What Would Florence Do in 2009?
Application of Evidence-Based Fundamental Nursing Care

Panel of Experts
- Mary Lou Sole
  - Oral care in reducing VAP
- Kathleen M. Vollman
  - Bathing & other basics care activities to reduce spread of microorganisms
  - Mobility practices to prevent VAP, pressure ulcers and long term functional limitations
- Mary Beth Flynn Makic
  - Prevention of incontinence-associated dermatitis & pressure ulcers
- Pat J. Posa
  - Eliminating catheter-associated blood stream infections
- Ginger S. Pierson
  - Prevention of Sternal Wound Infections Following Cardiac Surgery

Quality & Safety Drivers
- Institute for Medicine
  - IOM report
  - Crossing the Quality Chasm
  - Transforming the work culture
- Evidence based practice
- Quality organizations
- Joint Commission
- Public transparency
- Medicare/Medicade /CMS
- Professional Nursing: Back to the Basic

HealthGrades Report 2009
- 2005-2007 data
- 913,215 total patient safety events among 864,765 Medicare patients
- 2.3 percent of the nearly 38 million Medicare hospitalizations.
- 92,888 deaths directly attributable to safety indicators, $6.9 billion of excess cost.
- Eight indicators showed improvement (2.3%-52%)
  - Complications of anesthesia, death in low mortality DRGs, failure to rescue, iatrogenic pneumothorax, selected infections due to medical care, post-operative hip fracture, postoperative hemorrhage or hematoma, and transfusion reaction
- 14.5 percent of the total patient safety events
- Seven indicators worsened over the course of the study

Worsen Safety Indicators (1%-23.4%)
- Seven Indicators Accounted for 85.5% of the Total Safety Event

- Highest Incidence: Failure to rescue/ 96.2 per 1000 pts, (death among surgical inpatients with serious treatable complications), decubitus ulcer/ 32 per 1000 pts, post-operative respiratory failure/ 17.2 per 1000 pts, and post-operative sepsis/ 14.9 per 1000 pts.
  - Post-operative abdominal wound dehiscence
  - Accidental puncture or laceration

Impact of Error: Human & Financial
- Healthcare-associated infections account for an estimated 1.7 million infections and 99,000 associated deaths annually
- Preventable errors have been estimated to cost $17 - $29 billion annually in healthcare expenses, lost worker productivity, lost income and disability.
- Healthcare expenditures are growing at more than 7% annually and patient safety is improving by only 1%.
Quality & Safety Drivers

- Institute for Medicine
  - IOM report
  - Crossing the Quality Chasm
  - Transforming the work culture
- Evidence based practice
- Quality organizations
- Joint Commission
- Public transparency
- Professional Nursing: Back to the Basic
- Medicare/Medicade /CMS

New CMS Guidelines:
If It's Not POA, We Won't Pay 10/08

Conditions No Longer Covered
- Falls
- Mediastinitis (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

Components of Successful Long Lasting Change

Factors Impacting the ability to Achieve Quality Nursing Outcomes at the Point of Care

Value
Attitude & Accountability
Skills & Knowledge
Resources & System

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

Advocacy = Safety

Fortifying Host Defense

Implement Interventional Patient Hygiene

INTERVENTIONAL PATIENT HYGIENE(IPH)
Nurse Sensitive Hospital Acquired Injury

- Ventilator-associated Pneumonia & Hospital Acquired Pneumonia: oral care & mobility
- Source control: Screen/Isolate/Environment/Bathe
- Prevention of Hospital-acquired skin injuries cause by pressure and moisture
- CA-BSI’s: catheter care, bathing
- CA-UTI’s: catheter care

ORAL CARE

Mary Lou Sole, PhD, RN, CCNS, FAAN, FCCM
Professor, College of Nursing
University of Central Florida
Orlando, FL

Disclosure: Speaker's Bureau Sage Products, Cary.

VAP Rates

- Calculated per 1000 ventilator days
- Highest in burn and trauma units
- Rates continue to drop with prevention efforts

CDC, National Healthcare Safety Network, AJIC, 2008

VAP (Vent) Bundle

- Elevate HOB 30-45° → Prevent GASTRIC aspiration
- Daily assessment readiness to extubate → Remove source (tube)
- Stress ulcer disease → Good patient care
- DVT prophylaxis → Good patient care

http://www.ihi.org/IHI/Programs/Campaign

The Missing Link

- Nurse-Driven
- Recommended by CDC
  - Comprehensive oral-hygiene program for patients at high risk (II)
  - No recommendation routine oral CHG rinse critically ill patients (Unresolved) (II)
  - Oral CHG (0.12%) rinse perioperative period adult patients cardiac surgery patients (II)
  - Oral decontamination topical antimicrobials; no recommendation (unresolved)


SHEA/IDSA Recommendation

- Perform regular oral care with an antiseptic solution
- The optimal frequency for oral care is unresolved

Role of Oral Care

- Comfort
- Clean
- Remove plaque biofilm
- Disinfect
- Remove secretions

(c) Mary Lou Sole, 2009

Issues

- Not a priority
- Impact of closed suction
- Varied evidence as to best practices
- Equipment
  - Availability
  - Right items
  - Disposables
  - Frequency of changing


Oral Care Practices

- Swabs
  - Comfort Care
  - Stimulate gums
  - Remove debris
- Oral Suction
  - Remove colonized secretions
  - Yankauer (tonsil tip) vs. suction swabs
  - Deep suctioning
- Toothbrushing
  - Mechanical intervention
  - Plaque removal
- Antiseptics & plaque control solutions

What Solutions Available for Oral Care?

Chlorhexidine Gluconate

- Antimicrobial against aerobic and anaerobic bacteria; creates film
  - 0.12% solution in 11.6% alcohol
  - Cleanse mouth BEFORE application
  - Avoid brushing and mouthwashes for 2 hr
- Side effects
  - Staining of natural and artificial teeth
  - Rare allergic reaction
- Requires MD order—better compliance?


Hydrogen Peroxide

- Cytotoxic chemical aerobic life
- Bactericidal and sporicidal
- Release of bubbles of oxygen by enzymatic action when peroxide comes into contact with tissues

Povidone Iodine Antiseptic

- Kills bacteria, fungi, viruses, protozoa and bacterial spores; used in oral surgery
  - 1% solution with 8% alcohol
- Gargle/rinse for up to 30 sec; do not swallow
- Cautions
  - Use no more than 14 days
  - Allergy to iodine; children < 6
  - Thyroid disorder
  - Pregnancy / breastfeeding
- Side effects
  - Irritation of oral mucosa and throat
  - Systemic absorption

http://www.netdoctor.co.uk/medicines/100002965.html

Other Solutions

- Antiseptic Oral Rinse/Antiplaque Solution
  - (Cetylpyridinium Cl 0.5%)
  - Positive charge on chemical reacts with negative charge of the bacterial cell to cause cell death
  - Some commercial products; Crest Rinse
- Biotene
  - Contains salivary enzymes
  - Moisturize
  - Some oral care kits
- Alcohol-Free Mouthwash
  - Cleans and refreshes
- Nurse concoctions

Review of the Evidence

Studies leading the way

Success with Protocols

- Schleder (2002)
  - ↓ VAP standardized oral care protocol
  - 5.6 → 2.2 cases per 1000 vent days
  - ↓ VAP education and std oral care protocol
  - 8.3 → 4.5 cases per 1000 vent days
- Cutler (2005) oral care in ICU
  - Availability of equipment 42% to 81%
  - Oral cleansing 31% to 69%
  - Oral suctioning 32% to 61%


Recent Trials CHG or Iodine

- 2004, Grap (CHG via swab)
- 2005, Fourier (CHG)
- 2006, Koeman (CHG or CHG/colistin)
- 2006, Munro (CHG via swab)
- 2006, Sequin (povidone-iodine)
- 2007, Munro (CHG)
- 2008, Tantipong (CHG)
- 2009, Sona (CHG)
- 2009, Panchabhai (CHG)—no decrease
**Synthesis of Evidence**

Meta-analyses

Systematic reviews

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**Systematic Review**

- 55 articles
  - 11 RCT
  - 20 observational studies
  - 24 descriptive studies

- Despite importance of oral care, high level evidence from rigorous RCT is scarce


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**Systematic Review**

Oral Decontamination

- 11 RCT—3,242 patients
  - 4 trials oral application abx—no \(\downarrow\) VAP
  - RR .69 (95% CI .41-1.18)
  - 7 trials oral antisepic—\(\downarrow\) VAP
  - RR .56 (95% CI .39-.81)
  - Pooled data also showed \(\downarrow\) VAP

- NO DECREASE
  - Mortality
  - Duration of mechanical ventilation
  - ICU LOS

Chen et al. BMJ 2007;334:888

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**Meta-Analysis CHG** (Chlebicki, 2007)

- Analyzed 7 RCT
- Reduced incidence VAP
- No reduction mortality
- Benefit most marked in cardiac surgery patients


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**Meta Analysis** (Beraldo, 2008)

- Eight publications were analyzed
- In seven (87.5%) CHG diminished the colonization of the oropharynx
- In four (50%) reduction of VAP
- Conclusion: CHG seems to reduce colonization, thus reducing the incidence of VAP

Canadian Clinical Practice Guidelines

• Systematic review of evidence
• Consider use of oral antiseptic rinses


Sample CHG Protocols

<table>
<thead>
<tr>
<th>Kit</th>
<th>No Kit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oropharyngeal suction</td>
<td>Oropharyngeal suction</td>
</tr>
<tr>
<td>Brush teeth, gums,</td>
<td>Brush teeth, gums,</td>
</tr>
<tr>
<td>tongue with soft brush using the CHG</td>
<td>tongue with soft brush</td>
</tr>
<tr>
<td>Apply remainder of</td>
<td>Rinse and suction</td>
</tr>
<tr>
<td>CHG to oral surfaces for 30 sec</td>
<td>15 ml CHG in med cup</td>
</tr>
<tr>
<td>Suction excess</td>
<td>Apply CHG to oral surfaces for 30 sec</td>
</tr>
<tr>
<td>Mouth moisturizer</td>
<td>Suction</td>
</tr>
<tr>
<td></td>
<td>Mouth moisturizer</td>
</tr>
</tbody>
</table>


CHG versus Toothbrushing

• CHG showing strong results in preventing VAP; no difference in mortality and LOS outcomes
  BUT
• Evidence that regular mouth care with standard protocols has reduced VAP with dedicated champion


Oral Suction

• Don’t forget about secretion removal…
• Two recent studies from Taiwan noted reduction in VAP when oral suction done immediately prior to turning
• Secretions were removed with the tonsil suction device “saliva ejector”


Limitations of the Evidence

• Comparison
  – Something to nothing to usual care
• Difficulty of conducting RCT
  – Enrollment at different times
  – Who implemented the protocol
  – U.S. versus international
• Variation in interventions
  – Concentration/strength of solutions
  – Not all available solutions tested
• Different methods for diagnosing VAP
  – Clinical diagnosis
  – CPIS


Comprehensive Oral Care

More than a swish and a swab…

• Assess
• Suction
• Brush
• Antiseptic
• Moisturize
• Avoid oral airways
• Disposable equipment
• Kits versus no kits
  – Standardize and track compliance
Unknown

• What is best protocol?
  – Frequency
  – Method
  – Oral suction

We need to “put the mouth back in the body …because it is the window to many body systems”

HALSTROM W. LET’S PUT THE MOUTH BACK IN THE BODY. CMAJ 2007;176(2):145

Nurse + Oral Care = VAP + Positive Patient Outcomes!

Thank You
msole@mail.ucf.edu

PURPOSES OF A BATH

♦ HEALTH: cleanse the skin, control infection, stimulate tissues & muscles as well as inspecting the skin
♦ SOCIAL: odor control & overall well being
♦ COMFORT: relaxation & positive sensory stimulation
Strategies from the 5 Million Lives Campaign for Preventing Pressure Ulcers & Reduction of MDRO's

- Maintain healthy skin
- Prevent spread of resistant micro-organism

The Bath: The First Line Of Defense

Nurse!!

Optimal Hygiene

- pH balanced (4-6.8)
  - Stable pH discourages colonization of bacteria & risk of infection
  - Bar soaps may harbor pathogenic bacteria
  - Skin pH requires 45 minutes to return to normal following a ordinary washing
- Non-drying, lotion applied
- Multiple steps can lead to large process variation
- Excessive washing/use of soap compromises the water holding capacity of the skin

Impact of Wash Cloth/Soap Cleansing and Towel Drying on Skin

- Methodology
  - 15 healthy volunteers, 6 different W/D techniques
  - 3 W/D techniques on each arm repeated twice with a 2hr rest period
  - Measured: Transepidermal water loss (TEWL), skin hydration, skin pH and erythema
- Results:
  - TEWL increased with each type of W/D episode, further loss with repeated procedures
  - Increase skin pH with all W/D, esp with soap

Washing with soap & water and towel drying significantly disruptive effective on skin barrier function

Voegel D. J WOCN, 2008;35(1):84-90

Comparison of Basinless Bath to a Basin Bath

Methodology:

- 60 patient in a progressive & surgical unit in an acute care institution compared basin bath vs. comfort bath
- Served as their own control with the right side of the body bathed with basinless bath/ left side with a basin bath
- Required a partial or complete bath conducted over 3 consecutive days
- Measured: skin condition using SCDF, nurse satisfaction & patient satisfaction

Overall preference
- 97% Basinless Bath
- 3% Basin Bath

Nurse satisfaction
- 100% Basinless Bath
- 0% Basin Bath

Time
- 10 minutes Basinless Bath
- 21 minutes Basin Bath

SCDF (skin condition)
- Significantly improved Basinless Bath
- Improved Basin Bath

Kron-Chalupa J et.al. Iowa City Veterans Medical Center

Kron-Chalupa J et.al. Iowa City Veterans Medical Center
Traditional vs. Disposable Bath in Critically Ill Patients

Methodology:
- 40 patients in Surgical, Medical and CT ICU received both baths on different days
- Compare basin bath vs. disposable
- Measure: time, quality of bath, microbial counts on skin (periumbilicus & groin, nurse satisfaction & costs

Results:
- No difference in quality or microbial scores between the two bathing procedures
- Fewer products used*, lower costs, less time and higher nurse satisfaction with disposable bath*

Larson E. et al. AJCC. 2004; 13(3):235-41

The Bath: The First Line Of Defense

Early Detection of Skin Injury

Nurse!!!

Reducing Microorganism Spread

Efficiency & Effectiveness

Florence Nightingale on:

PREVENTION OF INFECTION

“True nursing ignores infection, except to PREVENT IT. Cleanliness and fresh air from open windows, with unremitting attention to the patient, are the only defense...”

Notes on Nursing (1860/1969), pg 34

Sources Control

Reducing the Patient’s Risk of Infection

Guidelines for Hand Hygiene in Health Care Settings

- When hands visibly soiled or working with C-diff, wash with either a non-antimicrobial or antimicrobial soap & water (Cat 1A)
- If hands are not visibly soiled, alcohol-based hand rub for routinely decontaminating hands is the front line hand hygiene strategy (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


Reasons for Non-Compliance

- Lack of knowledge on importance and how the hands become contaminated
- Lack of understanding of correct technique
- Inconsistent following of practices to reduce load (fingernails < 2mm, absence of rings)
- Understaffing and overcrowding
- Poor access to hand gel & sinks
- Irritant contact dermatitis associated with frequent exposure
- Lack of institutional commitment to good hand hygiene

Measurement: Know Your Direction

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

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 > 10^5 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

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>Monhs</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>

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
**Waterborne Infections Study**

- Conservative estimates suggest significant morbidity and mortality from waterborne pathogens
- Immunocompromised patient's 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**

- Organized communities of viable & non-viable microorganisms protected within a matrix of extracellular polysaccharides, nutrients & entrained particles
- Adhere to inert material (plumbing)
- Bacteria contain within Biofilm may be transmitted to at risk patient's by direct contact with water used for ingestion, ice, washing


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**ICU & Hospital Water Samples**

- Systematic review published studies 1998-2005
  - 9.7%-68.1% of random ICU water samples + for Pseudomonas aeruginosa
  - 14.2%-50% of patient infections were due to genotypes found in ICU water
- 9 hospital in New York city
  - Bacteria recovered in every hospital
  - 4-14 species identified
  - 1/3 organism known to be responsible for HAI’s


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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
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>Scrape and Water (n = 311)</th>
<th>Chlorhexidine Gluconate Cloth (n = 327)†</th>
<th>Nonmedicated Cloth (n = 140)‡</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table</td>
<td>10 (3)</td>
<td>4 (1)</td>
<td>13 (9)</td>
</tr>
<tr>
<td>Bed rail</td>
<td>33 (11)</td>
<td>13 (4)</td>
<td>23 (16)</td>
</tr>
<tr>
<td>Pull sheet</td>
<td>63 (20)</td>
<td>17 (6)</td>
<td>43 (31)</td>
</tr>
</tbody>
</table>

*Veron M et al. Archives Internal Med 2006;166:306-312
†Climo MW, et al. SHEA 2007; Abs 297
‡Milstone AM et al. Clinical Infectious Disease, 2008;46:274-281

Multicenter trial: 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)

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

- All ICU patients receive the CHG basinless bath
- All Patients in the ICU with a + swab for VRE, MRSA receive CHG basinless bath
- All ICU patients admitted from a high risk location* receive CHG basinless bath

- All other patients receive the non-medicated basinless bath unless admitted from a high risk location*

- Never Events: Pressure Ulcers
  - Pressure ulcers (PUs) can be identified, measured, and reported
  - Usually preventable
  - Result in adverse patient outcomes, prolonged/additional care, increased costs
  - Significant body of scientific evidence is available to guide practice and prevent PUs
  - October, 2008: Stage III and IV PUs acquired after admission will not be reimbursed
Pressure Ulcer Facts

• 4th leading preventable medical error in the United State
• 3 million patients are treated annually
• National acute care prevalence rates 10-18%
• NDNQI data base: critical care 5-14%
• ↑LOS ~ 4 to 14 days
• PU related hospitalizations ↑80% from 1993 to 2006
• Cost to treat PU $43,000 per hospital stay


Pressure Ulcer Facts

• 503,300 PU related hospitalizations in 2006
• 45,500 admissions, PU secondary diagnosis
• 1 of 8 admissions ended in death


Pressure Ulcer Prevention: A Nursing Sensitive Indicator

• National Database of Nursing Quality Indicators (NDNQI)
  - www.nursingworld.org
• 2004 National Quality Forum
  - National Voluntary Consensus Standards for Nursing-Sensitive Care
• IHI 5 Million Lives Campaign
  - http://www.ihi.org/IHI/Programs/Campaigns

Evidence-Based Risk Assessment Tools

<table>
<thead>
<tr>
<th>Tool</th>
<th>Setting</th>
<th>Subscales</th>
<th>Score Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Braden</td>
<td>Acute care, home care, nursing homes</td>
<td>6</td>
<td>6-23</td>
</tr>
<tr>
<td>Norton</td>
<td>Acute care, rehab</td>
<td>5</td>
<td>5-20</td>
</tr>
<tr>
<td>Gosnell</td>
<td>Acute care, nursing home</td>
<td>4</td>
<td>5-20</td>
</tr>
<tr>
<td>Braden Q</td>
<td>Acute care, Pediatrics</td>
<td>6</td>
<td>6 subscales + tissue perfusion</td>
</tr>
</tbody>
</table>


Practicing by Best-Evidence Nursing Care Making a Difference

• 2003 Wound Ostomy Continence Nurses Society Guidelines for Prevention and Management of PU
• National Pressure Ulcer Advisory Panel
  www.npuap.org

Skin Assessment on Admission

• Essential that nurses document assessment of skin to include alterations and pressure ulcers on admission
• Differentiate
  – Community acquired pressure ulcer: Present on Admission (POA)
  – Hospital acquired pressure ulcer (HAPU)
Risk Assessment On Admission, Daily, Change in Patient Condition

• Use standard EBP risk assessment tool
• Research has shown Risk Assessment Tools are more accurate than RN assessment alone.
• Braden Scale for Predicting Pressure Sore Risk
  – 6 subscales
    • Rated 1-4
  – Pressure on tissues
    • Mobility, sensory perception, activity
  – Tissue tolerance for pressure
    • Nutrition, moisture, sheaf friction
  – Score 6-23

[Image: www.ihi.org; Macklebust, JA (2009) The Braden Scale reliable assessment to effective interventions]

Nursing Driven Interventions to Prevent HAPU

• Assessment of risk
  • Other factors: age, vasopressors, instability, severe agitation, comorbidities, obesity
• Optimize nutrition & hydration
  • Albumin, prealbumin
  • Fluid balance
• Frequent repositioning
  – Manual turning and relieving pressure
  – What about CLRT?
  – Avoid Friction and Sheer


What Lies Beneath the Patient

• Linen
  – Linen increases entrapment of moisture
  – Creates wrinkles
  – May increase risk of skin compromise
  – Limit linens on all beds
  – Especially on pressure redistribution beds and low air loss beds
  – Newer ICU beds are pressure redistribution surfaces
  – www.npuap.org/npuap_s31_1position statement on bed surface terminology


Nursing Driven Interventions to Prevent HAPU

• Manage Moisture
  – Evaluate and treat cause of moisture- early
  – Protect skin with moisturizers and skin barriers
  – Effective moisture wicking underpads
• Developing and implementing a pressure ulcer prevent protocol
  – User friendly
  – Products immediately available
  – RNs knowledge of protocol and products


Staging Pressure Ulcers

http://www.npuap.org/pr2.htm

• Deep Tissue Injury (DTI)
• Stage I
• Stage II
• Stage III
• Stage IV
• Unstageable
• ?mucosal injury
"If a patient is feverish, if a patient is faint, if he is sick after taking food, if he has a bed sore, it is generally the fault NOT OF THE DISEASE, BUT OF THE NURSING."

~Nightingale

Prevalence & Incidence Assessment for IAD

Evidence-Based Management of IAD

- 1st identify the source of IAD
  - In ICU frequently it is antibiotics or tube feeding
  - Consult nutritionist: evaluate osmolarity of tube feeding; add fiber to diet
- Consider medications to slow diarrhea

Evaluate medications that may be causing diarrhea
- ACE inhibitors, beta-blockers, digoxin, lasix, mannitol, octreotide, lactulose
- Absorbent underpads, changed frequently
- Low airloss therapeutic mattress

Evidence-Based Management of IAD

- First, do no harm…
  - Soaps ↑ skin pH
  - Wash clothes rough-up already fragile skin
  - Diapers/briefs keep moisture, enzymes in
- Cleans frequently and avoid scrubbing
- Apply barrier creams that: moisturize and protect skin
- Polymer-based underpads; limit linens

Cleans frequently…with what?

- Skin pH is acidic (5.0 to 6.0)
- Cleansing products should be pH balanced or neutral (7)
- Soaps are alkaline:
  - Dryness, irritation, breakdown, ↓ barrier
- Soap pH
  - Dove 7.0
  - Dial 7.9
  - Zest 10
- Use pH balanced no-rinse cleansing products

- Skin pH is acidic (5.0 to 6.0)
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- Wash clothes irritate skin
- Perineal wipes:
  - Are pH balanced
  - Contain moisturizers and emollients
- Skin protectant creams:
  - Dimethicone, petrolatum, zinc oxide
  - Use antifungal as indicated, early
- Keep skin clean, dry, moisturized, protected

Evidence-Based Management of IAD

- Containment devices
  - What’s the evidence?
  - Rectal pouches
    - 1-2 days; 2 individuals to apply correctly
    - May still tear intact skin upon removal
  - Nasopharyngeal airway
  - Mushroom catheter or balloon tipped catheter
  - Bowel Management Systems (BMS)

- What about CA-UTIs and urinary incontinence?
- How to prevent CA-UTIs?
  - How was the Foley placed
    - Is Foley secured
    - Foley always below bladder
    - Daily perineal care
    - Metered bag

- Remove Foley ASAP
- Bladder scan for bladder volume BEFORE patient can’t void
- Intermittent catheterization for retention
- Excessive moisture?
  - Treat cause/protection skin
“Poisoning by the skin is no less certain than poisoning by the mouth—only it is slower in its operation.”

~Nightingale

Florence Nightingale Notes on Nursing (1860/1969)

Practicing by Best-Evidence Nursing Care Making a Difference

• Assess on admission and daily
• Implement interventions driven by your assessment
  – Excessive moisture?
  – Apply barrier cream
  – NMBAs, Sedated, Intubated?
  – Turn frequently, prop and tuck bony prominences frequently, assess pressure redistribution
  – Critically evaluate your bathing/skin care system
  – Excessive moisture?
• Moisturize and hydrate the skin
  – Critically evaluate your bathing/skin care system
• Minimize friction and shear
  – HOB 30\(^\circ\), lift sheet, airpals
• Document POA and new pressure ulcers
  – Develop interprofessional plan of care

The Effects of Immobility/Supine Position on Respiratory Function

• Decreased Respiratory Motion
  – Abdomen influence on diaphragm motion
  – Atelectasis
• Decreased lung volume
• Increased airway resistance
• Increased Dependent Edema
  – Fluid accumulation in the dependant regions
  – Compression atelectasis

Pavey-LeTraon et al. 2007 EurJApplPhys:101
Oskenberg et al. 2000 Chest 118, Miyamoto et al. 2002 AmJCard:89

The Effects of Immobility/Supine Position on Respiratory Function

• Decreased Movement of Secretions
  – Impaired ability to clear tracheobronchial secretions
  – Normal mechanism dysfunctional in supine position
  – Mucociliary escalator
  – Gravity drainage
  – Cough reflex
• Increased Risk of Atelectasis & the Development of a Ventilator Associated Pneumonia

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Disclosure: Hill-Rom Inc. Speakers Bureau and Consultant
Skeletal Muscle Deconditioning

- Skeletal muscle strength reduces 4-5% every week of bed rest
- Without activity the muscle loses protein
- Healthy individuals on 5 days of strict bed rest develop insulin resistance and myocardial dysfunction
- 2 types of muscle atrophy
  - Primary: bed rest, space flight, limb casting
  - Secondary: pathology
- Muscle groups that lose strength most quickly related to immobilization are those that maintain posture, transferring positions & ambulation.
- One day of bed rest requires two weeks of reconditioning to restore baseline muscle strength

Homburg NL, Arterioscler Thromb Vasc Biol, 2007;27(12):2650-2656

Adverse Effects of Supine Positioning

GI
- Stomach contents displaced upward

Skin
- Pressure ulcers
- Decreased wound healing

Bone
- Degradation within 6-8 days; continues as long as bed rest occurs

Topp R et al. Am J Crit Care, 2002;13(2):263-76
Candow DG, Chilibick PD. J Gerontol, 2005:60A:148-155
Zhang et al. 2008 GenomProtBioinf: 6

Body Position: Clinical Practice vs. Standard

- Methodology
  - 74 patients/566 total hours of observation
  - 3 tertiary hospitals
  - Change in body position recorded every 15 minutes
  - Average observation time 7.7 hours
  - Online MD survey
- Results
  - 49.3% of observed time no body position change
  - 2.7% had a q 2 hour body position change
  - 80-90% believed q 2 hour position change should occur but only 57% believed it happened in their ICU

Krishnagopalan S. Crit Care Med 2002;30:2588-2592

Positioning Prevalence

Methodology
- Prospectively recorded, 2 days, 40 ICU’s in the UK
- Analysis on 393 sets of observations
- Turn defined as supine position to a right or left side lying
- Results:
  - 5 patients prone at any time, 3.8% (day 1) & 5% (day 2) rotating beds
  - Patients on back 46% of observation
  - Left 28.4%
  - Right 25%
  - Head up 97.4%
  - Average time between turns 4.85 hrs (3.3 SD)
  - No significant association between time and age, wt, h, resp dx, intubation, sedation score, day of wk, nurse/patient ratio, hospital

Goldhill DR et al. Anaesthesia 2008;63:509-515

Implementation Plan:
Moving Evidence into Practice

Mobilization
What is Progressive Mobility

- Progression:
  - Moving forward or onward
  - A continuous & connected series
- Mobility:
  - Capable of moving or being moved
- Progressive Mobility:
  - Planned movement in a sequential manner beginning at a patient’s current mobility status

Progressive Mobility Includes:

- Head elevation
- Manual turning
- Passive & Active ROM
- Continuous Lateral Rotation Therapy
- Movement against gravity
- Physiologic adaptation to an upright/leg down position (Tilt table, Bed Egress)
- Chair position
- Dangling
- Ambulation

HOB Research

Methodology:
- 86 patients
- Randomly assigned to supine position or HOB 45
  degrees (39 semi recumbent, 47 supine)
- Monitored clinical suspected & microbiologically
  confirmed nosocomial pneumonias

Results:
- Microbiologically confirmed nosocomial pneumonia
  lower in the semi recumbent group 2/39 (5%) vs. 11/47 (23%)
- Supine position & enteral nutrition were independent
  risk factors for VAP & had the greatest number of
  VAP’s 14/28 (50%)


Manual Turning

- Turn & reposition every 2
  hours (avoid positioning the
  patient on a pressure ulcer)
  - Pillows and cushioning
    devices to maintain alignment
    & prevent pressure on boney
    prominences
- Changes to sustain the gain
  - Tools inside the patient’s room
    (turn clock)
  - Unit or hospital wide musical
    cues
  - Use products that makes it
    easier to prevent pressure

www.ihi.org
Rieger SI et al. OWM, 2007;53(10):50-58
Systematic method of approaching placement & removal of rotational therapy

Advancing to Other Forms of Mobility

- Assess daily to determine readiness to progress to other forms of mobility using the following criteria
  - When the patient no longer fits the criteria that placed them on CLRT
  - When the patient can be mobilized into an upright position without hemodynamic compromise

The Beach Chair Position© in ICU

- Defined as having the patient’s Head of Bed elevated to 70 degree and their Foot of Bed at a negative 75 degree angle.
- Method of early mobilization
- Use with patients who are unable to walk or get out of bed to the chair due to:
  1. serious pathological and/or physiological conditions
  2. mechanical ventilation
  3. sedation
  4. hemodynamic instability
Design, Sample & Setting

- Non-randomized pilot study
- Single Academic Medical Center
- Aim: To decrease VAP rates, ICU and hospital LOS and vent days in STICU and NSICU
- Six month intervention began 06/06/2008, recruiting 200 pts meeting inclusion and exclusion criteria
- Intervention group: goal Beach Chair Position in 60 minute increments 4 times/day
- Comparison group: Six month retrospective ICU ventilated patients cohort

Ventilator-Acquired Pneumonia

No difference in ICU or Hospital LOS, severity of illness higher in the Beach chair group

Early ICU Mobility Therapy

Methodology

- Prospective cohort study
- Measured impact of mobility protocol on number of patients receiving physical therapy in ICU, ICU LOS, Hospital LOS & costs when compared to usual care
- 330 mechanically ventilated patients
- Protocol group via Mobility team (nurse, physio, nursing assistant) had the protocol initiated with in 48hrs of intubation/72 hours in the ICU
- 4 phase step wise mobility progression based on physiologic condition
- Outcome measures preformed on protocol group & usual care patients that survived to discharge

Results

- Baseline characteristic similar in both groups
- Protocol group:
  - received at least 1 PT session vs. usual care (80% vs. 47%, p ≤ .001)
  - Out of bed earlier (5 vs. 11 days, p ≤ .001)
  - Therapy initiated more frequently in the ICU (91% vs. 13%, p ≤ .001)
  - Reduced ICU LOS (5.5 days vs. 6.9 days, p=.025)
  - Reduced Hospital LOS (11.2 days vs. 14.5 days, p =.006)
  - No adverse outcomes; most frequent reason for ending mobility session was patient fatigue
  - No cost difference between protocol/mobility team & usual care

Early PT & OT in Mechanically Ventilated Patients: RCT

- MV patients < 72hrs met criteria for baseline functional independence
- 1161 patients screened/104 pts randomized to:
  - early PT & OT during daily sedation interruption (n=49)
  - Daily interruption of sedation with therapy as ordered by primary care team (n=55)
- Primary outcomes: # of pts returning to baseline independent function at hospital d/c (6 ADL’s & walk independently)
- Secondary outcomes: Duration of delirium and VFD during first 28 days of their hospital stay

Schweickert, WD, et al. Lancet, 2009; Online May 14th
Early PT & OT in Mechanically Ventilated Patients: RCT

Results
- Time to PT after intubation
  - Intervention: 1.5 days
  - Control: 7.2 days
- Total sedation duration longer & delirium (2 days) in the control
- Variable associated with independence
  - Age, absence of sepsis, intervention
- Adverse events uncommon
- No diff in ICU or hospital LOS

2009 - Progressive Patient Positioning

- Old way
  - Admission, bed, immobility, supine, complications
- New way
  - Lateral rotation
  - HOB elevation
  - Full-chair position
  - Bed egress/weight bearing
  - Bedside chair
  - Ambulation
  - Enhanced recovery

Human & Technological Resources

- Personnel
- Aging personnel
- Use of Lift teams
- Fear
- Lines and tubes
- Patient size

Can We Safely Mobilize Intubated Patients?

Early Activity is Safe & Feasible in ARF Patients

Methodology
- Prospective cohort study
- 103 patients/1449 activity events
- Mechanically ventilated patients for > 4 days
- Airway: Tracheotomy & endotracheal tube
- Measured recorded activity events & adverse events
- Activity events included:
  - Sit on bed, Sit in chair, Ambulate
- Adverse events defined as:
  - Fall to knees, tube removal, SBP > 200 mmHg, SBP < 90 mmHg, O2 desaturation < 80% & extubation


Barriers to Mobility Strategies

- Human or Technological Resources
- Hemodynamic instability
- Knowledge/Priority

Morris PE Crit Care Clin, 2007;23:1-20
Early Activity is Safe & Feasible in ARF Patients

Results:
• Activity events included:
  - Sit on bed (233 or 16%)
  - Sit in chair (454 or 31%)
  - Ambulate (762 or 53%)
• With an ET in place:
  - Sit on bed, chair or ambulate (593)
  - Ambulate (249 or 42%)
• Adverse events
  - < 1% activity related adverse events (no extubations occurred)
  - 69% all to ambulate at > 100 feet at RICU discharge


Hemodynamic Instability

Is it a Barrier to Positioning?

Hemodynamic Status

• No differences noted in hemodynamic variables between supine & positions
• Lateral turn results in a 3-9% decrease in SVO2 which takes 5-10 minutes to return to baseline
• Appears the act of turning has the greatest impact on any instability seen
• Minimize factors which contribute to imbalances in oxygen supply & demand

Price P. Dynamics CACCN, 2006, 17(1):12

Patients at Risk for Intolerance to Positioning

• Elderly
• Diabetes with neuropathy
• Prolonged bedrest
• Low Hb an cardiovascular reserve
• Prolonged gravitational equilibrium


Building a Comprehensive Mobility Protocol

Impacting Patient Outcomes

Admission & Daily Mobility Assessment

• Is the patient immobile?
• If immobile, do they meet the criteria for CLRT &/or unable to tolerate manual turning … Initiate CLRT
• If not a candidate for CLRT, place HOB at 30 degrees & initiate every 2 hour manual turning
• Post 24 hours consider Beach chair positioning
• Post 48 hours assess for readiness to progress
Implementation/Measuring Success

- Create a Team
- Review the evidence-based guideline
- Ensure you have policies and procedures for progressive mobility (prone, CLRT, Upright/chair/ambulation)
- Identify additional resources for the change
- Determine outcomes measures
  - VAP, time on ventilator, LOS, functional ability, pressure ulcers
- Build value using the science
- Change strategies
- Measuring the outcome and celebrating

Prevention of Sternal Wound Infections Following Cardiac Surgery

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Surgical Site Infections

- Post-operative infection is a major cause of patient injury, mortality and healthcare costs
- A surgical site infection (SSI) is defined as:
  - An infection that develops within 30 days after an operation
  - Occurs within one year, if an implant was placed and related to the surgery
- It is estimated that approximately 500,000 to 750,000 surgical site infections (SSI) occur annually in the USA (2% - 5% of inpatient surgeries)

Pathogenesis of Surgical Site Infections

- Bacteria contaminate every surgical wound
- The amount of bacteria required to cause infection in a wound is variable and depends on:
  - Virulence of the organism
  - Condition of the wound
  - Presence of non-biologic substance
  - Host immune competence

Methods of Surveillance of SSI

- Direct method: ("gold standard") daily observation of the surgical site (impractical)
- Indirect methods: (can be reliable, with high sensitivity and specificity)
  - Review of microbiology reports and patient records
  - Surgeon and/or patient surveys
  - Screening for remissions of surgical patients
  - Others: coding diagnoses or operative reports
  - Post-discharge surveillance (no standard or reliable method established)

Classifications of SSIs

- Superficial incisional SSI (involving only skin or subcutaneous tissue of the incision)
- Deep incisional SSI (involving fascia and/or muscular layers)
- Organ/space
Significance of SSIs

- SSIs develop in almost 2% of patients after discharge and are five times as likely to be readmitted.
- Patients who develop an SSI:
  - Require significantly more medical care/↑ costs
  - Are 60% more likely to spend time in ICU
  - May have a ↑ LOS by ~1 to 2 weeks
  - Increased mortality (is doubled or greater)
  - 2-11x higher risk of death (compared with surgical patients without a SSI)

Rhee, H. & Harris, B., Infection Control Today, March, 2008

Surgical Infection Prevention (SIP) Project was developed in 2002.

- National, collaborative quality initiative to substantially reduce surgical mortality and morbidity through collaborative efforts.
- SCIP became the expanded project to include surgical complications in 2006 by Centers for Medicare and Medicaid Services (CMS) and the Joint Commission.

Fitzgerald, J. et. al, Nursing Management, Nov. 2007, 35

SCIP Steering Committee
(10 National Organizations)

- Centers for Medicare & Medicaid Services
- Centers for Disease Control and Prevention
- Department of Veteran’s Affairs
- Institute for Healthcare Improvement
- Joint Commission
- American College of Surgeons
- American Hospital Association
- American Society of Anesthesiologists
- Association of Peri-Operative RNs
- Agency for Healthcare Research and Quality

SCIP/SCIP National Expert Panel

- Society for Healthcare Epidemiology of America
- Association of Peri-Op Registered Nurses
- American Association of Critical Care Nurses
- American College of Obstetricians & Gynecologists
- Society of Thoracic Surgeons (STS)
- Surgical Infection Society
- VHA, Inc.
- American Academy of Orthopedic Surgeons
- American Society of Anesthesiologists
- American Society of Health System Pharmacists
- American Geriatrics Society

SIP/ SCIP- Opportunity to Prevent Surgical Site Infections

- Evidence shows that approximately 40 – 60% of SSIs can be prevented
- GOAL: To reduce incidence of surgical complications by 25% by the year 2010* (*in selected surgical procedure patients)


Three performance measures were created related to antimicrobial prophylaxis:

1. Timely delivery of IV antimicrobial prophylaxis within one hour of surgical incision (2 hrs if Vanco)

2. Use of appropriate prophylactic antimicrobial selection- based on published guidelines

3. Discontinuation of antimicrobials within 24 hours after surgery end time (48 hrs OK for cardiac surgery patients)
Three Added Performance Measures to Prevent SSIs (SCIP, 2003)

Surgical Care Improvement Project (SCIP) added 3 evidence-based measures:
1. Proper hair removal (or no hair removal)
2. Peri-operative normothermia for colorectal surgery patients
3. Controlling blood glucose during immediate post-operative period to < 200mg/dl for cardiac surgery patients

SCIP Selected Surgical Procedures

- Cardiac Surgery
  - Coronary Artery Bypass Graft (CABG)
- Colon
- Hip & Knee Arthroplasty
- Abdominal & Vaginal Hysterectomy
- Vascular Surgery
  - *Aneurysm repair
  - *Thromboendarterectomy
  - *Vein Bypass

Mediastinitis

- Occurs after 0.25% to 4% of cardiac surgeries
- Mortality rates range from 10% to 47% with costs of $40K to $50K per case
- Coagulase-negative Staphylococcus species account for half of all cases
- Especially complicated course when there are multiple antibiotic-resistant pathogens present such as MRSA

SCIP Quality Initiatives and Application to Cardiac Surgery Patients ("CABG")

- Appropriate use of prophylactic antibiotics
  - Antibiotic selection
  - Timing of administration
  - Timing for discontinuation post-op
- Appropriate hair removal and skin prep
- Controlled post-operative serum glucose

Deep Sternal Wound Following Cardiac Surgery

**CDC and DHS definition:**

- Infection occurs within 30 days of surgery AND
- Involves the deep, soft tissues (fascial and muscle layers) of the incision AND
- Patient has at least ONE of the following:
  - Purulent drainage from the deep incision
  - Incision spontaneously dehisces or is deliberately opened by the surgeon and is culture +, or fever, pain or tenderness
  - Abscess/infection found on exam, re-operation, histopathology or radiologic exam
- Diagnosis of deep incisional SSI is made by the surgeon/attending MD

Medications/ CMS- “Pay for Performance”
(acute care, in-patient prospective payment system)
Who is at Risk for Sternal SSI?

**Host Risk Factors:**
- Obesity
- Diabetes Mellitus
- Use of IMA grafts
- Advanced age
- Male gender
- COPD
- Smoking
- Prolonged mechanical ventilation
- Steroids
- Pre-op hospital stay > 5 days

**Surgical Risk Factors:**
- Duration of surgery and perfusion time
- Use of an IABP
- Post-operative bleeding
- Re-operation
- Sternal re-wiring
- Extensive electrocautery
- Shaving with razors
- Use of bone wax

Prophylactic Antibiotic Selection and Timing for Cardiac Surgery

- **Pre-op** dose of 2 gm IV Cefazolin for a patient >60 kg body weight
- Repeat dose every 3 - 4 hours (while surgical incision remains open) - if normal renal function
- If β-lactam allergy to Penicillin or Cefalosporin: give Vancomycin or Clindamycin as acceptable substitutes
- Vancomycin dose of 1 to 1.5 gm IV or a weight-adjusted dose of 15 mg/kg IV, slowly over 1 hour, with completion within 1 hour of skin incision
- A 2.1 gm dose of Vancocin can be considered during CPB
- Mupirocin topical antibiotic in nares pre-op and post-op may also be considered

Peri-operative Antibiotics Timing of Administration

Discontinuation of Antibiotics

**SCIP Guidelines:**
- Most surgical procedures - D/C antibiotics within 24 hours of surgery end time
- Cardiac surgery - may D/C antibiotics within 48 hours of surgery end time

**STS Guidelines:**
- Do not favor 24 hours over 48 hours for discontinuation (surgeon/team preference)

Serum Glucose Control

- Strong relationship between hyperglycemia and surgical site infections - inhibits healing and the normal immune response
- Latham (2001) found that any cardiac surgery patient who had a glucose > 300 mg/dl within 48 hours post-op, was 3.3 times more likely to develop SSI than if glucose was kept < 200 mg/dl
- Evidence supports keeping serum glucose levels < 200 mg/dl in the peri-op and post-op phases
- SCIP guideline supports cardiac surgery patients to have controlled 08am post-operative serum glucose

Other Strategies

- **Appropriate hair removal**
  - Clipped (never shaved), just before surgery
- Systematic literature review by Kjonniksen et al (2002) showed:
  - No strong evidence to contraindicate preoperative hair removal; however, strong evidence against hair removal with a razor
  - Recommends depilatory or electric clippers used immediately prior to surgery when hair removal is required


Hollenbeak, C. et. al., *Chest*, 2000, 118(20):397


Hollenbeak, C. et. al., *Chest*, 2000, 118(20):397


Hall, M., SCIP: Medscape.com, Module 1, May, 2006


Preoperative Skin Preparation

- Adequate skin antiseptics/pre-op skin preparation
  - Agent with broad spectrum of activity
  - Rapid onset
  - Persistent effects
    *Most common: iodine, alcohol-based products and chlorhexidine (2% vs. 4%)
- Cochrane Collaboration Systematic Review (2007; assessed as up-to-date Sept., 2008)- Review objective was to review the evidence for preoperative bathing or showering with antiseptics for the prevention of hospital-acquired (nosocomial) surgical site infections (SSIs)
  - Baseline: Actively part of National SCIP program
  - Observational study with a pre & post intervention
  - Selection criteria:
    - RCTs which compared any antiseptic prep used for pre-op, full-body bathing or showering, with non-antiseptic preps in patients undergoing surgery
  - Results: Six trials involved a total of 10,007 participants
    - Three of the trials included, had three comparison groups
    - The antiseptic used in all trials was 4% chlorhexidine
    - Three trials, involving 7691 participants compared chlorhexidine with a placebo

Cochrane Systematic Review for Preoperative Bathing/Showering

- Background:
  - Pre-op bathing/showering with an antiseptic skin wash, is well accepted to reduce skin bacteria (microflora)
  - Less clear whether reducing skin microflora leads to a lower incidence of SSI

- Selection criteria:
  - RCTs which compared any antiseptic prep used for pre-op, full-body bathing or showering, with non-antiseptic preps in patients undergoing surgery

- Results:
  - 3396 participants compared
  - 11 SSI’s during historical period out of 4774 procedures (rate of SSIs = 2.1%)
  - Post-intervention period out of 4266 procedures (rate of SSIs = 0.7%)
  - 72% reduction

Innovative Strategy: 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 done the night before in home showering or washing with 4% CHG solution
- Post intervention: Pre-op prep done with a pre-packaged 2% CHG prep product with instructions for use
- Pre-package prep done at hospital prior to surgery
- Measured:
  - Change in baseline of SSI with new prep process

Mupirocin for Staph Aureus

- Staph aureus is the leading nosocomial pathogen globally (large portion is shown to be from the patient’s own flora)
- Associated with substantial morbidity and mortality
- Increasing trends in widespread MRSA
- Large study estimated that 0.6% of all hospitalized patients in USA suffer Staph aureus infection
- Annual impact of > $9.5 billion in excess hospital costs and at least 12,000 in-patient deaths
- Approximately 30% of the population carries Staph aureus at any given moment
- Nasal carriage “carrier” of Staph aureus is a known increased risk factor for subsequent infection in surgical patients

Cochrane Systematic Review for the Use of Mupirocin Pre and Post-Op

- Objective: to review the impact of treating identified carriers of Staph aureus pre-operatively with mupirocin nasal ointment to decrease post-op Staph aureus infection rates

- Key points:
  - Nine RCT’s involving 3396 participants
  - Subgroup analysis of surgical trials demonstrated significant reductions in Staph aureus infections in mupirocin treated patients overall; but effect disappeared if analysis included only SSIs with Staph aureus (possibly due to a lack of power)

- Conclusion: in nasal carriers of Staph aureus, the use of mupirocin/ointment results in a statistically significant reduction in Staph aureus infections.
Staph Aureus Carriers

- **Pre-op screening for MRSA**
  - PCR rapid analysis for Staphylococcus to detect colonization (“carriers”)

- **Mupirocin** intranasal has been recommended as a prophylactic measure limited to colonized patients to eradicate the nasal colonization of S. Aureus—including MRSA:
  - Begin at least the day before surgery
  - Continue for 2 – 5 days post-op
  - Considered a “sensible approach” (per STS)

Other Strategies

- **Post-op wound care and dressing changes**
  - No consensus on best practice

- **CDC (1999) recommends:**
  - Protect the incision for 24 to 48 hours after surgery with a sterile dressing
  - Wash hands before and after dressing changes and contact with the incisional site
  - No dressing should be taken off with bare, unwashed hands
  - Use sterile technique to change incisional dressings

Summary

- **Pre-operative phase**
  - Consider Staph aureus screening and mupirocin intranasal ointment pre-op in Staph aureus carriers
  - Skin antisepsis acceptable with choice of product
  - Surgical site preparation- appropriate hair removal as needed just before surgery
  - Appropriate selection and administration of antibiotics infused within one hour of incision

Summary

- **Intra-operative phase**
  - Antimicrobial administration may be repeated with length of procedure and/or blood loss
  - Hyperglycemic management
  - Management of OR environment
    - ↓ OR traffic
    - Minimal use of electrocautery
    - Minimal of no use of bone wax
    - Double-glove barrier technique
    - No infractions in sterile technique

Summary

- **Post-operative phase**
  - Appropriate discontinuation of antibiotics at 24 to 48 hours from end of surgery time
  - Maintain serum glucose < 200mg/dl post-op (CV programs vary on top of range: < 150 – 200mg/dl)
  - Post-op incisional care- sterile technique
  - Patient education to include:
    - signs and symptoms of possible SSI
    - prevention strategies post-op and at home
    - what to report to MD/ NP/ PA/ RN (and when)
Thank You

Eliminating Central Line Associated Blood Stream Infections (CLA-BSI)

- Incidence and risk factors
- Evidence based strategies to eliminate CLA-BSI—the BSI Bundle
- Additional strategies
- Insertion process standardization, education and evaluation
- Michigan Hospital Association Keystone ICU Collaborative

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: $3,700 to 29,000
- Annual cost: $296 million - $2.3 billion

SHEA and IDSA, Infection Control and Hospital Epidemiology Oct 2008

Risk Factors Associated with Increased Infections

- Prolonged hospitalization before catheterization
- Prolonged duration of catheterization
- Heavy microbial colonization at the insertion site
- Heavy microbial colonization of the catheter hub
- Internal jugular catheterization and femoral catheterization
- Neutropenia
- Total parenteral nutrition
- Substandard care of the catheter

Reduce Complexity – Increase Reliability

- Identify interventions associated with improved outcomes in specified population
- Select strongest interventions and convert to behaviors (“Bundles”)
- Develop measures (either process or outcome)
- Ensure patients reliably receive evidence
Blood Stream Infection (BSI)
Prevention Bundle

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

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

What Does the ‘Bundle’ Evidence Tell Us?

What are Maximal Barrier Precautions?

- For Provider:
  - Hands hygiene
  - Non-sterile cap and mask
    - All hair should be under cap
    - Mask should cover nose and mouth tightly
  - Sterile gown and gloves
- For the Patient
  - Cover patient’s head and body with a large sterile drape

Maximal Barrier Precautions

Efficacy of Maximal Sterile Barrier Precautions

<table>
<thead>
<tr>
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<th>Minimal</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local inf.</td>
<td>7.2%</td>
<td>2.3%</td>
</tr>
<tr>
<td>CVC-BSI</td>
<td>3.6%</td>
<td>0.6%</td>
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</tbody>
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** sterile gloves, small sterile drape
* cap, mask, sterile gloves, sterile gown, head/body of patient covered with large sterile drape


Chlorhexidine vs. Povidone Iodine for Catheter Site Care

Chlorehexidine Gluconate 2% with Isopropyl Alcohol 70%: Why is a Better Barrier than Betadine?

- Rapid bactericidal activity
  - (affective after 30 sec vs. 2 min)
- Persistent activity on the skin & cumulative
- Maintains its activity in the presence of other organic material
- Low allergic or toxic response
- None or mild systemic absorption


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 replaced 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.


Care After Insertion

- Disinfect catheter hubs, needleless connectors, and injection ports before accessing the catheter
- Change transparent dressing and perform site care with a CHG based antiseptic every 5-7 days or more frequent if the dressing is soiled, loose, or damp;
- Change gauze dressings every 2 days or more frequent if the dressing is loose, soiled or damp
- Replace administration sets not used for blood, blood products or lipids at intervals not longer than 96 hours

SHEA and IDSA, Infection Control and Hospital Epidemiology. Oct 2008

Additional Strategies:
- CHG Baths
- CHG Dressings
- Antimicrobial impregnated CVC

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

Bleasdale SC. et al. Arch Internal Med, 2007;167(18):2073-2079
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


CHG-impregnated Sponges for Prevention of CLA-BSI

Methodology:
- Multi-center, randomized controlled trial
- 7 ICUs participated
- Included all patients who required arterial or central venous catheter for 48 hours or longer
- Use of CHG dressing vs standard dressing
- Already using maximal barrier precautions, try and use subclavian site for central line, use alcohol/povidone-iodine prep solution (not CHG)
- Looked at 3 day vs. seven day dressing change (but changed when dressing was loose, soiled or damp in all gps)

Timsit JF, et al. JAMA 2009;301:1231-1241

CHG-impregnated Sponges for Prevention of CLA-BSI

Results:
- 1636 patients (3778 catheters, 28,931 catheter days)
- Median duration of catheter insertions 6 days (4-10)
- Use of CHG dressing decreased the CLA-BSI rate from:
  - 1.3 per 1000 catheter days to 0.4 per 1000 catheter days
- Use of CHG dressing not associated with greater resistance of bacteria in skin samples at removal
- 8 episodes of contact dermatitis with patch (817 pts)
- No difference in site colonization between dressing changes at 3 days or 7 days

Prevented 1 Major CLA-BSI per 117 Catheters

Timsit JF, et al. JAMA 2009;301:1231-1241

Antimicrobial CVC

Recommendations:
- Use of antimicrobial CVC should be limited to hospital units or patient populations have a CLABSI rate higher than the institutional goal, despite compliance with basic CLABSI prevention practices.


SHEA and IDSA, Infection Control and Hospital Epidemiology Oct 2008
How to Implement the Evidence Through a State-wide Collaborative

- Create Culture of Safety:
  - Completed unit education on patient safety
  - Training to senior medical staff and residents
  - Education to nurses and respiratory therapists
  - Empower nurses/RT to stop line placement
  - Pre-procedure Briefing
- Improve Processes
  - Reduce complexity: Line cart
  - Create independent checks for key processes: BSI checklist
  - Nurse in room during line insertion
  - Sign on door: 'Procedure in progress' to decrease traffic in room
- Automate:
  - Put checklist and standard documentation in new bedside computer system

Pre-Procedure Briefing Steps:

- Make introductions
- Discuss patient information and procedure
- Agree upon a time for line insertion
- Review best practice for line insertion (if necessary)
- Nurse defines their role to physician: provide equipment, monitor patient, provide patient comfort, observe for compliance with best practices and STOP procedure if sterile process compromised
  - Establish communication expectation for sterile procedure breaks
  - Examples include: your sleeve has touched the IV pole, the guidewire touched the headboard

Pre-Procedure Briefing Steps:

- Identify any special supply or procedural needs
- Discuss any special patient issues (IE: patient confused, patient awake)
- Answer any additional questions
- TIME OUT: RIGHT PATIENT—RIGHT PROCEDURE

Are We Implementing the Prevention Strategies and are They Effective???

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

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

- 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=.30)
- 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.


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)


St. Joseph Mercy Health System
Ann Arbor, MI

- 3 hospital system: 2 hospital having 4 ICUs
- Implemented BSI Bundle in July 2004
  - 5 best practices
    - BSI checklist
    - Line cart
    - Empower nurses to stop line placement if procedure not followed
    - Nurse in room during line insertion
    - Education—Education—Education
    - Share data monthly and chart review each of CLA-BSI (Learn from a Defect)

Posa, P Harrison, D & Vollman, K AACN Advanced Critical Care, 2006; 17(4):446-454

Results:

- Baseline rate: 7.6 per 1000 catheter days
  - 2005: 2.12 per 1000 catheter days
  - 2006: 1.11 per 1000 catheter days
  - 2007: 1.12 per 1000 catheter days
  - 2008: 0.9 per 1000 catheter days

St. Joseph Mercy Health System
Ann Arbor, MI

- Livingston CCU: 38 months without a BSI
- MICU: 29 months without a BSI
- CCU: 17 months without a BSI
- SICU: 6 months without a BSI

Results:

- Marginal cost avoidance of $8,800 per BSI prevented
  - 2004: 36 BSIs
  - 2005: 13 BSIs
  - 2006: 8 BSIs
  - 2007: 8 BSIs

$ 220,000 Marginal Cost Avoidance Between 2004 and 2005
Elimination of Catheter Associated Blood Stream Infections

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TARGET ZERO!!!!!!!

Our Next Steps

- Evaluation of the impact of the CHG Bath in all ICUs
- Use of the CHG dressing for femoral and PICC lines

Keys to Success

- Team in place with key stakeholders overseeing implementation
- Project coordinator with lead clinical staff on each unit
- Strong physician leadership on team
- Education of staff through use of BSI checklist
- Empowerment of nursing staff to prevent errors
- Administrative support to help manage barriers
- Review data monthly for opportunities for improvement (if further analysis is needed can use Learn from a Defect Tool)
- Support from state-wide collaborative

A Healthcare Imperative

“In medicine, as in any profession, we must grapple with systems, resources, circumstances, people—and our own shortcomings, as well. We face obstacles of seemingly endless variety. Yet somehow we must advance, we must refine, we must improve.”


Panel Discussion
CREATE A SAFE PATIENT ENVIRONMENT

Everyday hospital care activities increase the patient’s risk of INJURY & BACTERIAL INVASION ……

Help reduce that risk by changing the routine ways you provide care & replace it with the evidence….

WHEN WOULD NOW BE A GOOD TIME TO DO THIS?

Looking Through A Different Lens

“Setting an Example is Not the Main Means of Influencing Others….It is the Only Means”

Albert Einstein

Every Nurse is a Leader

“The shadow of the leader” is suggestive language used to describe how a leader’s choices, actions, style and values dramatically influence those same things within a unit/organization.

Most Important Words of Personal Responsibility

The 10th most important words: I won’t wait for others to take the first step.
The 9th most important words: If it is to be, it is up to me.
The 8th most important words: If it is not me, who? If not now, when?
The 7th most important words: Let me take a shot at it.
The 6th most important words: I will not pass the buck.
The 5th most important words: You can Count on me.
The 4th most important words: It is my job!
The 3rd most important words: Just do it!
The 2nd most important words: I will.
The 1 most important word: Me

B. J. Gallagher & Steve Ventura
Who are “They” any way?