Hospital-Acquired Infection Drill Down Collaborative: Sharing Our Journey and Lessons Learned

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Overview

- Our Journey
  - Background
  - How did we start?
  - Where are we now?
    - Examples of Data Outputs
  - Where are we going?
  - What have we learned?

- Translating the Process into Community Hospital Setting

- Q&A
Background

- Our infection prevention and hospital epidemiology (IPHE) team historically drove initiatives to decrease hospital-acquired infections (HAI)
  - Interventions not always sustainable without local champion(s)
- Example: In 2017, hospital-onset C. difficile infection (HO-CDI) above target
- IPHE rolled out a HO-CDI case review tool (among many other interventions) to begin systematically tracking 5 key process metrics/contributing factors
- Performance on the 5 metrics informed the development and helped prioritize targeted countermeasures
Process Measurement & Data Feedback

- Five Metrics
  - Hand hygiene
  - Personal protective equipment
  - Environmental cleaning
  - Antimicrobial stewardship
  - Diagnostic stewardship

- Goal: to develop dashboard with process and outcome measure data
Early Stages of Culture Change

- 2018 Leapfrog Results
- Helped create a sense of urgency
- Organizational focus
- Increased resource allocation
- Still largely driven by IPHE, but better positioned to build a coalition
- Vision = shift focus to process (proactive) vs. outcome (reactive)
Leveraging Organizational Safety Culture Change

- In 2019, Duke University Hospital embarked on a transformational journey, implementing a new quality management system (QMS)
  - Team member engagement - *Everyone. Everyday.*
  - Solving problems to root - A3, PDCA, humble inquiry
  - Delineation of a clear help chain to remove barriers
  - Tiered huddles - unit, service line, hospital, health system, university + health system
  - Improved communication - closing the loop, sharing lessons more broadly
Increased Visibility, Engagement, and Accountability

- Case review findings reported out at the hospital level huddle by IPHE
- Report out transitioned to unit leadership, though case reviews still performed by IPHE
- With the help of QMS and quality coaches, transitioned some of the case review elements to the local team to foster understanding of process defects
- Birth of the "SWARM"
Overarching Goals of a SWARM

- To advance safety culture by enhancing engagement and accountability for infection prevention processes, promote interdisciplinary teamwork, and improve patient safety through hospital-acquired infection (HAI) reduction
- Leverage existing methodologies
- Align efforts with the Duke Quality Team
What is a SWARM?

- The term “SWARM" is based on the concept of ‘swarm intelligence’ in social insects such as bees, where the collective intelligence is greater than that of individuals.
- SWARMS have been used for problem-solving in the aerospace industry and more recently in US hospitals to improve RCA after patient safety incidents.
- Multidisciplinary team - nurses, physicians, ancillary staff, administrative leaders, quality coaches, subject matter experts
- The primary goals of a SWARM are to find out: what happened and why it happened, and how to prevent it from happening again.

Overview of the SWARM Process

SWARM steps

1. Introductory explanation of goal for the SWARM and statement of commitment to psychological safety
2. Introductions from *multidisciplinary team* to help ”attack problems, not people”
3. Review of the facts prompting SWARM
4. Discussion of what happened, investigation of underlying system factors, theorizing what contributory factors led to the event
5. Conclusion with proposed focus areas for action and assignment of task leaders with specific deliverables and completion dates

SWARM Pilot

- Unit with uptick in HO-CDI was chosen as pilot unit
- Initially, the multidisciplinary team would meet on the unit within the week following an HAI to evaluate opportunities in the location where the harm occurred (Gemba walk)
- Unit, service line, and hospital leaders present to help identify and close gaps in process by removing barriers and providing needed support
- Paused and then pivoted to a virtual meeting because of the COVID-19 Pandemic
Current State
HAI Included

- HO-CDI
- CLABSI
- CAUTI
- Select SSI
Hospital-Acquired Infection Case Review/SWARM Process for HO-CDI

- **HO-CDI lab-ID event identified**
- **Hospital Epidemiologist** reviews case to evaluate for opportunities/root causes, where applicable
- **Antimicrobial Stewardship Evaluation Team** evaluates case for AS opportunities
- **Multidisciplinary Swarm** scheduled to review case, opportunities, and develop countermeasures to prevent future cases
- Learning opportunities shared during tiered huddles

*RedCap used to store case review findings*
Hospital-Acquired Infection Case Review Process for CLABSI/CAUTI

- CLABSI/CAUTI Identified via Centralized Surveillance
- Infection Prevention Specialist performs secondary review of case for validation
- Hospital Epidemiologist reviews case to evaluate for opportunities/root causes, where applicable
- Multidisciplinary Swarm scheduled to review case, opportunities, and develop countermeasures to prevent future cases
- Learning opportunities shared during tier 3 (hospital-level) huddle

*RedCap used to store case review findings
SSI Case Review Workflow

SSI identified through current EPIC workflow

Case is imported into REDCap (qSunday)

Infection preventionist reviews case for correctly imported data (1st survey)

Case is sent to surgeon and perioperative leadership (2nd and 3rd surveys)

Data summarized and populates SSI Dashboard
Example SWARM Forms - CLABSI

## CLABSI Review and Swarm Form

As you perform your preliminary investigation into the CLABSI, please look for any non-unit services that may have performed either line placement or care on this patient.

If you discover that care was provided by non-unit staff/providers, please include a representative form from those areas in the swarm. These individuals will be able to provide additional information and are our direct connection into their services should additional follow-up be needed. Current swarm invites include:

<table>
<thead>
<tr>
<th>Service(s)</th>
<th>Service to Swarms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vascular Access Team (line placement and/or unit)</td>
<td></td>
</tr>
<tr>
<td>Hemodialysis (for receiving hemodialysis on unit or transported to hemodialysis)</td>
<td></td>
</tr>
<tr>
<td>Pleuroscopy (drawing for blood tests or blood cultures)</td>
<td></td>
</tr>
<tr>
<td>Interventional Radiology (for IVP placement of lines within 7 days prior to infection)</td>
<td></td>
</tr>
<tr>
<td>Previous unit (if line placed and/or cared for within 7 days prior to current unit)</td>
<td></td>
</tr>
<tr>
<td>Cath lab (for placement of lines within 7 days prior to infection)</td>
<td></td>
</tr>
</tbody>
</table>

### Filled out by: INFECTION PREVENTION

**Patient Information**

- **Unit of Attribution**
- **Patient Name**
- **MRN**
- **DOB/Age**
- **Date of Admission**
- **Date of Event**
- **Days from Insertion to Infection**

**Culture Information**

- **Culture Indication**
- **Culture Source**
- **Organizer**

**Device Information**

- **Device Type/Anatomic location** (e.g., right subclavian line, temporary triple lumen CVL, tunneled subclavian dialysis line)

### Filled out by: CARE TEAM

**Care and Maintenance Information**

- For the 7 days leading to the infection, were there missed opportunities? Provide details:
  - Cap changes
  - Dressing Changes
  - Tubing Changes
  - CHG Bathing Treatments
  - Documentation of daily line necessity
  - Other

**Other Line Information**

- Was tPA used to de-clot the line? Yes, dates:
- Was the patient on dialysis?

**Current FY HH/PPE Unit Compliance**

- HH Compliance: xx%
- PPE Compliance: xx%

**Current FY Central Line Champion Data**

**Narrative Information**

- **Nursing Comments** (Please provide any relevant information regarding staffing issues (e.g., travel nurse or float staff assignment) or patient-specific concerns; e.g., refusals of care and escalation, extenuating circumstances, multiple stools, etc.)

- **Provider Comments** (Please provide any relevant information regarding the patient; e.g., extenuating circumstances, multiple stools, etc.)
**Potential Opportunities**

**Insertion**
- Daily review of indication
- Daily CHG bathing treatments
- Daily review of dressing integrity
- Dressing changed per policy
- Tubing changed per policy

**Care & Maintenance**
- Needleless caps changed per policy

**Removal**
- Removal opportunity

**Diagnostic**
- Blood cultures drawn from catheter
- Blood cultures not clinically indicated

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**To be filled out during the SWARM:**

**Other concerns the team may have regarding:**
- Procedures the patient had in or off the unit
- Disease processes present in the patient
- Length of time line in use
- Line not being used at all
- Line location
- Line securement
- Lumen not being used
- Patient self-manipulating lines

**Specific items to discuss during swarm:**

- Presumed root cause(s) for this infection
- Responsible Person(s):
  - Task:
  - Deadline:
- Follow-up action items post swarm:
  - Task:
  - Deadline:

**REPORT OUT TO Tiers 1, 2, 3 the following information:**

Brief background of the patient and harm

**Swarm learnings**

- Help needed from your help chain
- Key takeaways for Tier 3 attendees to take back

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**Duke Center for Antimicrobial Stewardship and Infection Prevention**
CLABSI Case Definitions Used by Hospital Epidemiology

- True CLABSI/primary blood stream infection
  - Infections where clinically the patient has a CLABSI based on the case review, discussion with primary team during swarm, and lack of alternate source for infection

- Probable secondary blood stream infection
  - Infections where clinically the patient has an identifiable primary source of infection (GI, GU, pneumonia, etc), but does not meet NHSN definition requirements to call it a secondary BSI

- Possible contaminant
  - Not clear if patient clinically had BSI

- Unclear
  - Sometimes it is not clear if it is truly CLABSI vs. secondary
## Translating Findings into CLABSI Prevention Activities

<table>
<thead>
<tr>
<th>Case Definition</th>
<th>Focus area for developing countermeasure</th>
</tr>
</thead>
</table>
| True CLABSI/primary BSI     | • Insertion bundle process measures  
                              | • Care and maintenance bundle process measures    
                              | • Line removal opportunity                      |
| Probable secondary BSI      | • Gaps in documentation  
                              | • Gaps in diagnostic work up  
                              | • Opportunities to prevent the primary infection |
| Possible contaminant        | • Diagnostic stewardship opportunities  
                              | • Blood culture collection techniques            |
| Unclear                     | n/a                                                                            |
Example SWARM Form - CAUTI

Filled out by: CARE TEAM

Care and Maintenance Information
For the 7 days leading to the infection, were there missed opportunities? Provide details:

Peri-Foley Care Q shift
Reason for continuing urinary catheter documented Q shift
Daily Bathing
Other

Was the patient having diarrhea?
If the patient still has a catheter in place, check the following:

Collection bag < ¼ full
Collection bag not touching floor
Drainage system closed (red seal)
Unobstructed flow (no kinks, dependent loops)
Collection bag below level of bladder
Securement device in place
Can the catheter be removed

Current FY HRU/PPE Unit Compliance

Current FY Urinary Catheter Champion Data

Narrative Information
Nursing Comments (Please provide any relevant information regarding staffing issues (e.g., traveler or float staff assignment) or patient-specific concerns; e.g., refusals of care and escalation, extenuating circumstances, multiple stools, etc.)

Provider Comments (Please provide any relevant information regarding the patient; e.g., extenuating circumstances, multiple stools, etc.)

Filled out by: INFECTION PREVENTION LEADERSHIP

CAUTI Adjudication
Was this a true primary CAUTI?
Was it preventable?

Potential Opportunities
Insertion
- Insertion bundle used
- Daily review of indication
- Peri-Care Q shift
- Foley Care Q shift

Care & Maintenance
- Daily bathing
- Other

Removal
- Removal opportunity

Diagnostic
- Cultures not clinically indicated

Additional Comments:
CAUTI Case Definitions Used by Hospital Epidemiology

- True CAUTI
  - Infections where clinically the patient has a CAUTI based on case review, discussion with primary team during swarm, and lack of alternate source for fever or other symptoms

- Colonization/Contaminant
  - Positive urine cultures not thought to represent infection with alternate cause of fever or other symptoms identified

- Unclear
## Translating Findings into CAUTI Prevention Activities

<table>
<thead>
<tr>
<th>Case Definition</th>
<th>Focus area for developing countermeasure</th>
</tr>
</thead>
</table>
| True CAUTI              | • Insertion bundle process measures  
                          | • Care and maintenance bundle process measures  
                          | • Catheter removal opportunity |
| Colonization/contaminant| • Diagnostic stewardship opportunities  
                          | • Urine culture collection techniques |
| Unclear                 | n/a                                                                           |

[Image of Duke Infection Prevention and Hospital Epidemiology logo]
Example SWARM Form: HO-CDI

### Filled out by: INFECTION PREVENTION

<table>
<thead>
<tr>
<th>Patient Information</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit of Attribution</td>
<td></td>
</tr>
<tr>
<td>Patient Name</td>
<td></td>
</tr>
<tr>
<td>MRN</td>
<td></td>
</tr>
<tr>
<td>DOB/Age</td>
<td></td>
</tr>
<tr>
<td>Date of Admission</td>
<td></td>
</tr>
<tr>
<td>Date of Event</td>
<td></td>
</tr>
<tr>
<td>Days from Admission to Infection</td>
<td></td>
</tr>
<tr>
<td>Patient background</td>
<td></td>
</tr>
</tbody>
</table>

### Antimicrobial & Testing Stewardship

- Amount of stool documented:
- Did the test follow the algorithm?
- Did the pt have a penicillin or cephalosporin allergy?
- Did the pt have an ID consult?
- Has pt previously been tested for C. diff?

### Comments from ASET team: (verbal during Swarm, ASET team documents findings in RedCap)

- High Risk antibiotics: cefotaxime, ceftriaxone, cefepime, ceftin, ceftriaxone, cephalosporins, clindamycin, and fluoroquinolones

### Filled out by: CARE TEAM

<table>
<thead>
<tr>
<th>Patient Care Information</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Were there indications the pt had C. diff on arrival?</td>
<td></td>
</tr>
<tr>
<td>Pt’s location prior to admission:</td>
<td></td>
</tr>
<tr>
<td>Has pt traveled to other areas inside the hospital?</td>
<td></td>
</tr>
<tr>
<td>Does the pt wash their hands prior to eating?</td>
<td></td>
</tr>
<tr>
<td>Opportunity to ingest C. diff spores (eating, oral care)?</td>
<td></td>
</tr>
<tr>
<td>In 7 days before the + C. diff, did the pt receive daily baths?</td>
<td></td>
</tr>
<tr>
<td>Anything unique about this pt?</td>
<td></td>
</tr>
</tbody>
</table>

### Isolation Practices – PPE and Hand Hygiene

- Issues with PPE (deficiencies, stocking)?
- Proper signage outside room (large, small signs)?
- Issues with hand hygiene (compliance, products)?
- Last 30 days HH/PPE Compliance Data from PS. Web?

### Environmental Factors

- Are there other C. diff + patients near this pt?
- Has the pt’s room regularly been cleaned prior to C. diff?
- Issues/challenges with EVS cleaning the room or unit?
- Issues/challenges with cleaning shared equipment?
- Anything unique about the pt’s room? Previous patient was Cdiff positive

### Narrative Information

#### Nursing Comments
*Please provide any relevant information regarding staffing issues (e.g., travelier or float staff assignment) or patient-specific concerns; e.g., refusals of care and escalation, extenuating circumstances, multiple stools, etc.)*

#### Provider Comments
*Please provide any relevant information regarding the patient; e.g., extenuating circumstances, etc.)*
<table>
<thead>
<tr>
<th>Potential Opportunities (Identified from previous sections)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Patient Care</strong></td>
</tr>
<tr>
<td>Daily bathing</td>
</tr>
<tr>
<td>Other</td>
</tr>
<tr>
<td><strong>Diagnostic</strong></td>
</tr>
<tr>
<td>Test not clinically indicated</td>
</tr>
<tr>
<td>Antimicrobial opportunities</td>
</tr>
<tr>
<td><strong>Environment</strong></td>
</tr>
<tr>
<td>Issues with PPE, hand hygiene</td>
</tr>
<tr>
<td>EVS/cleaning issues</td>
</tr>
<tr>
<td><strong>Additional Comments:</strong></td>
</tr>
</tbody>
</table>
SSI Process

- **Survey 1:**
  - Filled out by infection prevention
  - Adjudicates data elements from the chart regarding index surgery and subsequent infection
  - Pushes survey 2 and 3 to perioperative leadership and surgeon from index surgery

- **Survey 2:**
  - Perioperative leadership reviews elements regarding perioperative care from index surgery

- **Survey 3:**
  - Surgeon reviews risk factors pre-operatively, intraoperatively, and postoperatively to adjudicate if in fact the SSI was preventable.
  - Provides additional details that may not be easily identified via discrete data elements in the EMR
Examples of Data Output
Opportunities ≠ Root Cause

- Root Cause: Clear cause of HAI
- Opportunity: Deviation from recommended practice, but not the clear cause of the HAI
CLABSI Prevention Opportunities Identified During Swarms/Case Review

- Missed Bathing: 77
- No Swarm: 46
- Definition Issue: 44
- None Identified: 35
- Removal: 24
- Caps not changed per doc: 18
- Insertion: 18
- Other: 17
- EVS Opportunities: 8
- Needleless device not...: 4
- Drawn during comfort...: 3
- Low HH compliance: 3
- Unnecessary port access: 1
- TPA use: 1
- SWARMs Captured: 213
CAUTI Prevention Opportunities Identified During Swarms/Case Review

![CAUTI Opportunities Graph]

- Diagnostic stewardship: 30
- Missed bath: 29
- Foley care: 16
- Missed peri care: 13
- Removal: 11
- Insertion: 5
- No swarm: 3
- None identified: 1
- Definition issue: 1

82 CAUTIs reviewed
HO-CDI Prevention Opportunities Identified During Swarms/Case Review

![Bar Chart: HO CDI Opportunities 118 SWARMs reviewed]

- Antibiotic Stewardship: 35
- No Swarm: 35
- Low HH/PP E: 27
- Missed bathing: 23
- None identified: 17
- EVS: 11
- Diagnostic Stewardship: 10
- Patient Hygiene: 2
- Other: 1
SSI Dashboard

Categorical Variable SSI Invasive Rates Over Time

SSI Invasive Rate Trend (Excludes SSI Is PATOS): By NHSN Category Code

[Graph showing invasive rate trend over time from 2022 Q3 to 2023 Q3, with rate values at each quarter: 2.01, 1.63, 1.32, 0.99, 1.21]
SSI Dashboard: Categorical Risk Factors

Categorical Variable 100% Stacked Bar

Surgeries with and without SSIs (Excludes SSIs PATOS): By NHSN Category Code

<table>
<thead>
<tr>
<th>Category</th>
<th>No CMS SSI</th>
<th>SSI Detected</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>145</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>7.91%</td>
<td>3.70%</td>
</tr>
<tr>
<td></td>
<td>1,687</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>92.09%</td>
<td>96.30%</td>
</tr>
</tbody>
</table>

% of Total Surgery Count

Categorical Variable 100% Stacked Bar

Surgeries with and without SSIs (Excludes SSIs PATOS): By NHSN Category Code

<table>
<thead>
<tr>
<th>Category</th>
<th>No CMS SSI</th>
<th>SSI Detected</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>88</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>2.2%</td>
<td>11.11%</td>
</tr>
<tr>
<td></td>
<td>1,742</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>95.09%</td>
<td>85.19%</td>
</tr>
</tbody>
</table>

% of Total Surgery Count
SSI Dashboard: Continuous Risk Factors
SSI Dashboard: Other Tabs

- SSIs by Surgeon
- Perioperative Antibiotic(s)
- Antibiotic Allergies
- Preoperative Measures
  - CHG bathing
    - Day before surgery
    - Day of surgery
  - Povidone iodine administration
  - Hair clipping
Where Are We Going?
Goal: move from reactive to proactive work

Reactive (case review) harm already occurred

Proactive (process review) correct issue upstream of harm
Without stable and standardized processes, you cannot have sustainable improvements.
Sustaining Standard Work: Process Observation
Standard Work Process Observations

- **Goal:** Identify barriers and opportunities before harms occur
- **Observe** standard work prevention processes using Kamishibai cards (K cards)
- **Incorporate** learnings into tiered huddles
Why are Process Observations Key?

- Correct process upstream of outcome
- Leading indicator before harm
- Intervene ahead of harm occurrence
Next Steps

- Continue to use standardized case review tools to gather data from the multidisciplinary team and identify opportunities and record in RedCap database
- Arrive at the swarm with an understanding of contributing factors and opportunities identified by the case review – this will provide focus for the observations performed on the unit
- Pilot a new version of a SWARM in one service line
  - Return to the original intent of the SWARM process
  - Observe standard work in the place where the harm took place
  - Evaluating process performance for at-risk patients in real time and close identified gaps to prevent future harm, as able
Next Steps - Continued

- Continue to share learnings from the case review and swarm broadly
- Use findings from the case review and swarm to inform targeted improvement efforts/interventions in that area
- Engage providers
- Continue to PDCA this process
What Have We Learned?
Key Lessons

- Continuous improvement is just that! It never ends!
- Multidisciplinary engagement is critical
- Hospital leadership engagement is critical
- Pay attention to process - we can control processes/adherence, we cannot control host factors
- Go and see