A. GENERAL INFORMATION

1. INSTITUTION NAME:
   Mayo Clinic Rochester Methodist Hospital, Rochester, MN

2. NAME OF THE CASE STUDY:
   Colorectal Surgery SSI Reduction Initiative: Interventions across the Episode of Care

B. WHAT WAS DONE?

1. GLOBAL PROBLEM ADDRESSED
   According to the Institute for Healthcare Improvement (IHI), 2.6 percent of 30 million
   operations per year are complicated by a surgical site infection (SSI).¹ SSI is the second
   most common health care-associated infection, accounting for 17 percent of all
   hospital-acquired infections.² In surgical patients, SSIs are the most common
   health care-associated infection at 38 percent.³

   **Implications of having an SSI include the following:**
   - Increased length of hospital stay (two to four days on average)
   - Increased costs
   - Increased readmission rates
   - Increased patient morbidity, pain, and discomfort
   - Risk to other patients

2. IDENTIFICATION OF LOCAL PROBLEM
   At Rochester Methodist Hospital the colectomy SSI observed versus expected (O/E) ratios
   had been “as expected” on the last four Semiannual Reports (SAR), but the average rate
   increased from 7.05 percent on the January 2009 SAR to 10.1 percent on the
   February 2010 SAR.

   Although these rates were in line with other ACS NSQIP participating sites, the hospital
   felt it could do better. The goal was to reduce colorectal surgical site infections by
   50 percent and improve the current O/E ratio from decile 4 to decile 2 by December 2011.
BASELINE OVERALL SSIs

The image shows a P chart of total observed SSIs (n) by phase, with data points plotted over time from January 2009 to November 2010. The chart includes the following details:

- **Proportion**
  - The proportion range is indicated from 0.0 to 0.4.
  - The proportion value P = 0.1051 is marked.
  - The proportion value P̅ = 0.0960 is also indicated.

- **Control Limits**
  - UCL = 0.3907 (Upper Control Limit)
  - LCL = 0 (Lower Control Limit)

- **Months**
  - The months are labeled from Jan-09 to Nov-10.

- **Notes**
  - Tests performed with unequal sample sizes.
C. HOW WAS THE QUALITY IMPROVEMENT (QI) ACTIVITY PUT IN PLACE?

1. CONTEXT OF THE QI ACTIVITY

Mayo Clinic Rochester Methodist Hospital and Saint Marys Hospital together form an integrated medical center dedicated to providing comprehensive diagnosis and treatment in virtually every medical and surgical specialty. Combined, the hospitals have 1,951 licensed beds and are located in Rochester, MN.

Mayo Clinic Rochester Methodist Hospital has a dedicated colorectal surgery (CRS) specialty with eight board-certified colon and rectal surgeons and four colorectal surgery fellows performing more than 2,300 colectomies a year. The hospital has dedicated CRS operating rooms and allied health staff along with two dedicated CRS postoperative nursing floors.

2. PLANNING AND DEVELOPMENT PROCESS

To understand current practices in CRS, Robert Cima, MD, developed a surgeon survey for the CRS division. Results showed variability among the surgeons and started a conversation on best practices and opportunities to reduce unnecessary variation. There was a consensus to move toward more standardization of the surveyed items.

Data analysis identified the significant ACS NSQIP variables contributing to SSI occurrences and helped to focus improvements.
D. DESCRIPTION OF THE QI ACTIVITY

Using the DMAIC (Define, Measure, Analyze, Improve, Control) Method to guide the quality improvement process, the hospital began by defining the key principles of its SSI reduction effort:

- Interventions across the episode of care
- Multidisciplinary
- Engage staff, patient, and families
- Standardize as many processes as possible
- Ensure high compliance with elements
- Build elements into the system
- Frequent feedback and communication

The hospital’s multidisciplinary team met to review the existing literature on SSI prevention as well as develop a detailed value stream map of the entire surgical episode. The hospital optimized its processes to ensure that it had very high compliance with those best practices strongly supported in the literature. Furthermore, other practices that may have had less support in the literature but made sense from a workflow and/or economic perspective where also incorporated into its bundle. The overall goal was to institute process steps that would be performed at a very high level of compliance across the continuum of care. The intervention bundle was rolled out in the practice on January 1, 2011.
# Mayo Clinic SSI Reduction Bundle Elements

|-----------------------|-------------------------|------------------------|----------------------------|
| **Patient Education**| **Ensure SCIP compliance**  
1. Correct antibiotics and weight-based dose  
2. Administer within 60 min prior to incision  
Ensure re-dose of cefazolin (weight-based dose) 3 hrs after last dose  
Chlorhexidine-alcohol skin preparation—appropriate application education on amount and process of application  
Use dosing tray for closure of fascia and skin  
Glove change by staff before closure of fascia  
Re-block sterile field with newsurgical towels | **Antibiotic Administration**  
Patient hand hygiene education  
Prominent display in patient rooms of hand hygiene sign  
Chlorhexidine shower following dressing removal  
Personal hand sanitizing wipes at bedside / Alcohol hand rub on bed pole  
Ensure dressing removal morning of POD 2  
Discontinue antibiotics after two post-op doses | **Patient Hygiene**  
Dismiss patient with 4 oz bottle of Chlorhexidine for body cleansing  
Patient education on wound care and recognizing infection signs & symptoms  
Followup phone call from nurses |
### E. RESOURCES USED AND SKILLS NEEDED

**1. STAFF: NUMBER AND TYPE OF STAFF INVOLVED IN THE PROGRAM**

<table>
<thead>
<tr>
<th>ROLE</th>
<th>DEPARTMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgeon, Project Leader</td>
<td>Surgery, Division of Colon and Rectal Surgery</td>
</tr>
<tr>
<td>Quality Advisor</td>
<td>Systems and Procedures</td>
</tr>
<tr>
<td>Infection Control Nurse</td>
<td>Nursing</td>
</tr>
<tr>
<td>Nurse Managers on CRS Patient Care Units</td>
<td>Nursing</td>
</tr>
<tr>
<td>Clinical Administrator</td>
<td>Nursing</td>
</tr>
<tr>
<td>Clinical Nurse Specialist</td>
<td>Nursing</td>
</tr>
<tr>
<td>Wound, Ostomy, Continence Nurse</td>
<td>Nursing</td>
</tr>
<tr>
<td>Operating Room Nursing Managers Supporting CRS</td>
<td>Nursing—Hospital Surgical Services</td>
</tr>
<tr>
<td>Quality Improvement Advisor</td>
<td>Nursing—Hospital Surgical Services</td>
</tr>
<tr>
<td>Data Abstraction and Analysis</td>
<td>Surgery Clinical Research Office—ACS NSQIP</td>
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<tr>
<td>Pharmacist</td>
<td>Pharmacy</td>
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<tr>
<td>Process Engineer</td>
<td>Systems and Procedures</td>
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<tr>
<td>Extended Nurse Practitioner</td>
<td>Colon and Rectal Surgery</td>
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<tr>
<td>Research Fellow</td>
<td>Surgery, Division of Colon and Rectal Surgery</td>
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F. WHAT WERE THE RESULTS?

1. OVERALL RESULTS
Since the January 2012 SAR, Mayo Clinic Rochester Methodist Hospital has been ranked in decile 1 with low outlier and/or exemplary status for CRS SSI. The overall SSI rate declined to 4.3 percent with a superficial SSI rate of 1.6 percent.\textsuperscript{4}

OVERALL SSI RATES PRE- AND POSTINTERVENTION
SUPERFICIAL SSI RATES PRE- AND POSTINTERVENTION

Percentage Chart of Superficial SSI by Phase

Tests performed with unequal sample sizes
2. COST SAVINGS

PROJECTED COST SAVINGS AT A MACRO-LEVEL

<table>
<thead>
<tr>
<th>TOTAL CASES</th>
<th>PERCENT SSI BY TYPE (FROM ACS NSQIP)</th>
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<tbody>
<tr>
<td></td>
<td>Overall</td>
</tr>
<tr>
<td>2010</td>
<td>190</td>
</tr>
<tr>
<td>2011-</td>
<td>284</td>
</tr>
<tr>
<td>June 2012</td>
<td></td>
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<table>
<thead>
<tr>
<th>TOTAL CASES</th>
<th>&lt; == PROJECTED SSIS == &gt;</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Total</td>
</tr>
<tr>
<td>2010 [Baseline]</td>
<td>250</td>
</tr>
<tr>
<td>2012</td>
<td>124</td>
</tr>
<tr>
<td></td>
<td>126</td>
</tr>
<tr>
<td></td>
<td>$2,000</td>
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<tr>
<td></td>
<td>$176,000</td>
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Based upon internal Mayo charges for CRS patients identified in the Mayo ACS NSQIP data set of CRS with only an SSI compared with matched CRS patients with no identified postop occurrences: (charge differential for event; 2008 unadjusted dollars) superficial SSI $2,000; organ space SSI $14,000; deep SSI $12,000.
6. TIPS FOR OTHERS

- Set a shared goal
- Multidisciplinary approach is essential
- Reliable, timely, and actionable data is needed
- Not a one-size-fits-all process
- Look at the entire episode of care and optimize each element
- Understand the current practice
- Introduce elements of change and audit compliance
- Build improvements into the system to increase compliance
- When no evidence for which of the element(s) makes a difference in the “bundle,” the outcome is what matters

REFERENCES


