Can We Achieve Zero Harm? Innovation at Cincinnati Children’s

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Disclosures

• None
Objectives

• Identify key themes in the evolution of a safety program from being reactive to proactive
• Describe how engagement of frontline physicians/caregivers produces better insights and creates more durable change
• Understand a method of how to learn from multiple events/near misses to create system wide change
• Appreciate how integrating research and QI methods can generate new insights to address preventable harm
Brief History of Safety at Cincinnati Children’s

• System-level priority for well over a decade
  – Serious patient safety event every 22 days; went over 400 days 2016-2017
  – 80% decrease in most serious employee injuries
• System-level safety behavior and culture training
• System-level application of root cause analysis with monthly detailed reports to CEO and Board of Trustees
• Institutional portfolio of patient and staff safety priorities
Ongoing challenges at Cincinnati Children’s

• Sustaining and spreading effective projects
  – Operational ownership
  – Limits of root cause analysis

• The “plateau”
  – Moving from reactive to proactive as harm becomes more rare
  – Limits of what we know to be the right thing to do
Perioperative Safety: Multidisciplinary Teamwork to Improve Patient AND Employee Safety

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Professor of Surgery

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Background-Patient Safety

• Potential and real Serious Safety Events
  – Wrong site surgery
  – Wrong procedure
  – Retained foreign body

• Surgical Site Infections
Patient Safety – Time Outs/Announce and Count
Patient Safety – Time Outs/Announce and Count

• Despite having a policy for procedural time outs and announce and count for an extended period of time, doing education, doing audits and measurement, we were still having problems related to time outs.

WHY??
Patient Safety – Time Outs/Announce and Count

- Going through the motions – not paying attention
- Procedure/policy too complicated/exceptions
- Team not engaged
Patient Safety – Time Outs/Announce and Count

- Multi-disciplinary team
  - Quality improvement consultant
  - Surgical nurses
  - Scrub technicians
  - Surgeons
  - Human factors expert
Enhanced Timeout

All present will actively listen and participate
Patient Safety – Time Outs/Announce and Count

ANNOUNCE AND COUNT PROCESS:  
*Everything and Anything* that is placed temporarily in the patient

1.) Surgeon announces item **IN**
2.) Circulator RN acknowledges
3.) Circulator RN documents item on visual count sheet/board
4.) Surgeon announces item **OUT**
5.) Circulator RN acknowledges
6.) Circulator RN documents item as **REMOVED**
## Central Line Insertion Check Sheet Example

### Pre-Procedure TIME-OUT

<table>
<thead>
<tr>
<th>Procedure Type</th>
<th>New CVC Placement</th>
<th>Rewire Existing CVC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Line:</td>
<td>Nontunneled</td>
<td>UAC/UVC PA Catheter</td>
</tr>
<tr>
<td>Indications for Use:</td>
<td>Lack of Access</td>
<td>Emergent</td>
</tr>
<tr>
<td>Consent Obtained:</td>
<td>Verbal</td>
<td>Written</td>
</tr>
<tr>
<td>Patient Verified:</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Any Safety Concerns:</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>If Yes, Concerns Addressed:</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Appropriate Flush Verified:</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Pertinent Imaging Reviewed:</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>(If Applicable)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time Out Completed:</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>
## Central Line Insertion Check Sheet Example

### Post-Procedure TIME-OUT

<table>
<thead>
<tr>
<th>Step</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guidewire Removed:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Lumen Flushed and Aspirated:</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>X-ray Confirms Tip Placement &amp; No Wire Guidewire:</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

X-ray Verified By: ________________________________
Patient Safety – Surgical Site Infection

DAYS SINCE OUR LAST SSI
FY18 Count = 18  Goal = 24

13
Patient Safety – Surgical Site Infection

• Early success with antibiotic timing emphasis
• Focus success in key high risk areas such as spine, neurosurgery, and pectus surgery
• Challenges –
  – Attention to bundle in non-focus areas
  – Spread house-wide to inpatient units – Will now leverage operational excellence unit leadership team
Employee Safety – House Wide Blood Born Pathogen Exposure
Employee Safety – House Wide Blood Born Pathogen Exposures

FY 14
FY 15
FY 16

BBPE
Employee Safety – Blood Born Pathogen Exposures

• Perioperative environment accounted for consistently over 34% of all blood born pathogen exposure

• Area with a high number of potential exposures
  – Over 35,000 operative procedures each year
  – Many cases have multiple exposure risks
  – Exposures 0.001 per case (approximately 35 a year)
Are we at risk?

PLEASE NOTE: This chart only shows the number of patients who have newly converted. It does not show the number we work with each year who have previously converted.
What did we do?

• Initially employee safety/employee health attempted to create change
  – Little involvement from perioperative staff
  – Limited knowledge of perioperative environment
  – Not a hospital priority
So now what??
Perioperative Diverse Team Assembled

- Employee safety/employee health
- OR frontline and nurse leaders
- Surgical technologist
- Surgeon champion/team member
- Quality improvement consultant
- Human factors expert
What Surgical Divisions are Involved?

16% from Pediatric Surgery
How do we get exposed?

Things we are directly involved with make up 62% of exposures
Who gets’s exposed?

Periop OSHA Recordable BBPE by Role
7/1/14 to 5/31/15

Category Percentages

Cumulative Percentages

- Attending Surg: 21.6%
- Surg Tech: 43.2%
- Residents: 62.2%
- Fellow: 73.0%
- OR RN: 83.8%
- VAT RN: 89.2%
- Periop Coordinator: 94.6%
- PACU RN: 97.3%
- Anesthesia RN: 100.0%

Individual Quantities & Percentages

- Attending Surg: 8
- Surg Tech: 8
- Residents: 7
- Fellow: 4
- OR RN: 4
- VAT RN: 2
- Periop Coordinator: 2
- PACU RN: 1
- Anesthesia RN: 1
Can these be prevented?
Why don’t surgeons take proper precautions?

• Risk Taking Personality
• Perception that they are not at risk
• Perception of conflict between patient care and personal protection
• Reluctance to change “proven” methods of care
• Interest in “Blood-borne Infections” has declined in the past 5 years at the Annual Clinical Congress of the American College of Surgeons
A team approach to sharps safety is critical to reduce the risk of blood-borne infections resulting from sharps injuries in the operating room. Hospitals and health care facilities should make sharps injury-reduction techniques and instruments available for surgeons and OR personnel.
Double gloving

• The ACS states, “Double gloving reduces the risk of exposure to patient blood by as much as 87 percent when the outer glove is punctured.”

• The ACS recommends the universal adoption of the double glove (or underglove) technique in order to reduce body fluid exposure caused by glove tears and sharps injuries in surgeons and scrub personnel. In certain delicate operations, and in situations where it may compromise the safe conduct of the operation or safety of the patient, the surgeon may decide to forgo this safety measure.
Neutral zone

A previously agreed upon location on the surgical field where all sharps are placed

Two techniques using the neutral zone:

1.) Hands Free Technique (HFT): all sharps are placed in the neutral zone from which the surgeon and scrub can retrieve them eliminating the hand-to-hand passing of sharps

2.) Partial Technique: scrub hands the surgeon the sharp directly; surgeon returns the sharp via the neutral zone; used when surgeon cannot break eye contact with the surgical field
Engineered Sharps Injury Prevention (ESIP) devices

- The ACS recommends the use of ESIP devices as an adjunctive safety measure to reduce sharps injuries during surgery except in situations where it may compromise the safe conduct of the operation or safety of the patient.

- Use ESIP devices and safety accessories where available and appropriate.
Prevention Bundle

- Double glove every case
- Determine safe zone for sharp return at beginning of every case
- Clearly communicate when a sharp is being passed or placed down
- Support an environment for all members to raise a concern
- Reinforce proper/safe technique, especially during closures
Periop Blood Borne Pathogen Exposure Days-Between Chart
Base and Liberty July 2015 – November 1, 2017

Average of less than 3 days between each exposure

Stepwise implementation with Pediatric Surgery and then Urology
Up to 6 days between

Spread through all surgical divisions.
Increase to 16 days between, nearly 50% reduction in total exposures

Note: started to include residents in FY 16
Some Keys to Success

- True multidisciplinary team and leadership support
- Simplify reporting and have cases evaluated by periop content experts – not employee health or business leaders only
- Buy in from patient services was KEY – they helped change the culture – “Do you want to double glove?” Changed to “What size under glove do you wear?”
Some Keys to Success

• Look for patterns and engage content expert – spinal monitoring needles
• Standardize education for all staff including rotating residents
• Keep sharp awareness and safety part of operations, leadership and every day activities
Thank You
Beyond Scrubbing the Line: Next Steps to Reducing Hospital Infections

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Assistant Professor of Clinical Pediatrics

Division of Bone Marrow Transplantation & Immune Deficiency
Cancer & Blood Diseases Institute
James M. Anderson Center for Health Systems Excellence
Cincinnati Children’s Hospital Medical Center
Bloodstream Infections are Associated with High Mortality Rates and Increased Medical Costs

MORTALITY RATES
ASSOCIATED WITH CLABSI INFECTIONS ARE AS HIGH AS 25%

The Average Cost to Treat a Bloodstream Infection
$26,000
Primary BSI Rate in CCHMC CBDI (July 2011-May 2014)

- 12/11: VeloC-Clip Testing, CVC Rounds
- 13/11: Bi-monthly CVC Newsletter
- 1/12: Monthly CVC Theme, New Nurse Meeting
- 2/12: Swab Cap, Blood Sparing
- 6/12: No Medication Overfill
- 10/12: Weekly CVC Rounds
- 13/12: CHS Bathing

- 1/13: Weekly CVC Rounds
- 3/13: Rounds "Lessons Learned" to Staff, Blood Sparing, CHS scrub testing
- 7/13: Prevention Standard
- 9/13: New Pump
- 12/13: Prevention Standard Rounds

- Monthly Primary BSI Rate
- Median BSI Rate
- Control Limits

Possible Influences on Bloodstream Infection Rate

- Patient specific variables
- Less experienced staff caring for complex patients
- Increased “stress” and overwhelming feeling on floor
- Daily bath and oral care compliance
- Timely response to escalated concerns
FMEA Learnings

• Many providers felt uncomfortable asking for assistance

• Higher acuity patients, phase I patients and non-English speaking patients put additional stress on the healthcare delivery system

• Many providers required additional education and instruction on line care
Central Line Care
- CHG scrub used on lines
- 30 second scrub, 30 second dry time of line
- Dressing changes every 7 days or as needed
- Indirect line changes Q24 hours
- Direct line change every three days
- Cap changes every 7 days unless blood product administered, then every 24 hours
- 2 person dressing change
- Line changes with 1 or 2 people (if needed)
- Cap change with 1 or 2 people (if needed)
- Masking of patient and all present in room during sterile procedures
- Formal/informal education at regular intervals to all nursing staff

Real Time Analysis of System Stress
- Average Daily Census
- Float nurse hours
- Number of new Phase 1 patients
- Regional and international referrals
- Number of new relapsed/refractory patients, monthly number of stem cell transplants
- Subjective microsystem stress assessment

Mediation of System Stress
- Increased overtime pay is provided to incentivize tenured nursing staff
- Heightened awareness of potential medical errors

Daily Hygiene: 1-2-3 Initiative
- Daily: CHG bathing, linen change
- Twice daily: Activity
- Three times daily: oral care
- Daily text message reminders
- Physician intervention with non-compliant patients
- Early family involvement in 1-2-3 Initiative

CBDI CLABSI Prevention team:
- Rapid analysis of each positive blood culture
- Thorough analysis of prevention standard compliance
- Address medical issues requiring attention

Rapid Identification of Patients at Risk of CLABSI
- High-risk patients were discussed during daily shift changes
- Provider team also informed
- Preemptive CLABSI prevention measures identified and implemented during daily rounds
- High-Risk for CLABSI Variables:
  - Graft versus host disease (gut or skin)
  - Patients within 15 days of stem cell transplant
  - Underlying diagnosis of: high risk neuroblastoma, AML, relapsed ALL
  - Dressing/line concerns or issues within the past 72 hours
  - The most recent ANC <200
  - Fever >38 in last 48 hours
  - Behavioral issues

Environmental Cleanliness:
- Bi-weekly assessments of room cleanliness
- Monthly crib exchange
- Daily linen change

Safety Coach and Prevention Standard Rounding
- Safety Coach on floor at all times to assist with procedures
- Safety Coach approaches all nursing staff daily to anticipate procedures
- Daily CLABSI Prevention Standard Rounding
  - Evaluation of dressing integrity, completion of cap/line changes, presence of caps on all ports on lines

Blood Stream Infections Reduction Interventions

• Task force to address daily hygiene
• 1-2-3 initiative
  – Daily CHG bath
  – Activity twice daily
  – Oral care three times per day

CBDI 1-2-3 Compliance (3 opportunities per patient day)
April ‘14 – Sept ‘15

Percent compliance with 1-2-3 process (completed/opportunities)

- 4/24/14: ADL Discussion in Rounds and in RN/PCA shift handoff
- 5/1/14: ADL Education & Standard Documentation
- 5/2/14: ADL Signage Placed in Patient Rooms
- 5/8/14: EMR Admission Oral Care Order Set, weekly Evaluation by Pharmacy
- 5/15/14: ONC: Bath PCA
- 5/22/14: Automated ADL Reminder
- 6/5/14: Quality Assurance
- 6/19/14: Physician Engagement
- 9/3/14: BMT: Bath PCA
- 10/1/14 ADL Education in Family Education Binders

Week

- Percentage completed
- Median
We evaluated variables that could be associated with increased stress to the microsystem

- Patient volume (ADC)
- Active phase I patients
- New regional and international
- New referrals
- Daily average float staff hours
- Total number of chemotherapy doses administered
- Number of transplants per month
- Nursing staff experience
System Variables Associations with Increased CLABSI Rate

- Average Daily Float Nurse Per Month
- Average Daily Census
- Number of New Relapse/Refractory Patients
- Active Phase 1 Patients

Increased Percentage of Less Experienced Nurses

- 2012 FY Nursing Licensed Years:
  - < 1 year: 15%
  - 1-2 years: 23%
  - 2-5 years: 43%
  - > 5 years: 19%

- 2014 FY NursingLicensed Years Oncology:
  - < 1 year: 31%
  - 1-2 years: 26%
  - 2-5 years: 12%
  - > 5 years: 31%

- 2014 FY Nursing Licensed Years Bone Marrow Transplant:
  - < 1 year: 34%
  - 1-2 years: 16%
  - 2-5 years: 31%
  - > 5 years: 19%
Oncology: New Relapsed/Refractory Patients Per Month (7/11 to 5/15)

- Increased CLABSI Rate
- Intervention Period

CBDI: Average Daily Census (7/11 to 5/15)

Average Daily Census

Month

Increased CLABSI Rate

Intervention Period

Oncology: Number of Active Phase 1 Patients per Month
(7/11-5/15)

CBDI: Average Daily Float Nurse Hours
(7/11 to 5/15)

Average Daily Float Nurse Hours

Month


Increased CLABSI Rate

Intervention Period

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• Early family involvement in 1-2-3 Initiative

Environmental Cleanliness:
• Bi-weekly assessments of room cleanliness
• Monthly crib exchange
• Daily linen change

Blood Stream Infection Rate in the Cancer and Blood Disease Institute (Infections / 1000 line days)

Month (number of line days)

- Monthly Blood Stream Infection Rate
- Average Rate of Blood Stream Infections
- Control Limits
Bone Marrow Transplant: Days Between Last CLABSI (1/2007 to 5/2015)

Days Since Previous Event

Average Days Between Events

Control Limits

Pathogenesis of Bloodstream Infections in Immunocompromised Patients

- Bacterial translocation through oral mucosa
- Bacterial translocation through bowel wall

- Illustrations showing oral cavity, intestine, and bloodstream with medical icons.
Bloodstream infections are associated with increased morbidity and mortality

<table>
<thead>
<tr>
<th></th>
<th>MBI-LCBI (n=80)</th>
<th>CLABSI (n=68)</th>
<th>Secondary Infections (n=22)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Septic Shock at Time of Infection</td>
<td>37 (46%)</td>
<td>34 (50%)</td>
<td>10 (45%)</td>
</tr>
<tr>
<td>Central line Removed Within 7 Days</td>
<td>31 (39%)</td>
<td>30 (44%)</td>
<td>10 (45%)</td>
</tr>
<tr>
<td>Death Within 10 Days</td>
<td>7 (9%)</td>
<td>7 (10%)</td>
<td>3 (14%)</td>
</tr>
<tr>
<td>Transfer to PICU within 48 hours</td>
<td>17 of 73 (23%)</td>
<td>14 of 59 (24%)</td>
<td>2 of 13 (15%)</td>
</tr>
<tr>
<td>PICU days in patients transferred from floor</td>
<td>Total PICU days: 165 median 6 (3-10)</td>
<td>Total PICU days: 257 median 5 (3-15)</td>
<td>Total PICU days: 64 Median 32 (18-46)</td>
</tr>
</tbody>
</table>

Dandoy. BBMT.2016.
Dandoy. BBMT. 2016.
Identification and Implementation of Best Practices

- Standardize care
- Measure outcomes
- Generate hypotheses
- Basic and Translational studies
- Clinical trial
- QI and Innovations related to delivery
- Gaps in Knowledge
- Gaps in delivery
- Change care
Bloodstream Infection Reduction Team

**CBDI:** Christopher Dandoy, Sonata Jodele, Stella Davies, Brian Turpin, Dana Lounder, Seth Rotz
**Infectious Disease/Infection Control:** David Haslam, Heidi Andersen, Beverly Connelly, Josh Schaffzin
**Dental:** Sarat (Bobby) Thikkurissy
**Pathology:** Lindsey Romick-Rosendale
**Quality Outcome Managers:** Kathy Demmel, Cheri Cole-Jenkins, Victoria Hickey
**Patient Services:** Laura Flesch, Deanna Hawkins, Jackie Hausfeld, Deanna Best, Connie Koons, Caryl Shelton, Tammy Otis, Melissa Hayward, Shawn Mock, Ashley Alford, Jackie Hausfeld, Kathi Kramer, Anna Herbert, Kayla Buckley, Erin Osterkamp, Susan Spear, Reenie Giesken, Kristy Feld, Shawna Langworthy, Erin Sandfoss, Amy Hendrix, Sylvia Rineair, Kathi Kramer, Paige Lovelace, Abigail Pate, Miranda Flemming, Kristen Coleman, Tracey Mason, Brenda Mott, Rachel Vakerics, Piper Coleman
**Behavioral Medicine:** Ahna Pai
**Palliative Care:** Lori Ann McKenna, Kelly Porter
**Pharmacy:** Ashley Bedel, Ashley Teusink
**Laboratory:** Kelly Lake, Abigail Pate, Alyss Wilkey, Bridget Litts
Bloodstream Infection (BSI) Prevention Reduction in Hematopoietic Stem Cell Transplant (HSCT) Patients

**SMART AIM**
Decrease the mean BSI rate in patients undergoing HSCT at CCHMC from 2.1 to 1.0 BSIs/1000 line days by June 2019

**GLOBAL AIM**
Improve the outcomes and overall health and outcomes of pediatric HSCT patients

**Mechanism of Infection**
- Bacteremia through Central Venous Access
- Translocation of bacteria through oral mucosa
- Translocation of bacteria through the gut

**KEY DRIVERS**
- Engaged Multidisciplinary Team
- Division, institutional, and family engagement in BSI prevention work
- Multi-institutional collaboration to test and spread mechanisms to decrease BSIs
- Rapid identification and analysis of all bloodstream infections
- Identification of high risk populations and interventions
- Identification of evidence that support BSI reduction mechanisms
- Infrastructure to pilot, test, and spread interventions to decrease BSIs
- Optimal patient environment for infection risk reduction

**SUB-KEY DRIVERS/INTERVENTIONS**
- Risk stratification for BSIs through retrospective analysis
- Prospectively monitor BSIs in collaborative institutions to determine variables and practices associated with increased/decreased rates
- Grimestoppers Initiative, Room Declutter initiative, Daily Bed Change and bed wipe-down
- Reliable measurement of CVC maintenance care compliance, hand hygiene compliance, and 1-2-3 compliance
- Microsystem stress mitigation
- Patient/family/staff engagement in hand hygiene and 1-2-3 compliance
- Determine influence of gingivitis, mucositis, and oral microbiome dysbiosis in BSIs from oral bacteremia
- Determine influence of daily dental xylitol-wipe application in decreasing bacteremia due to oral flora
- Identify best oral care practices to reduce bacteremia
- Determine influence of daily dental xylitol-wipe application in decreasing bacteremia due to oral flora
- Determine influence of vitamin A on gut permeability
- Develop a standardized microbiome-favorable antibiotic regimen
- Determine dosing safety of one time vitamin A supplementation
- Determine influence of vitamin D on gut permeability
- Division, institutional, and family engagement in BSI prevention work
- Identification of high risk populations and interventions
- Optimal patient environment for infection risk reduction
Lower Vitamin A Levels are Associated with Increased Rate of Bacteremia

Bloodstream Bacterial Isolates Match Dominant Bacteria in the Gut

**Stool microbiome**

**Bloodstream Klebsiella Isolate**
Decreased Microbiome Diversity is Associated with Antibiotic Use in HSCT patients (n=14)

Change in microbiome diversity from baseline to day 14 (y-axis) compared with total number of antibiotic days during that time.
Decreased Diversity of the Microbiome is Associated with Increased Frequency of Mucosal Barrier Infections But Not CLABSI
Antibiotic use: Bone Marrow Transplant Service
Evaluation of Potentially Modifiable Variables Associated with Bacteremia: FUT2

Evaluation of the influence of enteral human milk on the human microbiome and bloodstream infections from mucosal barrier injury

Rayes A. BBMT. 2016.
Dental Health in Stem Cell Transplant Recipients

Figure 1C) Modified Gingivitis Index of Somi and Barbano

Figure 1B) Mean Modified Oral Index Score

Hypothesis: The addition of daily dental xylitol-wipe application to current oral care practice will decrease oral flora bacteremia in the first 100 days post transplant from 18% to 9%
Impact of Xylitol Wipes on Oral Health, Oral Microbiome and Blood Stream Infections in HSCT Patients (n=13)

Preliminary Analysis
Impact of Xylitol Wipes on Oral Health, Oral Microbiome and Blood Stream Infections in HSCT Patients (Preliminary Analysis)
Activities of Daily Living are Difficult to Enforce in Healthy Children and Adolescents
Weekly Reward Chart

Taking Care of Me is Easy as 1-2-3

Name: ________________
Week of:_______________

6 opportunities to earn BMT BUCKS per day

Mean Adherence with ADL (n=21) (3 Opportunities/Day)

- 3 Oral Care
- 2 ACTIVITY
- 1 BATH

Patient

14 Days Pre-Intervention (Baseline)
14 Days-Intervention (BMT Bucks)

p <0.001
ADL Adherence Device
BMT Unit All Bloodstream Infections (CLABSI, MBI, secondary) per 1000 line days (Jan 15-Oct 17)

- **BSI per 1000 line days**
  - **Month**
    - Jan-15 (n=0834)
    - Feb-15 (n=0735)
    - Mar-15 (n=0737)
    - Apr-15 (n=0857)
    - May-15 (n=0920)
    - Jun-15 (n=1004)
    - Jul-15 (n=0910)
    - Aug-15 (n=0903)
    - Sep-15 (n=0956)
    - Oct-15 (n=0816)
    - Nov-15 (n=0895)
    - Dec-15 (n=0889)
    - Jan-16 (n=0785)
    - Feb-16 (n=0765)
    - Mar-16 (n=0955)
    - Apr-16 (n=0902)
    - May-16 (n=0942)
    - Jun-16 (n=0946)
    - Jul-16 (n=0590)
    - Aug-16 (n=0502)
    - Sep-16 (n=0497)
    - Oct-16 (n=0566)
    - Nov-16 (n=0547)
    - Dec-16 (n=0543)
    - Jan-17 (n=0612)
    - Feb-17 (n=0669)
    - Mar-17 (n=0652)
    - Apr-17 (n=0660)
    - May-17 (n=0742)
    - Jun-17 (n=0750)
    - Jul-17 (n=0800)
    - Aug-17 (n=0780)
    - Sep-17 (n=0800)
    - Oct-17 (n=0800)

- **BSI per 1000 line days**
  - **Mean BSI Rate**
  - **Control Limits**
BMT Unit MBI-LCBI Rate January 2015 through October 2017

- Monthly MBI-LCBI Rate
- Mean MBI-LCBI Rate
- Control Limits
Summary

• Mitigation of microsystem stress were associated with decreased CLABSI rates

• Based on our data, we restructured our bloodstream infection prevention team to include basic science and clinical researchers, psychologists, software developers, dentists, physicians, nursing leadership, and front-line staff

• Discovery is as important as quality improvement methodology in bloodstream infection prevention
Thank You
Improving Tracheostomy Safety at Home

Catherine K. Hart, MD
Assistant Professor, Pediatric Otolaryngology

Department of Otolaryngology, University of Cincinnati, Division of Pediatric Otolaryngology Head & Neck Surgery, Cincinnati Children’s Hospital Medical Center, Cincinnati, Ohio, USA
Background: Tracheostomy

- Approximately 1600 tracheostomies performed annually in children <2
- ~50 per year at our institution
- Risk of accidental decannulation is 0.7-13%
- Mortality rate is 0.7-3.6%

An Unfolding Event

- Higher incidence of events at home than expected
- Patients with tracheostomy/ventilator and tracheostomy only
  - Trach plugged
  - Accidental decannulation
- Significant harm
  - Death
  - Neurologic disability
Immediate Actions

• Patients requiring new tracheostomy and ventilator support no longer discharged without home nursing
• Report built to monitor ED visits in tracheostomy-dependent children
• Recognition that we needed to identify why the events were occurring
First Step: Build the Team

- Led by 2 physicians involved in care of trach patients
  - Dan Benscoter (Pulmonary Medicine)
  - Catherine Hart (Otolaryngology)
- Supported by QI Staff and Event Manager
- Frontline staff
  - Respiratory Therapists
  - Registered Nurses
  - Advanced Practice Nurses
Second Step: What happened?

• Needed to identify approach that would be most useful
  – Root Cause Analysis (RCA)
  – Common Cause Analysis
  – Failure Modes Effect Analysis (FMEA)
Root Cause Analysis

• Used at CCHMC to investigate all Serious Safety Events (SSE)
• SSE is defined as a variation in practice followed by death, severe permanent harm, moderate permanent harm, or significant temporary harm
• Measured using a standard definition adopted by the Ohio Children’s Hospitals’ Solutions for Patient Safety Collaborative
Serious Safety Events

Serious Safety Event Rate

Rate over 11 Years
Root Case Analysis

The **goal** of a *Root Cause Analysis* is to find out:

- What happened?
- Why did it happen?
- What to do to prevent it from happening again?

- Root cause analysis is a tool for identifying vulnerabilities and corrective prevention strategies
- It is a process that is part of the effort to build a culture of safety and move beyond the culture of blame
The Swiss Cheese Model

Approach to Analysis

• Best approach?
  – Multiple events
  – Occurred outside of the hospital
  – Didn’t meet the usual definitions of SSE

• Discussed options with leadership

• Hybrid approach
  – Basic structure of RCA using Process Map/Simplified FMEA
Reducing Adverse Events among Children with Tracheostomy Tubes (KDD)

Project Leader(s): Dan Benscoter, DO, Catherine Hart, MD

Revision Date: 01/03/2017 (v2)

Global Aim
Reduce morbidity and mortality of children with tracheostomy tubes

SMART Aim
Decrease the incidence of the tracheostomy tube plugging and decannulation requiring medical attention at CHMC from X to Y by xx/xx/2017

Key Drivers
- Effective home monitoring with technology
- Standardized medical and surgical therapy
- Proper use of durable medical equipment
- Ongoing caregiver education on tracheostomy care and monitoring
- Competent home nursing and community providers
- Timely reporting of plugging and decannulation

Interventions (LOR #)
- Develop algorithm for home ventilator alarms
- Create tool to accurately document and trigger ventilator alarm settings
- Standardize orders for pulse oximetry monitoring at home
- Implement standardized flow care guidelines (#7)
- Algorithm to optimize trach size and length
- Establish follow-up frequency
- Create order set with list of recommended equipment
- Early switch to home equipment during initial hospitalization
- Review written instructions to parents and home nursing at time of discharge and clinic visit
- Establish role for RT educator in implementing consistent education
- Face-to-face care for caregivers during week before discharge
- Create action plan when inadequate care is identified
- Designated Teaching Days (#1)
- Optimize 24-Hour Stay Simulation (#2)
- Head of Bed Sheet (#3)
- Home Organization (#5)

Legend
- Potential intervention
- Active intervention
- Adopted/abandoned intervention
- Level of Reliability Number, e.g., LOR 1

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Simplified Failure Modes Effect Analysis (FMEA)

- Performed by the team
- Key steps in the process identified
- For each step
  - How can/does failure occur?
  - What can be done to mitigate that risk?
Third Step: Interventions

- Key steps in the process identified
- How things can go wrong at each step identified
- Possible solutions identified
  - Long list of ideas generated
  - Too many to tackle at once
Prioritization

• Categorize interventions
  – Impact on outcome
  – Resources/time needed to complete
• Identify initial interventions to pursue
Fourth Step: Start the work

For Each Intervention

- *Action Item Owner(s):*
- *Level of Action:*
- *Scope of Action:*
- *Completion Date:*
- *At risk areas not included in Action*
Action Items

Organized by Steps in the Process

1. Prepare the patient to go home
2. Optimize the home environment
3. Ongoing care and management
Action Plan 1: Prepare the patient to go home

- Standardize caregiver education
  - Required consensus across multiple units
  - Collaborative effort
- Optimize 24 hour stay simulation
  - Standardized checklist to improve consistency
Action Plan 2: Optimize the Home Environment

• Airway information sheet
  – Used while inpatient
  – Copy to go home

• Home organization
  – Engaged home health nurse and family of a trach/vent patient
  – Educational materials created
Action Plan 3: Ongoing care and management

- Connect local Emergency Providers with families
- Training home care nursing
- Build tracheotomy patient registry
- Develop care algorithm
Fifth Step: Measure/Monitor Progress

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Ongoing Work

- Creating a “Trach Team”
- Tracking process measures
- Refining trach registry to better follow these patients
Summary of Lessons Learned

• Culture of safety enabled identification of possible problem
• Large number of people from many areas were highly invested in the population and engaged in the project
• Engagement and investment of frontline staff is essential to identify and achieve goals
• Identifying occurrence of multiple events and then analyzing them together can lead to system wide change
Thank You