

Introduction

Negative pressure wound therapy (NPWT) has been a mainstay of open wound management strategies since Morykwas et al. described its successful use in animal models in 1997.¹ The development of NPWT in its current form combines two methods of treating wounds: mechanical force and locally applied suction.^{2,3} The mechanism of NPWT has been extensively studied. Sealing of open-cell foam into a wound, along with application of sub-atmospheric pressure, promotes healing by secondary intention. Blood flow to the tissue bed and rate of granulation tissue formation are significantly increased.⁴ Over time, NPWT has expanded in scope and has been incorporated into the treatment of non-traumatic wounds, including ulcers, burns, and open surgical abdominal wounds.⁴ In the early 2000s, with Operation Iraqi Freedom(OIF), NPWT became a popular approach for treating traumatic wounds. OIF saw up to 90% of combat-related wounds treated using NPWT.⁵

Despite the widespread use of NPWT due to its purported benefits, literature on NPWT presents a very heterogeneous body of evidence. Studies typically focus on individual indications for specific anatomic locations. While there have been numerous literature reviews, they present either a mixed response on cost-effectiveness and efficacy of NPWT, or they focus on specific populations that are not generalizable.^{6–9}

Methods

- Articles were collected from PubMed, SCOPUS, and CINAHL through the assistance of a librarian.
- Articles were limited to English and published in the last 15 years. After removing duplicates, abstracts from the 156 remaining articles were screened for relevance using the preferred reporting items for systematic reviews and meta-analysis (PRISMA) guidelines (Figure 1).

- Studies were included where end points of infection rate, wound closure, and length of stay were evaluated, and NPWT was a major aspect of the intervention in the settings of reconstructive surgery.
- Based on these inclusion criteria 55 articles were selected for further eligibility. Of these, further screening for inclusion criteria and applicable studies to use the GRADE framework provided 18 eligible studies for this systematic review.

Results

- There were a total of 18 studies included in this review investigating the effects of negative pressure wound therapy (NPWT) on wounds arising from a variety of etiologies. Study designs were nine randomized controlled trials (RCTs), two case-control studies, three cohort studies, and four observational/miscellaneous studies, with a total of 3131 patients.
- Length of Stay:** There were seven studies (1279 patients) that included results pertaining to the effect of negative pressure wound therapy (NPWT) on length of stay (LOS). Out of the seven papers investigating LOS, five papers had significant improvements following NPWT usage, and two papers found no significant changes. The four significant studies had GRADE scores of moderate (2), low (1), and very low (2) as opposed to moderate (1) and low (1) GRADE scores of the studies finding insignificant results.
- Infection Rate:** Fourteen articles (2201 patients) in this review discuss the impact NPWT has on infection rates in reconstruction surgeries. Studies finding significant results had GRADE scores of high (1) moderate (5), low (2), and very low (2), whereas studies with insignificant results had GRADE scores of low (4).

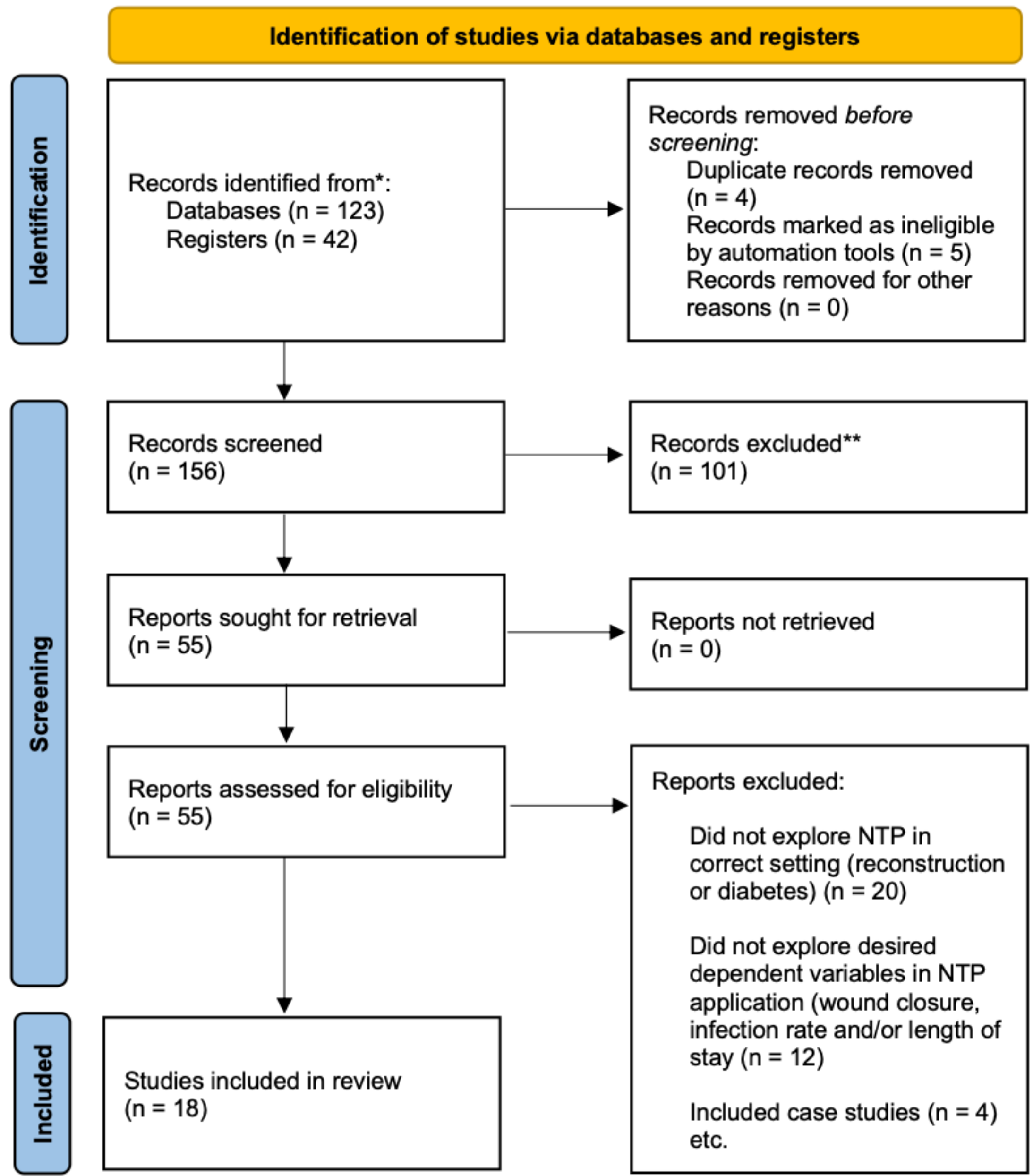


Figure 1. PRISMA flowchart used to screen papers included in this study based on our inclusion criteria.

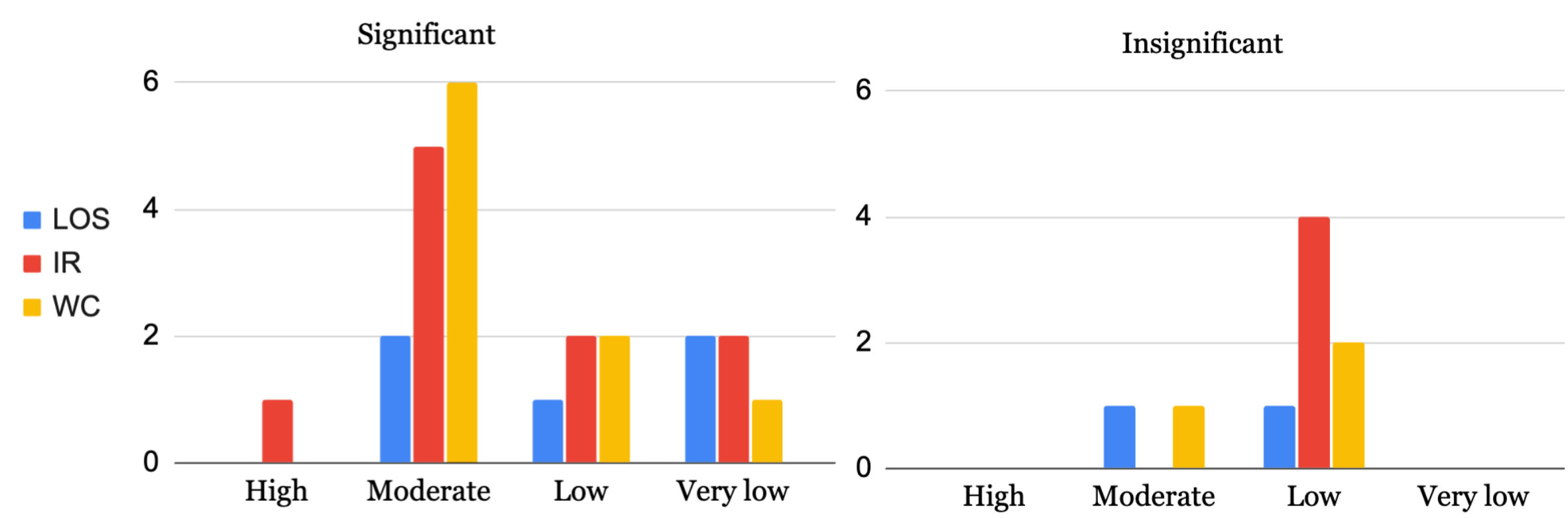


Figure 2. Bar graph depicting the number of papers at each quality of evidence level that found either significant or insignificant support of the efficacy of TNP on length of stay, infection rates, and wound closure.

- Wound Closure:** Twelve articles (2233 patients) in this review discuss the impact NPWT has on wound closure rates. Studies looking at wound closure tended to have higher GRADE scores with six of the studies finding significant beneficial results to wound closure being of a moderate grade, which compared to the three significant studies with GRADE scores of moderate, low, and very low.

Conclusion

Our systematic review was able to derive 18 papers with varying GRADE scores to conclude that there are varying degrees of endorsement for NPWT application in cases of traumatic, burn, surgical, and diabetic wounds. In our review, we found the majority of papers to support the efficacy of NPWT across all three variables. Along with a larger portion of the studies showing significant improvement in each variable, these studies tented to be of higher quality of evidence.

There remains, however, the ambiguity of NPWT significance in reconstruction settings. The diversity of wound type, healing time, and confounding variables highlighted in several papers reviewed by this study are the main culprits preventing solidified findings in RCT evaluating NPWT. Despite these concerns, many wound care practitioners and surgeons find NPWT to be a practical dressing choice linked to improve outcomes in patients.

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