

Pre-operative and post-operative recommendations to surgical wound care interventions: A systematic meta-review of Cochrane reviews

Supplemental material 1: Study characteristics for pre- and post-operative reviews

	Author (year)	No. studies (no. patients)	Population and surgery	Intervention	Comparator	Outcome (italics denotes outcomes identified in the review but no primary studies had data on these outcomes)	Quality/certainty of evidence
Pre-operative	Arrowsmith and Taylor (2014)	1 (102)	Scrub nurses prior to surgery	Removal of nail polish or rings	No removal	<ul style="list-style-type: none"> number of bacterial colonising forming units 	Not reported No GRADE
	Basevi and Lavender (2014)	Review 3 (1039) Surgical wound studies 1 (458)	Women in labour	Perineal shaving before birth	No shaving or clipping	<ul style="list-style-type: none"> maternal fever perineal wound infection <i>perineal dehiscence</i> <i>side effects (irritation)</i> <i>need for resuturing</i> maternal satisfaction neonatal infection 	Very low to low GRADE
	Dumville et al. (2015)	13 (2623)	Patients of any age undergoing clean surgery	Various skin antiseptics	Alternative antiseptics or soap	<ul style="list-style-type: none"> surgical site infection (risk and rate) <i>adverse events</i> <i>quality of life</i> <i>resource use</i> 	Very low estimate or low GRADE
	Gurusamy et al. (2014)*	7 (614)	Patients undergoing liver transplantation	Various methods to prevent liver transplantation wound complications	Other practices	<ul style="list-style-type: none"> mortality retransplantation <i>adverse events</i> <i>graft rejection</i> <i>intensive therapy stay</i> <i>hospital length of stay</i> <i>quality of life</i> 	Very low GRADE
	Haas et al. (2018)	11 (3403)	Women undergoing caesarean section	Various vaginal cleaning solutions and practices prior to caesarean section	No preparation or use of saline	<ul style="list-style-type: none"> post-op fever post-op complications (endometriosis, wound infection, adverse events) 	Moderate GRADE
	Hadiati et al. (2018)	11 (6234)	Women undergoing caesarean section	Various agents for skin preparation prior to caesarean section	Other practices	<ul style="list-style-type: none"> surgical site infection <i>endometriosis</i> endomyometritis <i>maternal mortality</i> <i>repeat surgery</i> skin irritation (or reaction) hospital length of stay <i>readmission for infection</i> 	Very low to moderate GRADE
	Liu et al. (2017)	2 (291)	Carriers of <i>Staphylococcus aureus</i> undergoing cardiac surgery	Nasal decontamination with antiseptic or antibiotic	Placebo or no decontamination	<ul style="list-style-type: none"> mortality surgical site infection other nosocomial infections <i>adverse events</i> <i>resource use</i> <i>cost</i> <i>quality of life</i> 	Very low to low GRADE
	O'Kelly and Moore (2017)	0 (0)	Pregnant women	Antenatal education about potential perineal wounds	Other practices	<ul style="list-style-type: none"> perineal wound healing infection rate re-attendance or re-admission postnatal pain quality of life maternal bonding negative emotional experiences 	Not reported No GRADE
	Stewart et al. (2006)	35 (13 669)	Arterial reconstruction	Bathing/showering with antiseptic	Normal bath/shower	<ul style="list-style-type: none"> Wound/graft infection 	Jadad score**: M = 2.7 (0 = very poor, 5= rigorous) No GRADE
	Tanner et al. (2011)	14 (3638)	Adult patients undergoing surgery	Pre-operative hair removal, timing and method	No hair removal or different methods/ timing of hair removal	<ul style="list-style-type: none"> wound complications including surgical site infection <i>hospital length of stay</i> <i>cost of hair removal</i> 	Not high quality No GRADE
	Webster and Osborne (2015)	7 (10,157)	Adults and children undergoing any type of surgery	Bathing or showering with antiseptics	Bathing or showering without antiseptics	<ul style="list-style-type: none"> mortality surgical site infection allergic reaction hospital length of stay readmission 	Very low to high GRADE

(Continued on next page.)

Study characteristics for pre- and post-operative reviews (continued)

	Author (year)	No. studies (no. patients)	Population and surgery	Intervention	Comparator	Outcome (italics denotes outcomes identified in the review but no primary studies had data on these outcomes)	Quality/certainty of evidence
Post-operative	Dat et al. (2012)	Review 7 (347) Surgical wounds 2 (98)	Acute and chronic wounds	Aloe-vera dressing	Placebo	<ul style="list-style-type: none"> wound healing <i>wound appearance</i> <i>adverse events (including infection)</i> <i>cost</i> <i>quality of life</i> 	Poor quality trials No GRADE
	Dumville et al. (2016)	29 (5718)	Adults or children who had undergone surgical procedures	Various wound dressings	Alternative dressings or no dressings	<ul style="list-style-type: none"> surgical site infection scarring acceptability ease of removal <i>pain</i> <i>cost</i> 	Very low to low GRADE
	Fernandez and Griffiths (2012)	Review 11 (3449) Surgical wounds 4 (1238)	People of all ages with a wound of any aetiology	Water, normal saline, tap water, distilled water, boiled water	No cleansing, procaine spirit, saline, isotonic saline	<ul style="list-style-type: none"> infection proportion of wounds that healed rate of healing pain <i>discomfort</i> patient satisfaction <i>staff satisfaction</i> <i>costs</i> 	Poor quality trials No GRADE
	Heal et al. (2016)	14 (6466)	Wounds healing by primary intention	Topical antibiotics	Placebo	<ul style="list-style-type: none"> surgical site infection allergic contact dermatitis time to healing proportion of wound that had healed patient satisfaction <i>quality of life</i> <i>cost for preventing infection</i> 	Very low to moderate GRADE
	Jull et al. (2015)	Review 26 (3011) Surgical wounds 1 (50)	Acute or chronic wounds, women undergoing caesarean section or hysterectomy	Topical honey	Antiseptic washes followed by gauze or other practice	<ul style="list-style-type: none"> wound healing time adverse events infection <i>quality of life</i> <i>costs</i> 	Moderate GRADE
	Lethaby et al. (2013)	11 (572)	External bone fixation and pins	Various methods to clean or dress pin sites	Other practices	<ul style="list-style-type: none"> pin site infection pin site re-siting external fixator apparatus removal patient comfort <i>patient acceptability</i> <i>duration of treatment and overall treatment</i> <i>cost</i> <i>limb amputation</i> <i>mortality</i> 	Poor quality trials No GRADE
	Smith et al. (2013)	5 (159)	Patients with a surgical wound that required debridement	Various debridement methods	Other debridement, placebo or no debridement	<ul style="list-style-type: none"> time to complete debridement time to healing proportion of wounds that healed completely <i>infection</i> hospital length of stay <i>cost</i> <i>patient satisfaction</i> <i>quality of life</i> 	Poor quality trials No GRADE
	Toon et al. (2015)	4 (280)	Primary closure of clear and clean contaminated surgical wounds	Early dressing removal (within 48 hours)	Delayed removal	<ul style="list-style-type: none"> superficial surgical site infection wound dehiscence serious adverse events <i>quality of life</i> <i>time to return to work</i> hospital length of stay costs 	Very low to low GRADE

(Continued on next page.)

Study characteristics for pre- and post-operative reviews (continued)

	Author (year)	No. studies (no. patients)	Population and surgery	Intervention	Comparator	Outcome (italics denotes outcomes identified in the review but no primary studies had data on these outcomes)	Quality/certainty of evidence
Post-operative	Toon et al. (2015)	1 (857)	Patients with a surgical procedure and had surgical closure of their wounds	Early post-operative bathing (dressing to be removed after 12 hours and normal bathing resumed)	Delayed post-operative bathing (dressing to be retained for at least 48 hours before removal and resumption of normal bathing)	<ul style="list-style-type: none"> surgical site infection <i>dehiscence</i> <i>wound delayed morbidity (i.e. incisional hernia, keloid scar)</i> <i>number of dressing changes</i> <i>quality of life</i> <i>hospital length of stay</i> <i>number of hospital/home visits</i> <i>antibiotics required</i> 	Very low GRADE
	Vermeulen et al. (2007)	Review 3 (847) Surgical wounds 1 (619)	Contaminated or infected wounds	Topical silver	Local practice	<ul style="list-style-type: none"> wound healing <i>pain</i> <i>days of wound infection</i> adverse effects systemic antibiotics patient satisfaction <i>quality of life</i> <i>hospital length of stay</i> <i>costs</i> 	Not reported No GRADE
	Webster et al. (2014)	9 (785)	Skin grafts and wounds healing by primary intention	Negative pressure wound therapy	Other dressings	<ul style="list-style-type: none"> mortality surgical site infection wound dehiscence seroma/haematoma failed skin graft time to complete healing re-operation hospital length of stay fracture blisters <i>pain</i> <i>quality of life</i> <i>costs</i> 	Unclear, poor quality trials No GRADE

Notes

GRADE = Grading of Recommendations Assessment, Development and Evaluation

*Gurusamy et al. focussed on both pre- and post-operative interventions.

**Jadad score = 3-point questionnaire using yes/no response for the following questions: Was the study described as randomised?, Was the study described as double blind? and Was there a description of withdrawals and dropouts? (Reference: Jadad AR, Moore RA, Carroll D, Jenkinson C, Reynolds DJM, Gavaghan DJ et al. Assessing the quality of reports of randomized clinical trials: Is blinding necessary? *Control Clin Trials* 1998;17(1):1-12.)

Supplemental material 2: Recommendations for future research, including methodological issues

		Future research			Methodological issues									
		Further trials needed Y/N	Better quality research needed	More research based on collaboration with decision makers	Larger sample/ more sites	Powered sample	Allocation concealment	Blinding outcomes	Longer follow up	Appropriate statistical analysis	Inclusion of intention to treat analysis	Clearly defined interventions	Reporting by CONSORT statement	Include baseline comparability of groups
Surgical site infection – pre-op	Removal of nail polish and finger rings to prevent surgical site infection	Y	✓		✓	✓	✓	✓				✓		
	Routine perineal shaving on admission in labour	N												
	Pre-operative skin antiseptics for preventing surgical wound infections after clean surgery	Y		✓	✓									
	Methods of preventing bacterial sepsis and wound complications after liver transplantation	Y	✓										✓	
	Vaginal preparation with antiseptic solution before caesarean section for preventing postoperative infections	Y												
	Skin preparation for preventing infection following caesarean section	Y	✓		✓		✓	✓				✓		
	Nasal decontamination for the prevention of wound infections in <i>Staphylococcus aureus</i> carriers	Y	✓	✓	✓	✓			✓					
	Antenatal maternal education for improving postnatal perineal healing for women who have birthed in a hospital setting	Y			✓									
	Prevention of infection in arterial reconstruction	Y												
	Pre-operative hair removal to reduce wound infections	Y			✓	✓			✓				✓	✓
	Pre-operative bathing or showering with skin antiseptics to prevent wound infection	Y	✓		✓	✓			✓				✓	✓
Surgical site infection – post-op	Aloe vera for treating acute and chronic wounds	Y	✓		✓	✓	✓	✓			✓		✓	
	Dressings for the prevention of wound infections	Y	✓	✓	✓	✓						✓		
	Water for wound cleansing	Y	✓			✓	✓	✓	✓	✓			✓	✓
	Methods of preventing bacterial sepsis and wound complications after liver transplantation	Y	✓										✓	
	Topical antibiotics for preventing wound infections in wounds healing by primary intention	Y	✓					✓						
	Honey as a topical treatment for wounds	Y	✓		✓	✓	✓				✓		✓	✓
	Pin site care for preventing infections associated with external bone fixators and pins	Y	✓		✓	✓	✓							
	Topical silver for preventing wound infection	Y	✓	✓	✓	✓								
	Debridement for surgical wounds	Y	✓				✓	✓	✓				✓	
	Early vs. delayed dressing removal after primary closure of clean and clean-contaminated surgical wounds	Y												
	Early vs. delayed post-operative bathing or showering to prevent wound complications	Y	✓						✓					
	Negative pressure wound therapy for skin grafts and surgical wounds healing by primary intention	Y	✓		✓	✓								

Supplemental material 3: Recommendations for future research, including methodological issues

		Outcomes																
		Cost/economics	Different settings	Different populations/sub-group	Infection incidence	Patient experience/satisfaction	Product acceptability	Adverse events/effects	Quality of life	Mortality	Hospital length of stay	New comparisons	Valid wound measures	Time to heal	Wound infection measure	Wound complications	Pain	
Surgical site infection – pre-op	Removal of nail polish and finger rings to prevent surgical site infection	✓			✓			✓	✓									
	Routine perineal shaving on admission in labour																	
	Pre-operative skin antiseptics for preventing surgical wound infections after clean surgery	✓						✓				✓						
	Methods of preventing bacterial sepsis and wound complications after liver transplantation							✓	✓	✓	✓							
	Vaginal preparation with antiseptic solution before caesarean section for preventing postoperative infections		✓									✓ ²			✓			
	Skin preparation for preventing infection following caesarean section							✓		✓	✓	✓ ³		✓		✓		
	Nasal decontamination for the prevention of wound infections in <i>Staphylococcus aureus</i> carriers	✓						✓	✓			✓ ⁴						
	Antenatal maternal education for improving postnatal perineal healing for women who have birthed in a hospital setting							✓		✓	✓	✓ ⁵						
	Prevention of infection in arterial reconstruction																	
	Pre-operative hair removal to reduce wound infections										✓	✓ ⁶						
Pre-operative bathing or showering with skin antiseptics to prevent wound infection																		
Surgical site infection – post-op	Aloe vera for treating acute and chronic wounds	✓			✓			✓	✓									
	Dressings for the prevention of wound infections																	
	Water for wound cleansing	✓	✓	✓		✓												
	Methods of preventing bacterial sepsis and wound complications after liver transplantation	✓						✓	✓	✓	✓							
	Topical antibiotics for preventing wound infections in wounds healing by primary intention	✓		✓					✓			✓ ⁷						
	Honey as a topical treatment for wounds	✓							✓			✓ ⁸						
	Pin site care for preventing infections associated with external bone fixators and pins			✓														
	Topical silver for preventing wound infection	✓							✓				✓					
	Debridement for surgical wounds	✓			✓	✓		✓	✓			✓		✓	✓			
	Early vs. delayed dressing removal after primary closure of clean and clean-contaminated surgical wounds			✓														
	Early vs. delayed post-operative bathing or showering to prevent wound complications	✓		✓					✓							✓		
Negative pressure wound therapy for skin grafts & surgical wounds healing by primary intention	✓		✓							✓	✓ ⁹				✓			

Notes

1. Comparison: alcohol vs. aqueous solutions.
2. Intervention: care bundles.
3. Comparison: iodine versus chlorhexidine, night versus day of surgery.
4. Intervention: consider harm of intervention antibiotic resistance.
5. Qualitative outcomes.
6. Hair removal using clippers v razors v depilatory cream. Different times prior to surgery; Different settings for hair removal (operating theatre, anaesthetic room, ward, patient's home).
7. Topical antibiotics alone versus systemic antibiotics alone versus a combination of systemic and topical antibiotics in preventing surgical site infections.
8. Honey versus other dressing.
9. Different types of negative pressure wound therapy and different pressures.

Supplemental material 4: Quality assessment of surgical site infection reviews using the A MeaSurement Tool to Assess Systematic Reviews 2 (AMSTAR 2) checklist (n = 22)

Author (year)		1. Question and inclusion	2. Protocol	3. Study design justification	4. Comprehensive search	5. Study selection	6. Data extraction	7. Excluded studies justification	8. Included studies details	9. Risk of bias (RoB)	10. Funding sources	11. Statistical methods	12. RoB on meta-analysis	13. RoB in individual studies	14. Explanation for heterogeneity	15. Publication bias	16. Conflict of interest	Rating	
Pre-operative (n = 11)	1. Arrowsmith and Taylor (2014)	Y	Y	N	PY	Y	Y	Y	Y	Y	N	NMC	NMC	Y	Y	NMC	Y	Moderate	
	2. Basevi and Lavender (2014)	Y	Y	N	PY	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	High	
	3. Dumville et al. (2015)	Y	Y	N	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	N	Y	Low	
	4. Gurusamy et al. (2014)*	Y	Y	Y	PY	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	High	
	5. Haas et al. (2018)	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	High	
	6. Hadiati et al. (2018)	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	High	
	7. Liu et al. (2017)	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	NMC	NMC	Y	Y	NMC	Y	High	
	8. O'Kelly and Moore (2017)	Y	Y	N	Y	Y	Y	Y	Y	NSI	Y	Y	NMC	NMC	NSI	NSI	NMC	Y	High
	9. Stewart et al. (2006)	Y	PY	N	Y	Y	Y	Y	Y	Y	N	Y	Y	N	Y	N	Y	Critically low	
	10. Tanner et al. (2011)	Y	Y	N	Y	Y	Y	Y	Y	PY	Y	Y	Y	Y	Y	Y	N	Y	Low
	11. Webster and Osborne (2015)	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Low
Percentage of pre-op reviews meeting each criterion		100	91	9	73	100	100	100	90	100	73	100	100	90	100	50	100		
Post-operative (n = 11)	12. Dat et al. (2012)	Y	Y	N	PY	Y	Y	Y	Y	Y	N	NMC	NMC	Y	Y	NMC	Y	Moderate	
	13. Dumville et al. (2016)	Y	Y	Y	PY	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	High	
	14. Fernandez and Griffiths (2012)	Y	Y	N	PY	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	N	Y	Low	
	15. Gurusamy et al. (2014)*	Y	Y	Y	PY	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	High	
	16. Heal et al. (2016)	Y	Y	N	PY	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	High	
	17. Jull et al. (2015)	Y	Y	Y	PY	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	High	
	18. Lethaby et al. (2013)	Y	Y	N	PY	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	High	
	19. Smith et al. (2013)	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	NMC	NMC	Y	Y	NMC	Y	High	
	20. Toon et al. (2015)	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	High	
	21. Toon et al. (2015)	Y	Y	Y	PY	Y	Y	Y	Y	Y	Y	NMC	NMC	Y	Y	NMC	Y	High	
	22. Vermeulen et al. (2007)	Y	PY	N	Y	Y	Y	Y	Y	PY	Y	Y	NMC	NMC	Y	Y	NMC	Y	High
23. Webster et al. (2014)	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	High	
Percentage of post-op reviews meeting each criterion		100	92	50	33	100	100	100	91	100	67	100	100	100	100	88	100		
Percentage of all reviews meeting each criterion		100	91	26	57	100	100	100	91	100	65	100	100	95	100	67	100		

Notes

- Bolded table headings denote essential A MeaSurement Tool to Assess Systematic Reviews 2 checklist domains.
- Y = yes, PY = partial yes, N = no, NSI = no studies identified, NMC = no meta-analysis conducted.
- Bolded items are A MeaSurement Tool to Assess Systematic Reviews 2 (AMSTAR 2) checklist critical domains.
- Reviews with NSI and or NMC in their items cell were excluded from the summary percentage.
- * Gurusamy et al., 2014 is the same review, replicated as both pre- and post-operative.