Reducing Surgical Site Infections in Colon Surgery Patients

Mercy Health
St. Elizabeth Boardman Hospital
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St. Elizabeth Boardman Hospital

- 294 – Bed Community Hospital
- Magnet
- Level 3 Maternity
- 2909 Deliveries- 2017
- 53,902 ED visits- 2017
- 13,725 Admissions- 2017
- 7109 Surgeries-2017
- ED-Family Medicine-Otolaryngology Residency Programs
Problem/Background:

Despite current preventive measures, SSIs remain a significant problem:

- In the US, at least 780,000 SSIs occur each year\(^1\)
- SSIs account for about 23% of all hospital-acquired infections for surgical patients\(^1\)
- SSIs occur in up to 5% of surgical patients\(^2\)

Problem/Background, cont’d

Burden-US
- ~300,000 SSIs/yr (17% of all HAI)
- 2%-5% of patients undergoing inpatient surgery

Mortality
- 3 % mortality
- 2-11 times higher risk of death
- 75% of deaths among patients with SSI are directly attributable to SSI

Morbidity
- long-term disabilities

Length of Hospital Stay
- ~7-10 additional postoperative hospital days

Cost
- $3000-$29,000/SSI depending on procedure & pathogen
- Up to $10 billion annually
- Most estimates are based on inpatient costs at time of index operation and do not account for the additional costs of rehospitalization, post-discharge outpatient expenses, and long term disabilities

**Project Charter:**
Reducing Surgical Site Infections in Patients with Colon Procedures at SEBH

**Business Case:**
Increased adherence to evidence practices, following CDC guidelines and SCIP protocols will potentially reduce surgical site colon infections, resulting in decreased length of stay, decreased patient readmission rates, decreased cost, and increased patient satisfaction.

**Problem Statement:**
Review of Infection control (NHSN) data from January 1, 2013 through December 31, 2013: NHSN selected surgical procedures at St. Elizabeth Boardman Health Center showed a total of 18 SSIs in 2013: 2 total knee arthroplasty and 16 colon surgeries. There were 16 colon infections out of a total of 98 colon procedures in 2013 for 16.3% infection rate (16/98).

**Goal Statement:**
To decrease the percent of surgical site infections in patients undergoing colon surgeries at SEBHC from 16.3% to 5% by end of 4th quarter 2014, resulting in 11.3% reduction in SSIs.

**Project Metrics:**
Primary Six Sigma Metric: At SEBH, to reduce the percent of SSIs in colon surgeries from 16.3% to 5% (11.3% reduction) by December 31, 2014.
Primary Six Sigma Metric Type: reduce defect

**In Scope:**
In-patient/Surgical patient s at SEBH with colon surgery.

**Out of Scope:**
Surgical patients <18 years old
Surgical patients without colon surgery performed
Surgical patients who expire intra-operatively
Surgical patients with previous infection / on therapeutic antibiotic regime.
Medical patients
Project Charter: Reducing Surgical Site Infections in Patients with Colon Surgical Procedures at SEBH

Executive Champion: ID Physician
Project Champion: CNO
Process Owner: Nursing Surgery Director
Green Belt: Quality Manager
Master Black Belt: Regional Blackbelt
Infection Prevention: Infection Preventionist
Team Members:
Clinical Resource Specialist –SEBH ED
Nursing Clinical Resource Specialist
Wound Care Specialist SEBH
Clinical Resource Specialist- Peri-op

Anticipated Timeline:

Project Charter sign-off  Dec 2014
Initial data collection: 1st Q 2013 to December 31, 2013
Define  1/30/14
Measure 1/30/14
Analyze 2/05/14
Improve 5/31/14
Control 10/1/14
Realization 12/31/14
Sustainability 2015-2016-2017
SIPOC
(Steps- Inputs-Process-Outputs-Customers)

**Suppliers**
- Surgical patient
- RNs in Pre-Op
- Surgeons
- Surgery resident
- RNs on units

**Inputs**
- Pre op orders - ABX selection w/ documentation if infection/coverage
- RNs PAT RNs Pre-op
- Order ABX Document infection/reason for ABX
- Order pre post op ABX, dressings, documentation dsg
- Documentation dressing change

**Process**
- Implementing SSI bundles
- Skin prep - use of alcohol containing agent and standardizing skin prep process and CHG process
- Patient Education - use of CHG for AM admissions/evening before
- MRSA screening - screen for staph aureus and decolonize carriers
- Prophylactic antibiotics: Weight based, re-dose, selection, high risk abx selection/ documentation
- Post operative dressing changes: documentation, orders, assessment of incision

**Outputs**
- Reduced SSIs in colon surgeries
- Increased patient satisfaction
- Appropriate ABX coverage
- Improved physician and nursing documentation
- Standardize processes

**Customers**
- Patient
- Physician
- Nursing
- Administration

**LIST INPUT METRICS:**
- pre op orders-abx
- Post op orders
- RN work list- dressings
- physician documentation
- RN documentation
- CHG process

**LIST OUTPUT METRICS:**
- SSI reduction in patients undergoing colon surgeries
Demographic Information: Colon

- 16 cases
- 12.5% (2/16) admitted via the Emergency Department
- Median age = 63
- 50% (8/16) patients admitted prior to date of procedure: Range 1-10 days
- Median length of surgery = 124 minutes: Range 70-195 minutes
- Median time between OR and infection identified = 7.5 days: Range 4-20 days
- 1 contaminated; 15 clean contaminated
Analyzing Data

- **Metric:** # Colon SSIs / # Colon surgeries = 16/98 = 16.3%

- **Ages:** 30-92, Mean 66
- **Weight:** 121-267#, Mean 178#
- **Sex:** Male 7, Female 9
- **Diabetics:** 3
- **OR day:** Monday 3, Tuesday 6, Wednesday 1, Thursday 2, Friday 2, Saturday 1, Sunday 1
- **OR rooms:** room 1-6, room 2-6, room 4-3, room 5-1
- **OR length:** 1hr. 10 min. – 3 hrs. 15 min. Mean 1hr. 59min.
- **Prep:** Chloraprep 10, Duraprep 3, Betadine 3 (Betadine in addition to other prep 2)
- **Surgery month:** January-0, February-1, March-2, April-1, May-1, June-4, July-0, August-1, September-2, October-1, November-2, December-1
- **14/16 were in the SCIP Core measure; 1/14 failed SCIP d/t ABX selection**
Analyzing Data

Number of SSI by Month

Number of SSI by Day of Week
Analyzing Data

Comorbid Conditions

Prophylaxis – Antibiotic Selection

Hypertension
Cancer
Diabetes
Diverticulitis
COPD
Crohns
Obese
Chronic Renal Disease
PVD
Parkinson
Abscess
Hep-C
Bowel Obstruction

Mefoxin
Ampicillin
Clindamycin
Cefipime, Flagyl
Ancef

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12
Impact/Effort Matrix

Options:
1 – physician education on antibiotic selection for high risk patients
2 – pre-op order sets
3 – improve orders/documentation on post op dressing change
4 – Eliminate use of order sets
5 – Do nothing, continue current process
6 – Automate carepath to send notification to physician on ABX
7 – Process for CHG defined: night before / day of, chin to toe
8 – CHG for “day of” completed in pre-op

Based on the matrix, option 7, 8, 3, and 1 are recommended
What the Team Found

- 16.3% of patients having colon surgery had post op infection
- CHG process was “hit or miss”
  - Opportunity to standardize the process
- Antibiotic selection
  - Review of cases by ID physician- ABX selection not appropriate for the complexity and patient hx of prior infection-opportunity to educate general surgeons
- Orders and documentation for post operative dressing changes were non existent or not followed; documentation lacking
  - Require dressing order postoperatively
  - Require order to change post operative dressing
  - Opportunity to improve assessment/documentation of post operative incision site
Take Away

- SEBH had 20 surgical site infections in 2013
- Majority of cases are general surgery-colon (18)
- Surgeons / residents – opportunity for antibiotic selection based on patient co-morbidities, prior infection, and complexity of case
- CHG wipe process not well defined
- Post op dressing orders lacking/incomplete
- Documentation and assessment of post op incision lacking/ incomplete
Analyze Phase Conclusions

• Conclusions
  • FMEA confirmed variables
  • Critical Xs defined (from FMEA)
  • FMEA drove action plans
  • Team in agreement with conclusions

• Quick Wins
  • Medical Staff Education/ Awareness- letter sent
  • CHG process standardized

• Key Learning
  • Communication of data imperative to keep the team focused
## Action Plans

<table>
<thead>
<tr>
<th>Who</th>
<th>What</th>
<th>When</th>
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</thead>
<tbody>
<tr>
<td><strong>CMO</strong>&lt;br&gt;General Surgeon&lt;br&gt;Surgery Department Chair</td>
<td>Letters sent to surgeons on appropriate antibiotic selection, antibiotic timing, skin prep, dressings and post operative wound care, bowel prep, and focus on complicated cases and additional ABX coverage.</td>
<td>March 2014</td>
</tr>
<tr>
<td><strong>Surgery Department Chair</strong>&lt;br&gt;ID Physician&lt;br&gt;Quality</td>
<td>Physician education via posters, surgery department updates at surgery department meetings.&lt;br&gt;MEC presentation on SSI&lt;br&gt;Physician education on aquacel AG surgical dressings per Convatec representative</td>
<td>March- April 2014</td>
</tr>
<tr>
<td><strong>Clinical resource specialist</strong>&lt;br&gt;Director of Surgery&lt;br&gt;Mgr. Environment</td>
<td>OR process changes: new instruments to close case, change gloves prior to closure, weekend cleaning process&lt;br&gt;AM CHG head to toe wipe completed in pre-op</td>
<td>March and ongoing</td>
</tr>
<tr>
<td><strong>PAT staff</strong>&lt;br&gt;Convatec rep&lt;br&gt;Clinical resource specialist-peri-op&lt;br&gt;Director of Surgery</td>
<td>Patient preparation process – preop:for AM admit cases&lt;br&gt;Nares swabs on colons pre-op&lt;br&gt;Pre-op bath with dial soap&lt;br&gt;CHG wipes-night before and morning of&lt;br&gt;New education instruction form for patients on CHG wipe and bath</td>
<td>March 2014</td>
</tr>
<tr>
<td><strong>Nursing units</strong>&lt;br&gt;Wound Care Nurse&lt;br&gt;Clinical Resource Specialists&lt;br&gt;Nurse Manager</td>
<td>Patient preparation process – preop:for patients in hospital&lt;br&gt;Nares swabs on colons pre-op&lt;br&gt;Pre-op bath with dial soap&lt;br&gt;CHG wipes-night before&lt;br&gt;Nursing staff responsible to complete and document</td>
<td>March- April 2014</td>
</tr>
<tr>
<td><strong>Wound Care Nurse</strong>&lt;br&gt;Clinical Resource Specialists-Nsg&lt;br&gt;Convatec rep&lt;br&gt;Sage rep</td>
<td>Nursing Staff Education:&lt;br&gt;CHG wipe and Nares swab&lt;br&gt;Aquacel AG surgical dressings&lt;br&gt;Dressing change documentation in EPIC&lt;br&gt;Round with surgeons/residents to address dressing change orders and documentation of wound assessment and dressings</td>
<td>March- April 2014</td>
</tr>
<tr>
<td>Who</td>
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<tr>
<td>Clinical resource specialist-peri-op</td>
<td>Monitors compliance with pre-op process- communicates with nursing educators for opportunities for improvements</td>
<td>ongoing</td>
</tr>
<tr>
<td>Infection Prevention</td>
<td>Monitors SSIs at SEBH- data shared with surgeons at department of surgery meetings, MEC, OR governance, OR risk Ongoing rounding and in-services</td>
<td>ongoing</td>
</tr>
<tr>
<td>Wound Care Nurse Clinical Resource Specialists-Nsg</td>
<td>Monitors SSI bundle compliance: nares swab, bath night before, CHG wipe, Aquacell AG surgical dressings use, documentation of dressing change in EMR, physician orders to change dressings. Quarterly report shared with ID Physician Quarterly report shared at nursing operations meeting Staff re-education per wound care specialist and nursing educators for improvement opportunities</td>
<td>ongoing</td>
</tr>
<tr>
<td>Infection Prevention</td>
<td>SSI meeting follow up- October 3, 2014 Follow up per ID Physician for MEC/follow up on SSI project</td>
<td>10/3/2014</td>
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<tr>
<td>ID Physician Director of Surgery</td>
<td>PPE outside OR area: OR Staff and physicians educated on importance of removing PPE Discussion at Infection Control meeting per ID Physician on decreased observations of staff wearing PPE outside of surgery area</td>
<td>ongoing</td>
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<tr>
<td>Infection Prevention</td>
<td>Central Processing: completed observation in area for instrumentation sterilization process</td>
<td>ongoing</td>
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<tr>
<td>Quality</td>
<td>RETIRED→SCIP core measures monitored; OFI letters sent to surgeons for opportunities for improvement Data shared at Board, PI of the Medical staff, Administrative meetings, nursing and staff meetings, physician meetings, MEC</td>
<td>SCIP core measure retired Data sharing-ongoing</td>
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**Improve Phase Conclusions**

**Conclusions**
- Pilot showed improvement

**Quick Wins**
- ABX coverage for complex colon surgery cases
- CHG process defined
  - AM admit
  - Inpatient
  - Education for Patient / Nurses/Surgeons

**Key Learning**
- Results of the Lean/Six Sigma Project demonstrate sustainability of compliance →
- Not all improvements/action plans can happen at once: plan allotment / time for strategies
Monitoring Data

Target Goal: 5%
Stretch Goal: Zero Harm

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<thead>
<tr>
<th></th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
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<tr>
<td></td>
<td>16.4%</td>
<td>7.2%</td>
<td>9.6%</td>
<td>4.17%</td>
<td>3.15% YTD</td>
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“uptick” in 2015:
Nose to Toes trial
UV light in OR
Summary of Process Improvement:

- Pre-op nares cultures
- Dial soap bath night before
- CHG bathing cloths night before and morning of
- Nose to toes
- No bath basins
- Aquacel Ag surgical dressing implementation
- CMO letter to surgeons regarding appropriate ABX selection
- Include OB in process changes
- Review and drill down of SSIs led by Infection Preventionist
- Audits completed - Dressing Changes, including direct observation
- Revamping and re-commitment to OR cleaning process
- Ongoing Education – Clinical Resource Specialists and Wound Care Specialists
- UV light in ORs
**Bug Busters:**
Utilizing an Inter-professional Approach to Enhance Patient Outcomes

Maria Sliwinski RN, MHHS, CNOR, Clinical Resource Specialist Surgical Services
Sally Danilow RN, BSN, CIC, Infection Preventionist
Mercy Health St. Elizabeth Boardman Hospital, Boardman, Ohio

**BACKGROUND**

Surgical Site Infections (SSI) are a major cause of morbidity in surgical patients, leading to increased length of stay and healthcare costs. No single intervention has demonstrated efficacy in reducing SSIs.

Despite multiple preventative measures throughout our organization, in 2013, one hospital experienced an increase in the number of SSIs (16.3%). To address this concern, an interdisciplinary task force was developed to examine causes and trial interventions.

**METHODS**

Developed an interdisciplinary team of physicians, administration, educators, quality nurses, clinical nurses, infection control, and wound care.

Used Lean processes and the best available evidence to improve: preoperative antibiotic selection, preoperative skin cleansing, and changes in our post-operative dressing practices.

Preoperative antibiotic selection:
- Physician education relating to appropriate antibiotic selection and timing
- Infections disease consult on high-risk patients
- Ordering weight-based antibiotics and dosing as appropriate

Preoperative skin cleansing:
- Implemented a night before/morning of protocol
- Preoperative antibacterial soap cleansing night before
- 2% chlorhexidine gluconate (CHG) preoperative bath clothes night before/morning of
- Chlorhexidine gluconate (CHG) and isopropyl alcohol (IPA) skin prep in surgery

Postoperative dressing practices:
- Back to basics
- Orders for post-operative dressing changes
- Dressing changes utilizing evidence-based processes and products
- Education of residents and staff
- Implementation of surgical silver dressings

**RESULTS**

Our initiative resulted in a decrease in SSI from 16.3% to 6.7% which represents a 65% reduction.

Including the increase in cost of the CHG cloths used for our preoperative skin cleansing, we had an overall return on investment (ROI) of $305,000.

**CONCLUSION & IMPLICATIONS TO PERIOPERATIVE NURSING**

Utilizing Lean processes along with an interdisciplinary approach helped us create a team that identified three main areas that we were able to improve upon to help decrease infection rates, improve patient outcomes and ultimately a cost savings for our hospital system. In addition to a reduction of SSIs, improved SCIP measures, improved OR processes, improved documentation, and a more standardized process across the system resulted.
Moving Forward

- Continued collaborative integration
- Commitment and involvement from team
- Use data to drive improvements/hold the gain

- Questions?