

CADTH RAPID RESPONSE REPORT: SUMMARY OF ABSTRACTS

Negative Wound Pressure Therapy for Caesarean Sections: Clinical Effectiveness, Cost Effectiveness and Evidence- Based Guidelines

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Research Questions

1. What is the clinical effectiveness of negative pressure wound therapy for caesarean section incisions?
2. What is the cost-effectiveness of negative pressure wound therapy for caesarean section incisions?
3. What are the evidence-based guidelines for the use of negative pressure wound dressings for the management of surgical incisions following caesarean section?

Key Findings

Four systematic reviews (two with meta-analyses), five randomized controlled trials, seven non-randomized studies, four economic evaluations and two evidence-based guidelines were identified regarding negative pressure wound therapy for surgical incisions following cesarean delivery.

Methods

A limited literature search was conducted by an information specialist on key resources including MEDLINE, the Cochrane Library, the University of York Centre for Reviews and Dissemination (CRD) databases, the websites of Canadian and major international health technology agencies, as well as a focused Internet search. The search strategy was comprised of both controlled vocabulary, such as the National Library of Medicine's MeSH (Medical Subject Headings), and keywords. The main search concepts were negative pressure wound therapy and caesarean sections. No filters were applied to limit the retrieval by study type. The search was also limited to English language documents published between January 1, 2014 and June 11, 2019. Internet links were provided, where available.

Selection Criteria

One reviewer screened citations and selected studies based on the inclusion criteria presented in Table 1.

Table 1: Selection Criteria

Population	Patients who have undergone caesarean section Sub groups: <ul style="list-style-type: none"> • Patients with Body Mass Index >30 • Patients with Body Mass Index <30
Intervention	Negative pressure wound therapy for C-section incisions Also known as vacuum-assisted wound closure
Comparator	Q1-Q2: Standard of care (plain dressing; suture, staples, adhesive glue) Q3: Not applicable

Outcomes	Q1: Clinical effectiveness (e.g., surgical site infection (i.e. ASEPSIS wound score), time taken for surgical wound to heal (i.e. wound assessment score), wound healing complications, patient comfort, mortality and morbidity Q2: Cost-effectiveness Q3: Evidence-based guidelines
Study Designs	Health technology assessments, systematic reviews, meta-analyses, randomized-controlled trials, non-randomized studies, economic evaluations, and evidence-based guidelines

Results

Rapid Response reports are organized so that the higher quality evidence is presented first. Therefore, health technology assessment reports, systematic reviews, and meta-analyses are presented first. These are followed by randomized controlled trials, non-randomized studies, economic evaluations, and evidence-based guidelines.

Four systematic reviews (two with meta-analyses), five randomized controlled trials, seven non-randomized studies, four economic evaluations and two evidence-based guidelines were identified regarding negative pressure wound therapy for surgical incisions following cesarean delivery. No relevant health technology assessments were identified.

Additional references of potential interest are provided in the appendix.

Overall Summary of Findings

Four systematic reviews (SRs)¹⁻⁴ (two with meta-analyses³⁻⁴), five⁵⁻⁹ randomized controlled trials (RCTs), seven non-randomized studies (NRS),¹⁰⁻¹⁶ four economic¹⁷⁻²⁰ evaluations and two evidence-based guidelines²¹⁻²² were identified regarding negative pressure wound therapy (NPWT) for surgical incisions following cesarean delivery. Detailed study characteristics are outlined in Table 2.

There was no consensus among the four identified systematic reviews and meta-analyses¹⁻⁴ whether NPWT was more effective than standard wound dressings for surgical incisions for patients undergoing cesarean delivery. Three of the identified SR^{1,3,4} concluded that NPWT or closed incisional negative pressure therapy (ciNPT) did not reduce dehiscence, reoperation, wound complications and other outcomes compared with standard wound dressings. However, one of these SRs² included a variety of surgeries in their inclusion criteria and did not report the cesarean delivery outcomes separately, making it unclear whether NPWT was more effective than standard dressings for cesarean incisions. Moreover, NPWT reduced surgical site infections (SSIs) in two identified studies.^{2,4} However, the study by Webster et al (2019) did not specify whether the results were statistically significant while the study by Smid et al (2017) found the results to be statistically significant.^{2,4} Comparatively, another identified study³ concluded that SSIs and wound complications were significantly lower with NPWT compared to standard dressings.

Of the five identified RCTs,⁵⁻⁹ the authors of three of these studies^{5,8,9} concluded that NPWT reduced SSIs compared to standard dressings for obese patients undergoing cesarean delivery, although none of these studies deemed the results to be statistically significant.^{5,8,9} Additionally, one RCT⁶ reported there was no difference in SSIs between NPWT and standard dressings while another RCT⁷ did not specify the results of their study as to whether ciNPT reduced surgical site occurrences compared to standard dressings in obese patients.

Of the seven identified NRS,¹⁰⁻¹⁶ two studies^{10,13} reported that NPWT and standard dressings for cesarean incisions had similar effectiveness, although some of these results were not statistically significant including wound complications and separation. Outcomes reported by the authors of these two studies^{10,13} included cellulitis, dehiscence, wound separation and complications. Moreover, five identified NRSs^{11,12,14,15,16} concluded that NPWT and ciNPT were more effective compared to standard dressings for cesarean incisions in both obese and non-obese patients. The authors of three of these studies^{11,12,14} reported SSI as an outcome while other studies^{15,16} reported wound complication and dehiscence.

Moreover, three economic evaluations^{17,18,20} concluded that NWPT was cost-effective compared to standard dressings while one study³ noted that NWPT was more costly than standard dressing and had similar outcomes for cesarean incisions.

Finally, two evidence-based guidelines^{21,22} were identified with conflicting recommendations regarding the use of NWPT for cesarean incisions. The guideline²¹ by the Royal College of Obstetricians and Gynecologists acknowledges there is a lack of good quality evidence to recommend the routine use of NWPT for cesarean while the National Institute for Health and Care Excellence (NICE) guideline²² recommends the use of NWPT for cesarean incisions as it is associated with fewer SSIs and seromas when compared to standard wound dressings.

Table 2: Summary of Findings

First Author (Year)	Patient Population (Number of Subjects)	Intervention	Comparator	Outcomes	Results
Systematic Reviews and Meta-Analyses					
Feinstein ¹ (2019)	Patients undergoing cesarean delivery (Not Specified)	ciNPT	Standard wound dressings	Outcomes were not specified	<ul style="list-style-type: none"> - Five studies identified - Two articles stated positive outcomes for ciNPT - Two studies concluded similar outcomes for ciNPT and traditional incisions - One study reported negative outcomes for ciNPT
Webster ² (2019)	Patients undergoing surgery and require wound dressings (N=2957)	NPWT	Another type of NWPT or standard wound dressings	<ul style="list-style-type: none"> - Mortality - SSI - Dehiscence - Reoperation rates - Hematoma QALY 	<ul style="list-style-type: none"> - Study conclusions are not specific to cesarean surgery - 23 studies reported that NWPT may reduce SSI rates - Uncertain whether NWPT reduces risk of dehiscence and reoperation rates compared to standard dressings

First Author (Year)	Patient Population (Number of Subjects)	Intervention	Comparator	Outcomes	Results
					<ul style="list-style-type: none"> - One study reported no difference between QALY for NPWT and standard dressings. - Another study deemed NPWT cost-effective compared to standard dressings
Smid ⁴ (2017)	Obese patients undergoing cesarean delivery (Not specified)	Prophylactic NPWT	Standard wound dressings	<ul style="list-style-type: none"> - Wound complications - SSIs - Cellulitis - Seroma - Hematoma - Dehiscence 	<ul style="list-style-type: none"> - Ten studies were identified - No difference in primary outcomes between NPWT and standard dressings
Randomized Controlled Trials					
Hyldig ⁵ (2019)	Obese patients undergoing cesarean delivery (N=876)	Prophylactic NPWT (N=432)	Standard wound dressings (N=444)	<ul style="list-style-type: none"> - SSIs requiring antibiotic treatment - Would exudate - Dehiscence HRQoL 	<ul style="list-style-type: none"> - NPWT reduced SSIs compared to standard dressings but was not statistically significant - There was no difference in QALYs and dehiscence
Wihbey ⁶ (2018)	Obese patients undergoing cesarean delivery (N=161)	Prophylactic NPWT (N=80)	Standard wound dressings (N=81)	<ul style="list-style-type: none"> - Superficial SSIs 	<ul style="list-style-type: none"> - No difference in SSIs between two groups
Gunatilake ⁷ (2017)	Obese patients undergoing cesarean delivery (Not specified)	ciNPWT	Standard wound dressings	<ul style="list-style-type: none"> - SSOs 	<ul style="list-style-type: none"> - Not specified
Ruhstaller ⁸ (2017)	Obese patients undergoing cesarean delivery (N=126)	Prophylactic NPWT (N=67)	Standard wound dressings (N=69)	<ul style="list-style-type: none"> - SSIs - Wound opening 	<ul style="list-style-type: none"> - No significant difference between groups regarding SSIs and wound openings
Chaboyer ⁹ (2014)	Obese patients undergoing elective cesarean delivery (N=92)	NPWT (N=46)	Standard wound dressings (N=46)	<ul style="list-style-type: none"> - SSIs 	<ul style="list-style-type: none"> - Lower SSI rate was found in NPWT group compared to standard dressings group - Statistical significance was not identified for SSI rate

First Author (Year)	Patient Population (Number of Subjects)	Intervention	Comparator	Outcomes	Results
Non-Randomized Studies					
Kawakita ¹⁰ (2019)	Patients with extreme obesity patients undergoing cesarean delivery (N=179)	NPWT (N=73)	Standard wound dressings (N=106)	<ul style="list-style-type: none"> - Cellulitis - Hematoma - Seroma - Dehiscence 	<ul style="list-style-type: none"> - Outcomes were similar between groups
Looby ¹¹ (2018)	Obese patients undergoing cesarean delivery (N=467)	NPWT (N=234)	Control group (preintervention)	<ul style="list-style-type: none"> - SSIs 	<ul style="list-style-type: none"> - NPWT significantly decreased the incidence of SSIs
Searle ¹² (2017)	Patients undergoing cesarean delivery with high BMI (N=399)	ciNPT (with PICOTM system)	None	<ul style="list-style-type: none"> - SSIs - Hospital readmissions 	<ul style="list-style-type: none"> - ciNPT reduced SSI and readmissions
Orth ¹³ (2016)	Patients undergoing cesarean delivery (N=970)	ENPDS (N=103)	Standard wound dressings (N=867)	<ul style="list-style-type: none"> - Wound complications - Wound separation 	<ul style="list-style-type: none"> - Wound complications had similar outcomes and results in both groups - Wound separation was higher in ENPDS group although it was not statistically significant
Anglim ¹⁴ (2015)	High-risk patients undergoing elective cesarean delivery (N=20)	NPWT (Prevena TM)	None	<ul style="list-style-type: none"> - Dehiscence - Wound complications - Reoperation 	<ul style="list-style-type: none"> - Wound complication rates were low - No cases of dehiscence or reoperation
Swift ¹⁵ (2015)	Patients undergoing cesarean delivery	NWPT system (N=110)	Control cohort	<ul style="list-style-type: none"> - SSIs - Wound separation 	<ul style="list-style-type: none"> - NWPT system group had significantly lower rate of SSIs - Wound separation was not statistically significant between groups
Mark ¹⁶ (2014)	Morbidly obese patients undergoing cesarean delivery (N=63)	Prophylactic NWPT (N=21)	Standard wound dressing (Control) (N=42)	<ul style="list-style-type: none"> - Wound complications 	<ul style="list-style-type: none"> - Wound complications were in control group while none were identified in NWPT group

First Author (Year)	Patient Population (Number of Subjects)	Intervention	Comparator	Outcomes	Results
Economic Evaluations					
Hyldig ¹⁷ (2019)	Obese patients undergoing cesarean delivery	iNPWT (N=432)	Standard wound dressings (N=444)	- Costs - QALYs	- NWPT was both less costly and more effective than standard dressings - No statistical difference in costs or QALYs between iNPWT and standard dressings
Heard ¹⁸ (2017)	Obese patients undergoing elective cesarean delivery (N=87)	NWPT (N=44)	SoC (N=43)	- Cost per SSI - QALYs	- NWPT was costlier and more effective compared to SoC - NWPT was considered cost-effective
Echeberi ¹⁹ (2015)	Patients undergoing cesarean delivery	Prophylactic NWPT	Standard wound dressings	- Expected value of the cost per strategy	- NWPT cost more than standard dressings
Tuffaha ²⁰ (2015)	Obese women undergoing high-risk cesarean deliveries	NWPT	Standard wound dressings	- Costs - SSI prevention	- NWPT was considered cost-effective compared to standard dressings

BMI= body mass index; ciNPT= closed incisional negative-pressure therapy; ENPDS= external negative pressure dressing system; HRQoL= Health-related Quality of Life; iNPWT= incisional negative pressure wound therapy; NPWT= negative pressure wound therapy; NRS= non-randomized studies; QALY= quality-adjusted life years; RCT= randomized controlled trial; SoC= standard of care; SSI= surgical site infections; SSO= surgical site occurrences

References Summarized

Health Technology Assessments

No literature identified.

Systematic Reviews and Meta-analyses

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Randomized Controlled Trials

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Guidelines and Recommendations

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See: 1 Recommendations

Appendix — Further Information

Review Articles

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