Session Content

- Source Control: Why?
- Environmental Source Control
  - Strategies: Hand Hygiene, environmental cleaning/housekeeping, active surveillance, appropriate use of isolation and contact precautions
- Reducing Environmental Load and Preventing Infection Through Creative Care Strategies & Case Examples
  - SSI, UTI, Basinless Bathing, BSI
- Reducing bacterial load in the oral cavity

IHI 5 Million Lives Campaign

- Prevent Pressure Ulcers
- Reduce surgical complications
- Reduce MRSA infection
- Prevent harm from high-alert medications
- Deliver reliable evidence-based care for congestive heart failure
- Getting the Boards on board

Conditions Not Reimbursed

Since 2003, Half the States Have Passed Infection Reporting and Control laws.

- Reproduced with permission of the Robert Wood Johnson Foundation, Princeton, N.J.
HAI's – Costs
Real Numbers / Real People

- 2.5 million HAI’s year
- Everyday, 247 people die in the USA as a result of a HAI
- Worldwide, at least 1 in 4 patients in ICU will acquire a HAI during their stay
- 6th leading cause of death in the US
- Higher nurse staffing results in lower HAI’s*

*Hugonnet S et al CCM 2007:35:76-81
*Pronovost PJ et al JAMA 1999;281:1310-1317

WHO 2005

Costs of HAI’s

- CDC $6 billion
- PHCA $3.5 billion
- Other Group $30-50 billion

2,000,000
Estimated infections per year
$15,000
Average additional hospital costs when a patient contracts an infection
$30 Billion
Spent per year treating HAI’s

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$15,000
Average additional hospital costs when a patient contracts an infection
$30 Billion
Spent per year treating HAI’s

Patient View Points: Choosing a Hospital

Ranking of Factors – Top Two

- 94% rate clean very important
- 85% low infection rates
- 93% knowing infection rates for hospital/doctor would influence their selection


Example: Why Source Control?

- MRSA accounts for > 50% of hospital acquired S aureus infections
- 63% of S aureus acquired in the ICU
- 126,000 hospitalized persons are infected annually (3.95 MRSA infections occur per 1000 hospital discharges)
- Over 5000 patients die as a result of these infections
- 2.5 billion excess health care cost attributable to MRSA

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A Vision for the Future?
MRSA in Denmark

Prevent Infection and Colonization

- Colonized patients
  - Reservoir for transmission
  - Nearly 1/3 develop infection, often after discharge
  - Long-lasting and can transmit MRSA to patients in other health care settings (e.g., nursing homes) and family members
- High rates of MRSA colonization complicate empiric antibiotic therapy (e.g., vancomycin)

www.IHI.org
**National MRSA Prevalence Study**

- 1237 facilities participated, 21% of all hospitals
- All states in the US
- 46 out of every 1000 patients studied were either infected or colonized with MRSA
- 8 to 11x > than previous estimates
- States reporting > 5 facilities rates were between 16-91 per 1000 inpatients
- Only infections: 16-48 average 34 per 1000 inpatients
- Majority of MRSA isolates were from HA-MRSA
- Average ICP’s 1.6 per facility
- 28% active surveillance cultures (ASC) for MRSA

APIC June 25, 2007

**What Does the Evidence Tell Us?**

- Target Modes of MRSA Transmission
  - Person-person via hands of health care providers
  - Personal equipment (e.g., stethoscopes, PDAs) and clothing
  - Environmental contamination…maybe people?
  - Carriers on the hospital staff
    - Rare common-source outbreaks

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**The Facts: Each Patient with MRSA Infection Results In….**

- 9.1 days longer in the hospital
- Extra cost between $7,000-$32,000 more (average $20,000)
- A 4% higher in-hospital mortality


**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

**5 Million Lives Campaign: Reducing MRSA**

- Hand hygiene
- Decontamination of environment and equipment
- Active surveillance cultures
- Contact precautions for infected and colonized patients
- Practice the device bundles (VAP & BSI)

Start in the ICU & have a clinical champion or opinion leader

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**Hand Hygiene is the Single Most Important Factor in Preventing the Spread of Infection**
**COMPLIANCE WITH HAND WASHING IN A TEACHING HOSPITAL**

- 2834 observations
- 1043 HCW
- Average compliance: 48%
- Average soap usage: 34%
- Antiseptics: 14%

Lowest compliance: ICU, higher risk procedures & ↑ work load

**Handwashing Compliance**

- HCW’s - 85% said they washed
- HCW’s peers - 50% said they washed
- Observation - 25% washed

- Females - 33% more likely to wash than males but males wash more effectively

**Handwashing Compliance**

1981-2007  26 Years of Data/Research

Findings: 1) Healthcare workers wash hands less than 50% of time after direct patient contact.
2) Higher workload and activities of higher risk for transmission → lower hand washing compliance

**Reasons for Non-Compliance**

- Lack of knowledge on importance and how the hands become contaminated
- Lack of understanding of correct technique
- Understaffing and overcrowding
- Poor access
- Irritant contact dermatitis associated with frequent exposure
- Lack of institutional commitment to good hand hygiene

**Guidelines for Hand Hygiene in Health Care Settings**

- When hands visibly soiled, wash with either a non-antimicrobial or antimicrobial soap & water (Cat 1A)
- If hands are not visibly soiled, use an alcohol-based hand rub for routinely decontaminating hands in all other clinical situations (Cat 1A)
- Decontaminate hands after removing gloves
- When washing with soap & water, wet hands first, apply soap, rub vigorously for 15 seconds, rinse and dry. Use towel to turn off faucet.
- Provide HCW with hand lotions & creams to minimize occurrence of irritant contact dermatitis
- Use multidimensional strategies to improve hand hygiene practice

**Strategies to Improve Adherence**

- Education & motivation
- Alcohol-based hand rub as primary method for hand hygiene...right product
- Wearing gloves while performing patient care and used properly
  - Removed or change when moving from contaminated to clean site
- Use of performance indicators
- Strong commitment to improve hand hygiene by frontline workers


Robert Weinstein, M.D. 2000 - 4th Decennial Conference on HAI's


WHO Guidelines 2005
Hand Hygiene Package

- Clinical staff understand key elements of hand hygiene practice
- Clinical staff use appropriate technique when cleansing hands (live demonstrations, use dye, monitor)
- Alcohol-based hand rub and gloves are available at point of care (examine location, design and function of the dispensers)
- Hand hygiene is performed at right time in right way and gloves are used appropriately (CDC)
- Verified by competency, monitored compliance and feedback

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Measurement: Know Your Direction

- Policies and guidelines will not increase hand hygiene compliance unless measurement and feedback are part of the process

Hand Hygiene Basic 101

- HH Before and After Patient Contact
- HH Before and After Glove Usage
- Gloves do not replace HH
- HH at entrance of room or in room, not the previous patient’s room
- Sanitizer/Foams – very effective
- Soap/Water – Visibly dirty
- C.difícile - ? Soap/Water

Hand Hygiene Measurement Methods

- Direct Observation
- HCW Self-reporting
- Product Usage/Volume


Individual unit scores are posted to give staff feedback and to identify poor performers who need support
Five Key Interventions

1. Hand hygiene
2. Decontamination of the environment and equipment
3. Active surveillance cultures (ASCs)
4. Contact precautions for infected and colonized patients
5. Compliance with Central Venous Catheter and Ventilator Bundles

Application of Recommendations for Environmental Cleaning

- Resources to ensure effective cleaning and decontamination
  - Use of a check list
  - Clean equipment that is transported from room to room
  - Dedicated equipment in isolation rooms
  - Reduce load
  - Education of healthcare workers and support staff

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Contact Precautions For Infected and Colonized Patients

- Contact Precautions are intended to prevent transmission of infectious agents, including epidemiologically important microorganisms.
- A single-patient room is preferred for patients who require Contact Precautions.
- When a single-patient room is not available, consultation with infection control is necessary to assess the various risks associated with other patient placement options.
- Precautions should wear a gown and gloves for all interactions that may involve contact with the patient or potentially contaminated areas in the patient’s environment.
- Donning gown and gloves upon room entry and discarding before exiting the patient room is done to contain pathogens.

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Screening: It is the Right Thing to Do

- Active surveillance cultures (ASC’s) are necessary on all admitted patients
  - not as expensive as caring for the MRSA patient
  - To truly capture the problem & begin to develop realistic solutions ASC’s performed on admission, weekly and/or at discharge

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Environmental Contamination as a Source of Health Care Acquired Pathogens

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Survival</th>
<th>Data</th>
<th>Transmission Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>C. difficile</td>
<td>Months</td>
<td>3+</td>
<td>Healthcare facilities</td>
</tr>
<tr>
<td>MRSA</td>
<td>d-weeks</td>
<td>3+</td>
<td>Burn units</td>
</tr>
<tr>
<td>VRE</td>
<td>d-weeks</td>
<td>3+</td>
<td>Healthcare facilities</td>
</tr>
<tr>
<td>Acinetobacter</td>
<td>33 d</td>
<td>2/3+</td>
<td>ICUs</td>
</tr>
<tr>
<td>P. aeruginosa</td>
<td>7 h</td>
<td>1+</td>
<td>Wet environments</td>
</tr>
</tbody>
</table>


To Screen or Not to Screen?

www.ihi.org

ASC’s

- Active surveillance cultures (ASC’s) are necessary on all admitted patients
  - ASCs of the anterior nares capture 80% of colonized adults
  - ASC’s of the anterior nares & wounds capture 92% of colonized adults
  - To truly capture the problem & begin to develop realistic solutions ASC’s performed on admission, weekly and/or at discharge
  - Provide real time notification of the staff so contact precautions can be implemented (Rapid Assay)

[www.ihi.org](http://www.ihi.org)


Active Surveillance

- Begin with admission cultures only.
  - Measure compliance; add the second culture when high (> 90%).
- Provide real-time notification of positive admission culture.
- Schedule consistent day of week for second culture.
- Include culture in routine discharge order sets.
- Measure transmission.
  - Number or rate of patients who convert from negative to positive
  - Flag colonized patients when discharged.

[www.IHI.org](http://www.IHI.org)

Screening of High-risk Patients

- High risk is defined as: (Cat 1B)
  - From LTC facilities (nursing homes, prisons, rehab)
  - Readmission from acute care hospital w/i 6 months
  - Roommates of colonized or infected patients
  - History of hemodialysis
- Obtain ASC’s from skin breakdown & wounds
- MRSA – anterior nares swab (Cat 1B)
- VRE – rectal swab (Cat 1B)
- ICU screen on admission & discharge/transfer
- For consideration:
  - Screening all admissions
  - Isolation of all patients with skin/soft tissue infections until proven negative for MRSA


Reducing Environmental Load & Preventing Infection Through Creative Care Strategies

Prevention Surgical Site Infection, Basinless Bathing, UTI Prevention, Blood Stream Infection & Oral Care,

Surgical Site Infections (SSI’s)

What can you do?

(measured within 30 days of the surgery)

Impact of SSI

<table>
<thead>
<tr>
<th></th>
<th>Infected</th>
<th>Uninfected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality (in-hospital)</td>
<td>7.8%</td>
<td>3.5%</td>
</tr>
<tr>
<td>ICU admission</td>
<td>29%</td>
<td>18%</td>
</tr>
<tr>
<td>Readmission</td>
<td>41%</td>
<td>7%</td>
</tr>
<tr>
<td>Median initial LOS</td>
<td>11d</td>
<td>6d</td>
</tr>
<tr>
<td>Median total LOS</td>
<td>18d</td>
<td>7d</td>
</tr>
<tr>
<td>Initial excess cost</td>
<td>+$3,644</td>
<td>(median)</td>
</tr>
<tr>
<td>Total excess cost</td>
<td>+$5,038</td>
<td>(median)</td>
</tr>
</tbody>
</table>

*Pairs matched for procedure, NNIS index, age
*General inpatient surgical population; 22, 742 procedures included

Opportunity to Prevent Surgical Infections

- An estimated 40-60% of SSIs are preventable.
- Improper timing, selection, and duration of prophylactic antibiotics occurs in 25-50% of operations.
- Appropriate Hair Removal
- Post-operative Glucose Control
- Post-operative Normothermia

HICPAC Guideline for the Prevention of Surgical Site Infections - 1999

- Require patients to shower or bathe with an antiseptic agent on at least the night before the operative day. Category 1B
- Thoroughly wash and clean at and around the incision site to remove gross contamination before performing antiseptic skin preparation. Category 1B
- Use an appropriate skin antiseptic agent for skin preparation. Category 1B

Pre-Op Prep

- Antisepsis must demonstrate a 3.0 log 10 from baseline in groin, 2.0 log reduction on the abdomen and maintain effectiveness for minimum of 6 hrs.
- CHG shower/bathing versus soap & water showed no difference in SSI (Cochrane EBR. 2007:CD004985)
- 2% prep cloth more effective in reducing bacterial load than 4% CHG solution that must be rinsed off (Edmiston CE. Et al AJIC, 2007:35:89-96)
- CDC recommends must bathe or shower night before
  - Compliance issues, consistency in application, unable to bathe self

Innovative Strategy: Study
Re-examine Pre-op Prep

- Methodology
  - Observational study with a pre & post intervention period
  - Baseline: Actively part of National SCIP program
  - Pre-intervention pre-op prep was night before in home showering or washing with 4% CHG solution
  - Post intervention: Pre-op prep performed with a pre-packaged 2% CHG prep product with instructions on its use
  - Pre-package prep performed at hospital prior to surgery
- Measured:
  - Change in baseline SSI would occur with new prep process
  - Cost saving

Innovative Strategy: Case Study
Re-examine Pre-op Prep

- Results:
  - 25 SSIs during historical period out of 5174 procedures (rate of 2.1%)
  - 11 SSIs during interventional period out of 4266 procedures (rate 0.7%)
  - 72% Difference

Innovative Strategy: Case Study
Re-examine Pre-op Prep

- Cost Savings
  - Before intervention: $648,471 for SSI’s
  - After intervention: $290,827
  - Cost of product: $8,721
  - Readmission savings: $177,937
  - Total Savings $526,860.00
**Traditional Bathing**

Why are there so many bugs in here?

Spreading Microorganism

**Bath Water: A Source of Health-Care Associated Microbiological Contamination**

- Compared normal bath water with chlorhexidine bath water on 3 wards
- Without Chlorhexidine: All samples + for bacterial growth (14/23 > 10^5 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


**Dry Basin Study: Level of Bacterial Growth**

- 25 basins (children’s hospital)
- 52% + for organisms
- 62% of those + had multiple organism present
- > multiple organisms present in the CCU

O’Flynn, J. APIC Meeting June 2007
Kosair children’s Hospital

**Waterborne Infections Study**

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


**Guidelines for Environmental Infection Control**

- Practice hand hygiene to prevent the hand transfer of water borne pathogens and use barrier precautions (Cat 1A)
- Eliminate contaminated water or fluid environmental reservoirs wherever possible (Cat 1B)
- Clean and disinfect sinks & wash basins on a regular basis using an EPA-registered product (Cat 2)
- Evaluate for possible environmental sources ie colonization after use of tap water in patient care (Cat 1B)

CDC. MMWR June 6th, 2003, 52/No. RR-10
**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)


**Bathing with CHG Basinless Cloths**

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

Veron MO et al. Archives Internal Med 2006;166:306-312

**Table 3. Percentage of Environmental Surface Culture Specimens That Were Positive for Vancomycin-Resistant Enterococci During the 3 Study Periods**

<table>
<thead>
<tr>
<th>Site Where Culture Specimen Was Obtained</th>
<th>Study Period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Soap and Water</td>
</tr>
<tr>
<td>Bedrail</td>
<td>(n = 311)</td>
</tr>
<tr>
<td>Pull sheet</td>
<td>33 (11)</td>
</tr>
<tr>
<td>Table</td>
<td>10 (3)</td>
</tr>
</tbody>
</table>

Veron MO et al. Archives Internal Med 2006;166:306-312

**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

**Control of Nosocomial Acinetobacter in a University-Affiliated Medical Center**

- 2 year retrospective analysis of all hospital acquired Acinetobacter
- Increase in rate confirmed
- Plan:
  - Education of physicians, nurses, allied support staff
  - Monitoring of hand hygiene & housekeeping compliance
  - 2% chlorhexidine cloths for daily bathing in the TICU & RICU
  - Terminal cleaning in both ICUs’
  - All Acinetobacter patients in contact isolation
- Measured: Acinetobacter rates

Blanchard K et al. APIC 2007
### Control of Nosocomial Acinetobacter in a University-Affiliated Medical Center

<table>
<thead>
<tr>
<th>Pre: 10/1000</th>
<th>Post: 1.6/1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicates Infection Control Plan Initiated: Education, Hand Hygiene (72%), housekeeping compliance (85% TICU and 75% RICU) and CHG bath daily</td>
<td></td>
</tr>
</tbody>
</table>

| Pre: 1.8/1000 | Post: 0/1000 |

**Munoz-Prince L & Weinstein R. N J of Med, 2008;358:1271-1281**

### Strategies for Bathing to Reduce Source Control & Improve Skin Defense

**Basin Bath**
- Transmission of organisms
- Time & effort
- # of supplies
- Harmful soaps
- Rough washcloths
- Cold/tepid water
- Scrubbing technique

### CA-UTI’s: Reducing Load

- Use of catheter increased risk
- > 40% of HAI’s are UTI’s
- Add 1 day LOS per patient
- EBR: insufficient evidence regarding methods to prevent CA-UTI (33 RCT’s)
  - Use of sterile technique has not demonstrated reduction (level 1)
  - Catheter care: good hygiene around meatal area during daily hygiene (level 1)
  - Impregnated catheters may reduce incidence (level 1)
  - Sealed drainage system should not be relied on for the only mechanism of prevention (level 1)

**Joanna Briggs Institute EBR: 2007**

### CDC: Guideline

**Cat I: Strong Recommendation**
- Educate key personnel in correct techniques of catheter insertion and care
- Catheterize only when necessary
- Correct hand hygiene
- Insert catheter using aseptic technique in sterile equipment
- Secure catheter properly to leg and maintain dependant loop
- Maintain close drainage systems
- Obtaining urine samples aseptically
- Maintain an unobstructed urine flow

**New guideline development underway**

**Joanna Briggs Institute EBR: 2007**

**Wong ES et al. Guidelines for Prevention of Catheter-associated UTI, 1981:**
- www.cdc.gov , accessed April 25th

### CDC: Guideline

**Cat II: Moderately Recommended for Adoption**
- Periodically re-educate personnel in catheter care
- Use smallest most suitable bore catheter
- Avoid irrigation unless needed to prevent or relieve obstruction
- Do not change catheters at arbitrarily fixed intervals

**Additional Care Practices based on studies**
- Keep bag below level of bladder to prevent reflux
- Use silver-coated catheters
- Remove catheters as soon as no longer necessary for medical care based on daily assessment and recording of need
- Implement a system for documenting in the medical record the indication for catheter insertion, date & time of catheter insertion and removal

**Wong ES et al. Guidelines for Prevention of Catheter-associated UTI, 1981:**
- www.cdc.gov , accessed April 25th, Joanna Briggs Institute EBR
Control Through IPH

Case I

UTI Rate-Removal of Prepackaged Bath Product QTR 3 FY05

The Effect of Bathing with Basin and Water and UTI Rate, LOS and Costs

Unit Census: 14

<table>
<thead>
<tr>
<th>Phases</th>
<th>Product Cost/UTI</th>
<th>No. of UTI</th>
<th>Median(^a) LOS 17 Days</th>
<th>Median(^a) Cost (4857.00)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I- Pre-Packaged Bathing Washcloths (9 months)</td>
<td>$10,530(^{2}) ($3.00)</td>
<td>25</td>
<td>175</td>
<td>$117,175</td>
</tr>
<tr>
<td>II- Basin/Water (9 months)</td>
<td>$3,510(^{2}) ($1.00)</td>
<td>48</td>
<td>336</td>
<td>$224,916</td>
</tr>
<tr>
<td>III- Additional Product Cost, UTI, LOS, COSTS</td>
<td>$7,020</td>
<td>23(^{1})</td>
<td>151</td>
<td>$107,741</td>
</tr>
</tbody>
</table>

Based on 3 packages of 8 towels each. Based on product cost of towels, soap, and basin. Difference between phase I pre-packaged/phase II basin water.

Chen Yin-Yin, Chou Yi-Chang, Chou Pesus.. Infect Control Hosp Epidemiol 2005;26:281-287

Central Line - Associated Blood Stream Infections

Creative Strategies for Eliminating

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]

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: change 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]
Blood Stream Infection (BSI) Bundle

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

Use of CVC-Related Bloodstream Infection Prevention Practices by US Hospitals

- National survey of infection control coordinators regarding CVC related BSI prevention practices
- Maximal Barrier Precautions, CHG prep or composite (MSP + CHG + avoidance of routine central line changes)
- March 2005 to August 2005
- Random sample of non-federated hospitals with ICU and more than 50 beds (n=600) and VA hospitals (n=119)
- 72% response rate (n=516):
  - VA hospitals: n=95
  - Non-VA hospitals: n=421


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


Use of CVC-Related Bloodstream Infection Prevention Practices by US Hospitals

- Results:
  - Use of maximal barrier precautions: 84% for VA vs 71% non-VA (p=.01)
  - Use of CHG for insertion site prep: 91% for VA vs 69% non-VA (p=.001)
  - Use of Composite approach: 62% for VA vs 44% for non-VA (p=.003)
  - Antimicrobial catheter use: 32% for VA vs 38% for non-VA (p=.50)
  - Use of CHG dressing: 29% for VA vs 25% for non-VA (p=.47)


Hospitals with higher safety culture score, having a certified infection control professional and participating in an infection prevention collaborative were more likely to use CR-BSI prevention practices

CHG Bathing Reduces CLA-BSI’s

- 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

CHG Bathing Reduces CLA-BSI’s

Results:
- CHG arm were significantly less likely to acquire a CA-BSI 4.1 vs. 10.4 infections per 1000 patient days.
- Benefit against primary CA-BSI’s by CHG cleansing after 5 days in MICU.
- No difference in clinical sepsis or other infections.


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

To Prevent Mistakes

- Create culture of safety.
- Improve Processes.
  - Reduce complexity.
  - Create independent checks for key processes.
- Automate.
- Training to senior medical staff and residents.
- Education to nurses and respiratory therapists.
- Nurses/RT assist with lines insertions.
- Empower nurses/RT to stop line placement.

QUALITY IMPROVEMENT PROJECT

USING THE EVIDENCE

Healthcare Acquired Infections: Central Lines

<table>
<thead>
<tr>
<th></th>
<th>Device Utilization</th>
<th>Bloodstream Infection</th>
<th>Rank Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benchmark MICU</td>
<td>&gt; 50</td>
<td>5.9</td>
<td>50-75%</td>
</tr>
<tr>
<td>(Pre change) HFH MCC</td>
<td>&gt; 90</td>
<td>6.8</td>
<td>50-75%</td>
</tr>
<tr>
<td>(Post change 2000 using 1996 guidelines) HFH MCC</td>
<td>&gt; 90</td>
<td>2.90*</td>
<td>10-25%</td>
</tr>
<tr>
<td>(Post change 2002 &gt; barrier) HFH MCC</td>
<td>&gt; 90</td>
<td>1.33</td>
<td>10-25%</td>
</tr>
</tbody>
</table>

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

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.
Interventions To Ensure Patient Receive Evidence

- Education
- Ask Daily if line needed
- Checklist, nurse
- Empower nurses
- Line cart/Packaged kit

Oral Care

Reducing Major Bacterial Source for Health Care Acquired Pneumonia

Oropharyngeal Colonization

Methodology:
- 89 critically ill patients
- Examined microbial colonization of the oropharynx throughout ICU stay
- Used pulse field gel electrophoresis to compare chromosomal DNA

Results:
- Diagnosed 31 VAPs
- 28 of 31 VAPs the causative organism was identical via DNA analysis


Oropharyngeal Colonization

Methodology:
- 49 elderly nursing home residents admitted to the hospital
- Examined baseline dental plaque scores & microorganism within dental plaque
- Used pulse field gel electrophoresis to compare chromosomal DNA

Results:
- 14/49 adults developed pneumonia
- 10 of 14 pneumonias, the causative organism was identical via DNA analysis

El-Solh AA. Chest. 2004;126:1575-1582

Oral Hygiene

- Implementation of a comprehensive oral care program (Cat II)
- Systematic method of delivery
- Clean oral cavity frequently
- Keep oral mucosa moist
- Cleansing & suctioning q 2-4 hours
- Brush twice daily


Literature Review: Oral Care Impact of VAP

- Comprehensive Oral Care:
  - Reduction in VAP from 5.6 to 2.2 (Schleder B et al. Advocate Health 2002;4(1):27-30)
  - Reduction in VAP from 8.3 to 4.4, vent bundle already being performed (Garcia R et al AJIC, 2006;34(5):E47-E48)
  - Reduction in VAP of 71%, vent bundle performed (Lowder M, The Source, March 2007)

- Comprehensive Oral Care & CHG:
  - Reduction in VAP to zero for 2 years, vent bundle, mobility and comprehensive education preformed (Murray TM et al. AACN Advanced Critical Care. 2007;18(2):190-199)
  - Reduction in VAP, vent bundle already in used (Dickinson S et al. SCCM Critical Connections, Feb 2008)
Literature Review: Oral Care Impact of VAP

- CHG vs. Tooth brushing vs. Usual Care
  - Reduction of VAP 24.4% vs. 52.4% p=0.0093, Receive one of 4 treatments: usual care, tooth brushing x3 daily, CHG & tooth brushing. (Munro CL, et al. Crit Care Med. 2006;34(12):Abstract 1)
  - EBR: CHG; grade B evidence, Sodium Bicarb; unresolved, H2O2; unresolved, Salt solutions; unresolved; Tap water; not recommended, Sterile water; unresolved. Did not include dental literature. Toothbrush; grade D, Swabs; unresolved, Use of flexible suction catheter post oral cleansing; Grade D (Berry AM et al. AJCC, 2007;16:552-563)

Combination of Interventions has the Greatest Impact on VAP between a 31 to 57% Reduction and Should Include Oral Care Protocol (Gastmeir P et al. J Of Hosp Infect, 2007;67:1-8)

RCT & Meta-analysis

- RCT: 207 patients randomized to receive 2% CHG or normal saline 4x a day until ET tube removal
- Measurement: VAP
  - No difference in baseline characteristics
  - CHG group: 5/102 (7 episodes per 1000 vent days) p<0.04
  - Saline group: VAP 12/105 (21 episodes per 1000 vent days)


Nurses Implementation of Guidelines from the CDC

- 1200 nurses attending education seminars completed a 29 question survey about the type and frequency of care provided (return rate of 81%)
- Examine the extent to which nurses working in the ICU implemented best practices in ventilated patients

Nurses in hospitals with oral care protocols reported better compliance with HOB and hand washing & were more likely to perform regular oral care & familiar with their VAP rates than without nurses in hospitals without an oral care protocol

Methodology:

- Observational before and after interventional study
- 5 acute care hospitals
- Measure oral care practices before & after multifaceted education & implementation of a 24 hour oral care kit at bedside

Results:

- Baseline oral care: swabs, 32% suctioned oral secretions, 0% brushing
- Post intervention: 33% brushing, 65% swab cleaning, 65% moisturizing, 61% management of oral secretions & 38% deep oral cleansing

Cutler CJ et al. AJCC, 2005;14:389-394
**Creative Technology**

- Endotracheal tube cuff that prevents leakage through a redesign
- Impregnated endotracheal tube that minimize the bacteria biofilm
- A phase III multicenter, prospective, randomized, controlled trial demonstrated a significant reduction of microbiologically documented
  - VAP (4.8% in the silver group vs. 7.5% in the control group, p < 0.05)


**TARGET ZERO!!!!!**

![TARGET ZERO!!!!!](image)

**How to Get the Bugs to Be Gone**

- Perform an initial assessment of the current state of the union on care practices within your environment that impact MDRO load & strategies currently being used to reduce impact
- Build the valuing of changing of those care practices through sharing of the scientific literature with your peers
- Select a products and design processes that allow the health care worker to “do the right thing in an efficient manner”

**How to Get the Bugs to Be Gone**

- Implement Interventional Patient Hygiene
  - Hand hygiene
  - Environmental load reduction (bathing)
  - UTI bundle
  - SSI bundle
  - Comprehensive Oral care for VAP reduction
  - BSI bundle + CHG bathing
- Compare against the benchmarks or more importantly yourself
- Celebrate & reward your success and growth as a team
- Monitor process and outcome measures until new care practices are routine

**CREATE A SAFE PATIENT ENVIRONMENT**

Everyday hospital care activities increase the patients risk of INJURY & BACTERIAL INVASION

Help reduce that risk by changing the ways you provide care & replace it with the evidence.....Implement Interventional Patient Hygiene

**Forbid yourself to be deterred by poor odds just because your mind has calculated that the opposition is too great. If it were easy, everyone would do it.**

**Be the Change Agent**