The Advanced Colon Bundle
# Agenda

<table>
<thead>
<tr>
<th>Topic</th>
<th>Speakers</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Welcome and Introductions</td>
<td>Wing Lee, Project Manager, NYSPFP</td>
</tr>
<tr>
<td>II. Introducing the Advanced Colon Bundle</td>
<td>Wing Lee, Project Manager, NYSPFP</td>
</tr>
<tr>
<td>III. Surgical Site Infection Reduction Efforts:</td>
<td>Robert R. Cima, MD, MA</td>
</tr>
<tr>
<td>What It Means in 21st Century Healthcare</td>
<td>Professor of Surgery, Mayo Clinic</td>
</tr>
<tr>
<td>IV. Hospital Gap Analysis</td>
<td>Maria Sacco, Project Manager, NYSPFP</td>
</tr>
<tr>
<td>V. Hospital Discussion and Question and Answer</td>
<td>Facilitated by Maria Sacco, Project Manager, NYSPFP</td>
</tr>
</tbody>
</table>
Advanced Colon Bundle
No Harm Across the Continuum of Surgical Care

Pre-Operative
- Pre-admission preparation
- Preoperative bathing
- Antimicrobial prophylaxis
- Normothermia
- ADE – medication reconciliation
- Patient education

Intra-operative
- Glucose control
- Normothermia
- Weight-based Antimicrobial Redosing
- Pressure ulcer prevention
- Brief, debrief, checklists

Post-operative
- ADE – pain control
- VTE prophylaxis
- Foley catheter removal
- Fall prevention
- Pressure ulcer prevention
- Patient and family caregiver information on wound care

NYS PARTNERSHIP FOR PATIENTS
Why Focus on Colon Surgical Site Infections?

- 2.6% of 30 million operations per year are complicated by SSI (800,000 – 2 million SSI annually)
- SSI accounts for 38% of HAI in surgical patients
- Colorectal surgery SSI rate varies between 5% to 30%
- SSIs are associated with:
  - Increased length of stay
  - Increased hospital costs (estimated increase of $1,300 – $5000 per case)
  - Increased patient morbidity, and mortality
  - Increased readmissions rates

References:
2. Poulsen KB, Bremmelgaard A, Sorensen AI, Raahave D, Petersen JV. Epidemiol Ifect. 1994; 113(2); 283-295
NYSPFP Colon SSI SIR

COLO SSI Standardized Infection Ratio
by Year and Month

27% Increase
SSI-Colon Surgery Standardized Infection Ratio (SIR) All NHSN-Reporting Hospitals Nationally (n = 3,308)

Source: NHSN (n = 3,308 to 3,441 hospitals, depending on the quarter).
National SSI-Colon Surgery Standardized Infection Ratio (SIR), Current Rate and Percent Improvement by HEN

Source: NHSN (Q1 2012 – Q3 2013).
Notes: Figure represents HENs with at least 60 percent of non-CAHs reporting. Progress is seen as movement toward the bottom right corner of the figure, indicating both reduction in harm and low current event rate.
One HEN is not shown because reporting was under 60 percent: Ohio Children’s.
+ Indicates HEN met High Performance Benchmark.
High Performance in NYS

SSI Colon Surgery Standardized Infection Ratio (SIR)
Top 75% of Hospitals Performing for Sep-Nov 2013 (n=90)

18.7% Improvement
Bundle Elements

- Normothermia
- Glucose Control
- Antimicrobial Prophylaxis
- Increased Peri-operative Oxygenation
- Skin Preparation
- Clean Standardized Fascia Close
- Wound Management
Flowchart is available for download from https://www.nyspfp.org/Members/Initiatives/InfectionPrevention/SSI/Tools.aspx
## Bundle Elements

<table>
<thead>
<tr>
<th>Essential Bundle Element</th>
<th>Strategies for Application of Bundle Element</th>
</tr>
</thead>
</table>
| **Normothermia**        | • Standardize warming interventions and protocols in both the pre-operative holding area, OR, and PACU.  
                          | • Active warming of patients (e.g., Bair hugger) in the holding area to reduce risk of inadvertent hypothermia for patients with temperature ≤ 36°C.  
                          | • Check temperature prior to entering the operating room. Check every 15 minutes intra-operatively. Check immediately upon arrival in PACU and every 30 minutes until discharge from PACU.  
                          | • Use of warmed IV fluids in the OR |
| **Glucose Control**     | • Establish glucose control protocols for use throughout peri-operative operative process.  
                          | • Identify known diabetics and potential hyper-glycemics in the PAT. Work with endocrinologist to reduce HbA-1C for known diabetics.  
                          | • Frequent monitoring of blood glucose (all patients, both known diabetics and non-diabetics) beginning in the pre-operative holding area, in the OR, in the PACU, and on all units. Institute glucose management protocol (e.g. Basal bolus or standard protocol insulin delivery for blood glucose > 200 mg/dl.) |
## Bundle Elements (Cont.)

<table>
<thead>
<tr>
<th>Essential Bundle Element</th>
<th>Strategies for Application of Bundle Element</th>
</tr>
</thead>
</table>
| **Antimicrobial Prophylaxis**                 | • Standardize prophylactic antibiotic protocols, with additional guidance on weight-based dosing and re-dosing for long cases based on the half-life of the selected antibiotic.  
• Administer weight-based antibiotics within 1 hour prior to surgical incision. (N.B. Vancomycin or a fluoroquinolone should be administered within 60-120 minutes before the initial incision due to the longer infusion time of these antimicrobials).  
• Re-dosing for long cases based on half-life of drug used or when there is excessive blood loss.  
• Prophylactic antibiotics discontinued within 24 hours after surgery end time (48 hours for cardiac surgery). |
| **Increased Perioperative Oxygenation**        | • In patients with normal pulmonary function administer increased FiO₂, (i.e., up to 0.80 FiO₂) intra-operatively and post-operatively while in PACU or for 2 hours in the receiving unit, in combination with strategies to optimize tissue oxygenation through maintenance of perioperative normothermia and adequate volume replacement. |
Bundle Elements (Cont.)

<table>
<thead>
<tr>
<th>Essential Bundle Element</th>
<th>Strategies for Application of Bundle Element</th>
</tr>
</thead>
</table>
| **Skin Preparation**     | • Use chlorhexadine gluconate with isopropyl alcohol or iodine povacrylex with alcohol (70%) to prepare skin prior to surgery.  
                             • Allow skin to dry completely prior to application of adhesive drapes to ensure good adhesion and to reduce fire risk.  
                             • Standardize processes for hair removal prior to surgery. If hair removal is required, use clippers. (N.B. razor or depilatory creams should not be used.) |
| **Clean Standardized Fascia Close** | • Surgeon announces time to close to indicate necessity for change of gowns, gloves, and closing trays.  
                                       • Ensure clean closing trays and instruments are available for closing of fascia.  
                                       • Standardize closing of abdominal wound (e.g. with a subcuticular closure except type IV cases, where skin is left partially open). |
| **Wound Management**     | • Standardize intra-operative application of wound dressing to reduce risk of contamination and maximize wound healing.  
                             • Standardize post-operative wound dressing, such as continuation of wound dressing for 24-48 hours and dressing removal on POD 2.  
                             • Instructions for cleansing agent use based on open or closed status of wound.  
                             • Provide patient and caregiver education on optimal post-discharge wound care. |
### Essential Bundle Element: Normothermia
- Maintain core temperature ≥ 36°C during the perioperative period
  - Standardize warming interventions and protocols in both the preoperative holding area, OR, and PACU
  - Active warming of patients (e.g., Bairruggers) in the holding area to reduce risk of inadvertent hypothermia for patients with temperature ≤ 36°C
  - Check temperature prior to entering the operating room. Check every 15 minutes intraoperatively. Check immediately upon arrival in PACU and every 30 minutes until discharge from PACU
  - Use warmed IV fluids in the OR

### Essential Bundle Element: Glucose Control
- Maintain blood glucose level < 200 mg/dL on the day of surgery and through the postoperative period
  - Establish glucose control protocols for use throughout the perioperative and postoperative processes
  - Identify known diabetes and potential hyperglycemia in the PAT. Work with endocrinologist to reduce HbA1c for known diabetics
  - Frequent monitoring of blood glucose (6-12 hours, both known diabetics and non-diabetics) beginning in the preoperative holding area, in the OR, in the PACU, and on units
  - Institute glucose management protocol (e.g., basal bolus or standard protocol insulin delivery for blood glucose > 200 mg/dL)

### Essential Bundle Element: Antibiotic Prophylaxis
- Maintain therapeutic levels of the prophylactic antimicrobial agent in arnarmid tissue throughout the operation, using weight-based dosing and re-dosing as appropriate
  - Standardize prophylactic antibiotic protocols, with additional guidance on weight-based dosing and re-dosing for long cases based on the half-life of the selected antibiotic
  - Administer weight-based antibiotics within 1 hour prior to surgical incision in the OR, Vancomycin or a fluoroquinolone should be administered within 60-120 minutes prior to the initial incision or the longer infusion time required for those antibiotics
  - Redosing for long cases based on half-life of drug used or when there is excessive blood loss
  - Prophylactic antibiotics discontinued within 24 hours after surgery and time (96 hours for cardiac surgery)

### Essential Bundle Element: Inhaled Perioperative Oxygenation
- Maintain optimal tissue oxygenation throughout the perioperative period by administering supplemental oxygen at intraoperatively and postoperatively
  - In patients with normal pulmonary function administer increased FiO₂ (e.g., up to 0.80%) intraoperatively and postoperatively while in PACU or for 2 hours in the PICU. In combination with strategies to optimize tissue oxygenation through maintenance of perioperative normothermia and adequate volume replacement

### Essential Bundle Element: Skin Preparation
- Use an antiseptic agent with alcohol for skin preparation unless contraindicated
  - Use chlorhexidine gluconate with isopropyl alcohol or iodine povidone with alcohol (70%) to prepare skin prior to surgery
  - Allow skin to dry completely prior to application of adhesive drapes to ensure good adhesion and to reduce the risk of standard processes for hair removal prior to surgery. If hair removal is required, use shavers (in B. mohs and endoprosthetic cramps should not be used)

---

**Advanced Colon Surgery Bundle**

**Summary Table**

### Strategies for Application of Bundle Element

<table>
<thead>
<tr>
<th>Essential Bundle Element</th>
<th>Strategies for Application of Bundle Element</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean Standardized Fascia Close</td>
<td>Surgeon announces time to close to indicate necessity for change of gowns, gloves, and closing trays. Ensure clean closing trays and instruments are available for closing of fascia. Standardize closing of abdominal wound (e.g., with a subcuticular closure except type IV cases, where skin is left partially open).</td>
</tr>
<tr>
<td>Wound Management</td>
<td>Standardize intra-operative wound dressing to reduce risk of contamination and maximize wound healing. Standardize post-operative wound dressing, such as continuation of wound dressing for 24-48 hours and dressing removal on POD 2. Instructions for cleansing agent use based on open or closed status of wound. Provide patient and caregiver education on optimal post-discharge wound care.</td>
</tr>
</tbody>
</table>

**SSI Prevention Basics**
- Hand Hygiene (for staff, patient, and family)
- Environmental Cleanliness (maintaining aseptic environment in the OR)
- Basic Safe Surgery Bundle
Surgical Site Infection Reduction Efforts
What It Means in 21st Century Healthcare

Robert Cima, MD, MA
New York State Partnership for Patients
April 2014
How Does One Define *Quality*

1. a: peculiar and essential character; b: an inherent feature; c: capacity, role
2. a: degree of excellence; b: superiority in kind
3. a: social status; b: aristocracy
4. a: a distinguishing attribute: characteristic; b: an acquired skill: accomplishment
5. the character in a logical proposition of being affirmative or negative
6. vividness of hue
7. a: timbre; b: the identifying character of a vowel sound determined chiefly by the resonance of the vocal chambers in uttering it
8. the attribute of an elementary sensation that makes it fundamentally unlike any other sensation

Defining Quality Healthcare

• The degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge.
  • Institute of Medicine; Crossing the Quality Chasm: A New Health System for the 21st Century (2001)

• The Six Aims of Quality Healthcare
  • Safe: Avoiding preventable injuries, reducing medical errors
  • Effective: Providing services based on scientific knowledge (clinical guidelines)
  • Patient centered: Care that is respectful and responsive to individuals
  • Efficient: Avoiding wasting time and other resources
  • Timely: Reducing wait times, improving the practice flow
  • Equitable: Consistent care regardless of patient characteristics and demographics
Stakeholders in Surgical Quality
Traditional View of Surgical Quality

- Patient Risk Factors
- Surgical Skill (Implied)
- Outcome

21st Century View of Surgical Quality
A Surgical “System of Care”

Operation Profile
- Surgical team
- Procedures
- Operative events
- Communication
- Technical Skills
- Team Performance
- Decision-making
- Operative environment

Hospital Profile
- Medical Services
- Nursing Services
- Pathology Services
- Radiology Services
- Hospital Infrastructure
- Communication
- Information Processing/Technology

Patient Factors

Outcome

Essential Healthcare Quality Improvement Concept

• Health care outcomes are the result of an interaction between natural and health care delivery processes
  • **Common cause variation**
    • Phenomena constantly active within the system
    • Variation predictable
    • Irregular variation within an historical experience base
    • Lack of significance in individual high or low values
  • **Special cause variation**
    • Stems from external sources that influence the process
The Role of Complexity in Surgical Outcomes

• Colorectal Surgical Site Infections (SSIs) result from an interaction of numerous factors.

Patient Factors
• Weight
• Smoking
• Diabetes
• Heart disease
• Genetics
• Age
• Gender

Disease Factors
• Cancer
• Inflammatory bowel disease
• Infectious diseases
• Immunosuppressed states
• Chemo/XRT Treatment

Surgical Factors
• Emergent v Elective
• Laparoscopic v Open
• EBL
• Wound classification
• Site of resection and type of anastomosis
• Case duration
• Fluid status
• Body temperature
• Surgeon experience
• Team experience

SSI
SSI Reduction Efforts

• Facts:
  • Numerous elements contribute to SSI development
  • Relative contribution of each element to SSI development is unknown
  • The influence of each element to SSI development is not constant
  • SSI occurrence for an individual patient is unpredictable

• Conclusion
  • No single intervention will have a significant impact on SSI
The Role of Complexity in Changing SSI Outcomes

Multiple Contributing Factors

No Impact on SSI

A Single Intervention
Complexity, Quality Improvement, and SSI Reduction

• In any complex system, successful QI requires reducing process variation as much as possible.

Uniformity leads to predictability, improved process control, and more predictable outcomes.
The Beginnings of SSI Reduction Process Improvement

• Multi-disciplinary team
  • Multiple contributing factors need multiple experts to understand how we can address these factors

• Define the Current State across the Entire Process
  • What is current performance?
  • What is/are the current process(es)?
SSI Reduction Process Improvement Effort

• Construct a Value Stream Map (VSM) of the processes across the episode of care
  • Identify steps/interventions that can add “value” to the outcome
    • Known interventions that are associated with SSI reductions
      • Appropriate, weight based antibiotics administered at the correct time
    • Possible interventions that might contribute to reducing SSI if they are
      • Easily placed into the system
      • Can be done with high compliance
      • Make economic sense
What Does Process Improvement for SSI Reduction Really Mean

• Gain consensus on those VSM elements that all stakeholders agree to implement
• Design processes to ensure a high level of compliance with each implementation element
• Actively monitor compliance with the process steps and provide feedback on compliance
• Long and short:
  • Develop a “bundle” of interventions and make sure everyone does what they are suppose to do
Why is Surgical QI Difficult for Surgeons?

A perspective problem
Mayo CRS SSI Reduction Effort
Process Improvement Approach

DMAIC Method: process improvement based upon a Lean/Six Sigma approach

D M A I C
Define Measure Analyze Improve Control

Project selected by sponsor

Project either closed or transitioned to operational owner

Improvement cycle
“As Expected” in NSQIP CRS SSI
Critical to Quality Tree: Surgical Site Infections for Colorectal Surgery

Pre-operative Processes
- Patient Skin Cleansing:
  - 2% Chlorhexidine Cloths @ AM admission
  - Hibiclens® shower night before and day of surgery
  - Ensure patient understanding by reading pamphlet “Preventing SSI”

Antibiotic Administration
- Ensure SCIP compliance:
  1. Right antibiotics
  2. Administer 60 min prior to incision
  3. Discontinued within 24 hours

Intra-operative Processes
- Ensure re-dose of cefazolin within 3-4 hours after incision
- Chloraprep® applied – use appropriate amount to ensure complete coverage of incisional area
- Closing Protocol at Time of Fascia Closure:
  - Use closing tray for closure of fascia and skin
  - Glove change by staff before closure of fascia
  - Hand hygiene education – Patient, Visitor, and Staff
  - Patient shower with Hibiclens® following dressing removal

Post-operative Process
- Hand cleansing agent readily available – Patient and Staff
- Place room sign for “Moments of Hand Hygiene”
- Purify # hand wipes made available to patients

Post-hospitalization Process
- Ensure dressing removal within 48 hours
- Dismiss patient with 4 oz. bottle of Hibiclens®
- Patient education on wound care and recognizing infection symptoms
- Follow-up phone call from nurses

Mayo Bundle

Reduce SSI by 50%
(10% → 5%)

SCIP – Surgical Care Improvement Project
Improvement Phase
Results

P Chart of Total Observed SSI by Phase

Tests performed with unequal sample sizes
SSI Reduction in Colorectal Surgery

- SSIs in colorectal surgery is a complex, multifactorial problem
- Reduction efforts require multiple interventions across the surgical episode
- Development of a “bundle” of interventions will help to reduce variation
  - Stakeholder buy-in is essential
  - Designing into the system of care is essential
  - Monitoring compliance is essential
Questions & Discussion
Gap Analysis

Maria Sacco, NYSPFP
# Gap Analysis

## Advanced Colon Surgery Bundle

### Gap Analysis

<table>
<thead>
<tr>
<th>Essential Bundle Element</th>
<th>Bundle Element Specifics</th>
<th>Is the Element a Routine Part of Practice at My Hospital (Yes/No)</th>
<th>Action Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normothermia</td>
<td>Active patient warming (e.g., using Bair Hugger) in:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Pre-operative holding area</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• OR</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• PACU</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mechanism to check and maintain patients’ core temperature ≥36°C°C:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• OR</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• PACU</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glucose Control</td>
<td>Glucose control protocols for use throughout peri-operative and operative process:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Pre-operative holding area</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• OR</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• PACU</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Surgical Unit</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Identify known diabetics and potential hyperglycemics in the PAT:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Frequent monitoring of blood glucose (all patients, both known diabetics and non-diabetes) beginning in the pre-operative holding area, in the OR, and in the PACU and surgical units</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Blood glucose management protocol to maintain blood glucose between 50-200 mg/dl</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESSENTIAL BUNDLE ELEMENT</td>
<td>BUNDLE ELEMENT SPECIFICS</td>
<td>IS THE ELEMENT A ROUTINE PART OF PRACTICE AT MY HOSPITAL (YES/NO)</td>
<td>ACTION PLAN</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td><strong>Antimicrobial Prophylaxis</strong></td>
<td>Maintain therapeutic levels of the prophylactic antimicrobial agent in serum and tissues throughout the operation, using weight-based dosing and re-dosing, as appropriate. Prophylactic antibiotic protocol is present. Antibiotic protocol has guidance on weight-based dosing and re-dosing for long cases. More than 99% of prophylactic antibiotics administered within one hour prior to surgical incision. (NB: Vancomycin or a fluoroquinolone should be administered within 60–120 minutes before the initial incision due to the longer infusion time of these antimicrobials.) Prophylactic antibiotics discontinued within 24 hours after surgery end time (48 hours for cardiac surgery).</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Increased Peri-operative Oxygenation</strong></td>
<td>Maintain optimal tissue oxygenation throughout peri-operative period by administering supplemental oxygen intra-operatively and post-operatively. In patients with normal pulmonary function administer increased ( \text{FiO}_2 ) (e.g., up to 0.80 ( \text{FiO}_2 )). In OR In PACU or receiving unit for two hours post-operatively.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Skin Preparation</strong></td>
<td>Use an antiseptic agent with alcohol for skin preparation, unless contraindicated. Chlorhexidine gluconate with isopropyl alcohol or iodine povacrylex with alcohol (70%) stocked as standard for skin preparation in the OR. Standardize processes for hair removal prior to surgery. If hair removal is required, use dippers.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Clean Standardized Fascia Close</strong></td>
<td>Change gown, gloves, and surgical instruments for closure of fascia. Clean closing trays and instruments used routinely for closing of fascia. Standardized closure of abdominal wound for all colorectal surgeries (e.g., with a subcuticular closure except type IV cases, where skin is left partially open).</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Hospital Discussion and Question and Answer
Next Steps
Next Steps

- Complete Gap Analysis
- Recruit appropriate team members to attend in person session:
  - May 5 - Syracuse
  - May 6 - NYC
- For more information and to register visit:
  - https://www.nyspfp.org/Members/myCalendar.aspx