Implementing a Colon SSI Reduction Bundle
The NYU Lutheran Experience, Lessons Learned

Michael Timoney, MD, FACS
Chief Quality Officer, NYU Lutheran
Implementing a Colon SSI Reduction Bundle

Demographics of NYU Lutheran

- 450 bed “safety net” hospital
  - “Open door” access to care.
  - Ethnically diverse.
  - Large percentage of uninsured, Medicaid, and other vulnerable patients

- Teaching Hospital
- Level 1 Trauma center

- Number of colectomies / year
  - 2014 = 164
  - 2015 = 106 (YTD)
Implementing a Colon SSI Reduction Bundle

The Team

- Monthly Meeting
- Inter-departmental
- All levels of providers
- Open forum
- Case review of each SSI
- PDSA Cycles

Goal:
- Reduction in SSI rates through:
  - Culture change
  - Process change

The Team
- Surgeon Leader (Co-Chair)
- Infection Control (Co-Chair)
- Ortho Chair
- Anesthesia Chair
- Ob Gyn Chair / Nursing
- Colorectal Surgery
- Infectious Disease
- OR Nursing Leadership
- OR Coordinators
- Quality Assurance
- QI Core Measure
An Overview of the Lutheran Quality Program
The Colon Bundle

<table>
<thead>
<tr>
<th>Pre-Op</th>
<th>Peri-op</th>
<th>Post-op</th>
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<tbody>
<tr>
<td>* Warming suits</td>
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<td>* Warming suits</td>
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<tr>
<td>* Antibiotic selection</td>
<td>* CHG pre-incision scrub</td>
<td>* Automatic Foley discontinuation</td>
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<td>* Antibiotic timing</td>
<td>* Standard ABX selection</td>
<td>* Standard post op wound care</td>
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<tr>
<td>* Pre-op CHG showers / Wipes</td>
<td>* ABX re-dosing (&gt; 3 hrs)</td>
<td>* Standard home wound care orders</td>
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<tr>
<td>* Bowel prep</td>
<td>* ABX selection / dosing guide poster in all ORs</td>
<td>* Hyperglycemia Initiative</td>
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<td>* Pre-op glycemic control</td>
<td>* Intra-op glycemic control</td>
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<tr>
<td>* Standardized orders</td>
<td>* Standard wound closure</td>
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</table>
Implementing a Colon SSI Reduction Bundle

Colon SSI Rates

SSI Colon: 2010 - 2015 (Not Risk Adj.)
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Colon SSI Rates (Risk Adjusted)

SSI Colon (SIR): 2012 - 2015 YTD

National Average (VBP FY2017): 0.751
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CHG Skin Prep

Chlorhexidine–Alcohol versus Povidone–Iodine for Surgical-Site Antisepsis

Rabih O. Darouiche, M.D., Matthew J. Wall, Jr., M.D., Kamal M.F. Itani, M.D., Mary F. Otterson, M.D., Alexandra L. Webb, M.D., Matthew M. Carrick, M.D., Harold J. Miller, M.D., Samir S. Awad, M.D., Cynthia T. Crosby, B.S., Michael C. Mosier, Ph.D., Atef AlSharif, M.D., and David H. Berger, M.D.

- Home CHG baths or wipes
- Mandated CHG skin prep prior to incision
- Hair clipping
An Overview of the Lutheran Quality Program

Active Core Body Warming

• SSI rate hypothermic patient - 19% vs. 6%
• Increased cost and LOS

• Active patient warming is routine intra-op
  • SCIP Core Measure
• Active warming in operative continuum advised

• Forced Warming Blanket
  • Maintains core body temp
    • Pre-, Peri-, Post-op
An Overview of the Lutheran Quality Program
Antibiotic Selection, Dosing, and Timing

The NYU Lutheran Experience, Lessons Learned
### Implementing a Colon SSI Reduction Bundle
#### Antibiotic Dosing

<table>
<thead>
<tr>
<th>SURGICAL PROCEDURE</th>
<th>APPROVED ANTIBIOTICS</th>
<th>BETA-LACTAM ALLERGY</th>
</tr>
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<tbody>
<tr>
<td>SCIP</td>
<td>Cefazolin (Ancef) OR Vancomycin OR Clindamycin</td>
<td></td>
</tr>
<tr>
<td>VASCULAR</td>
<td>Cefoxitin (Mefoxin) OR Ampicillin/Subactam (Unasyn) OR Metronidazole (Flagyl) + Cefazolin</td>
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<tr>
<td>SCIP</td>
<td>Clindamycin (Cleocin) + Gentamicin OR Clindamycin (Cleocin) + Cipro OR Metronidazole (Flagyl) + Gentamicin OR Metronidazole (Flagyl) + Cipro</td>
<td></td>
</tr>
</tbody>
</table>

#### REDOSING INTERVAL

- **ADULTS**
  - Cefazolin (Ancef)
    - Weight < 120 kg: 2 g q 8 hr IV
    - Weight > 120 kg: 2 g q 8 hr IV
  - Ampicillin/Subactam
    - Ampicillin component: 50 mg/kg q 6 hr IV
    - Maximum dose: 2 g q 6 hr IV
  - Clindamycin (Cleocin): 2 g q 8 hr IV
  - Cefazolin (Mefoxin): 2 g q 8 hr IV
  - Cefoxitin (Mefoxin): 40 mg/kg q 8 hr IV
  - Clindamycin (Cleocin): 500 mg IV
  - Cipro: 400 mg IV
  - Metronidazole (Flagyl): 300 mg IV

- **PEDIATRICS**
  - Cefazolin (Ancef): 30 mg/kg IV
    - Maximum dose: 1 g IV
  - Ampicillin/Subactam
    - Ampicillin component: 50 mg/kg IV
    - Maximum dose: 2 g q 6 hr IV
  - Clindamycin (Cleocin): 10 mg/kg IV
    - Maximum dose: 600 mg IV
  - Cipro: **NOT ROUTINELY USED**
  - Metronidazole (Flagyl): 15 mg/kg IV
    - Maximum dose: 500 mg IV
  - For infants weighing less than 1000 grams, give dose of 2.5 mg/kg IV

- **NO REDOSING**
  - Vancomycin 25 mg/kg IV based on actual body weight
    - Maximum dose: 1500 mg IV
  - Gentamicin 5 mg/kg IV **SINGLE DOSE BASED ON IDEAL BODY WEIGHT**
  - Gentamicin 25 mg/kg IV **SINGLE DOSE BASED ON IDEAL BODY WEIGHT**
An Overview of the Lutheran Quality Program
Peri-operative Glucose Control (Beyond the Sliding Scale)

Importance of Perioperative Glycemic Control in General Surgery

A Report From the Surgical Care and Outcomes Assessment Program

Steve Kwon, MD MPH,*† Rachel Thompson, MD,‡ Patchen Dellinger, MD,* David Yanez, PhD,§ Ellen Farrohki, MD,|| and David Flum, MD, MPH*†

- Insulin Protocol on the Surgical Services
  - Long and Intermediate acting insulin (weight-based)
  - Correctional short acting insulin
  - Intra-op glucose management
  - Pre-op treatment of hyperglycemia or case cancellation

- Addition of Endocrine NP

- Peri-operative glycemic control
  - Glucose < 180

- Better Glycemic Control - Hospital-wide Goal
  - Development of more in-depth protocol
    - Accounts for body habitus
    - Insulin naivety
    - Type of feeding
    - Insulin drips
    - Hypoglycemia rate (glucose < 60) 1 – 2%
An Overview of the Lutheran Quality Program

Pre-op Bowel Prep

Combined Preoperative Mechanical Bowel Preparation With Oral Antibiotics Significantly Reduces Surgical Site Infection, Anastomotic Leak, and Ileus After Colorectal Surgery

Ravi Pokala Kiran, MBBS, MS, FRCS, FACS, MSc (EBM), FASCRS,* † Alice C. A. Murray, BSc, MBBS, MRCS,* Cody Chiuzan, PhD, † David Estrada, MD,* and Kenneth Förde, MD*

Annals of Surgery • Volume 262, Number 3, September 2015

Conclusions: These data clarify the near 50-year debate whether bowel preparation improves outcomes after colorectal resection. MBP with oral antibiotics reduces by nearly half, SSI, anastomotic leak, and ileus, the most common and troublesome complications after colorectal surgery.
An Overview of the Lutheran Quality Program
Wound Protector and Standardized Fascial Closure

Wound Protectors Reduce Surgical Site Infection
A Meta-Analysis of Randomized Controlled Trials
Janet P. Edwards, MD, MPH, CPH,* Adelyn L. Ho, MD, MPH,† May C. Tee, MD, MPH, ‡ Elijah Dixon, MD, MSc,* and Chad G. Ball, MD, MSc*

Annals of Surgery • Volume 256, Number 1, July 2012

- Significant reduction in SSI
- Wound protector is placed
  - Once laparotomy or mini-laparotomy is performed
- Double gloving throughout case
Implementing a Colon SSI Reduction Bundle

Increased Oxygenation

The New England Journal of Medicine

Supplemental perioperative oxygen to reduce the incidence of surgical-wound infection

Robert Greif, M.D., Ozan Akça, M.D., Ernst-Peter Horn, M.D., Andrea Kurz, M.D., and Daniel I. Sessler, M.D., for the Outcomes Research Group*

January 20, 2000

- Supplemental administration of oxygen during the perioperative period decreases the incidence of wound infection.
- 500 patients undergoing colorectal randomized to receive 30% or 80% Fi02 during colon surgery and for two hours afterward.
- Significantly higher PaO2 in the patients on 80% FiO2.
- Percent SSI in high O2 group 5.2%
- Percent SSI in low O2 group 11.2%
- P=0.01
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Standardized Fascial Closure

- Anastomosis “Time Out”
- Re-draping
  - New Mayo stand cover
  - Clean light handles
  - New patient drapes over the old
- Glove and gown change for entire team
- Instrument change
  - Sterile closure tray opened
- Pulse irrigation of the wound
The Preventive Surgical Site Infection Bundle in Colorectal Surgery
An Effective Approach to Surgical Site Infection Reduction and Health Care Cost Savings

Jeffrey E. Keenan, MD; Paul J. Speicher, MD; Julie K. M. Thacker, MD; Monica Walter, DNP; Maragatha Kuchibhatla, PhD; Christopher R. Mantyh, MD

• Retrospective study of 559 patients who underwent major elective colorectal surgery.
  • 346 (61.9%) before bundle
  • 213 (38.1%) after bundle

• Implementation of the bundle was associated with:
  • Reduced superficial SSIs 19.3% vs 5.7% $P < .001$
  • Postoperative sepsis 8.5% vs 2.4% $P = .009$

• No difference in deep SSIs, organ-space SSIs, wound disruption, LOS, 30-day readmission, or variable direct costs (VDC).

• Subgroup analysis showed superficial SSI associated with 35.5% increase in:
  • VDC $13,253 vs. $9,779 $P = .001$
  • LOS 7.9 vs. 4.6 days (71.7%) $P < .001$
Implementing a Colon SSI Reduction Bundle
Other Interventions – Hygiene and Reducing OR traffic

- Hand washing re-education
- Terminal OR cleaning
- Equipment redistribution in OR to optimize flow
- Restriction of passage through the ORs
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Other Interventions - Hair Clipping Outside of the OR
Implementing a Colon SSI Reduction Bundle

Other Interventions – Warm up jackets
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A Closer Look at 2014 SSIs – Urgency of Case

Overview Analysis of 2014 SSI-Colon

Total Number of Actual SSI-Colon: **13 Cases**
- 1) **Emergent Cases**: 7 (54%)
- 2) **Elective Cases**: 6 (46%)

Emergent Cases: 7
Elective Cases: 6
Implementing a Colon SSI Reduction Bundle
A Closer Look at 2014 SSIs – Wound Classification
Implementing a Colon SSI Reduction Bundle
A Closer Look at 2014 SSIs – Overall Bundle Compliance

Overview Analysis of 2014 SSI-Colon

(SSI-Colon Bundle Compliance)

Total Number of Actual SSI-Colon: 13 Cases
1) Compliant with Bundle: 0 (0%)
2) Non compliant with Bundle: 13 (100%)

Count of Cases

0 2 4 6 8 10 12 14

Compliant with Bundle

Non compliant with Bundle

13
Implementing a Colon SSI Reduction Bundle
A Closer Look at 2014 SSIs – Compliance with Bundle Elements

Overview Analysis of 2014 SSI-Colon

(Frequency of Incidences that were not Adherent to Bundle)

Total Number of Actual SSI-Colon: 13 Cases

Bundle elements that were not adhered to:
1) Instrument Change: (0 cases)
2) Necessary ABX re-dose: (0 cases)
3) CHG Prep: (2 cases)
4) Double Gloves: (2 cases)
5) Gown Change: (4 cases)
6) Bowel Prep: (7 cases)
7) CHG bath/Sage wipe: (7 cases)
8) Wound Protector: (13 cases)
## Implementing a Colon SSI Reduction Bundle

### Colon Bundle Compliance 2015

<table>
<thead>
<tr>
<th></th>
<th>Bowel Prep</th>
<th>Operative area prepped with ChloraPrep</th>
<th>Double Gloves</th>
<th>Gowns changed prior to closure</th>
<th>Gloves changed prior to closure</th>
<th>Drape: Alexis wound protector used</th>
<th>Separate dirty instruments</th>
<th>Antibiotics Redose</th>
<th>Pulsavac Wound Irrigation</th>
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The NYU Lutheran Experience, Lessons Learned
Implementing a Colon SSI Reduction Bundle
Colon SSI Prevention Bundle Refinements in 2014 - 2015

• Individual conversations w non-compliant surgeons
  • CHG
  • Wound protector
• CHG wipes in the pre-op area
• CHG bathing nurse driven protocol for the in patient
• Improved standardized wound closure
  • Sterile tray
  • Re-drape the patient
  • Pulse Irrigation
Implementing a Colon SSI Reduction Bundle
Process Refinement, Data Reporting Data, and Work to Do

• **Process refinement and improvement**
  • Continuous monitoring of protocols and of outcomes
  • Evaluate what works and what does not
  • Secret shoppers

• **Other areas for work at Lutheran**
  • High FiO2 protocol
  • Glucose management
  • Post op Debrief
  • Standard post op wound care

• **Data Accuracy**
  • Emergency vs. Elective cases
  • Wound classification