Killing the Sacred Cows Through the Use of the Evidence

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Evidence-Based Practice

- Empowering Critical Care Nurses to Improve Compliance w Protocols in the ICU
- EBP:
  - Elicit Best-Practice Performance From Healthcare Practitioners
  - Improve Patients’ Outcomes

Plost & Nelson, AJCC, March 2007,
Evidence-Based Practice

- EBP:
  - Simplifies Processes
  - Standardizes Care
  - Facilitates Patients’ Safety
  - Reduces Cost

Plöst & Nelson, *AJCC; 2007*

**CAN WE MOBILIZE CRITICALLY ILL PATIENTS SAFELY AND IS THERE A BENEFIT?**
The Effects of Immobility/Supine Position on Respiratory Function

- Decreased Respiratory Motion
  - Abdomen influence on diaphragm motion
  - Atelectasis
- Increased Dependent Edema
  - Fluid accumulation in the dependent regions
  - Compression atelectasis
- Decreased Movement of Secretions
  - Impaired ability to clear tracheobronchial secretions
  - Normal mechanism dysfunctional in supine position

The Effects of Immobility on Cardiovascular Function

• Fluid Shift
  – Fluid shift from upright to sitting…500cc shift
  – ↓ of plasma volume of 8-10% that occurs in the first 3 days of bedrest
  – Stabilizes at 15-20% volume loss by the 4th week of bedrest

• Cardiac Effects
  – ↑ workload (fluid shift)
  – ↑ resting heart rate & ↓ cardiac output

• Cardiac Deconditioning & Decreased Maximum Oxygen Uptake
  – Falls 23% after 3 weeks of strict bedrest


The Effects of Immobility on Cardiovascular Function

• Orthostatic Intolerance
  – Deteriorates rapidly with bed rest
  – Occurs within 1-2 days with maximum effect at 3 weeks
  – Results from decreased autonomic tone & fluid shifts

Melada, G.A., et. al. Space and Environmental Medicine, August 1976
Pressure Ulcers – Risk Factors

1. Immobility 87.0%
2. Fecal Incontinence 56.7%
3. Malnutrition 54.4%
4. Decreased Mental Status 50.7%
5. Peripheral Vascular Disease 28.1%
6. Urinary Incontinence 27.0%
7. Diabetes 23.7%

Skeletal Muscle Deconditioning

- Skeletal muscle strength reduces 4-5% every week of bed rest (1-1.5% per day)
- Without activity the muscle loses protein
- Healthy individuals on 5 days of strict bed rest develop insulin resistance and microvascular dysfunction
- 2 types of muscle atrophy
  - Primary: bed rest, space flight, limb casting
  - Secondary: pathology

Skeletal Muscle Deconditioning

- Muscle groups that lose strength most quickly related to immobilization are those that maintain posture, transferring positions & ambulation.
- > 1/3 of patients with ICU stays greater than two weeks had at least two functionally significant joint contractures.
- Muscle atrophy in mechanically ventilated patients contribute to fatigue of the diaphragm and challenges with weaning.
- Degradation within 6-8 days; continues as long as bedrest occurs
- One day of bed rest requires two weeks of reconditioning to restore baseline muscle strength
Impact of Quality of Life

Functional Disability 5 Years after ARDS

• 109 survivors of ARDS at 3, 6, 12 months, 2, 3, 4 & 5 yrs
• Interviewed, pulmonary function tests, 6 minute walk test, resting & exercise oximetry, chest imaging, quality of life & reported use of health services
• Results:
  – Median 6 minute walk distance 436m (76% of predicated)
  – Physical component score of medical outcomes was 41 (mean norm score matched for age & sex, 50)
  – Pulmonary function normal or near normal
  – Constellation of other physical & psychological problems develop or persisted in pts & family caregivers for up to 5 yrs

Definition

- **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 and returning them to baseline

Progressive Mobility Includes:

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

- ↓ incidence of skin injury
- ↓ time on the ventilator
- ↓ incidence of VAP
- ↓ days of sedation
- ↓ delirium
- ↑ ambulatory distance
- Improved function

Thomsen GE, et al. CCM 2008;36;1119-1124
Winkelman C et al, CCN,2010;30:36-60

Progressive Mobility Continuum

START HERE

Perform Initial mobility screen w/in 8 hours of ICU admission
Reassess mobility at least every 24 hours
Recommended at shift change

- RASS -5 to -3
- Goal: upright sitting; increased strength and moves arm against gravity
- PT consultation p/rn
- OT consultation p/rn

- RASS -3 & up
- Goal: upright sitting, increased strength and moves arm against gravity
- PT consultation p/rn
- OT consultation p/rn

- RASS -1 & up
- Goal: (level II)
- RASS 0 & up
- Goal: Increase distance in ambulation & ability to perform some ADLs

For each position/activity change allow 5-10 minutes for equilibration before determining the patient is intolerant

*Mobility is the responsibility of the RN, with the assistance from the RN’s Unlicensed Assistive Personnel and PT/OT. PT and OT may assist the team with placement to the appropriate mobility level of activity, always prioritizing patient and provider safety. Placement is based on clinical judgment.
# Determining Readiness

## Mobility Assessment for Readiness

- Perform Initial mobility screen w/in 8 hours of ICU admission & daily

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient Stable, Start at Level II &amp; progress</td>
<td>Patient is unstable, start at Level I &amp; progress</td>
</tr>
</tbody>
</table>

- PaO2/FiO2 > 250
- Peep <10
- O2 Sat > 90%
- RR 10-30
- No new onset cardiac arrhythmias or ischemia
- HR >60 <120
- MAP >55 <140
- SBP >90 <180
- No new or increasing vasopressor infusion
- RASS > -3
WITHOUT EFFECTIVE SEDATION & DELIRIUM MANAGEMENT MOBILITY PROGRAMS WILL LIKELY FAIL

Wake up & breathe, lower sedation use, demonstrates 14% absolute survival advantage, 4 day reduction in LOS & no difference in incidence of PTSD, depression or cognitive decline & less likely to report functional decline 1 yr post follow up.

Jackson JC. et al. Am J Respir Crit Care Med; 2010;182:183-191
## Continuous Lateral Rotation Therapy

### Figure 4

Meta-analysis of pneumonia (with subgroups of prophylaxis and treatment for respiratory dysfunction): rotation versus control.

<table>
<thead>
<tr>
<th>Study or subcategory</th>
<th>Proportion of patients with pneumonia</th>
<th>Odds ratio (fixed)</th>
<th>Weight (%)</th>
<th>Odds ratio (fixed)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rotation</td>
<td>Control</td>
<td>95% CI</td>
<td>95% CI</td>
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<tr>
<td>Pneumonia and prophylaxis</td>
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<td></td>
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<tr>
<td>Demarest et al**</td>
<td>1/16</td>
<td>4/14</td>
<td>3.45</td>
<td>0.12 (0.02, 1.72)</td>
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<tr>
<td>Fink et al**</td>
<td>7/51</td>
<td>19/48</td>
<td>14.55</td>
<td>0.24 (0.09, 0.65)</td>
</tr>
<tr>
<td>Gentilello et al**</td>
<td>5/27</td>
<td>13/38</td>
<td>7.58</td>
<td>0.44 (0.13, 1.42)</td>
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<tr>
<td>Kelley et al**</td>
<td>5/18</td>
<td>13/25</td>
<td>6.77</td>
<td>0.36 (0.10, 1.30)</td>
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<tr>
<td>Kirschenbaum et al**</td>
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<td>10/20</td>
<td>6.52</td>
<td>0.21 (0.05, 0.98)</td>
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<tr>
<td>Summer et al**</td>
<td>4/41</td>
<td>7/42</td>
<td>5.38</td>
<td>0.54 (0.15, 2.01)</td>
</tr>
<tr>
<td>Traver et al**</td>
<td>8/44</td>
<td>17/59</td>
<td>10.24</td>
<td>0.55 (0.21, 1.42)</td>
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<tr>
<td>Whiteman et al**</td>
<td>10/33</td>
<td>14/36</td>
<td>8.04</td>
<td>0.68 (0.25, 1.86)</td>
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<tr>
<td>deBoisblanc et al**</td>
<td>6/49</td>
<td>11/51</td>
<td>9.95</td>
<td>0.35 (0.12, 1.01)</td>
</tr>
<tr>
<td>Subtotal (95% CI)</td>
<td>46/316</td>
<td>106/333</td>
<td>72.49</td>
<td>0.40 (0.27, 0.58)</td>
</tr>
</tbody>
</table>

Test for heterogeneity: $\chi^2 = 4.03$, df = 8 ($P = .85$), $I^2 = 0$

Test for overall effect: $Z = 4.06$ ($P < .001$)

Pneumonia treatment:

<table>
<thead>
<tr>
<th>Study or subcategory</th>
<th>Proportion of patients with pneumonia</th>
<th>Odds ratio (fixed)</th>
<th>Weight (%)</th>
<th>Odds ratio (fixed)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Rotation</td>
<td>Control</td>
<td>95% CI</td>
<td>95% CI</td>
</tr>
<tr>
<td>Ahrens et al**</td>
<td>1/47</td>
<td>45/137</td>
<td>27.51</td>
<td>0.34 (0.18, 0.67)</td>
</tr>
<tr>
<td>Subtotal (95% CI)</td>
<td>1/47</td>
<td>45/137</td>
<td>27.51</td>
<td>0.34 (0.18, 0.67)</td>
</tr>
</tbody>
</table>

Test for overall effect: $Z = 3.12$ ($P = .002$)

Total (95% CI) | 63/413 | 153/470 | 100.00 | 0.38 (0.27, 0.53) |

Test for heterogeneity: $\chi^2 = 4.16$, df = 9 ($P = .60$), $I^2 = 0$

Test for overall effect: $Z = 5.63$ ($P < .001$)

Goldhill DR et al. Amer J Crit Care, 2007;16:50-62
CLRT to Prevent VAP

Methodology
- Prospective randomized controlled trial, 3 medical ICUs at a single center
- Eligible if ventilated < 48 hours & free from pneumonia, ALI or in ARDS
- 150 patients with 75 in each group
- 35 CLRT patients allocated to undergo percussion before suctioning
- Measures to prevent VAP were standardized for both groups including HOB

Results: CLRT vs. Control
- VAP: 11% vs. 23% p = .048
- Ventilation duration: 8 ± 5 days vs. 14 ± 23 days, p = .02
- LOS: 25 ± 22 vs. 39 ± 45 days, p = .01
- Mortality: no difference


CLRT Practical Challenges
- CLRT is an advance therapeutic technique
- The therapy is driven by a protocol and changes in settings are nursing orders
- Yearly competency based education to ensure proper use of the therapy
- Monitor initial turn cycle to ensure one lung is above the other
- Automation of turning requires insertion of usual assessment practices
- Minimum of 18 hours per day & six cycles per hour
Do We Even Achieve the Minimum Mobility Standard… “Q2 Hours”? 

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, ht, resp dx, intubation, sedation score, day of wk, nurse/patient ratio, hospital

The Beach Chair Position© in ICU

- Prospective/Retrospective design
- 200 patients
- Intervention group: 60 minutes 4x day
- 6 month retrospective group
- 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

Defined as having the patient’s Head of Bed elevated to 70 degree and their Foot of Bed at a negative 75 degree angle.
Inclusion Criteria

- Admitted to STICU/NSICU and on ventilator
- Hemodynamic stability defined by:
  - No active bleeding
  - HR 60-120
  - MAP ≥ 60
  - SpO2 ≥ 90
  - RR ≤ 30
  - PaO2 ≥ 60
- Patient appearance, pain, fatigue, SOB, emotional status acceptable, safe environment & lines maintained

Exclusion Criteria

- Temporary Pacemakers
- Intra-aortic Balloon Pump
- Sengstaken-Blakemore/Minnesota tubes
- Vasopressor requirement increase
- ICP >20
- ECMO
- Specialty beds/mattress (ex Rotoprone, Rotorest or KCI First step)
- Paralytics in use
- Ordered HOB flat/bedrest
- Clarify with physician as some are ok:
  - Recent SSG/flap to lower limbs or trunk
  - Recent Open Abdomen
  - Unstable C-spine
  - Pelvic or spine fractures
  - Unstable head bleeds/post craniotomy/deep coma patients
  - Require continuous lower extremity elevation

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 within 48 hours of intubation/72 hours in the ICU
- 4 phase step wise mobility progression based on physiologic condition
- Outcome measures performed on protocol group & usual care patients that survived to discharge


<table>
<thead>
<tr>
<th>LEVEL I</th>
<th>LEVEL II</th>
<th>LEVEL III</th>
<th>LEVEL IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Participatory</td>
<td>Participatory</td>
<td>Participatory</td>
<td>Participatory</td>
</tr>
<tr>
<td>Progressive Upright Mobility: HOB elevation</td>
<td>Passive ROM 3x/d</td>
<td>Passive ROM 3x/d</td>
<td>Passive ROM 3x/d</td>
</tr>
<tr>
<td>Tilt table trials q2Hr positioning</td>
<td>q2Hr turning</td>
<td>q2Hr turning</td>
<td>q2Hr turning</td>
</tr>
<tr>
<td>Passive ROM 3x/d</td>
<td>Active Resistance PT</td>
<td>Active Resistance PT</td>
<td>Active Transfer to Chair (OCR) PT + MT</td>
</tr>
<tr>
<td>Active Resistance PT</td>
<td>Sitting Position Minimum 20 minutes 3x/d</td>
<td>Sitting on edge of bed PT + MT</td>
<td>Minimum 20 minutes 3x/d</td>
</tr>
<tr>
<td>Chair Position Minimum 20 minutes 3x/d</td>
<td>Sitting on edge of bed PT + MT</td>
<td>Sitting on edge of bed PT + MT</td>
<td></td>
</tr>
<tr>
<td>Can move arm against gravity</td>
<td>Can move leg against gravity</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Early ICU Mobility Therapy

Results

• Baseline characteristic similar in both groups
• Protocol group:
  – received as 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


Progressive Mobility Programs

Journey to tolerating upright position, tilt, sitting, standing and walking can occur quicker through the use of technology
Early Physical and Occupational Therapy in Mechanically Ventilated Patients

- Prospective randomized controlled trial from 2005-2007
- 1161 screen, 104 patients mechanically ventilated < 72hrs, functionally independent at baseline met criteria
- Randomized to early exercise of mobilization during periods of daily interruption of sedation (49 pts) or two daily interruption of sedation with therapy as ordered by the primary care team (55 pts)
- Primary endpoint: number of patients returning to independent functional status at hospital discharge (able to perform activities of daily living and walk independently)

Early Physical and Occupational Therapy in Mechanically Ventilated Patients

- Safe
- Well tolerated
- ↑ functional outcome
- ↓ duration of delirium
- ↑ VFD


Building the Culture

- Presentation of an organizational development tool or concept that provided teams with an opportunity to move their culture towards the desired change
- Teams' roundtable contributions of ideas and challenges with group response and support
- Teams' verbal commitment to a course of action resulting from call learning's.

Schein EH. Organizational culture and leadership. San Francisco: Jossey-Bass; 2004
Changing Culture

Team Sharing

– Networking with other organizations
– Discussion of logistic and operational challenges at a unit level
– Use of monthly coaching calls to discuss challenges/successes and plan fine tuning of process based on feedback from teams and faculty
– Reward structures:
  • One reward was M&Ms® for team members for “Movement and Mobility”
  • Another idea was a Three Musketeers® bar for a team effort to mobilize a patient
– Listserv and website
  • Allowed teams to actively query each other regarding specific issues
  • Provided a framework for collaboratively sharing tools, order sets and other documents

Changing Culture

Recognizing the Hard Work and Safety Issues

– Mobilizing critically ill patients is not without risk
  • Having an well-structured framework helps to reduce fear and improve safety...build the will
  • Having the knowledge that it is not as risky as first perceived
  • Acknowledgement that it can be time consuming/labor intensive
– Demands coordination of resources from multiple disciplines
– Displaying the Progressive Mobility Continuum at the bedside allowed for just-in-time coaching
– Developed formal exclusion criteria. If no exclusions then patient gets mobilized
– Mobility is nurse driven but team participation is essential
– Create a reliable process for early mobility that includes measurement & feedback mechanisms
2012 – Early Progressive Patient Mobility

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

Mobility: Is it Safe? Can We Do It?
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


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

Feasibility of PT & OT at Beginning of Mechanical Ventilation

- 49 mechanically ventilated patients
- Underwent daily sedation interruption followed by PT & OT daily until achieving physical function independence
- Started with ROM, ADL’s, sitting, standing and walking as tolerated


Feasibility of PT & OT at Beginning of Mechanical Ventilation

- 55% of the 49 patients in the early PT OT group had acute lung injury (most with ARDS)
- 69% had steroids ever administered
- Patient had delirium on 53% of all therapy sessions
- 75% of therapy sessions, A central line was present. A dialysis catheter was present 18% of therapy sessions
- Safety events occurred in 16% of all sessions
  - Loss of 1 arterial line, 1 nasogastric tube, 1 rectal tube
- Therapy was stopped on 4% of all sessions for vent asynchrony, agitation, or both

Hemodynamic Instability

Is it a Barrier to Positioning Critically Ill Patient?

Hemodynamic Instability with Turning

- Evidence-Based Strategies to Determine Toleration
- Theory on Prolonged Gravitational Equilibrium
- Strategies to Overcome Hemodynamic Instability That Occurs With Turning
Hemodynamic Instability:

- Lateral Turn Results in a 3-9% Decrease in SVO2 Which Takes 5-10 Minutes to Return to Baseline
- HOB Elevation/Dangling Resulted in a 20% SVO2 Decrease & Returned to Baseline Within 10 Minutes
- Appears the Act of Turning or Raising the HOB/dangling After Being Supine has the Greatest Impact on any Instability Seen

Winslow, E.H. Heart and Lung, 1990 Volume 19, 557-561

Patients at Risk for Intolerance to Positioning

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

Ensuring Safety

• Mobility readiness assessment
• Determining absolute contraindications for any mobility protocol
• Criteria for stopping a mobility session
• Changing the culture
• Sufficient resources and equipment

Bathing:

Should Basin Bathing Be the Standard for Patients Who are Unable to Bath Themselves?
The Bath: The First Line Of Defense

Who is Giving the Care?

- Who is doing the bath?
- Who is turning the patient?
- Who is changing the linen?
- Where should the focus of our education be?
What Happens During a Bath in Addition to Cleaning?

Assessments:
• Complete assessment of the skin
• Muscle tone & strength
• Range of motion
• Participation in ADL’s…physical & mental
• Pain assessment with activity
• Opportunity to communicate
• Opportunity to identify coping, feelings of powerlessness, depression, family support etc.
• Fatigue factor

The Role of IPH in Improving Clinical and Economic Outcomes

• 21-bed SICU
• Prospective study:
  – Staff education to improve knowledge base of the non-licensed staff
  – Patient intervention component to improve communication of pressure ulcer risk to the registered nurses
• A pre and post intervention knowledge survey was conducted.
• Implemented Basinless Bath with Skin Check and Barrier cloths with Peri Check
• Educated around the Skin Check label and proper usage. Non-licensed staff received instruction in observational skills and the facilities bathing and incontinence management protocol were changed.

Carr D, Benoit R. Advances in Skin and Wound Care. 2009;22(2)
The Role of IPH in Improving Clinical and Economic Outcomes

Outcomes

- Pressure ulcers decreased from 7.14% to 0%
- 100% of the staff were able to demonstrate adequate knowledge of hospital protocol and procedure after the intervention
- Department manager confirmed by random sampling of the audit tools that reported alterations in skin integrity was followed up by the responsible RN.

Carr D, Benoit R. Advances in Skin and Wound Care. 2009;22(2)

The Bath: The First Line Of Defense

Nurse!!!

Early Detection of Skin Injury

Reducing Microorganism spread

Efficiency & Effectiveness
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

• Excessive washing/use of soap compromises the water holding capacity of the skin

• Non-drying, lotion applied

• Multiple steps can lead to large process variation

Voegel D. J WOCN, 2008;35(1):84-90
Kabara JJ. et. al. J Environ Pathol Toxicol Oncol. 1984;5:1

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

Kron-Chalupa J et. al. Iowa City Veterans Medical Center
Comparison of Basinless Bath to a Basin Bath

<table>
<thead>
<tr>
<th>Questions</th>
<th>Basinless Bath</th>
<th>Basin Bath</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall preference</td>
<td>97%</td>
<td>3%</td>
</tr>
<tr>
<td>Nurse satisfaction</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>Time</td>
<td>10 minutes</td>
<td>21 minutes</td>
</tr>
<tr>
<td>SCDF (skin condition)</td>
<td>Significantly improved</td>
<td>Improved</td>
</tr>
</tbody>
</table>

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

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
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

Traditional Bathing

Spreading Microorganism

Why are there so many bugs in here?
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>
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<tbody>
<tr>
<td><em>C. difficile</em></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><em>P. aeruginosa</em></td>
<td>7 h</td>
<td>1+</td>
<td>Wet environments</td>
</tr>
</tbody>
</table>


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

Bath Basins: Potential Source of Infection

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


Bath Basins: Potential Source of Infection

Results
- 98% of all cultures grew some form of bacteria after plating or enrichment

Enrichment Results
- 54% enterococci. 32% for gram -, 23% for S aureus and 13% VRE (statistically significant)
- <10% growth rates for: MRSA 8%, P aeruginosa 5%, C albicans 3% & E coli 2%

Large Multi-Center Basin Evaluation For Presence of MDRO’s

Methodology
- 88 hospitals from US & Canada
- From July 2007 to February 2011
- Randomly selected basins for damp swab culture
- External lab tested for MRSA & VRE & gram – bacilli
- All basins were clean & were not visibly soiled

Results:
- 1103 basins: 63.2% contaminated
- 385 basins (34.9%) from 80 hospitals were colonized with VRE
- 495 basins (44.9%) from 86 hospitals had gram-negative bacilli
- 36 basins (3.3%) from 28 hospitals had MRSA


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 patients are at the greatest risk
- Recommendation I: Minimize patient exposure to hospital tap water via bottled water and pre-packaged, disposable bathing sponges


ICU & Hospital Water Samples

- Systematic review published studies 1998-2005 (29 studies)
  - 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

Bacteria 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 patients by direct contact with water used for ingestion, ice, washing


Pre-Op Prep

- Antisepsis must demonstrate a 3.0 log $10^3$ from baseline in groin, 2.0 $10^3$ 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/Inguinal sites sustained action at 10min, 30 min, 6 hrs > than 4% (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
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

26 colonization's with VRE per 1000 patients days vs. 9 colonization's per 1000 patient days with CHG bath

Veron MO et al. Archives Internal Med 2006;166:306-312
Effect of CHG Cloth Bath of HAI’s in Trauma Patients

- Retrospective analysis 6 months before and after institution of CHG bathing
- 12 bed level 1 trauma center
  - 286 severely injured patients bathes 2% CHG cloth
  - 253 severely injured patients bathed without CHG cloth
- Results: CHG bathed patients less likely to acquire a CLA BSI (2.1-vs. 8.4), MRSA VAP 1.6 vs. 5.7 & rate of colonization was significantly lowers; 23.2 vs.69.4 per 1000 patient days

Reducing UTI’s Through Basinless Bathing

CA-UTI 7.5 per 1000 catheter days to 4.42 per 1000 catheter days, then to .46 per 1000 catheter days

Simple Cost Effective Strategies to Reduce HAI’s

Implementation:
• Utilize daily 2% CHG cloths for cleansing at night in any patient with a central line or foley catheter
• Focused on areas most prone to bacterial colonization from the neck down

Was moved from the ICU to house wide post initial project with similar results in Med-Surg

Corcoran F. Presented at APIC 2009
What Happened To Concentric Circle for Cleaning & Prepping Line Insertion Sites?

CDC Guidelines for Insertion Site Preparation

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

Prevention of Catheter Infection: MMWR 2002;51 (No. RR-10):[1-29]
Chlorhexidine vs Povidone Iodine for Catheter Site Care

Ann Intern Med 2002;136:792-801

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

Cleansing Motion

- Betadine: prep done in circular motion from center to periphery
  - Betadine not an antiseptic until dry
  - Center to periphery necessary to prevent going back & forth over the site and contaminating the cleaned area

- Chloraprep: Prep motion back & forth and up & down in order to clean multiple layers of the skin
  - An antiseptic when wet
  - Cross over of previously cleaned area does not cause contamination
  - If circular motion used, must do a forward & reverse clean

How do we get information to leap from the pages of magazines and become part of our new daily routine?
Four Es

• Engage: help staff understand the preventable harm
  – Share stories about patients affected
  – Estimate number of patients harmed
  – Develop a business case

• Educate: ensure staff and senior leaders understand what they need to do to prevent injury and improve teamwork and communication
  – Conference calls, webcasts, meetings

• Execute: how given the resources and culture they would ensure that all patients received the evidence
  – Share what's working, what's not
  – Coaching calls

• Evaluate: project leader monitors that teams are using standardized definitions, report their data and make it transparent at the unit level


Interventions To Ensure Patients Receive Evidence-Based Care

• Evidence based education
• Recognition of value and reinforcement
• Products/Processes that make it easy for the frontline caregiver to provide the care (make it part of the bundle)
  • Bathing kits
  • Placement on the med record
  • Automated charting with flag reminders
• Frequent rounding/reinforcement of standard
• Multidisciplinary rounds/Checklists

Westwall S. Nursing in Critical Care, 2008;13(4):203-207
Abbott CA, et al. Worldviews on Evidence Based Practice, 2006;136-152
Interventions To Ensure Patients Receive Evidence-Based Care

- Setting targets/Celebrating successes
- Placement of new practice/education in orientation
- Attractive signs to outline protocol in the patient rooms near the products
- Compliance program with feedback to all caregivers
- Outcome measurement/Feedback*
- Include RNs in Morbidity & Mortality peer review for nurse sensitive outcome indicators (VAP, Falls, CLA-BSI, CA-UTI, Falls, Hospital Acquire Skin Injury (HASI))

Westwall S. Nursing in Critical Care, 2008;13(4):203-207
Abbott CA, et al. Worldviews on Evidence Based Practice, 2006:139-152

Be Courageous

We all are responsible for the safety of our patients……Own the Issues
Kill the Sacred Cows of Practice

- “If not this, then what??”
- “If not now, then when?”
- “If not me, then who??”