Ritualistic Practices Aid the Surgeon in Preventing Surgical Site Infections

Joon H. Lee
U of Colorado Surgery Resident
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Objectives

1. Current CDC Recommendations
2. Hand Scrub and Skin Prep
3. Gown and Drape
4. Masks
5. Conclusions
Hand antisepsis for surgical team member

- Perform 2-5 minute scrub ... to elbow (IB)
- Keep hands up and away then dry with sterile towel (IB)

Current CDC Recommendations

Patient preparation

- Require patients to shower/bathe with antiseptic agent on or at least the night preceding OR day (IB)
- Thoroughly wash/clean at/around incision site before skin prep (IB)
- Use appropriate antiseptic agent for skin preparation (IB)

Current CDC Recommendations

Surgical attire and drapes

- Wear surgical mask if operation is about to begin/sterile instruments are exposed (IB)
- Wear cap/hood to fully cover hair on head/face. (IB)
- Wear sterile gloves – put on gloves after putting on sterile gown. (IB)
- Use surgical gowns and drapes that are effective barriers when wet. (IB)

Category IB

- Strongly recommended for implementation and supported by some experimental, clinical, or epidemiological studies and strong theoretical rationale.
There are no trials to date comparing surgical hand antisepsis vs. no surgical antisepsis

One trial where aqueous scrub compared to alcohol rub with a clinical primary endpoint

Aqueous scrub v. Alcohol rub

• Parienti et al. n=4387 prospective randomized clinical trial with primary endpoint of surgical site infection (SSI). SSI is primary endpoint.
  – Scrub group: 53 of 2135 patients developed SSI (2.48%)
  – Hand-rubbing group: 55 of 2252 patients developed SSI (2.44%)

Parienti. JAMA 2002
Parienti et al.

- Only an equivalence trial – by definition, unable to demonstrate statistically significant differences in two techniques
- 6 separate surgical services alternated qMonthly between aqueous scrub and alcohol rub for 16 mos
Other comparative studies

1. Herruzo compared chlorhexidine scrub vs. povidone scrub vs. N-duopropidenide rub.
   - Chlorhexidine had $10^{18}$ greater CFU vs scrub
   - Povidone had $10^{66}$ greater CFU vs scrub

2. Pietsch compared chlorhexidine scrub w Sterillium alcohol rub
   - Statistically significant number of CFUs with scrub

Conclusion

• CFU data will get you published
• CFU data, as currently obtained (finger press method), is not clinically meaningful

Why do scrubbed hands matter?
Glove Perforation

- Palmer and Rickett report overall perforation rate of 43%
- Gloves collected from all members of surgical team after 100 operations
- Glove fingers distended after instillation of water and leaks visibly detected

Palmer. *J of Hospital Infection*. 1992
Glove Perforation

• Wong et al. report 31.5% of 514 gloves collected from 48 operations
• 12% of all perforations were recognized during the operation – 88% were occult

• 61% of gloves from scrub nurses were perforated

Glove Perforation

- Hollaus *et al.* – prospective trial w ALL gloves collected from 100 open lung operations
- 10.1% percent (169) of all gloves (1673) w perforations
  - 150 outer gloves
  - 19 inner gloves
- Surgeons’ gloves perforated in 61.2% of all operations

Skin Preparation

- No trials exist comparing any skin preparation versus none.
- Traditional scrub-based skin preparation prior to paint application versus paint alone.
Skin Preparation

- Ellenhorn et al. prospective randomized clinical trial of scrub-and-paint vs. paint-only. n=234.
- 10% of patients developed SSI in both arms. Again, only an equivalence study.
- More intraabdominal infections complicated pts in the scrub arm (4) vs. paint only (2) p=0.14

Ellenhorn. JACS. 2005
Skin Preparation

- In Cochrane review of skin preparations, Ellenhorn study further evaluated by inclusion standards of the Cochrane review.
- Only clean surgeries were included in eval
- 8/34 pts w skin infections in paint group and 4/36 in the scrub and paint group
- OR 0.41 w 95% CI of 0.11 to 1.50

Gowns and Drapes

- Again, no trials evaluating sterile drapes and gowns versus none.
- 4 very early studies showed statistically significant decrease in surgical site infections with disposable gowns and drapes over reusable ones.
- Only a single study failed to demonstrate this same effect – a study 1/10th the size of the others.

Rutala. *Infect Control Hosp Epidemiol.* 2001
# Gowns and Drapes

## Table 2

<table>
<thead>
<tr>
<th>Study Characteristic</th>
<th>Moylan(^2)</th>
<th>Garibaldi(^1)</th>
<th>Bellin(^3)</th>
<th>Moylan(^4)</th>
<th>Baldwin(^5)</th>
<th>Bellchambers(^6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design</td>
<td>Prospective, crossover</td>
<td>Prospective, randomized</td>
<td>Prospective, crossover</td>
<td>Prospective, pre- and post-initiation of disposable draping</td>
<td>Prospective, randomized</td>
<td></td>
</tr>
<tr>
<td>Outcome by masked observers</td>
<td>Yes</td>
<td>Not specified</td>
<td>No (independent observer)</td>
<td>Not specified</td>
<td>Not specified</td>
<td>Yes</td>
</tr>
<tr>
<td>No. of operations</td>
<td>1,100</td>
<td>1,153</td>
<td>236</td>
<td>236</td>
<td>3,326</td>
<td>236</td>
</tr>
<tr>
<td>Intraperative contamination</td>
<td>Low level: NS</td>
<td>Low level: 66 (30.5%)</td>
<td>Low level: NS</td>
<td>Low level: NS</td>
<td>Low level: NS</td>
<td>Low level: NS</td>
</tr>
<tr>
<td></td>
<td>High level: NS</td>
<td>High level: 35 (15.5%)</td>
<td>High level: 35 (13.1%)</td>
<td>High level: NS</td>
<td>High level: NS</td>
<td>High level: NS</td>
</tr>
<tr>
<td>Infection rate</td>
<td>Overall no. (rate): 25 (2.27%)</td>
<td>Overall no. (rate): 66 (6.2%): 109 (5.09%), 132 (6.0%), 30 (2.97%)</td>
<td>Overall no. (rate): 77/1,655 (4.7%), 95/1,706 (5.6%), 14 (1.7%)</td>
<td>Overall no. (rate): 31/513 (6.0%): 32 (6.2%)</td>
<td>Overall no. (rate): 15 (5.09%), 35 (1.11%), 11 (0.6%)</td>
<td>Overall no. (rate): 12 (5.96%)</td>
</tr>
<tr>
<td></td>
<td>Clean procedures: 1,080 (4.42%)</td>
<td>Clean procedures: NS</td>
<td>Clean procedures: 77/1,655 (4.7%), 95/1,706 (5.6%), 14 (1.7%)</td>
<td>Clean procedures: NS</td>
<td>Clean procedures: NS</td>
<td>Clean procedures: NS</td>
</tr>
<tr>
<td></td>
<td>Clean-outdrain procedures: 2,099 (10.89%)</td>
<td>Clean-outdrain procedures: NS</td>
<td>Clean-outdrain procedures: 32 (6.2%)</td>
<td>Clean-outdrain procedures: NS</td>
<td>Clean-outdrain procedures: NS</td>
<td>Clean-outdrain procedures: NS</td>
</tr>
</tbody>
</table>

*Abbreviation: NS, not specified.*

Rutala. *Infect Control Hosp Epidemiol.* 2001
Wound infection was not determined clinically.
Instead, assigned wound nurse placed membrane filter to sterile surgical wound at operation end for 5 sec, then cultured on blood agar.
>30 CFU = “high level of contamination.”
Again – CFU ≠ clinical infection
Investigators admit because the study was undersized, primary endpoint was “wound contamination.”

Gowns and Drapes

• Bellchambers et al. – prospective randomized clinical trial w n=505, all underwent cardiothoracic surgery

• Unable to detect statistically significant difference in wound infections – using ASEPSIS scoring system.

Bellchambers et al.

<table>
<thead>
<tr>
<th>ASEPSIS score</th>
<th>Sternal wound</th>
<th></th>
<th>Leg wound</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Fabric (n = 236)</td>
<td>Paper (n = 250)</td>
<td></td>
</tr>
<tr>
<td>Satisfactory healing</td>
<td>0–10</td>
<td>419</td>
<td>204 (86%)</td>
<td>215</td>
</tr>
<tr>
<td>Disturbance of healing</td>
<td>11–20</td>
<td>42</td>
<td>20 (8%)</td>
<td>22</td>
</tr>
<tr>
<td>Minor infection</td>
<td>21–30</td>
<td>16</td>
<td>7 (3%)</td>
<td>9</td>
</tr>
<tr>
<td>Moderate infection</td>
<td>31–40</td>
<td>6</td>
<td>4 (2%)</td>
<td>2</td>
</tr>
<tr>
<td>Severe infection</td>
<td>41+</td>
<td>3</td>
<td>1 (0.4%)</td>
<td>2</td>
</tr>
</tbody>
</table>

Results for 505 patients using the maximum ASEPSIS score for any wound. There was no difference in severity of wound infections by drape system; $P = 0.87$. 

- **Study was smaller in size, consisted only of cardiothoracic surgery patients.**
- **Ioban was used in all patients**
- **All prior studies: General Surgery patients**

Masks

• Most contended of all “ritualistic practices” of surgery. Two studies evaluating 1° clin outcome of SSI.

• Swedish study n=3088, unable to demonstrate statistically significant difference in SSI between 2 arms

Lipp. Cochrane Database Syst Rev. 2002
Masks

- Prospective randomized trial n=41 having gyn. operation.
- Study was stopped after 3 surgical site infections occurred in the experimental arm after only 5 operations.
- No such occurrences in control arm (masked) with zero out of 4 operations.

Masks

• Neil Orr published finding of decreased infection rates after 6 mos. of abandoning masks as protocol.

• 8/432 (1.8%) infections in 1980 (Mar – Aug), versus 72/1634 (4.4%) during same Mar-Aug periods over 4 previous years.

• Single-OR “hospital.” Speech in the OR was restricted during the study months.

• Weaknesses of this “study” are evident.

Conclusions

• Surgical scrub of the hands prevents wound contamination when breaks in gloves occur – a common phenomenon

• An antiseptic prep of the pt is mandatory

• Sterile gown and drapes of disposable type prevent surgical site infections

• Masks as a standard can be challenged -just not in the OR while unmasked.
Thank You
References


• J Tanner, S Swarbrook, J Stuart. Surgical hand antisepsis to reduce surgical site infection. *Cochrane Database of Systematic Reviews*. 2008;1:CD004288


References

### ASEPSIS Wound Score

<table>
<thead>
<tr>
<th>Wound characteristic</th>
<th>Proportion of wound affected</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Serous exudate</td>
<td>0</td>
</tr>
<tr>
<td>Erythema</td>
<td>0</td>
</tr>
<tr>
<td>Purulent exudate</td>
<td>0</td>
</tr>
<tr>
<td>Separation of deep tissues</td>
<td>0</td>
</tr>
</tbody>
</table>

Points are scored for daily wound inspection.

### Criterion

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Additional treatment; antibiotics</td>
<td>10</td>
</tr>
<tr>
<td>Drainage of pus under local anaesthesia</td>
<td>5</td>
</tr>
<tr>
<td>Debridement of wound (general anaesthesia)</td>
<td>10</td>
</tr>
<tr>
<td>Serous discharge*</td>
<td>daily 0-5</td>
</tr>
<tr>
<td>Erythema*</td>
<td>daily 0-5</td>
</tr>
<tr>
<td>Purulent exudate*</td>
<td>daily 0-10</td>
</tr>
<tr>
<td>Separation of deep tissues*</td>
<td>daily 0-10</td>
</tr>
<tr>
<td>Isolation of bacteria</td>
<td>10</td>
</tr>
<tr>
<td>Stay as inpatient prolonged over 14 days</td>
<td>5</td>
</tr>
</tbody>
</table>

* Given score only on five of seven days. Highest weekly score used.

Category of infection:
- total score 0-10 = satisfactory healing;
- 11-20 = disturbance of healing;
- 20-30 = minor wound infection;
- 31-40 = moderate wound infection;
- >40 = severe wound infection.