Target Zero: Strategies for Reducing for Lowering/Eliminating Blood Stream Infections

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Disclosures
- Sage Products Speaker Bureau & Consultant
- Hill-Rom Speakers Bureau & Consultant
- Lilly & Merck Speakers Bureau

PATIENT SAFETY
Driving Forces for Change
- Scientific Driver
  - Evidence-based practice movement
- Economic & Social Drivers
  - IOM/Medical error
  - Leap Frog group
  - Institute for HealthCare Improvement/VHA
    - 100,000 lives campaign
    - 5,000,000 lives campaign
  - Joint Commission
  - CMS
- Professional Driver: Back to the basics

Evidenced-Based Practice
The conscientious, explicit, and judicious integration of
- the best available evidence from systematic research,
- with individual clinical expertise and
- patient preference
at the bedside in making decisions about clinical practice.

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New CMS Guidelines: If It's Not POA, We Won't Pay 10/08
Conditions No Longer Covered
- Falls
- Mediascleritis (after heart surgery)
- Avoidable Pressure Ulcers
- Vascular and Urinary Tract Infections from Catheters
- "Never Events"
  - Objects left in body during surgery
  - Air embolisms
  - Blood incompatibility
  - SSI post some orthopedic procedures
  - Bariatric Surgery
  - Certain manifestations of poor blood sugar control
  - DVT/PE following total knee and hip replacements
HealthGrades Report 2008

- Patient Safety Incidents for Medicare
  - Analysis of 41 million Medicare patients between 2004-2006
  - 5000 hospitals studied
  - 238,337 potential preventable deaths
  - 8.8 billion in preventable costs
  - 249 hospitals top safety performers (5%)
  - Failure to rescue improved by 11%
  - Bed-sores & post op respiratory complications worsened

Notes on Hospitals: 1859

"It may seem a strange principle to enunciate as the very first requirement in a Hospital that it should do the sick no harm."

-Florence Nightingale

In God We Trust!

Everyone else please bring data

Fortifying Host Defense

Implement Interventional Patient Hygiene
Interventional Patient Hygiene

- Hygiene... the science and practice of the establishment and maintenance of health
- Interventional Patient Hygiene... nursing action plan directly focused on fortifying the patients host defense through proactive use of evidence based hygiene care strategies

Central Line-Associated Blood Stream Infections

Creative Strategies for Eliminating

The Problem is Large

- 80,000 CLA-BSI in U.S. ICUs annually
- Mortality: 18% (0-35%)
- Annual deaths: 500 - 28,000
- Cost per episode: $25,000-$45,000
- Annual cost: $296 million - $2.3 billion

Risk Factors Associated with Increased Infection Rates

- Cutaneous colonization of insertion site
- Moisture under the dressing
- Prolonged catheter time
- Technique of care and placement

Focus on care practices that reduce the risk factors..... prep & clean the site with the most effective barrier & use full sterile barrier precautions for insertion

Components of Successful Long Lasting Change

Skills & Knowledge

Resources & System

Factors impacting the ability to achieve quality nursing outcomes at the point of care

Value

Attitude & Accountability

NSO
Blood Stream Infection (BSI) Bundle (B-II)

- Maximal barrier
- Hand hygiene
- Chlorhexidine for skin prep
- Avoid femoral lines
- Remove/Avoid unnecessary lines

CDC. Prevention of Catheter Infection: MMWR 2002;51 (No. RR-10):[1-29]
www.ihi.org

CDC Guidelines for Insertion Site Preparation

- Sterile technique; cap, mask, gown, gloves, and a large sterile drape
- Recommend 2% Chlorhexidine be the cleanser of choice if available

CDC. Prevention of Catheter Infection: MMWR 2002;51 (No. RR-10):[1-29]

Chlorhexidine vs Povidone Iodine for Catheter Site Care


<table>
<thead>
<tr>
<th>Study Reference Year</th>
<th>Odds Ratio (95% CI)</th>
<th>Catheter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adel et al., 1991</td>
<td>0.18 (0.08-1.44)</td>
<td>011</td>
</tr>
<tr>
<td>Sheafer et al., 1993</td>
<td>1.05 (0.07-14.61)</td>
<td>346</td>
</tr>
<tr>
<td>Metha et al., 1995</td>
<td>0.97 (0.26-4.77)</td>
<td>1117</td>
</tr>
<tr>
<td>Milnor et al., 1996</td>
<td>0.45 (1.5-2.91)</td>
<td>319</td>
</tr>
<tr>
<td>Logan et al., 1997</td>
<td>0.13 (0.03-4.95)</td>
<td>417</td>
</tr>
<tr>
<td>Manter et al., 1999</td>
<td>0.79 (0.26-2.78)</td>
<td>974</td>
</tr>
<tr>
<td>Knaus et al., 2004</td>
<td>0.54 (0.14-3.94)</td>
<td>849</td>
</tr>
</tbody>
</table>

Chlorhexidine 0.5% (95% CI) 3999

What Site is Best?

- RCT of femoral and SC lines in the ICU
- 145 pts femoral/144 pts SC
- Outcomes
  - Higher rate of infectious complications in femoral grp: 19.8% vs 4.5% (p<.001)
  - Higher rate of thrombotic complications in femoral grp: 21.5% vs 1.9% (p<.001); complete thrombosis 6% vs 0%
  - Similar rates of mechanical complications: 17.3% vs 18.8% (p=NS)

JAMA 2001, 286: 700-7

CDC Recommendation for Catheter Replacement

- Replace all catheters inserted under emergency conditions within 48 hours
- Do not routinely replace non-tunnelled CVC catheters
- PA catheters should be changed no more frequently than every 7 days.
- Use a guidewire assisted catheter exchange if infection is not suspected.
- Do not use guidewire technique to replace catheters if there is a clinical suspicion for CR-BSI.
- Routine culture of the tip is not recommended.
- For arterial lines: changed no more frequently than q 5 days along with the transducer and tubing.

CDC. Prevention of Catheter Infection: MMWR 2002;51 (No. RR-10):[1-29]

CDC Recommendations for Site Care

- Use either sterile gauze or transparent dressing (High MVP rate) to cover the site (Cat 1A)
- If you place the 2x2 under the transparent it becomes a gauze dressing
- Change gauze q 2 days & transparent q 7 days (Cat 1A)
- Replace dressing if damp, loosened or soiled or inspection of the site is necessary
- Chlorhexidine/Alcohol skin prep recommended for every dressing change.
- Do not routinely apply antimicrobial ointments to the site (Cat 1A)

CDC. Prevention of Catheter Infection: MMWR 2002;51 (No. RR-10):[1-29]
Additional Strategies Used When Basic Care Has Not Achieve Zero)

- CHG Baths (B-II)
- CHG Dressings (B-I)
- Antimicrobial impregnated CVC (A-I)
- Antimicrobial locks (A-I)


CHG Bathing Reduces CLA-BSI

- 52 week, 2 arm, cross-over design clinical trial
- 22 bed MICU with 11 beds in 2 geographically separate areas
- 836 MICU patients
  - 1st 28 weeks: 1 hospital randomize to bathe with (Sage 2%) CHG cloths & the other unit bathe with soap & water
  - 2 week wash out period
  - 2nd 24 weeks: methods were crossed over
- Measured: Primary outcomes: incidence of CA-BSI’s & clinical sepsis. Secondary: other infections


Results:

- CHG arm were significantly less likely to acquire a CLA-BSI 6.4 vs. 16.8 infections per 1000 catheter days
- Benefit against primary CLA-BSI’s by CHG cleansing after 5 days in MICU
- No difference in clinical sepsis or other infections


Traditional Bathing

Spreading Microorganism

Bath Water: A Source of Health Care Acquired Microbiological Contamination

- Compared normal bath water with chlorhexidine bath water on 3 wards
- Without Chlorhexidine: All samples + for bacterial growth (14/23 > 10^6 cfu/ml)
- With Chlorhexidine: 5/32 grew bacteria with growth 240 to 1900 cfu/ml
- Gloved hands/bathing: objects touch grew significant numbers of bacteria


Bath Basins: Potential Source of Infection

- Multicenter sampling study (3 ICU’s) of 92 bath basins
- Identify & quantify bacteria in patients basins
- Sampling done on basins used > 2x in patients hospitalized > 48 hours & preformed 2 hours post bath
- Cultures sent to outside laboratory
- Qualitative vs. quantitative measures used to exclude growth that may have occurred in transport
- Bathing practices not controlled & no antiseptic soaps used to bath

Bath Basins: Potential Source of Infection

- **Results**
  - 98% of all cultures grew some form of bacteria after plating or enrichment
- **Enrichment Results**
  - 54% enterococci, 32% for gram -, 23% for *S. aureus* and 13% VRE (statistically significant)
  - <10% growth rates for: MRSA 8%, *P. aeruginosa* 5%, *C. albicans* 3% & *E. coli* 2%


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Waterborne Infections Study

- Hospital tap water is the most overlooked source for Health Care Acquired pathogens
- 29 evidenced-based studies present solid evidence of waterborne Health Care Acquired infections
- Transmission occurs via drinking, bathing, items rinsed with tap water and contaminated environmental surfaces


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Waterborne Infections Study

- Conservative estimates suggest significant morbidity and mortality from waterborne pathogens
- Immunocompromised patients are at the greatest risk
- Recommendation I: Minimize patient exposure to hospital tap water via bottled water and pre-packaged, disposable bathing sponges


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Bacterial Biofilm

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P. aeruginosa Outbreak: Tap Water the Culprit

- Single genotype
- 59 burn patients (hydrotherapy tank)
- 19 adult ICU patients (wash basins & water taps)
- 13/31 ICU patients (tap water)
- 5/14 surgical unit patients (tap water)


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Bathing with CHG Basinless Cloths

- Prospective sequential group single arm clinical trial
- 1787 patients bathed
  - Period 1: soap & water
  - Period 2: CHG cloth cleansing
  - Period 3: non-medicated basinless cloth bath

Veron MO et al. Archives Internal Med 2006;166:306-312
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Multicenter Trail: Daily Bathing with CHG cloths

- Evaluated before and after implementation of daily bathing with CHG cloth
  - 32% decrease in new acquisition MRSA colonization (p < 0.05)
  - 30% decrease in new acquisition VRE (p < 0.01)
  - CA-BSI's decreased by 21% (p < 0.05)

Climo MW, et al. SHEA 2007; Abs 297
Milstone AM et al. Clinical Infectious Disease, 2008;46:274-281

Additional Strategies Used When Basic Care Has Not Achieve Zero)

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Chlorhexidine Patch to IHI Bundle: Impacting Rates

- BSI bundle implementation resulted in reduction of CA-BSI's from 24.8 to 3.1 per 1000 catheter days in 4 adult ICU's (30 beds)
- 8 month implementation regarding addition of the Chlorhexidine patch as part of site care

Results: Compared
  - 277 patients with CVC from May-April 2005 (Bundle)
  - 226 patients with CVC from Sept-Dec 2005 (Bundle & Patch) with 98% compliance of patch
  - CA-BSI went 3.1 to 0 per 1000 catheter days (p < 0.05)
  - Cost savings estimate: $314, 678

Garcia R et al. AJIC, 2006;34(5):E42
Antimicrobial CVC

- Prospective 2 year before and after study (1998-2000 compared to 2000-2002)
- Use of chlorhexidine/silver-sulfadiazene catheter in 6 ICUs at large teaching hospital

Results:
- CRBSI decreased from 8.2 per 1000 catheter days to 5.4 per 1000 catheter days (p=.003)
- Prevention strategies used: maximal barrier precautions (not using CHG for skin prep)

Borschel DM, et al Am Jo Infect Control 2006;34

Antimicrobial CVC

CDC Recommendations:
- Use of an antimicrobial or antiseptic-impregnated CVC in adults whose catheter is expected to remain in place for > 5 days if, after implementing a comprehensive strategy to reduce rates of CRBSI, the CRBSI rate remains above benchmarked goal (IE: 3.3/1000 catheter days)

Prevention of Catheter Infection: MMWR 2002;51

Intervention to Decrease CLA-BSI Statewide Collaborative-Keystone ICU

- 103 ICU’s in state of Michigan reported data
- Examine 375,757 catheter days
- Implementation of the BSI Bundle/checklist

Results
  - Median rate of CLA-BSI per 1000 catheter days went 2.7 to 0 at 3 months ((p<0.002)
  - Mean rate of CLA-BSI’s per 1000 catheter days went 7.7 to 1.4 at 18 month follow up (p<0.002)


QUALITY
IMPROVEMENT
PROJECT

USING THE EVIDENCE
Nosocomial Infections: Central Lines

- Pre-central line infection rate:
  - 6.8 per 1000 catheter days
- Pre-implementation practice
  - Gown, glove, mask and small drape
  - Routine change of central lines every 4 days
  - Dressing change every 4 days/prn when soiled with gauze dressing

Nosocomial Infections: Central Lines

- No routine changes of central lines
- If infection suspected, perform guidewire exchange and culture the tip
- If tip positive, remove line and perform a new stick
- No routine dressing changes/use of transparent dressing to view the site
- Three strikes and the most experience practitioner places the line (HFH guideline)

Healthcare Acquired Infections: Central Lines

<table>
<thead>
<tr>
<th>Benchmark Utilization</th>
<th>Bloodstream Infection</th>
<th>Rank Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>MICU</td>
<td>&gt; 50</td>
<td>5.9</td>
</tr>
<tr>
<td>(Pre change)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HFH MCC</td>
<td>&gt; 90</td>
<td>6.8</td>
</tr>
<tr>
<td>(Post change 2000 using 1996 guidelines)</td>
<td>&gt; 90</td>
<td>2.90*</td>
</tr>
<tr>
<td>HFH MCC</td>
<td>(Post change 2002 &gt; barrier)</td>
<td>&gt; 90</td>
</tr>
</tbody>
</table>

Cost avoidance associated with low Central Line rate: $1,240,000.
* Significant at p < 0.0001

New Guidelines…New Practice

- CHG prep for both insertion and dressing care (Category 1A)
- Full sterile barrier (hat, gown, glove, mask and full drape sheet) Category 1A
- No guidewire exchange unless for mechanical reasons (Category 1B)

CDC. Prevention of Catheter Infection: MMWR 2002;51 (No. RR-10):[1-29]

New Guidelines…New Practice

- Lessons Learned
  - Standardization across all ICU’s in both practice & equipment is necessary to reduce process variation
  - Line cart is not enough to ensure the correct procedure is done
  - Old habits are hard to break so remove the opportunity

- New Practices
  - Guidelines reviewed and adopted at institutional critical care
  - Insertion equipment available in one kit
  - Remove products to prevent use

TARGET ZERO!!!!!!!
Organizing Strategy to Reduce HAI: SMART

- S: Specific—precisely defined & quantification of desired outcome
- M: Measurable—monitor staff adherence/provide feedback
- A: Achievable—engage stakeholders in identifying tactics for implementation
- R: Relevant—to the institution so administrators provide adequate staffing, equipment & champion
- T: Time bound outcomes—set dates for baseline & periodic data collection and completion date


The things included in the measurement becomes relevant, the things omitted are out of sight out of mind

Peter F. Drucker

Blood Stream Infection (BSI) Bundle

- Remove/Avoid unnecessary lines
- Hand hygiene
- Maximal barrier
- Chlorhexadine for skin prep
- Avoid femoral lines

Interventions To Ensure Patient Receive Evidence

- Education
- Ask Daily if line is needed
- Checklist, nurse
- Empower nurses
- Products/Processes that make it easy for the frontline caregiver to provide the care
- Measurement/Feedback*

*Westwall S. Nursing in Critical Care, 2008;13(4):203-207

What Can You Do?

- Identify the challenges in your work environment
- Work with your colleagues to identify solutions (don’t wait for others to do it; if they were going to do it, it would already be done!)
- Look for tools to help you
- Find evidence such as best practice guidelines to support your plan and make your arguments more compelling
- Approach her supervisor of the chief nursing your facility for support
- Consult/network with experts in the field
- Think globally why acting locally
- Share your results so that best practices don’t just occur in isolated pockets

Tips To Get Started

- Implement the change
- Measure the results (use standardized definitions to capture & compile data)
- Compare against the benchmarks
- Celebrate & reward your success and growth as a team
- Check on a quarterly basis continued compliance with the new program
Measuring & Benchmarking

\[
\text{Rate per 1000 device days} = \frac{\text{# of infections}}{\text{Number of device days}} \times 1000
\]


CDC. Prevention of Catheter Infection: MMWR 2002;51 (No. RR-10):[1-29]

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