Surgical Site Infection
A surgeon’s perspective
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SSI

• 16 million operative procedures in 2010.
• Overall SSI rate 1.9% for 2006-8.
• Accounts 31% of healthcare-associated infection.
• Leads to further morbidity and mortality.
• Economic burden.
Team Approach

Wound Classifications

- Clean.
- Clean contaminated.
- Contaminated.
- Dirty/infected.
SSI and Wound

- Clean:
  - 1.76% vs. 0.54% vs. 0.28%
- Clean contaminated:
  - 3.94% vs. 0.86% vs. 1.87%
- Contaminated:
  - 4.75% vs. 1.31% vs. 2.55%
- Dirty:
  - 5.16% vs. 2.1% vs. 4.54%

Surgical perspectives

- Pre-op
  - Bowel prep, diabetic control, nutritional supplement, shower
- Intra-op
  - Hair removal, skin prep, antibiotic, body temperature, carbohydrate loading
- Post-op
  - Dressing, drain.
- Administrative intervention.
  - Database, disclosure.
Bowel Prep

- We practice medicine with tradition against scientific evidence.
- Types of bowel prep.
- Some studies showed increase of SSI with bowel prep.

Recommendations

1. There is good evidence for the omission of mechanical bowel preparation in the preoperative management of patients undergoing elective open right-sided colorectal surgery. (Grade A recommendation)

2. There is good evidence for the omission of mechanical bowel preparation in the preoperative management of patients undergoing elective open left-sided colorectal surgery. (Grade A recommendation)

3. There is insufficient evidence to support or refute the omission of mechanical bowel preparation in the preoperative management of patients undergoing elective low anterior resections with or without diverting ileostomy. (Grade I recommendation)

4. There is insufficient evidence to support or refute the omission of mechanical bowel preparation in the preoperative management of patients undergoing elective laparoscopic colorectal surgery. (Grade I recommendation)

5. There is fair evidence to recommend normal diet on the day prior to surgery in the preoperative management of patients undergoing elective colorectal surgery. (Grade B recommendation)

6. There is insufficient evidence to support or refute the use of enemas in the preoperative management of patients undergoing elective colorectal surgery. (Grade I recommendation)
Cochrane Review

<table>
<thead>
<tr>
<th>Outcome or subgroup title</th>
<th>No. of studies</th>
<th>No. of participants</th>
<th>Statistical method</th>
<th>Effect size</th>
</tr>
</thead>
</table>
| Anatomically leakage stratified for colonic or rectal surgery
  1.1 Leakage after low anterior resection
  1.2 Leakage after colonic surgery | 7 | 846 | Peto Odds Ratio (Peto, Fixed, 95% CI) | 0.88 [0.55, 1.40] |
| Overall anatomically leakage for colorectal surgery | 13 | 4533 | Peto Odds Ratio (Peto, Fixed, 95% CI) | 0.99 [0.74, 1.31] |
| Mortality | 11 | 4166 | Peto Odds Ratio (Peto, Fixed, 95% CI) | 0.93 [0.58, 1.47] |
| Peritonitis | 10 | 3983 | Peto Odds Ratio (Peto, Fixed, 95% CI) | 0.74 [0.50, 1.16] |
| Reoperation | 11 | 4319 | Peto Odds Ratio (Peto, Fixed, 95% CI) | 1.04 [0.81, 1.34] |
| Wound infection | 13 | 4395 | Peto Odds Ratio (Peto, Fixed, 95% CI) | 1.16 [0.95, 1.42] |

Bowel Prep

- Why we still do it?
  - Tradition.
  - Ease of bowel handling.
  - Ability to pass stapling devices.
- Not applicable to emergent surgery or patient with obstructive symptoms.
- Personally, bowel prep all my patients.
Diabetic control

- Keep BG 140-180.
  - Intra-op continuous BG monitoring.
- HbA1C < 8.0
  - Infection complication going up if > 7.5
  - Aggressive diabetic control.
- Obesity
  - BMI > 50, increased infection.

Nutrition

- Albumin > 3.0 correlates with less complications.
- Pre-op nutritional tune up with diet.
- 5 day fish oil intake pre-op
Shower

- 5 day of shower with Mupirocin pre op.

Hair removal

- Studies show shaving hair before surgery increases wound infection.
- Use electrical clippers.
- Locally, universal adoption of electrical clippers.
Skin prep

- Characteristics of prep:
  - Fast acting
  - Persistent and cumulative actions
  - Non-irritating
- Traditional B & B prep.
- Alcohol is acceptable, but should not be the only agent.
  - ChloraPrep/DuraPrep
  - Flammable.
  - Variations of usage in OR.

Antibiotics

- SCIP requirement:
  - Timing
  - Selection
  - Duration
SCIP Timing

- Within one hour prior to surgical infusion.
  - Anesthesia to start in the OR.
- Reality:
  - Patient arrives in OR and antibiotic infusion starts.
  - Then induction of anesthesia followed by line placement, patient positions, etc.
  - A rush to make incision.
- Ideally incision at the last drop of infusion.
  - ? Start infusion at surgical timeout.

Dosage

- Is it one size fits all?
  - 2 gm cephazolin for patient BMI < 30
  - 3 gm cephazolin for patient BMI > 30
SCIP selection

• Colon surgery:
  • Cefotetan, Cefoxitin, Ampicillin/Sulbactam or Ertapenem
  • Cefazolin plus metronidazole
• PCN allergy:
  • Clindamycin plus Aminoglycoside/Quinolone
  • Metronidazole plus Quinolone/Aminoglycoside
• Safe, cost-effective, broad spectrum.
SCIP duration

- Antibiotic discontinued within 24 hours.
  - Do not order antibiotics without stop date/time.
  - Specify the number and timing of doses.
  - Q8 hour no more than 2 dose, q12 hour no more than one dose.
  - Keep it simple surgeon.

SCIP duration

- Need for re-dose intra-operatively.
- For prolonged case, ie over 3-4 hours.
  - Additional dose intra-op will keep serum level at or above effective rate.
  - No clear guideline in this community.
Body Temperature

- Decrease of immune system with decrease of body temperature.
  - Increase wound infection with colder body temperature.
- Temperature $\geq 96.8$ F.
- Temperature taken on arrival in recovery area.
  - Widely practice in the community.
  - How accurate?

Body temperature

- Individual warming gown pre-op
- Warming of operating room
  - Surgeons tend to like to keep the room temperature down.
- Warming of the operating table.
  - Warm water blanket
  - Warm air blanket
- Warming of IVF.
- Warming of irrigation.
Carbo loading

- Development of insulin resistance when carbohydrate storage is depleted.
- Leading to decrease of wbc function.
- Typical patient has NPO after midnight prior to surgery.
  - Set up for insulin resistance
- Isotonic CHO ingestion
  - 800 cc 8 hour prior to surgery
  - 300 cc 3 hour prior to surgery

Skin barrier

- Iobane
  - Increase of infection rate if operation more than 4 hours.
Drains

- No data to support routine usage of drain in surgical wound.
- “Drains don’t stop abscess formation.”
- Antibiotic-coated drains.

Wound Care

- A wide selection of dressings available
  - Silver
  - Algae
  - Permeable vs. non permeable.
- In our community, ABD and clean gauze appear to be the norm.
- Cardiac surgery may serve as a model for wound care.
  - Different wound type.
Wound care

- VAC dressing
  - Short term immediately after surgery
  - Decrease local edema hence seroma formation
  - Decrease wound infection.
  - No evidence support its routine use.
  - Cost
- Leave wound open
  - Routinely done in ostomy take down.
  - Small wound, may not be applicable to large incision.
- Wicks

Wound care

- Wound protector
  - In fashion during early 2000s.
  - No study showed benefit.
  - Return to fashion with increase of laparoscopic colon surgery.
- Dermabond
  - Not water permeable.
  - Wound visible.
  - Only used in laparoscopic colon case.
- Impact of decreasing LOS.
Administrative

- Database tracking “outcome”
  - Public with confidential.
  - New York State Cardiac Surgery.
  - Overall decrease of morbidity and mortality.
  - Benchmarks that each surgeon/hospital can measure.
  - Under-reporting affects the accuracy/validity of data.
- In this community, outcome reports by health system for individual surgeons available.
  - Limit number of colo-rectal surgeon.

Administrative

- Public disclosure.
  - Pennsylvania law requires letter to patient/family to disclose every event during hospitalization, such as UTI, wound infection, C-diff etc.
  - Large amount of administrative work for compliance.
  - Confusion among patient and family.
  - Un-intended consequence: one surgeon left every wound open for elective colon resection.
Conclusion

- Team approach.
- Education plays a major role.
- Exchange of idea locally and nationally.