Quality Improvement in Surgical Settings: Perioperative Standardization

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Orthopedic Surgery & Joint Replacement

Little Company of Mary Medical Group

April 12, 2017
Objectives

- Describe the trends in infection rates, public awareness and cost implications
- Discuss the role of quality improvement and standardization
- Identify system-wide initiatives to manage risk factors in surgical care
- Focus on improving patient skin preparation in surgical care
- Illustrate the implementation process with case studies
Healthcare-Associated Infections Are a Quality Issue
The U.S. Healthcare System Has a Serious Quality Problem

HAIs Approach 100,000 Defects per Million Patients

Breast cancer screening (65-69)
Overall healthcare in U.S. (RAND)
Adverse drug events
Hospital-acquired infections
Airline baggage handling
Hospitalized patients injured through negligence
Phil Mickelson putting from 6 feet
NBA free throws
U.S. airlines flight fatalities
Anesthesia-related fatality rate
U.S. industry best-in-class

DEFECTS PER MILLION

σLEVELS

Buck CR. GE; 2003. Adapted by Dr. Sam Nussbaum, Wellpoint, and Mark Sollek, Premera; 2007.

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700+ Hospitals Failed Infection Measures in 2014


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The most recent economic evaluation showed an average attributable cost of $9.8 billion/year.

### Table: HAI Incidence, Rate, Cost/Patient, and LOS

<table>
<thead>
<tr>
<th>HAI</th>
<th>Incidence Rate</th>
<th>Cost/Patient</th>
<th>LOS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAUTI</td>
<td>1.87&lt;sup&gt;a&lt;/sup&gt;</td>
<td>$896</td>
<td>NR</td>
</tr>
<tr>
<td>CDI</td>
<td>3.85&lt;sup&gt;b&lt;/sup&gt;</td>
<td>$11,285</td>
<td>3.3</td>
</tr>
<tr>
<td>CLABSI</td>
<td>1.27&lt;sup&gt;a&lt;/sup&gt;</td>
<td>$45,814</td>
<td>10.4</td>
</tr>
<tr>
<td>SSI</td>
<td>1.98&lt;sup&gt;c&lt;/sup&gt;</td>
<td>$20,785</td>
<td>11.2</td>
</tr>
<tr>
<td>VAP</td>
<td>1.33&lt;sup&gt;a&lt;/sup&gt;</td>
<td>$40,144</td>
<td>13.1</td>
</tr>
</tbody>
</table>

<sup>a</sup>Per 1000 device-days.<br>
<sup>b</sup>Per 1000 patient-days.<br>
<sup>c</sup>Per 100 patient procedures.

CAUTI = catheter-associated urinary tract infection; CDI = *Clostridium difficile* infection; CLABSI = central line-associated bloodstream infection; LOS = length of stay; NR = not reported; SSI = surgical site infection; VAP = ventilator-associated pneumonia.


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Increasing Scrutiny & Financial Penalty for Healthcare-Acquired Conditions

- 1% reimbursement penalty for poor performance under Hospital-Acquired Conditions Reduction Program
- 758 hospitals were penalized in 2015
- $364 million in lost revenue from Medicare

Resistant Strains Spread Rapidly

FQRP = Fluoroquinolone-resistant *Pseudomonas aeruginosa*; MRSA = Methicillin-resistant *Staphylococcus aureus*; VRE = Vancomycin-resistant enterococci

HAIs: Evolving as Antibiotic Resistance Becomes More Common

National percentages*

46% of *S. aureus* HAIs are methicillin-resistant

14% of *Pseudomonas* HAIs are multi-drug resistant

7% of *E. coli* HAIs are multi-drug resistant

4% of *Enterobacter* HAIs are carbapenem-resistant

*Data for all HAIs, combined years (2011-2014)
HAIs are a Threat to Patient Safety and Quality Care

• Patient safety and the delivery of quality care are intertwined.
• Prevention is key for fighting HAIs, especially resistant HAIs.
• **Consistent, safer care through prevention is achievable in the inpatient and outpatient setting with standardization.**
Standardization Relies on Systemic Quality Improvement

- QI works as systems and processes
- Focus on patients
- Focus on being part of a team
- Focus on the use of data

4 principles of QI in healthcare

Standardization and Bundled Infection Prevention Strategies to Improve Quality
Standardization Can Minimize Variability in Processes

High variation
High potential defects
Unpredictable quality

Low variation
Low potential defects
Consistent quality

• Processes with less variation have fewer defects
• The concept of defect reduction applies to processes across industries, not just healthcare

LSL = lower specification limit; USL = upper specification limit.

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Clinical Practice Bundles are Tools

Clinical practice bundles target variable processes to improve outcomes.

- Potential for great harm
- High cost
- Strong evidence base

Comprehensive Unit-Based Safety Program (CUSP) is a model for safety improvement that leverages QI methodologies.

Identify defects
Learn from defects
Educate staff in the science of safety
Engage executive leaders
Implement teamwork tools

Multiple Factors Contribute to HAI Risk

One factor could lead to failure

Variability in Surgical Practices compounds impacts from risk factors

- Antimicrobial w/in 1 hr of incision: 98%
- Antimicrobial dose based on weight: 64%
- Hair removal by clippers: 99%
- Preop glucose monitoring: 71%
- Periop temperature evaluation: 96%
- CHG preoperative skin prep when used prior to colon surgery: 92%
- CHG preoperative skin prep when used prior to abdominal hysterectomy: 89%
- Education re: scrub technique w/in past yr: 58%

CHG = chlorhexidine gluconate
Improvement Must be Multidimensional

- Simplify processes and procedures
- Ensure personnel have competencies in evidence-based methods
- Use tools to improve processes

Successful standardized HAI prevention

Variability in Skin Preparation Yields Opportunities for Standardization
Selected Opportunities for Standardizing Skin Preparation

**Hand hygiene**
Compliance with procedures

**Hand/forearm scrubbing**
- Scrub technique\(^1\)
- Scrub duration\(^2\)
- Drying and gloving techniques\(^1\)

**Hair removal**
- Clipping outside the OR\(^2\)
- Use of vacuum assisted hair removal
  - Only around incision site only when hair will interfere with the operation\(^1\)
- Preventing abrasions: electric clippers > depilatory agent = no hair removal > razor\(^1\)

**Surgical site antiseptic**
- Antiseptic agent
- Application method
- Dry time

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High Variability in Patient Skin Prep Use and Processes

Primary Skin Prep Use\(^1\)
3005 Observations in 197 Hospitals\(^a\)

Processes Followed\(^1,2\)

- Skin prep application time sufficient: 60%
- Skin prep drying time sufficient: 53%
- Gloves used during skin prep application: 91%
- Skin prep application follows label directions: 63%
- Skin prep application from surgical site to periphery: 86%

\(^a\)OR observations conducted between October 2013 and July 2014.

1. Data generated from the BD Focus on Quality Care Program. 2. Xi H, et al. Focus on Quality Care: An Audit of Surgical Skin Prep Practices in U.S. Hospitals. Presented at the 2014 AORN Surgical Expo and Conference; March 30–April 2, 2014; Chicago, IL.

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Differing Application Instructions Among Patient Skin Prep Agents

<table>
<thead>
<tr>
<th>Example</th>
<th>CHG/IPA</th>
<th>Iodine/IPA</th>
<th>Aqueous CHG</th>
<th>Iodine Scrub/Pain</th>
</tr>
</thead>
<tbody>
<tr>
<td>ChloraPrep®₁</td>
<td>DuraPrep™₂</td>
<td>Preval-Fx®₃</td>
<td>Exidine®₅</td>
<td>Wet PVP-I Tray₆</td>
</tr>
<tr>
<td>Gentle back and forth strokes</td>
<td>Paint in concentric circles</td>
<td>Swab back and forth</td>
<td>Scrub and paint in concentric circles</td>
<td></td>
</tr>
<tr>
<td>0.5-2 min</td>
<td>≥0.5 min₄</td>
<td>4 min</td>
<td>5 min₇</td>
<td></td>
</tr>
<tr>
<td>≥3 min</td>
<td>≥3 min</td>
<td>Blot</td>
<td>~2-3 min</td>
<td></td>
</tr>
</tbody>
</table>

₅On hairless skin.


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Compliance of application method with label instructions

1-Step combination preps
- Iodine and alcohol, chlorhexidine and alcohol
  - 72%

2-Step combination preps
- Iodine based: 2-step PVP-I scrub and paint; 7.5% PVP scrub
  - 59%

One-step skin preps yield greater clinical efficacy and time savings for staff, which could impact overall quality

Based on 5439 procedures observed in 257 hospitals between December 2013 and December 2014. DFU = directions-for-use

Pearson L and Xi H. Focus on Quality Care: Surgical Skin Prep Practices in U.S. Hospitals and Ambulatory Care Centers. Presented at the OR Manager Conference. 2014.
## Compliance is a Source of Variation

<table>
<thead>
<tr>
<th>Compliance Definition</th>
<th>Compliance Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perform <strong>EITHER</strong> prep time or dry time according to the manufacturers direction for use</td>
<td>61%</td>
</tr>
<tr>
<td>Perform <strong>BOTH</strong> prep time or dry time according to the manufacturers direction for use</td>
<td>25%</td>
</tr>
</tbody>
</table>

Factors correlated with higher rates of compliance:
- One-step applicator
- Central-to-peripheral application
- Use of chlorhexidine-alcohol
- Performing a single prep

Evidence-based Selection of Skin Prep Agents

Positive Culture After Prep\(^1\)

- **ChloraPrep skin prep**: 7%
- **DuraPrep**: 19%
- **PVI**: 31%

\( P < .0001 \)
\( P = .05 \)
\( P = .01 \)

Positive Culture After Prep\(^2\)

- **Before prep**: 0%
- **ChloraPrep skin prep**: 20%
- **DuraPrep**: 35%
- **Techni-Care**: 35%

\( ^aP < .05 \) vs DuraPrep;
\( ^bP < .001 \) vs Techni-Care;
\( ^cP < .05 \) vs Techni-Care and preop.


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High Variability in Surgeon Antiseptic Technique

<table>
<thead>
<tr>
<th>CHG/IPA, n (%)</th>
<th>PVI</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prepped for recommended time</td>
<td>30 (100%)</td>
<td>0</td>
</tr>
<tr>
<td>Break in sterile technique</td>
<td>8 (26.7)</td>
<td>11 (36.7)</td>
</tr>
<tr>
<td>Performed all steps</td>
<td>5 (16.7)</td>
<td>0</td>
</tr>
<tr>
<td><strong>Performed all critical steps</strong></td>
<td><strong>27 (90)</strong></td>
<td><strong>10 (33.3)</strong></td>
</tr>
<tr>
<td>Total prep time, sec</td>
<td>84.9</td>
<td>102.9</td>
</tr>
</tbody>
</table>

*Thirty subjects who routinely perform surgical skin preparation were recruited from four hospitals to participate in this study. Participants were selected to randomly perform skin preparation using one formula on one site and another formula on the other site.*
Hair Removal Techniques Vary

Compliance rates with key recommended practices on surgical site hair (SSH) removal

- Clipping SSH instead of shaving: 98%
- Single-use clipper used: 96%
- Clipping outside OR: 40%

Reasons for clipping in the OR

- Surgeon/physician preference: 67%
- Patient safety/privacy: 57%
- Insufficient clipping outside of OR: 43%
- Lack of time: 40%
- No set policy at our institution: 37%
- Lack of trained staff: 28%
- Nursing/staff preference: 22%
- Patient safety/privacy: 6%

*aOnline survey of 250 members from the AORN database with at least 2 years of OR experience and with at least 2 procedures requiring surgical site hair removal conducted in April 2015.

Xi H, Pearson L and Perl TM. Minimizing hair dispersal: is this an opportunity for improvement in HAI prevention? IDWeek, October 7-11, 2015, San Diego, CA.
Proper Skin Preparation is an Important Preventive Measure

- 80% of skin flora in the first 5 cell layers of the stratum corneum\textsuperscript{1}
- $10^{13}$ cells in the human body, $10^{14}$ colonizing microbial cells, a 10-to-1 inequality\textsuperscript{2}
- Major risk factor for HAIs

Proper skin preparation is critical to prevent serious complications


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Deploying Technology to Standardize Hair Removal

Medical College of Wisconsin (Milwaukee, WI)

PROBLEM

Hair can harbor colonizing microbes and contaminate the operative field

Hair dispersed from preoperative clipping requires lengthy cleanup time

SOLUTION

Replacing standard surgical clippers (SSC) with surgical clippers that have a vacuum-assisted hair collection device (SCVAD) to limit opportunities for contamination and improve surgical team efficiency

RESULT

Significant reduction in microbial contamination from chest samples for SSC vs. SCVAD (0.8 vs 0.0 Log$_{10}$ colony-forming units, p<0.01)

Study of simulated surgical clipping performed on 18 subjects. Computer-generated randomization was used to select matched clip sites.

SSC=standard surgical clipper, SCVAD=surgical clippers with vacuum-assisted hair collection device

Vacuum-assisted Hair Removal Reduces Contamination Risks
Medical College of Wisconsin (Milwaukee, WI)

Results

- Hair is removed at the point of clipping
- Microbial contamination in the operative field is significantly reduced
- Ease of use with the SCVAD and elimination of post-clipping cleanup simplifies the hair removal process

SCVAD=surgical clippers with vacuum-assisted hair collection device

Initiating Quality Improvement in Surgery
Power in Prevention

**Observe**
Clinicians and consultants observe operating room procedures:

- Surgeon hand scrub
- Hair removal
- Patient pre-operative skin preparation

**Monitor**
Observations are collected daily and digitally recorded on a mobile device.

Practice is monitored for compliance with:
- Product directions
- Clinical practice guidelines
- Practice standards

**Report**
Percent compliance is calculated and quantified to uncover areas that can be improved with standardization and education.

**Educate**
Focus is on robust education and hands-on lessons rather than didactic approaches:

- Team is trained using best-practices roadmaps
- Evidence-based guidelines & recommendations are the basis for templates
- Regular review and reinforcement of competency
Impact of the Power in Prevention Program

4 years

Over 800 hospitals

More than 20,000 OR skin prep observations

1 publication and 4 posters generated
Preparing for Standardization

Identify best practice:
- Processes
- Products
- Behaviors

Set expectations and milestone dates

Conduct multiple-day observations/audits to determine baseline and identify opportunities

Present findings and confirm timeline

Build support from surgical services and surgeons

Develop evidence-based Best Demonstrated Practice template and change preference cards

Ongoing and repeatable training; program implementation and rollout

Review results, refine metrics and evaluate on a regular basis

Review results, refine metrics and evaluate on a regular basis
Implementing Standardized Procedures To Reduce HAIs

**ENGAGE**
- Commit to reducing HAIs
- Communicate your commitment and rationale
- Obtain team buy-in
- Engage patients

**EDUCATE**
- Use OR audit tools to assess current state
- Analyze procedures with competency worksheets
- Train staff on new processes
- Assess patient understanding

**EXECUTE**
- Develop action plan
- Implement new processes and leverage clinical job aids
- Educate patients on proper preop preparation at home

**EVALUATE**
- Ongoing OR observation
- Track and analyze data
- Competency testing
- Communicate successes and failures

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Case Studies: Practice Bundles for Standardizing Skin Preparation
Case Study Module 1

The Preventive Surgical Site Infection Bundle in Colorectal Surgery: An Effective Approach to Surgical Site Infection Reduction and Health Care Cost Savings

Duke University

Must present slides 38-42
Bundled Infection Prevention Strategies in Colorectal Surgery

Duke University Medical Center (Durham, NC)

**Problem**
Superficial HAI rate was nearly 20%, this was associated with increased patient morbidity and health care costs

**Solution**
Implement a clinical practice bundle and evaluate outcomes before and after implementation

**Result**
Significant reduction in HAIs, sepsis and costs associated with infection


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# Clinical Practice Bundle Covers Variable Processes and Procedures

**Duke University Medical Center (Durham, NC)**

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Preoperative</th>
<th>Operative</th>
<th>Postoperative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chlorhexidine shower</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanical bowel preparation with oral antibiotics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ertapenem within 1 h of incision</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standardization of preparation of surgical field with chlorhexidine alcohol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient education and reinforcement of HAI preventive measures and objectives</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fascial wound protector</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gown and glove change before fascial closure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dedicated wound closure tray</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limited OR traffic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance of euglycemia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance of normothermia during surgery and in the early postoperative period</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Removal of sterile dressing within 48 h</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daily washings of incisions with chlorhexidine</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Standardization Reduces HAI Rates
Duke University Medical Center (Durham, NC)

Infection Rates*

<table>
<thead>
<tr>
<th></th>
<th>Preintervention (n=212)</th>
<th>Postintervention (n=212)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superficial Postoperative sepsis</td>
<td>19.3% (P&lt;.001)</td>
<td>5% (P=.009)</td>
</tr>
<tr>
<td></td>
<td>8%</td>
<td>2%</td>
</tr>
</tbody>
</table>

*pre- and post-intervention groups were propensity matched to account for potential differences in patient characteristics.

Impact of Clinical Practice Bundles on Cost and LOS*

Duke University Medical Center (Durham, NC)

Impact of HAI post-bundle on cost

- Superficial HAI occurrence post-bundle: $14,000
- No superficial HAI occurrence post-bundle: $6,000

Impact of HAI post-bundle on LOS

- Superficial HAI post-bundle: 7 days
- No superficial HAI post-bundle: 4 days

* multivariate analysis of a subgroup analysis of patients who experienced occurrence of SSI in the post-bundle period

LOS = length of stay

Results of Targeted Changes
Duke University Medical Center (Durham, NC)

**RESULTS**

- Length of stay reduced by one day ($P = 0.001$)
- 13.6% reduction in superficial HAIs
- The clinical bundle is a viable method to improve quality of care

Case Study Module 2

Colorectal Surgery Surgical Site Infection Reduction Program: A National Surgical Quality Improvement Program-Driven Multidisciplinary Single-Institution Experience

Mayo Clinic
Bundled Clinical Practices to Reduce HAI Rates

Mayo Clinic (Rochester, MN)

**PROBLEM**

High rates of HAIs

**SOLUTION**

Lean Six Sigma quality improvement approach to introduce multiple interventions across the entire surgical episode of care

**RESULT**

Significant declines in overall and superficial HAI rates


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Multidisciplinary Team Identified Targets for Improvement

Mayo Clinic (Rochester, MN)

Surgeon, project leader

Quality advisor

Infection preventionist

Nurse managers on colon and rectal surgery patient care units

Clinical administrator

Clinical nurse specialist

Wound, ostomy, continence nurse

Operating room nursing managers supporting colon and rectal surgery

Quality improvement advisor

ACS NSQIP data abstraction and analysis

Pharmacist

Process engineer

Extended nurse practitioner

Research fellow

Phased Approach to Developing the Clinical Practice Bundle

Mayo Clinic (Rochester, MN)

Phase 3
Creating infrastructure to support change and education

Phase 2
Taking evidence-based steps to reduce variability between surgeons

Phase 1
Developing an understanding of HAIs and surgical processes by evaluating literature, facility data and current state findings as a team


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**GOAL:** Reduce HAI by 50% (10 → 5%)

**Bundled Clinical Practices to Reduce HAI Rates**

**Mayo Clinic (Rochester, MN)**

### Pre-operative processes

- **Patient cleansing**
  - Chlorhexidine cloths at AM admission
  - Shower with CHG skin cleanser night before and day of surgery
  - Ensure understanding by reading “Preventing HAI” pamphlet

### Intra-operative processes

- **Antibiotic administration**
  - Ensure SCIP compliance: (1) Right antibiotics, (2) Administer 60 minutes prior to incision, (3) Discontinued within 24 h
  - Ensure re-dose of cefazolin within 3-4 hours after incision
  - Chloraprep applied – use appropriate amount to ensure complete coverage of incision 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 and skin
  - Practice good hand hygiene

### Post-operative processes

- **Patient and hand hygiene**
  - Patient shower with CHG skin cleanser after dressing removal
  - Hand cleansing agent readily available
  - Signage encouraging hand hygiene
  - Hand sanitizing wipes made available to patients
  - Ensure dressing removal within 48 hours

### Post-hospitalization processes

- Dismiss patient with 4 oz. bottle of CHG skin cleanser
- Patient education on wound care and recognizing infection symptoms
- Follow-up phone call from nurses

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CHG = chlorhexidine gluconate


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Additional Targeted Changes Contributed to Success

Mayo Clinic (Rochester, MN)

- Including a question on hospital intake to determine if patients used chlorhexidine packets the night before and morning of surgery.

- Implementing a nurse-initiated protocol ensures use of chlorhexidine cloths over the entire body in the morning admission area if patient did not use chlorhexidine packets provided.

- Instituting strict hand-hygiene policies and practices for staff, patients, and patient visitors.

HAI Rates Reduced With Standardization

Mayo Clinic (Rochester, MN)

Infection Complications Reported with Colorectal Surgeries

Results of Targeted Changes

Mayo Clinic (Rochester, MN)

RESULTS

Significant reduction in overall and superficial HAIs

Sustained reduction in HAIs

Comprehensive approach that revolved around culture and quality

Case Study Module 3

Implementation of a Surgical Comprehensive Unit-Based Safety Program to Reduce Surgical Site Infections

Johns Hopkins University

Must present slides 52-58
Nearly 1/3 of patients undergoing elective colorectal surgery were developing HAIs after surgery.

Multidimensional, collaborative approach using evidence-based quality improvement strategies.

33% percent decrease in infection rate sustained for 12 months after interventions.
Collaborative Approach Identifies Improvement Focus Areas

Johns Hopkins University and Hospital (Baltimore, MD)

Successful HAI Reduction

- Infection control
- Policies & protocols
- Equipment & supplies
- Communication & teamwork
- Education & training
- Coordination of care

Multiple Targeted Changes Contributed to Success

Johns Hopkins University and Hospital (Baltimore, MD)

- Evidence-based elimination of mechanical bowel preparation for select patients only
- Instituting aggressive warming procedures for patients in the pre-anesthesia area
- Adopting consistent processes enhanced sterile techniques for skin and fascial closure
- Using techniques that promoted standardized adoption and created redundancy in processes to correct lapses in antibiotic prophylaxis that were brought to light by the compliance audit


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# Approaches to Standardizing Skin Preparation

**Johns Hopkins University and Hospital (Baltimore, MD)**

<table>
<thead>
<tr>
<th>BEFORE</th>
<th>AFTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two preparation options: chlorhexidine gluconate or povidone-iodine solution</td>
<td>Chlorhexidine gluconate used for all patients, including those with ostomy</td>
</tr>
<tr>
<td>Preparation application technique was variable</td>
<td>Gastrointestinal surgery nurses trained on preparation application; now the only team member to apply skin preparation agent</td>
</tr>
<tr>
<td>Some applications were performed by nurses, others by residents</td>
<td>All patients given chlorhexidine wash cloths to use the night before surgery; 95% compliance rate achieved</td>
</tr>
<tr>
<td>Confusion around which preparation to use if the patient had an ostomy</td>
<td></td>
</tr>
<tr>
<td>Patients not involved or inconsistently engaged in preoperative skin preparation</td>
<td></td>
</tr>
</tbody>
</table>


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Selected Improvements Lead to Enhanced Sterile Technique
Johns Hopkins University and Hospital (Baltimore, MD)

**BEFORE**

- Same instruments used for surgical procedure often used for skin closure
- Used instruments remained in the surgical field
- Lack of standardized education on sterile technique and processes

**AFTER**

- Designated instruments to be used exclusively for bowel manipulation
- Instruments are physically moved off of the sterile field after anastomosis
- Cautery and suction tip changed
- Education plan implemented to train nurses and scrub technicians to separate instruments and change entire team’s gloves both after completing bowel work and before starting wound closure


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HAI Rates Decrease Significantly
Johns Hopkins University and Hospital (Baltimore, MD)

Infection Rates

- **Overall HAI Rate**: Preintervention (n=278) - 27.3%, Postintervention (n=324) - 18.2%, P < 0.0001
- **Superficial HAI**: Preintervention (n=278) - 16.9%, Postintervention (n=324) - 13.6%
- **Organ space infections**: Preintervention (n=278) - 9%, Postintervention (n=324) - 4%

Based on evaluation of consecutive patients undergoing elective colorectal surgery procedures and included in the American College of Surgeons National Surgical Quality Improvement program at Johns Hopkins University from July 2009 to July 2011.

Collective Impact of Targeted Changes
Johns Hopkins University and Hospital (Baltimore, MD)

| RESULTS |
|-----------------|-----------------|-----------------|-----------------|
| Rate of HAIs decreased by 33% | 28 infections prevented in a single year | $168-280,000 saved by the institution | Estimated $102 to $170 million in healthcare savings* |

*Assuming widespread application of CUSP HAI intervention

Conclusions
Conclusions

- HAIs are evolving, threatening patient safety and the delivery of quality care

- Safety and quality improvement to mitigate risk of HAIs can be achieved with standardization

- Processes, technologies and/or behaviors selected for standardization should be grounded in evidence

- There are many opportunities for standardization in surgery, including skin preparation, antibiotic prophylaxis and policies and procedures that minimize risk
Questions?
Thank you!