

# WHO Surgical Site Infection Prevention Guidelines

## Web Appendix 7

### Summary of a systematic review on the effectiveness and optimal method of hair removal

#### 1. Introduction

Removal of hair from the intended site of surgical incision has traditionally been part of the routine preoperative preparation of patients undergoing surgery. Hair removal may be necessary to facilitate adequate exposure to the site and preoperative skin marking. Furthermore, suturing and the application of wound dressings can be complicated by the presence of hair. Apart from these practical issues, hair has been associated with a lack of cleanliness and the potential to cause surgical site infection (SSI). However, there is also the belief that hair removal inversely increases the risk of SSI by causing microscopic trauma of the skin. To minimize the potential of skin trauma, the use of clippers instead of razors has been proposed for preoperative hair removal. Clippers cut the hair close to the skin without actually touching it, whereas razors involve a sharp blade drawn directly over the skin. A third method for hair removal is the application of depilatory creams containing chemicals. The drawbacks are the necessity to leave the cream in place for approximately 15-20 minutes for the hair to be dissolved and the potential for allergic reactions. A Cochrane review, published in 2009 and updated in 2011, concluded that there was no statistically significant effect on SSI rates of hair removal<sup>1</sup>. However, a significant harm was seen when hair removal with razors was compared with clipping.

#### 2. PICO questions

1. Does hair removal affect the incidence of SSI?
2. What method and timing of hair removal is associated with the reduction of SSI?
  - **Population:** adult patients undergoing any type of surgical procedure
  - **Intervention:** avoidance of hair removal
  - **Comparator:** hair removal (different methods and timing)
  - **Outcomes:** SSI, SSI-attributable mortality

#### 3. Methods

The following databases were searched: Medline (PubMed); Excerpta Medica Database (EMBASE); Cumulative Index to Nursing and Allied Health Literature (CINAHL); Cochrane Central Register of Controlled Trials (CENTRAL); and WHO regional medical databases.

The time limit for the review was between 1 January 1900 and 17 January 2014. Of note, the usual time limit of 1990 for the systematic reviews conducted for the WHO SSI prevention guidelines was extended to include important relevant literature published prior to this date. Language was restricted to English, French and Spanish. A comprehensive list of search terms was used, including Medical Subject Headings (MeSH) (Appendix 1).

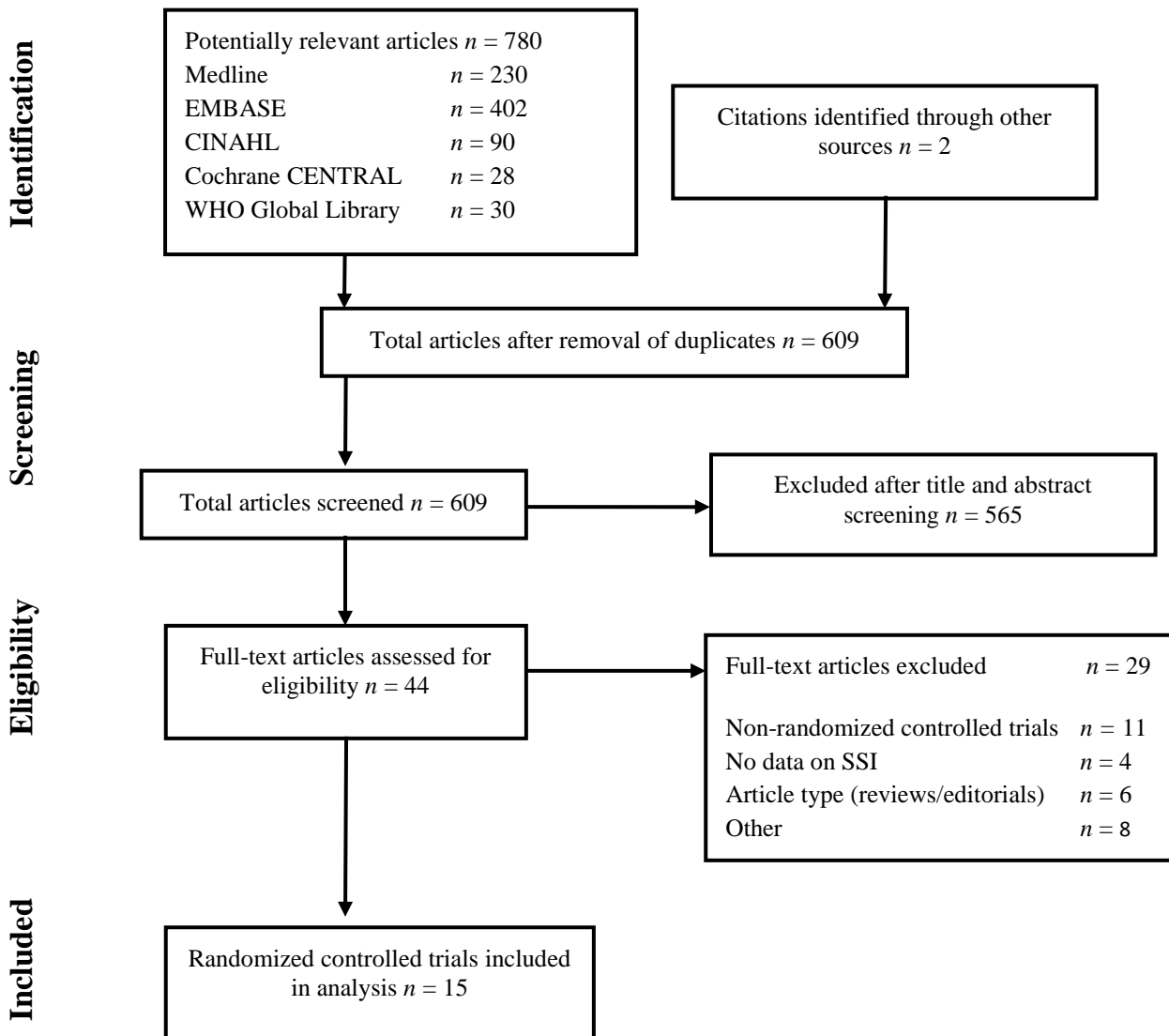
Two independent reviewers screened titles and abstracts of retrieved references for potentially relevant studies. The full text of all potentially eligible articles was obtained. Two authors independently reviewed the full-text articles for eligibility based on inclusion criteria. Duplicate studies were excluded.

Two authors extracted data in a predefined evidence table (Appendix 2) and critically appraised the retrieved studies using the Cochrane collaboration tool<sup>2</sup> for assessing risk of bias (Appendix 3). Any disagreements were resolved through discussion or after consultation with the senior author, when necessary. Publication bias was assessed using a funnel plot<sup>3</sup>.

Meta-analyses of available comparisons related to hair removal or not and the different methods used were performed using Review Manager v5.3 as appropriate<sup>4</sup> (Appendix 4). Odds ratios (OR) and mean differences with 95% confidence intervals (CI) were extracted and pooled for each comparison with a random effects model. The Grading of Recommendations Assessment, Development and Evaluation (GRADE) methodology (GRADE Pro software, <http://gradepro.org/>)<sup>5,6</sup> was used to assess the quality of the body of retrieved evidence (Appendix 5).

#### 4. Study selection

Flow chart of the study selection process



#### 5. Summary of the findings

Overall, 15 randomized or quasi-randomized trials<sup>7-21</sup> comparing the effect of preoperative hair removal vs. no hair removal or different methods of hair removal (shaving, clipping and depilatory cream) were identified as relevant to the research question. Any kind of surgical procedure was included. As no hair removal and clipping are similar in terms of reduced potential to cause microscopic skin trauma, an additional analysis was performed combining these two comparisons. Based on these considerations, we were able to make the following comparisons:

1. Hair removal vs. no hair removal
  - a. Shaving vs. no hair removal
  - b. Clipping vs. no hair removal
  - c. Depilatory cream vs. no hair removal
2. Comparisons of methods of hair removal
  - a. Clipping vs. shaving
  - b. Shaving vs. depilatory cream
  - c. Clipping and no hair removal vs. shaving
3. Timing of hair removal
  - a. Night before vs. day of surgery

The results of the meta-analyses based on these comparisons are as follows (Appendix 4).

1. Hair removal vs. no hair removal
  - a. Seven studies<sup>7,11,12,15-17,19</sup> comparing shaving vs. no hair removal were identified. Meta-analysis of these studies showed that shaving had neither benefit nor harm when compared to no hair removal (OR: 1.78; 95% CI: 0.96-3.29).  
The quality of evidence for this comparison was low (Appendix 5).
  - b. One study<sup>7</sup> comparing clippers vs. no hair removal was identified. This study showed that hair removal with clippers had neither benefit nor harm when compared to no hair removal (OR: 1.00; 95% CI: 0.06-16.34).  
The quality of evidence for this comparison was very low (Appendix 5).
  - c. One study<sup>12</sup> comparing depilatory cream vs. no hair removal was identified. This study showed that hair removal with depilatory cream had neither benefit nor harm when compared to no hair removal (OR: 1.02; 95% CI: 0.42-2.49).  
The quality of evidence for this comparison was very low (Appendix 5).
2. Comparisons of methods of hair removal
  - a. Four studies<sup>7,9,10,14</sup> comparing clipping vs. shaving were identified. Meta-analysis of these studies showed a significantly lower risk of SSI following hair removal with clippers compared to shaving (OR: 0.51; 95% CI: 0.29-0.91).  
The quality of evidence for this comparison was low (Appendix 5).
  - b. Six studies<sup>8,12,13,18,20,21</sup> comparing shaving vs. depilatory cream were identified. Meta-analysis of these studies showed neither benefit nor harm when shaving was compared to hair removal with depilatory cream (OR: 2.78; 95% CI: 0.86-9.03).  
The quality of evidence for this comparison was very low (Appendix 5).
  - c. Ten studies<sup>7,9-12,14-17,19</sup> comparing clipping or no hair removal vs. shaving were identified. Meta-analysis of these studies showed a significantly lower risk of SSI following hair removal with clippers or no hair removal compared to shaving (OR: 0.51; 95% CI: 0.34-0.78).

The quality of evidence for this comparison was moderate (Appendix 5).

### 3. Timing of hair removal

- a. One study<sup>9</sup> comparing hair removal the night before surgery vs. hair removal on the day of surgery by either shaving or clipping was identified. The study showed that hair removal on the night before surgery had neither benefit nor harm when compared to hair removal on the day of surgery (OR: 1.22; 95% CI: 0.44-3.42).

The quality of evidence for this comparison was very low (Appendix 5).

In conclusion the retrieved evidence can be summarized as follows:

Comparison no.	Subgroup	Summary results
1.	a	Overall, a low quality of evidence shows that shaving, clipping or the use of depilatory cream has neither benefit nor harm when compared to no hair removal in reducing the risk of SSI.
	b	Overall, a very low quality of evidence shows that clipping has neither benefit nor harm when compared to no hair removal in reducing the risk of SSI.
	c	Overall, a very low quality of evidence shows that the use of depilatory cream has neither benefit nor harm when compared to no hair removal in reducing the risk of SSI.
2.	a	Overall, a low quality of evidence shows that clipping has a significant benefit in reducing the risk of SSI when compared to shaving.
	b	Overall, a very low quality of evidence shows that depilatory cream has neither benefit nor harm when compared to shaving in reducing the risk of SSI.
	c	Overall, a moderate quality of evidence shows that clipping or no hair removal has a significant benefit in reducing the risk of SSI when compared to shaving.
3.	a	Overall, a very low quality of evidence shows that the timing of hair removal on the night before surgery has neither benefit nor harm when compared to the day of surgery in reducing the risk of SSI.

## 6. Other factors considered in the review of studies

The systematic review team identified the following other factors to be considered.

### *Values and preferences*

Ilnkovan and colleagues studied patient and surgeon preferences regarding hair removal before maxillofacial surgery. They showed that patients prefer no hair removal over shaving, while the surgeon's assessment of the difficulty of wound closure did not differ between the two methods<sup>16</sup>.

## 7. Key uncertainties and future research priorities

Available evidence is mostly underpowered and limited by flawed methodological design. Certain comparisons (depilatory cream vs. clipping) have not been made yet. Furthermore, the timing of hair removal and the location (ward or operating room [OR]) have not been sufficiently studied. Future well-designed and adequately-powered studies are needed to draw more firm conclusions.

## **APPENDICES**

### **Appendix 1. Search terms**

#### **Medline**

1. surgical wound infection/ or (surgical site infection\* or SSI or SSIs or surgical wound infection\* or surgical infection\* or post-operative wound infection\* or postoperative wound infection\*).ti,ab,kw.
2. wound infection.mp. or exp wound infection/
3. hair removal/ or (hair remov\* or shaving or shave).ti,ab,kw.
4. 1 or 2
5. 3 and 4
8. limit 5 to yr="1900 -current"

#### **EMBASE**

1. esthetic surgery/ or (hair remov\* or shaving or shave).ti,ab,kw.
2. surgical infection/ or (surgical site infection\* or SSI or SSIs or surgical wound infection\* or surgical infection\* or post-operative wound infection\* or postoperative wound infection\*).ti,ab,kw.
3. exp wound infection/
4. 2 or 3
5. 1 and 4
6. limit 5 to yr="1990 -current"

#### **CINAHL**

1. (MH "wound infection+")
2. (MH "surgical wound infection")
3. ("wound infection")
4. (MH "hair removal")
5. ("hair removal")
6. 1 or 2 or 3
7. 4 or 5
8. 6 and 7

#### **Cochrane CENTRAL**

1. wound infection:ti,ab,kw
2. surgical wound infection:ti,ab,kw
3. hair removal:ti,ab,kw
4. shaving:ti,ab,kw
5. 1 or 2
6. 3 or 4
7. 5 and 6

## **WHO regional medical databases**

1. (ssi)
2. (surgical site infection)
3. (surgical site infections)
4. (wound infection)
5. (wound infections)
6. (postoperative wound infection)
7. (hair removal)
8. (shaving)

### *African Index Medicus*

1. infection [Key Word]
2. surgical [Key Word]
3. surgery [Key Word]
4. 2 or 3
5. 1 and 4

ti: title; ab: abstract; kw: key word.

## Appendix 2. Evidence table

Author, year, reference	Design, setting, population	Type of surgery	SSI definition	Randomization and blinding	Intervention	Results
Abouzari, 2009 <sup>7</sup>	RCT, single centre mixed population	Elective cranial surgery (exclusion of ventriculo-peritoneal shunt surgery).	Follow-up until complete wound healing. Presence of infection, including pus at the operative site, a positive culture from a swab of the incision, development of postoperative bacterial meningitis and/or inflammation at the area of the wound.	Unknown randomization and blinding.	A) Shaving (unknown timing and location)  B) Clipping (unknown timing and location)  C) No hair removal	A) n=65 SSI: 3/65 (4.6%)  B) n=65 SSI: 1/65 (1.5%)  C) n=65 SSI: 1/65 (1.5%)  No <i>P</i> -value or OR reported
Adisa, 2011 <sup>8</sup>	RCT, single centre, adults	Clean operations with access through hair-bearing areas of the body.	Modified Southampton wound infection scoring system (presence of undue wound redness and swelling, discharge of serous or haemoserous fluids, discharge of pus or wound dehiscence).	Envelope randomization, blinding of assessor.	A) Shaving (immediately before surgery in the OR)  B) Depilatory cream (potassium thioglycolate) (morning of surgery, unknown location)	A) n=86 SSI: 11/86 (12.8%)  B) n=79 SSI: 2/79 (2.5%)  <i>P</i> =0.015
Alexander, 1983 <sup>9</sup>	RCT, single centre mixed population	Elective surgery (exclusion of dirty wounds, proctologic procedures, skin grafts, operations on the genitalia, head or hand, amputations of the toe or foot or operations for decubitus ulcers).	Infection defined as discharge of pus, classified as either stitch abscess, superficial abscess (requiring minor drainage) or deep abscess (requiring major drainage in the OR or extending into a major body cavity) checked at time of discharge.	Envelope randomization, unknown blinding.	A) Shaving (night before surgery)  B) Shaving (morning of surgery)  C) Clipping (night before surgery)  D) Clipping (morning of surgery) Unknown type of razor and clipper	A) n=271 SSI: 14/271 (5.2%) B) n= 266 SSI: 17/266 (6.4%) C) n=250, SSI: 10/250 (4.0%) D) n=226 SSI: 4/226 (1.8%)  No <i>P</i> -value or OR reported
Balthazar, 1982 <sup>10</sup>	RCT, single centre, male patients	Elective inguinal herniorrhaphy.	Infection defined as discharge of purulent exudate at postoperative day 5.	Randomization table, unknown blinding.	A) Shaving (wet shaving with standard safety razor immediately before surgery)  B) Clipping (non-sterilized, ordinary barber's electric clippers immediately before surgery)	A) n=100 SSI: 2/100 (2%)  B) n=100 SSI: 1/100 (1%) No <i>P</i> -value or OR reported
Celik, 2007 <sup>11</sup>	RCT, single centre, mixed population	Spinal surgery.	Purulent discharge from the surgical wound; increasing pain, tenderness, or redness around the incision line, in addition to haematologic test results showing a high polymorphonuclear lymphocyte count or an increasing	Unknown randomization and blinding.	A) Shaving (immediately before surgery in the OR)  B) No hair removal	A) n=371 SSI: 4/371 (1.1%)  B) n=418 SSI: 1/418 (0.2%)



			erythrocyte sedimentation rate; clinical features of meningitis; or an abscess identified via control magnetic resonance imaging studies and the results of haematologic tests.			$P < 0.01$
Court-Brown, 1981 <sup>12</sup>	RCT, single centre mixed population	Abdominal surgery (without any other incision or construction of a colostomy)	Infection defined as discharge of material from which bacteria were cultured; assessed daily and 28 days' postoperatively.	Unknown randomization and blinding	A) Shaving (disposable safety razor, 18-24 hours before elective surgery, within 6 hours before emergency surgery)  B) Depilatory cream (potassium thioglycolate and calcium hydroxide, identical timing to group A)  C) No hair removal	A) n= 137 SSI: 17/137 (12.4%) B) n= 126 SSI: 10/126 (7.9%) C) n= 141 SSI: 11/141 (7.8%)  $P = NS$
Goëau-Brissonnière, 1987 <sup>13</sup>	RCT, single centre mixed population	Elective surgery requiring hair removal (clean, clean-contaminated or contaminated).	Examined on postoperative days 2 and 5 after surgery by a blinded assessor and defined as purulent discharge or partial or complete dehiscence.	Randomization table, blinding of assessor	A) Razor (night before surgery)  B) Depilatory cream (thioglycolic acid in the form of sodium and calcium, night before surgery)	A) n=51 SSI: 0/51 (0%) B) n=49 SSI: 0/49 (0%)  No $P$ -value or OR reported
Grober, 2013 <sup>14</sup>	RCT, single centre male adults	Surgery involving male genitalia and requiring preoperative hair removal.	Evidence of increasing cellulitis and/or pus from the surgical incision within 3 months of surgery.	Unknown randomization, unknown blinding of SSI (blinding of photographs to assess skin trauma)	A) Clipping (3M surgical clipper, immediately before surgery in the OR)  B) Shaving (Gillette® 2 blade disposable plastic blue razor, immediately before surgery in the OR)	A) n=107 SSI: 2/107 (1.9%)  B) n=108 SSI: 2/108 (1.9%)  No $P$ -value or OR reported
Horgan, 1999 <sup>15</sup>	Quasi-RCT, single centre unknown population	Elective cranial surgery for tumour or vascular anomaly.	Unknown.	Alternately shave/unshaven, unknown blinding	A) Shaving (unknown timing and location)  B) No hair removal	A) n=10 SSI: 0/10 (0.0%)  B) n=10 SSI: 0/10 (0.0%)  No $P$ -value or OR reported
Ilnkovan, 1992 <sup>16</sup>	RCT, single centre mixed population	Maxillofacial surgery.	Presence of purulent material, local erythema associated with fever or tenderness and wound breakdown (7 days).	Random number sequence, unknown blinding	A) Shaving (immediately before surgery in the OR)  B) No hair removal	A) n=25 SSI: 0/25 (0.0%)  B) n=25 SSI: 0/25 (0.0%)  No $P$ -value or OR reported
Kattipattanapong,	RCT, single centre,	Ear and/or mastoid	CDC National Nosocomial Infections	Block computer randomization,	A) Shaving (mean time between shaving and surgery 16.7±6.7 hours,	A) n=66 SSI: 3/66 (4.5%)

2012 <sup>17</sup>	adults	surgery.	Surveillance system.	unknown blinding	unknown location) B) No hair removal	B) n=77 SSI: 2/77 (2.6%)  P=0.674
Powis, 1976 <sup>18</sup>	RCT, two centres  age of patients not reported	Surgery requiring removal of hair at the operative site.	Examined on postoperative days 2 and 5 by an independent observer; grade 3 or higher considered as infection (purulent discharge or dehiscence).	Randomization based on hospital registration number	A) Shaving (disposable razor or a safety razor with disposable blades; 20 patients on night before surgery, 26 patients on day of surgery; mean duration between shaving and surgery, 3.3 hours)  B) Depilatory cream (calcium thioglycolate trihydrate, calcium hydroxide and strontium hydroxide) (26 patients on night before surgery, 20 patients on day of surgery; mean duration between cream and surgery, 4.1 hours)	A) n=46 SSI: 1/46 (2.2%)  B) n=46 SSI: 1/46 (2.2%)  P=NS
Rojanapirom, 1992 <sup>19</sup>	RCT, single centre  mixed population	Open appendectomy for acute appendicitis.	Unknown definition, follow-up until stitches were removed (7-10 days).	Unknown randomization and blinding	A) Razor (day of surgery, unknown location)  B) No hair removal	A) n=40 SSI: 3/40 (7.5%)  B) n=40 SSI: 3/40 (7.5%)  No P-value or OR reported
Seropian, 1971 <sup>20</sup>	RCT, single centre  mixed population	Appendectomy.	Unknown definition, assessed by infection control unit.	Randomization based on hospital registration number	A) Shaving (standard razor, unknown timing and location)  B) Depilatory cream (calcium thioglycolate trihydrate, calcium hydroxide and strontium hydroxide)	A) n=249 SSI: 14/249 (5.6%)  B) n=157 SSI: 1/157 (0.6%)  P=0.02
Thur de Koos, 1983 <sup>21</sup>	RCT, single centre  male patients	Elective surgery.	Unknown.	Randomized by bed number (even=cream; uneven=razor), unknown blinding	A) Depilatory cream (cetyl alcohol and thioglycolic acid, night before surgery in the ward)  B) Shaving (wet, unknown type of razor, immediately before surgery in the OR)	A) n = 116 SSI: 9/116 (7.6%)  B) n = 137 SSI: 10/137 (7.3%)  P=NS

RCT: randomized clinical trial; SSI: surgical site infection; OR: odds ratio; OR: operating room; CDC: Centers for Disease Control and Prevention; NS: not significant

### Appendix 3. Risk of bias assessment of the included studies

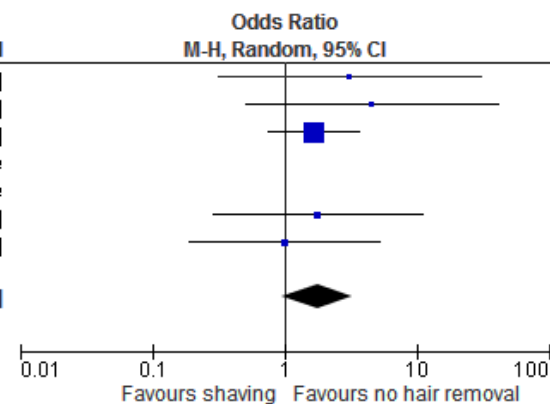
Author, year	Sequence generation	Allocation concealment	Participants blinded	Care providers blinded	Outcome assessors blinded	Incomplete outcome data	Selective outcome reporting	Other sources of bias
Abouzari, 2009 <sup>7</sup>	Unclear	Unclear	High risk	High risk	Unclear	Unclear	Low risk	-
Adisa, 2011 <sup>8</sup>	Low risk	Low risk	High risk	Low risk	Low risk	Low risk	Low risk	-
Alexander, 1983 <sup>9</sup>	Low risk	Unclear	High risk	Unclear	Unclear	Low risk	Low risk	-
Balthazar, 1982 <sup>10</sup>	Low risk	Unclear	High risk	Unclear	Unclear	Low risk	Low risk	-
Celik, 2007 <sup>11</sup>	Low risk	Unclear	High risk	High risk	Unclear	High risk	Low risk	-
Court-Brown, 1981 <sup>12</sup>	Unclear	Unclear	High risk	High risk	Unclear	Unclear	High risk	-
Goëau-Brissonnière, 1987 <sup>13</sup>	Low risk	Unclear	High risk	High risk	Unclear	Unclear	Unclear	-
Grober, 2013 <sup>14</sup>	Unclear	Unclear	Low risk	High risk	Unclear	Unclear	Low risk	-
Horgan, 1999 <sup>15</sup>	Unclear	High risk	High risk	High risk	Unclear	Low risk	Low risk	-
Ilanovan, 1992 <sup>16</sup>	Low risk	Unclear	Low risk	High risk	Unclear	Low risk	High risk	-
Kattipattanapong, 2012 <sup>17</sup>	Low risk	Low risk	High risk	High risk	Unclear	Low risk	Low risk	-
Powis, 1976 <sup>18</sup>	High risk	Unclear	High risk	Unclear	Low risk	Low risk	Low risk	-
Rojanapirom, 1992 <sup>19</sup>	Unclear	Unclear	High risk	High risk	Unclear	Low risk	Low risk	-
Seropian, 1971 <sup>20</sup>	High risk	Unclear	High risk	Unclear	Unclear	Low risk	High risk	-
Thur de Koos, 1983 <sup>21</sup>	High risk	Unclear	High risk	Unclear	Unclear	Low risk	Unclear	-

## Appendix 4. Comparisons

### Comparison 1. Hair removal vs. no hair removal

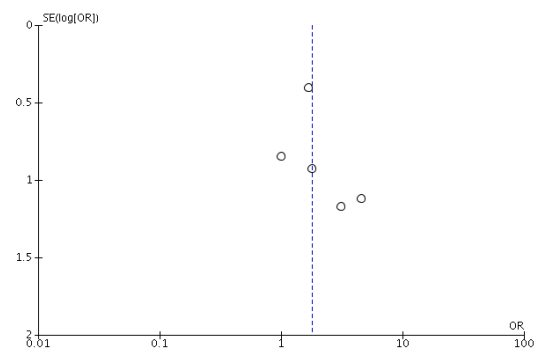
#### Comparison 1a. Shaving vs. no hair removal

Study or Subgroup	Shaving		No hair removal		Weight	Odds Ratio M-H, Random, 95% CI
	Events	Total	Events	Total		
Abouzari 2009	3	65	1	65	7.2%	3.10 [0.31, 30.58]
Celik 2007	4	371	1	418	7.9%	4.54 [0.51, 40.85]
Court-Brown 1981	17	137	11	141	59.7%	1.67 [0.75, 3.72]
Horgan 1999	0	10	0	10		Not estimable
Ilankovan 1992	0	25	0	25		Not estimable
Kattipattanapong 2013	3	66	2	77	11.5%	1.79 [0.29, 11.02]
Rojanapirom 1992	3	40	3	40	13.7%	1.00 [0.19, 5.28]
<b>Total (95% CI)</b>		<b>714</b>		<b>776</b>	<b>100.0%</b>	<b>1.78 [0.96, 3.29]</b>
Total events	30		18			
Heterogeneity: Tau <sup>2</sup> = 0.00; Chi <sup>2</sup> = 1.41, df = 4 (P = 0.84); I <sup>2</sup> = 0%						
Test for overall effect: Z = 1.83 (P = 0.07)						

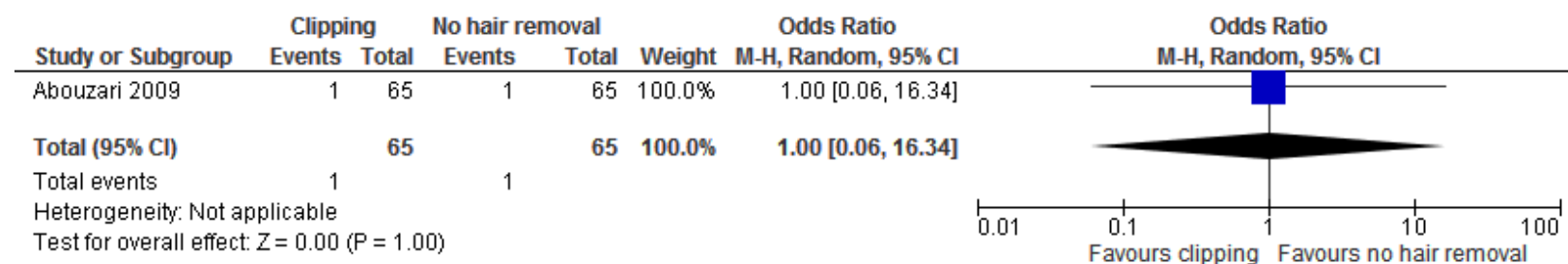


M-H: Mantel-Haenszel (test); CI: confidence interval

#### Funnel plot 1a: Shaving vs. no hair removal

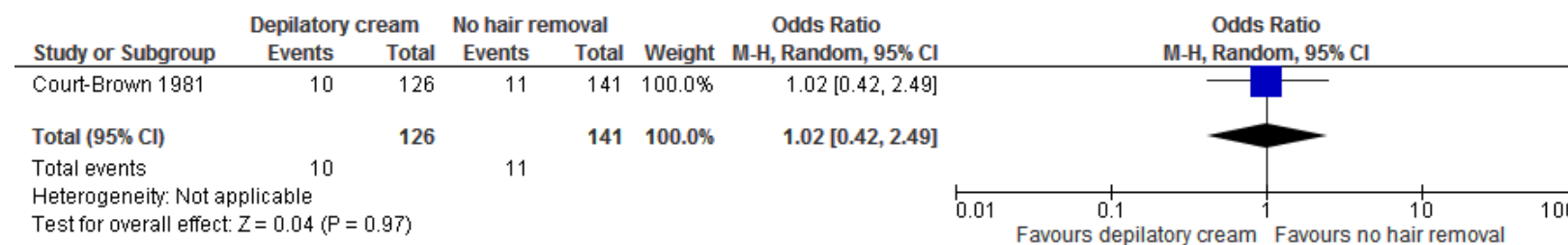


### Comparison 1b: Clipping vs. no hair removal



M-H: Mantel-Haenszel (test); CI: confidence interval

### Comparison 1c: Depilatory cream vs. no hair removal

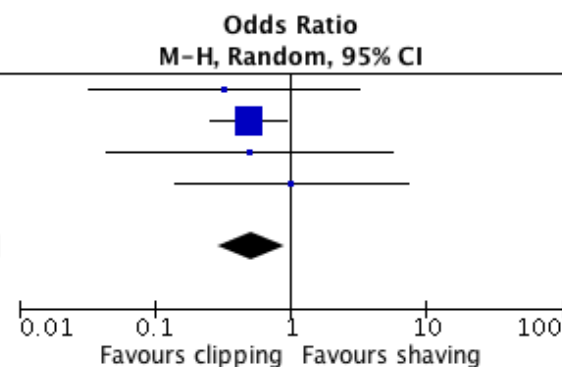


M-H: Mantel-Haenszel (test); CI: confidence interval

## Comparison 2: Comparisons of methods of hair removal

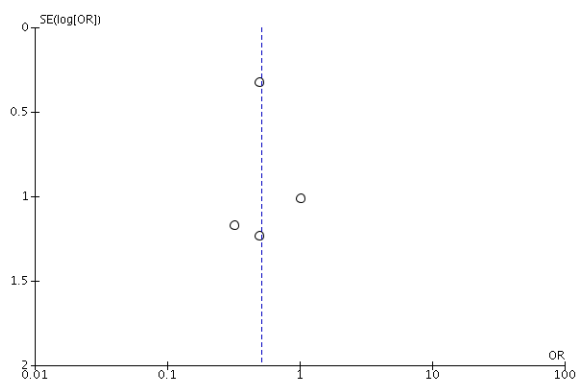
### Comparison 2a: Clipping vs. shaving

Study or Subgroup	Clipping		Shaving		Weight	Odds Ratio M-H, Random, 95% CI
	Events	Total	Events	Total		
Abouzari 2009	1	65	3	65	6.3%	0.32 [0.03, 3.19]
Alexander 1983	14	476	31	537	79.6%	0.49 [0.26, 0.94]
Balthazar 1982	1	100	2	100	5.6%	0.49 [0.04, 5.55]
Grober 2013	2	107	2	108	8.4%	1.01 [0.14, 7.30]
<b>Total (95% CI)</b>		<b>748</b>		<b>810</b>	<b>100.0%</b>	<b>0.51 [0.29, 0.91]</b>
Total events	18		38			
Heterogeneity: Tau <sup>2</sup> = 0.00; Chi <sup>2</sup> = 0.62, df = 3 (P = 0.89); I <sup>2</sup> = 0%						
Test for overall effect: Z = 2.29 (P = 0.02)						



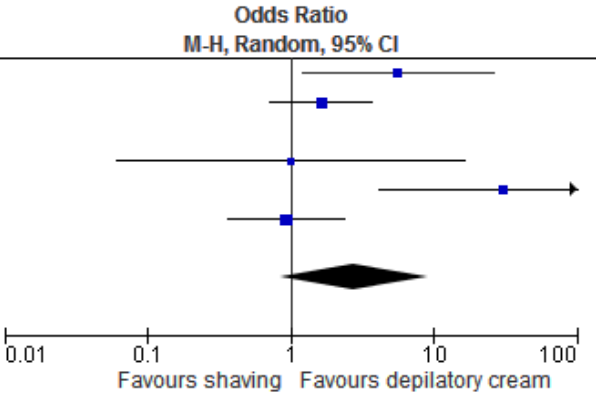
M-H: Mantel-Haenszel (test); CI: confidence interval

### Funnel plot 2a: Clipping vs. shaving



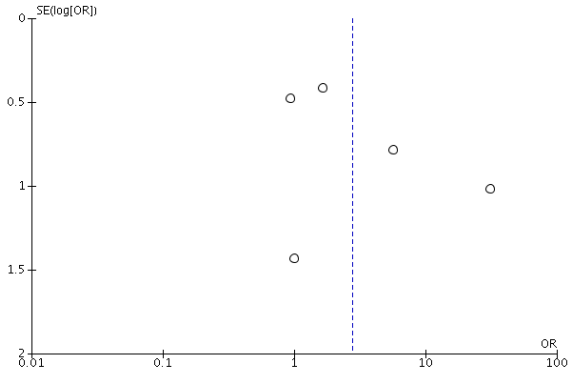
### Comparison 2b: Shaving vs. depilatory cream

Study or Subgroup	Shaving		Depilatory cream		Weight	Odds Ratio M-H, Random, 95% CI
	Events	Total	Events	Total		
Adisa 2012	11	86	2	79	20.1%	5.65 [1.21, 26.33]
Court-Brown 1981	17	137	10	126	26.7%	1.64 [0.72, 3.74]
Goëau-Brissonnière 1987	0	51	0	49		Not estimable
Powis 1976	1	46	1	46	11.2%	1.00 [0.06, 16.48]
Seropian 1971	41	249	1	157	16.3%	30.75 [4.18, 225.98]
Thur de Koos 1983	10	137	9	116	25.7%	0.94 [0.37, 2.39]
<b>Total (95% CI)</b>		<b>706</b>		<b>573</b>	<b>100.0%</b>	<b>2.78 [0.86, 9.03]</b>
Total events	80		23			
Heterogeneity: Tau <sup>2</sup> = 1.18; Chi <sup>2</sup> = 14.52, df = 4 (P = 0.006); I <sup>2</sup> = 72%						
Test for overall effect: Z = 1.70 (P = 0.09)						

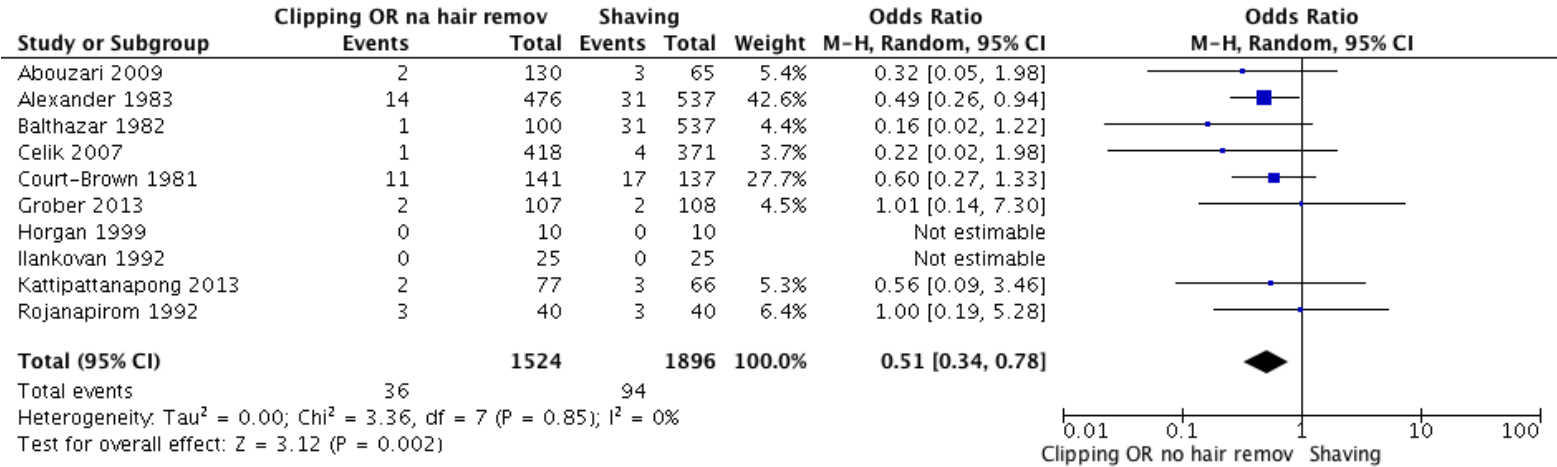


M-H: Mantel-Haenszel (test); CI: confidence interval

### Funnel plot 2b: Shaving vs. depilatory cream

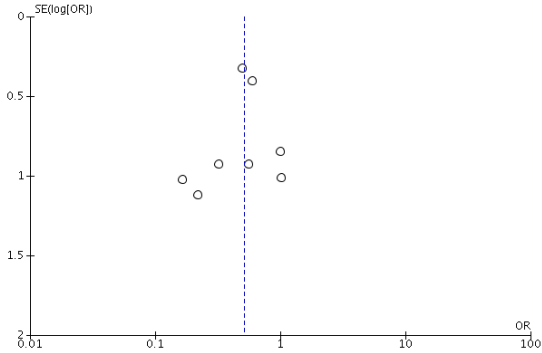


**Comparison 2c: Clipping or no hair removal vs. shaving**



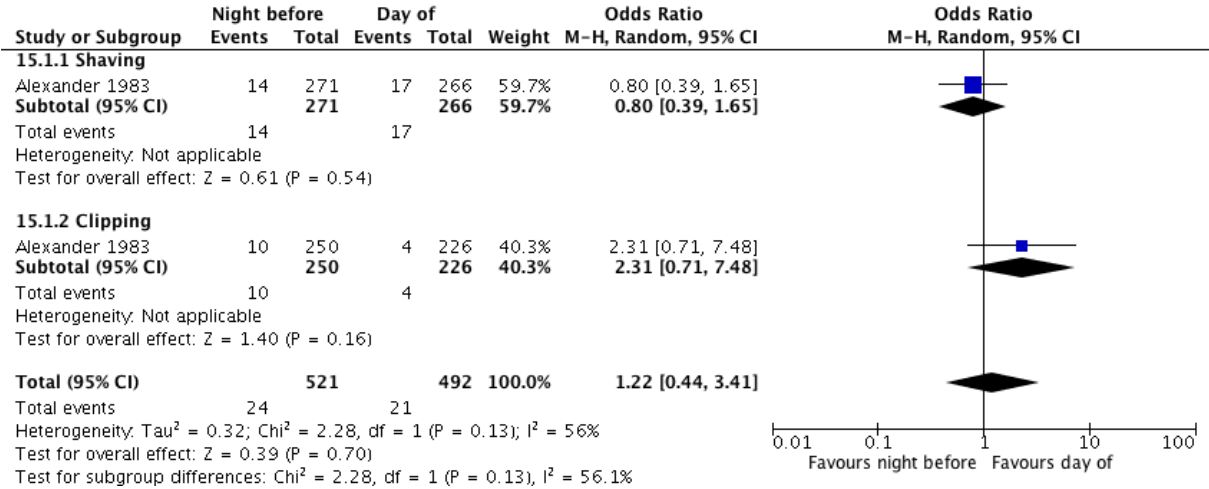
M-H: Mantel-Haenszel (test); CI: confidence interval

**Funnel plot 2c: Clipping or no hair removal vs. shaving**



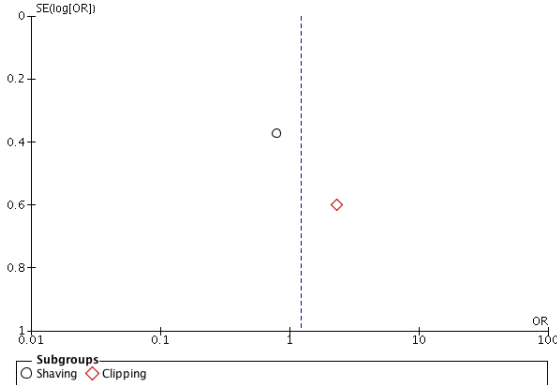


**Comparison 3: Timing of hair removal (hair removal the night before vs. day of surgery)**



M-H: Mantel-Haenszel (test); CI: confidence interval

**Funnel plot 3: Timing of hair removal (hair removal the night before vs. day of surgery)**



## Appendix 5. Grade tables

### Comparison 1a: Shaving vs. no hair removal

Quality assessment							№ of patients		Effect		Quality
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	With shaving	With no hair removal	Relative (95% CI)	Absolute (95% CI)	
Surgical site infection											
7	RCTs	serious <sup>1</sup>	not serious	not serious	serious <sup>2</sup>	none	30/714 (4.2%)	18/776 (2.3%)	<b>OR 1.78</b> (0.96 to 3.29)	<b>17 more per 1.000</b> (from 1 fewer to 49 more)	⊕⊕○○ LOW

1. Risk of selection bias and performance bias
2. Optimal information size not met

CI: confidence interval; RCT: randomized clinical trial; OR: odds ratio

### Comparison 1b: Clipping vs. no hair removal

Quality assessment							№ of patients		Effect		Quality
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	With clipping	With no hair removal	Relative (95% CI)	Absolute (95% CI)	
Surgical site infection											
1	RCT	serious <sup>1</sup>	not serious	not serious	very serious <sup>2</sup>	none	1/65 (1.5%)	1/65 (1.5%)	<b>OR 1.00</b> (0.06 to 16.34)	<b>0 fewer per 1.000</b> (from 14 fewer to 188 more)	⊕○○○ VERY LOW

1. Risk of selection bias, performance bias and detection bias
2. Optimal information size not met and CI includes both appreciable benefit and harm (RR and RRR of 25%)

CI: confidence interval; RCT: randomized clinical trial; OR: odds ratio

### Comparison 1c: Depilatory cream vs. no hair removal

Quality assessment							N° of patients		Effect		Quality
N° of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	With depilatory cream	With no hair removal	Relative (95% CI)	Absolute (95% CI)	
Surgical site infection											
1	RCT	serious <sup>1</sup>	not serious	not serious	very serious <sup>2</sup>	none	11/141 (7.8%)	10/126 (7.9%)	<b>OR 1.02</b> (0.42 to 2.49)	<b>1 more per 1.000</b> (from 44 fewer to 97 more)	⊕○○○ VERY LOW

1. Risk of selection bias, performance bias, detection bias and reporting bias
2. Optimal information size not met and CI includes both appreciable benefit and harm (RR and RRR of 25%)

CI: confidence interval; RCT: randomized clinical trial; OR: odds ratio

## Comparison 2a: Clipping vs. shaving

Quality assessment							№ of patients		Effect		Quality
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	With clipping	With shaving	Relative (95% CI)	Absolute (95% CI)	
Surgical site infection											
4	RCTs	serious <sup>1</sup>	not serious	not serious	serious <sup>2</sup>	none	18/748 (2.4%)	38/818 (4.6%)	<b>OR 0.51</b> (0.29 to 0.91)	<b>22 fewer per 1.000</b> (from 4 fewer to 33 fewer)	⊕⊕○○ LOW

1. Risk of selection bias, performance bias and detection bias
2. Optimal information size not met

CI: confidence interval; RCT: randomized clinical trial; OR: odds ratio

## Comparison 2b: Shaving vs. depilatory cream

Quality assessment							№ of patients		Effect		Quality
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	With shaving	With depilatory cream	Relative (95% CI)	Absolute (95% CI)	
Surgical site infection											
6	RCTs	serious <sup>1</sup>	serious <sup>2</sup>	not serious	serious <sup>3</sup>	none	80/706 (11.3%)	23/573 (4.0%)	<b>OR 2.78</b> (0.86 to 9.03)	<b>64 more per 1.000</b> (from 5 fewer to 234 more)	⊕○○○ VERY LOW

1. Risk of selection bias, performance bias and detection bias
2. High heterogeneity,  $I^2 = 72\%$
3. Optimal information size not met

SSI: surgical site infection; CI: confidence interval; OR: odds ratio

### Comparison 2c: Clipping or no hair removal vs. shaving

Quality assessment							N <sup>o</sup> of patients		Effect		Quality
N <sup>o</sup> of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	With clipping or no hair removal	With shaving	Relative (95% CI)	Absolute (95% CI)	
Surgical site infection											
10	RCTs	serious <sup>1</sup>	not serious	not serious	not serious	none	36/1524 (2.4%)	94/1896 (5.0%)	<b>OR 0.51</b> (0.34 to 0.78)	<b>24 fewer per 1.000</b> (from 10 fewer to 32 fewer)	⊕⊕⊕○ MODERATE

1. Risk of selection bias, performance bias and detection bias

SSI: surgical site infection; CI: confidence interval; OR: odds ratio

### Comparison 3: Hair removal the night before vs. day of surgery

Quality assessment							№ of patients		Effect		Quality
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	With hair removal the day of surgery	With hair removal the night before surgery	Relative (95% CI)	Absolute (95% CI)	
Surgical site infection											
1	RCT	serious <sup>1</sup>	not serious	not serious	very serious <sup>2</sup>	none	21/492 (4.3%)	24/521 (4.6%)	<b>OR 1.22</b> (0.44 to 3.41)	<b>10 more per 1.000</b> (from 25 fewer to 95 more)	⊕○○○ VERY LOW

1. Risk of selection bias, performance bias and detection bias
2. Optimal information size not met and CI includes both appreciable benefit and harm (RR and RRR of 25%)

SSI: surgical site infection; CI: confidence interval; RCT: randomized clinical trial; OR: odds ratio



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