Infection Prevention in Anesthesia Practice

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No disclosures
Overview

I. Bloodstream infections (BSI): Why do we care?

II. BSI, anesthesiologists, and the operating room

III. Quality improvement process and practice change
I. Bloodstream infections: Why do we care?

- Patient morbidity and mortality
  - Prolonged ICU stay and hospitalization
  - 19%-35% mortality

- Expensive
  - $40,000 per event (2005)

- “Preventable Harm”
  - Financial consequences pay-for-performance policies
  - Quality metric for comparing institutions

Attributable Cost of BSI in ICU. Elward et al. Pediatrics V115, 2005
Rate, Risk Outcome BSI in PICU. Yogaraj et al. Pediatrics V110, 2002
“The fundamental problem with the quality of American medicine is that we’ve failed to view delivery of health care as a science. The tasks of medical science fall into three buckets. One is understanding disease biology. One is finding effective therapies. And one is ensuring those therapies are delivered effectively. That third bucket has been almost totally ignored by research funders, government, and academia.”

--Peter Pronovost
PICU Best Practice Bundles

- Best practice bundles implemented in PICU decrease CABSI
  - NACHRI’s multicenter collaborative (29 PICUs, 5.4 → 3.1 CABSI/1000 catheter days)
    - Maintenance bundles key to reduce BSI
  
  - CHCA multicenter collaborative (26 children’s hospitals, 6.3 → 4.3 CABSI/1000 catheter days)

Decreasing PICU CABSI: NACHRI. Miller et al. Pediatrics 2010
II. BSI, Anesthesiologists, and the Operating Room
Human flora microbiology

• 500-1,000 different types of bacteria
• Clean mouth = 100,000 bacteria each tooth
• Dirty mouth = 1 billion bacteria each tooth
• Streptococcus and Staphylococcus

Anesthesiologists

• Pediatric Anesthesiologists
  – Routinely care for children with indwelling catheters undergoing procedures, imaging studies

• Unique dilemma: concurrently managing “dirty” airway and “clean” IV medications

• Limited guidance for preventing in situ catheter contamination in OR
Anesthesiologists—the data

• Hand hygiene (HH) among physicians 2004, Pittet et al
  – Anesthesiologists least compliant (23%)
  – RF: high workload, high risk contamination, procedural specialties (Anesthesia, Surgery, ER, ICU)

• Hand hygiene among anesthesia providers 2015, Fernandez et al
  – 82% Anesthesiologists incomplete knowledge WHO guidelines for HH
  – 65% report opportunity for self-improvement
  – 20%-30% perform HH after patient or equipment contact
  – 10% report colleagues are HH compliant

• Anesthesiology editorial 2009, Hopf et al
  – Barriers: access, work load, work space layout, culture, education
  – Anesthesia providers “focused on performing multiple complex tasks safely and efficiently—thus triaging hand hygiene to lower priority”
Transmission of Pathogenic Bacterial Organisms in the Anesthesia Work Area


• Anesthesia machine and IV stopcocks cultured at baseline and case completion

• Bacterial transmission
  – Anesthesia workspace (115 colonies/SA)
  – 32% IV stopcock

• Contaminated work area increased odds of stopcock contamination by 4.7
Reduction in Intraoperative Bacterial Contamination of Peripheral Intravenous Tubing Through the Use of a Novel Device

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- Anesthesia machine and stopcocks cultured
- Low rate hand hygiene by anesthesia providers (0.15-0.38/hr)
- POC hand gel + Q6min prompt → hand hygiene 7-8x/hr
- Reduced work area contamination
- Reduced patient stopcock contamination (32%→8%)
- Reduced HCAIs (17%→4%)
- 3 MDRO stopcock contamination (2/3 died)
“Poor hand hygiene by anesthesia providers contributes to HCAI, and we need to correct the problem.”
III. Quality improvement processes and practice change
The problem

Hospital-Acquired Catheter-Associated Bloodstream Infection Rates
Hospital Wide - Fiscal Year

3.7
4.7
0
1
2
3
4
5
6
FY 2006 FY 2007 FY 2008 FY 2009 FY 2010
as of 12/31
Rate per 1000 CL Days
Hospital BSI Rate Goal 3.08
116 BSIs
27 BSIs

- Institutional CABS1 rates plateaued
- 50% BSI -- procedure prior 7 days
- 14.1 BSI per 1000 trips off the unit
1. Multidisciplinary team (15) formed

2. Observation (video and manual) of anesthesia practice to audit contaminated touches
   - Airway management: clean = remove gloves + hand hygiene after airway management
   - PIV start: clean = 15 second prep chlorhexidine
   - Med administration: clean = 15 second scrub and dry before attaching med with clean hands
   - Anesthesia cart: clean = hand hygiene before touch

3. Team convened to:
   - compile observations
   - review evidence
   - analyze root causes
   - brainstorm countermeasures
Interventions

1. Anesthesia Checklist for Room Turnover
   - HH (hand hygiene) & Glove
   - REMOVE from anesthesia machine:
     - Airway bag, CO2 line, suction, tape
     - Laryngoscope handle, peel bag off dirty airway tray enclosing dirty contents (leave tray)
   - Unglove, HH, Reglove
   - CLEAN with lemoquat wipe:
     - Anesthesia Cart
       - Surfaces / handles / under emergency tray
     - IV pole & stopcock clamp
     - Anesthesia Machine
       - Computer, anesthesia monitor
       - Monitor cords, APL valve/mount, airway tree, gel donuts
       - Knobs & surfaces
       - Laryngoscope handle & dirty airway tray
     - Take dirty airway bag and garbage bag and set outside door to OR
   - Ungle, HH
   - SET UP clean items for next case:
     - Airway circuit & machine check
     - Monitors / suction
     - Airway tray & new bag
     - Laryngoscope handle & cover
   - Good to go → put "CLEANED" tape on anesthesia machine control knob

2. Interventions

3. Interventions
Interventions

4. 

5.
Implementation Plan-sequential test of change

1. Simulation by team members
2. Testing single clinical site by team members
3. Single site trials: team trained non-team (3wks)
   - Site rotated daily, all clinical locations tested
4. Three team members present to coach (3wks)
5. Continued coaching by charge anesthesiologists

- Feedback compiled throughout
CABSI Rate in Patients with Trips Out of the PICU/CICU (OR, IR, Cath Lab)

- Calendar Yr 2009: 14.1 BSIs per 1000 trips
- Calendar Yr 2010: 9.7 BSIs per 1000 trips
- Calendar Yr 2011 Through Sept: 0 BSIs per 1000 trips

*Anesthesia Intervention March 2010
Hospital-Acquired Catheter-Associated Bloodstream Infection

Number of Cases

Anesthesia Intervention

# of BSIs
Summary

• Anesthesiologists have an important role in BSI prevention

• System changes facilitate hand hygiene

• Develop a system to separate clean and dirty

• Team engagement, coaching, auditing are essential for successful improvement processes and practice change