

CADTH RAPID RESPONSE REPORT: SUMMARY OF ABSTRACTS

Interventions to Prevent Infection Post-Caesarean Section: Clinical Effectiveness

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Authors: Camille Dulong, Kelly Farrah

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Research Questions

1. What is the clinical effectiveness of preoperative interventions for infection prevention following caesarean section?
2. What is the clinical effectiveness of intraoperative interventions for infection prevention following caesarean section?

Key Findings

One overview of reviews, six systematic reviews and thirteen randomized-controlled trials were identified regarding the use of preoperative and intraoperative interventions for infection prevention following cesarean section.

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 caesarean sections and infection prevention. Search filters were applied to limit retrieval to health technology assessments, systematic reviews, meta-analyses, or network meta-analyses and randomized controlled trials. The search was also limited to English language documents published between January 1, 2014 and June 28, 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 undergoing caesarean section Sub groups: <ul style="list-style-type: none"> • Patients with Body Mass Index >30 • Patients with Body Mass Index <30
Intervention	Q1: Pre-operative antibiotic administration (i.e. antibiotic prophylaxis); vaginal preparation/ vaginal wash; hair removal; handwashing; surgical face masks; patient oxygen protocols; microbial sealants Q2: Surgical technique (i.e. method of surgical incision, method of skin closure), application of antiseptic patient skin preparation prior to incision
Comparator	Q1-Q2: No treatment, before and after
Outcomes	Clinical effectiveness (e.g., surgical site infections, morbidity, mortality)
Study Designs	Health technology assessments, systematic reviews, meta-analyses and randomized-controlled trials

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, followed by randomized controlled trials.

One overview of reviews, six systematic reviews and thirteen randomized-controlled trials were identified regarding the use of preoperative and intraoperative interventions for infection prevention following cesarean section. No relevant health technology assessments were identified.

Additional references of potential interest are provided in the appendix.

Overall Summary of Findings

One overview of reviews,¹ six systematic reviews (SRs)²⁻⁷ and thirteen randomized-controlled trials (RCTs)⁸⁻²⁰ were identified regarding the use of preoperative and intraoperative interventions for infection prevention following cesarean section. Detailed study characteristics are outlined in Table 2.

The identified overview of reviews¹ presented evidence on the use of intraoperative interventions to prevent surgical site infections (SSIs). Although this publication was not specific to cesarean surgeries (including all forms of surgery), the review identified 82 relevant trials that concluded that antibiotic prophylaxis may reduce SSI rates compared to no treatment for patients undergoing cesarean delivery.

Multiple preoperative and intraoperative interventions were identified from the six relevant SRs.²⁻⁷ Two SRs^{4,6} examined whether vaginal preparation with antiseptic solution (povidone-iodine and chlorhexidine benzalkonium chloride) was more effective in preventing endometritis, fever, and post-operative wound infections compared to no vaginal preparation. Both studies found that vaginal preparation with antiseptic solution reduced the incidence of endometritis and fever compared to no treatment.^{4,6} Additionally, one SR² concluded that O-ring retractors did not reduce SSIs while another SR³ could not determine whether mechanical dilation improved postpartum hemorrhaging in patients undergoing cesarean delivery. Another identified SR⁵ found that preoperative antibiotics before cord clamping reduced infectious morbidity, endometritis and endomyometritis compared to administering antibiotics after clamping. The final identified SR⁷ concluded that subcutaneous tissue suturing reduced wound complications and seroma in cesarean patients, while there was no effect on the incidence of hematoma.

Of the thirteen identified RCTs⁸⁻²⁰, two of these studies^{8,17} examined whether the use of pre-operative antibiotic prophylaxis compared to no treatment reduced non-infectious wound complications, SSIs, fever and endometritis. Both studies concluded that pre-operative antibiotics did not significantly reduce the outcomes of interest and no definitive conclusions could be drawn about pre-operative antibiotics.^{8,17} Additionally, four RCTs^{9,12,14,15} compared pre-operative vaginal cleansing or preparation with antiseptic solutions to no pre-operative cleansing to determine whether SSIs, endometritis, wound infections, length of hospital stay, and fever were significantly reduced. There was no consensus among these four RCTs^{9,12,14,15} if pre-operative vaginal cleansing significantly improved patient-related outcomes. Two identified RCTs^{10,11} compared mechanical cervical dilation to no cervical dilation in cesarean patients with differing patient-related outcomes. In one RCT,¹⁰ mechanical cervical dilation did not significantly reduce wound infection rates

and endometritis while there were no significant differences between groups for blood loss found in the other RCT.¹¹ Moreover, an identified RCT¹³ concluded that intraoperative glove changing during cesarean delivery led to a significant decrease in wound complications while another RCT¹⁶ found uterine cleansing with normal saline did not significantly reduce wound infections, fever, and febrile morbidity compared to no treatment. The use of povidone-iodine irrigation prior to skin closure in one RCT¹⁸ did not reduce SSI rates and/or readmission rates compared to no irrigation among cesarean patients. Another RCT¹⁹ concluded that suture closure of subcutaneous tissue did not significantly change wound complication or wound separation rates compared to no subcutaneous suture closures. The final identified RCT²⁰ summarized that electrocautery for coagulation did not significantly reduce hematoma, seroma, and infection rates compared to no treatment in patients undergoing cesarean delivery.

Table 2: Summary of Study Characteristics:

First Author (year)	Population	Intervention	Comparator	Outcomes	Results
Overview of Reviews					
Liu Z¹ (2018)	Cesarean surgery patients (N=14,407)	Antibiotic prophylaxis	No treatment	- SSI rates	- 82 relevant trials - Antibiotic prophylaxis may reduce SSI rates compared to no treatment
Systematic Reviews and Meta-Analyses					
Waring GJ² (2018)	Patients undergoing cesarean section (N=1,669)	O-ring retractors (Alexis/Mobius)	Routine care	- SSI rates (primary outcome) - Operating time - Estimated blood loss - Need for blood transfusion - Need to exteriorize the uterus - Additional post-operative analgesia	- Six RCTs were identified - The use of O-ring did not reduce the SSI rates, or any of the secondary outcomes

First Author (year)	Population	Intervention	Comparator	Outcomes	Results
Liabsuetra ku T³ (2018)	Patients undergoing elective cesarean section (N=2,227)	Mechanical dilation of the cervix (N=1,097)	No operative mechanical dilation (N=1,130)	<ul style="list-style-type: none"> - Postpartum hemorrhage (primary outcome) - Need for blood transfusion - Drop of baseline hemoglobin - Incidence of postpartum hemorrhage - Febrile morbidity - Endometritis - Uterine subinvolution 	<ul style="list-style-type: none"> - Eight studies included - Unclear whether postpartum hemorrhage improved with mechanical dilation - Slight improvement in secondary outcomes
Haas DM⁴ (2018)	Patients undergoing cesarean section (N=3,403)	Vaginal preparation with antiseptic solution (povidone-iodine, chlorhexidine benzalkonium chloride)	No vaginal preparation or saline preparation	<ul style="list-style-type: none"> - Incidence of endometritis (primary outcome) - Post-operative fever - Post-operative wound infection - Adverse effects 	<ul style="list-style-type: none"> - Eleven RCTs included - Vaginal preparation reduced post-operative endometritis
Bollig C⁵ (2018)	Patients undergoing cesarean section	Preoperative antibiotics before cord clamping	Antibiotics after cord clamping	<ul style="list-style-type: none"> - Infectious morbidity (primary outcome) - Endomyometritis and/or endometritis - Wound infections - Neonatal outcomes 	<ul style="list-style-type: none"> - 18 RCTs included - Preoperative antibiotics reduced infectious morbidity, endomyometritis and endometritis compared to after clamping
Caissutti C⁶ (2017)	Patients undergoing cesarean section (N=4,837)	Vaginal cleansing before cesarean delivery (e.g., povidone-iodine)	Placebo or no intervention	<ul style="list-style-type: none"> - Incidence of post-operative endometritis - Post-operative fever 	<ul style="list-style-type: none"> - 16 RCTs were identified - Significant reduction in post-operative endometritis and fever for those who had vaginal cleansing compared to those who didn't
Pergialiotis V⁷ (2017)	Patients undergoing cesarean delivery (N=3,696)	Subcutaneous tissue suturing	No subcutaneous tissue sutures	<ul style="list-style-type: none"> - Wound complications (Primary outcome) - Seroma incidence - Hematoma incidence 	<ul style="list-style-type: none"> - Ten RCTs were identified - Re-approximation of subcutaneous tissue reduced wound complications - The incidence of seroma decreased

First Author (year)	Population	Intervention	Comparator	Outcomes	Results
					<ul style="list-style-type: none"> with subcutaneous suturing - There was no effect of hematoma incidence
Randomized Controlled Trials					
Ausbeck EB⁸ (2019)	Patients undergoing Cesarean delivery (N=2,013)	Addition of azithromycin to pre-operative antibiotic prophylaxis (N=1,019)	Placebo (N=994)	<ul style="list-style-type: none"> - Non-infectious wound complications 	<ul style="list-style-type: none"> - Azithromycin reduced non-infectious wound complication rates although the results were not statistically significant
Aref NK⁹(2019)	Patients scheduled for term elective cesarean delivery (N=226)	Pre-operative vaginal cleansing (povidone-iodine)	Control	<ul style="list-style-type: none"> - Endometritis - Febrile morbidity - Maternal fever - Wound infection 	<ul style="list-style-type: none"> - Vaginal cleansing significantly reduced endometritis - Maternal fever and wound infection did not significantly differ between groups
Dawood AS¹⁰ (2019)	Patients undergoing elective cesarean delivery with singleton fetus over 37 weeks of gestation (N=420)	Mechanical cervical dilation	No cervical dilation	<ul style="list-style-type: none"> - Scar integrity (primary outcome) - Wound infection rates - Endometritis 	<ul style="list-style-type: none"> - Scar width and depth were higher in dilation group - No significant differences between groups for wound infections rates and endometritis
Ei-Shakawy M¹¹ (2018)	Patients undergoing scheduled cesarean delivery (N= Not reported)	Mechanical cervical dilation	No cervical dilation	<ul style="list-style-type: none"> - Blood loss (primary outcome) - Reduction of hemoglobin/hematocrit - Postpartum hemorrhage - Wound infection rates - Surgery duration/hospital stay - endometritis 	<ul style="list-style-type: none"> - No difference between groups regarding blood loss - Dilation group had higher hemoglobin/hematocrit and longer surgery length - No difference between groups for other outcomes

First Author (year)	Population	Intervention	Comparator	Outcomes	Results
La Rosa M¹² (2018)	Patients undergoing cesarean delivery (N = Not reported)	Institutional policies for vaginal prep with antiseptic solution (azithromycin) (N=523)	No policies for vaginal prep (N=1,490)	<ul style="list-style-type: none"> - Superficial or deep surgical SSI (primary outcome) - Endometritis - Wound infection - Length of hospital stay - Fever - Readmission rates 	<ul style="list-style-type: none"> - No difference in superficial or deep SSI rates between groups - No significant difference in outcomes between groups
Scrafford JD¹³ (2018)	Patients undergoing cesarean delivery (N = Not reported)	Intra-operative glove changing (N=276)	Usual care (N=277)	<ul style="list-style-type: none"> - Wound-related complications (primary outcome) - Infections complications (endometritis, SSI rates) 	<ul style="list-style-type: none"> - Glove changing led to significant decrease in wound complications compared to usual care.
Goymen A¹⁴ (2017)	Patients undergoing caesarean delivery (N = Not reported)	Vaginal cleansing: <ol style="list-style-type: none"> 1. Povidone iodine (N=41) 2. Benzalkonium chloride (N=39) 	Control group (N=40)	<ul style="list-style-type: none"> - Duration of operation - Length of hospital stay - Amount of bleeding - Post-operative pain - Flatulence - Defecation 	<ul style="list-style-type: none"> - No difference between group in operation time or hospital stay - Povidone iodine group had less post-operative pain compared to control group
Ahmed MR¹⁵ (2017)	Patients undergoing cesarean delivery (N=218)	Vaginal cleansing using chlorhexidine 0.25% wipes	Control group	<ul style="list-style-type: none"> - Endometritis - Febrile morbidity - Wound infection 	<ul style="list-style-type: none"> - Vaginal cleansing reduced infectious endometritis compared to control group - Fever and wound infection showed no significant difference between groups
Jafarzadeh L¹⁶ (2016)	Patients undergoing elective cesarean delivery (N=90)	Uterine cleansing with normal saline (N=45)	Control group (N=45)	<ul style="list-style-type: none"> - Bleeding - Fever - Wound infection 	<ul style="list-style-type: none"> - No significant difference between groups for febrile morbidity, fever and wound infections
Hong F¹⁷ (2016)	Patients undergoing elective cesarean delivery	Antibiotic prophylaxis (N=202)	No treatment (N=212)	<ul style="list-style-type: none"> - SSI - Fever - Endometritis - UTI 	<ul style="list-style-type: none"> - No statistical difference between groups for infection morbidity outcomes

First Author (year)	Population	Intervention	Comparator	Outcomes	Results
	(N=414)				
Mahomed K¹⁸ (2016)	Patients undergoing elective cesarean delivery (N = Not reported)	Povidone-iodine irrigation prior to skin closure	No irrigation	<ul style="list-style-type: none"> - SSI (primary outcome) - Readmission rates requiring antibiotics 	<ul style="list-style-type: none"> - SSI rates were similar between groups - No difference in readmission rates among groups
Carbacioglu E¹⁹ (2014)	Patients undergoing elective cesarean delivery (N=361)	Suture closure of subcutaneous tissue (N=176)	Non-closure of subcutaneous tissue (N=185)	<ul style="list-style-type: none"> - Composite wound complication - Superficial wound separation 	<ul style="list-style-type: none"> - No significant difference in wound complication rates and wound separation between groups
Moreira CM²⁰ (2014)	Patients undergoing elective cesarean delivery (N = Not reported)	Electrocautery for coagulation	No treatment	<ul style="list-style-type: none"> - Infection rates - Hematoma - Seroma - Dehiscence 	<ul style="list-style-type: none"> - No significant differences between group for all outcomes

RCT= randomized controlled trial; SSI= surgical site infection; UTI=urinary tract infection

References Summarized

Health Technology Assessments

No literature identified.

Systematic Reviews and Meta-analyses

Overviews of Reviews

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Systematic Reviews and Meta Analyses of Primary Studies

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Randomized Controlled Trials

All Patients Undergoing Caesarean Delivery

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Appendix — Further Information

Previous CADTH Reports

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Randomized Controlled Trials

Alternative Comparator

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Review Articles

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