may benefit from iNPWT. However, ongoing patient monitoring, addressing risk factors, and further research are essential to improve the reliability of current evidence, enhancing patient outcomes, and promoting optimal recovery.

Author Contributions

MF was the lead in conceptualization, methodology, and analysis and interpretation of the results. SE conducted the search strategy and the interpretation, provided support with supervision, and led the review and editing of the writing. Both MF and SE reviewed the results, contributed to the writing and editing of the manuscript, and approved the final manuscript.

Declaration of Conflicting Interests

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Ethics Approval

This is a review study of already published literature and ethical clearance was not required.

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Supplemental Material

Supplemental material for this article is available online.

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