CHLORHEXIDINE GLUCONATE BATHING: DOES IT DECREASE HOSPITAL-ACQUIRED INFECTIONS?

By Deana Sievert, RN, MSN, CCRN, Rochelle Armola, RN, MSN, CCRN, and Margo A. Halm, RN, PhD, ACNS-BC

As pay for performance becomes more prevalent, hospitals struggle to improve processes, especially those for preventing hospital-acquired infections (HAIs). Many hospital programs seek out evidence-based "best practices" to keep patients safe from deadly and costly HAIs. Critical care nurses have begun examining even the most rudimentary tasks, such as bathing patients, and the processes inherently associated with them.

It has been suggested that a bathing procedure that focuses on decolonization may decrease HAI rates. This procedure routinely includes administration of a nasal antibacterial agent and then bathing patients with a solution of 2% to 4% chlorhexidine gluconate, each for a series of days. It has also been suggested that bath basins may be a source of bacterial transmission. Further, use of a bath basin may lead to contamination of other items such as the sink for hand washing. These suggestions bring into focus several important steps that nurses must take to help keep patients safe from HAIs, although we cannot assume that these few steps are the complete answer for prevention.

The Society for Healthcare Epidemiology of America and the Infectious Diseases Society of America have developed a compendium of recommendations to prevent transmission of multidrug-resistant organisms and HAIs in acute care hospitals. The idea is that if procedures outlined in the compendium are performed, HAIs such as ventilator-associated pneumonia, central line–associated bloodstream infections (CLABSI), and transmission of multidrug-resistant organisms can be limited. Some researchers working with the Centers for Disease Control and Prevention and the authors of the compendiums believe hygiene regimens that use chlorhexidine gluconate are a formidable weapon for reducing HAIs. In this review, we summarize current evidence on the effect of bathing with chlorhexidine gluconate on reducing colonization, surgical site infection (SSI), and CLABSI.

Methods

MEDLINE, CINAHL, and Cochrane databases were searched by using the terms chlorhexidine bathing, central venous catheter infections, catheter-related infections, CLABSI, methicillin-resistant Staphylococcus aureus (MRSA) or vancomycin-resistant enterococcus (VRE) colonization/acquisition, gram-positive bacteria infections, or SSI. Only meta-analyses, randomized controlled trials (RCTs), and experimental studies from the past 10 years were included.

Results

CLABSI

No RCTs have addressed bathing with chlorhexidine gluconate and CLABSI reduction. Four quasi-experimental studies and 1 cross-over study in a pre-post study design were retrieved (Table 1). Most studies were set in an intensive care unit, but one study was conducted in a long-term acute care hospital. In 4 of the 5 studies, results indicated a significant reduction in CLABSI for subjects in the

©2011 American Association of Critical-Care Nurses
doi: 10.4037/ajcc2011841
<table>
<thead>
<tr>
<th>Reference</th>
<th>No. of patients/population</th>
<th>Design/Intervention(s)</th>
<th>Central catheter-associated blood-stream infections</th>
<th>Acquisition/decolonization</th>
<th>Surgical site infections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Munoz-Price et al</td>
<td>405/long-term acute care</td>
<td>Quasi-experimental</td>
<td>+ Weekly 2% CHG baths (vs soap/water)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bleasdale et al</td>
<td>836/MICU</td>
<td>Cross-over (concurrent control group)</td>
<td>+ CHG (after 5 days) vs soap/water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Popovich et al</td>
<td>318/MICU</td>
<td>Quasi-experimental</td>
<td>+ 2% CHG cloths (vs soap/water)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Climo et al</td>
<td>5320/MICU, SICU, MICU, CCU, CVSICU</td>
<td>Quasi-experimental</td>
<td>+ 4% CHG (vs soap/water) reduced VRE bacteremia</td>
<td>+ MRSA decreased 32%</td>
<td>+ VRE decreased 50%</td>
</tr>
<tr>
<td>Popovich et al</td>
<td>254/SICU</td>
<td>Quasi-experimental</td>
<td>0 CHG vs soap/water bathing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ridenour et al</td>
<td>1581/CCU, MICU</td>
<td>Prospective interventional cohort</td>
<td>+ 4% CHG bathing for 7 days and 2% mupirocin ointment twice daily for 5 days</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vernon et al</td>
<td>1787/MICU</td>
<td>Prospective sequential group (single arm) cohort</td>
<td></td>
<td>+ 2% CHG impregnated cloths (vs soap/water)</td>
<td></td>
</tr>
<tr>
<td>Wendt et al</td>
<td>114/university hospital nursing homes</td>
<td>Randomized controlled trial</td>
<td>0 4% CHG solution in water (vs placebo); all received mupirocin nasally and CHG oral rinse + CHG for groin area eradication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sandri et al</td>
<td>2200/general ICU (364 general ICU inpatients with positive MRSA screens)</td>
<td>Retrospective cohort with consecutive patients</td>
<td>+ CHG solution in water (no % specified) daily for 3 days and 2% mupirocin intranasally 3 times daily for 5 days</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Batra et al</td>
<td>4570/general ICU</td>
<td>Quasi-experimental</td>
<td>+ 1% CHG to nostrils, around mouth and tracheostomy site 4 times a day; 1% CHG acetate powder to groin, axillae, and skinfolds 2 times daily, and 4% CHG in water bathing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Darouiche et al</td>
<td>849/general surgery (clean-contaminated)</td>
<td>Randomized controlled trial</td>
<td>+ CHG-alcohol⁹ (vs povidone-iodine)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Veiga et al</td>
<td>150/plastic surgery (clean)</td>
<td>Randomized controlled trial</td>
<td>0 CHG shower (vs placebo/control)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paocharoen et al</td>
<td>500/general surgery (clean; clean-contaminated, contaminated)</td>
<td>Randomized controlled trial</td>
<td>+ CHG (vs povidone iodine)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eiselt</td>
<td>1463/orthopedics</td>
<td>Quasi-experimental</td>
<td></td>
<td>+ 2% CHG no-rinse cloth (vs povidone-iodine)</td>
<td></td>
</tr>
</tbody>
</table>

Continued
One nonrandomized trial,22 1 quasi-experimental study,21 5 RCTs,18-20,23,24 and 1 systematic review25 of surgical site infections were retrieved. Chlorhexidine gluconate was compared with povidone-iodine, 70% isopropyl alcohol, isopropyl alcohol (DuraPrep), or routine skin preparation/shaving. More than half of the studies18,20-22,24 revealed significant effects of chlorhexidine gluconate on SSI rates in general surgery patients (ie, clean, clean-contaminated, or contaminated abdominal, orthopedic, plastic surgery).

**Recommendations**

The available studies on CLABSI reduction by bathing with chlorhexidine gluconate provide class IIb evidence (Table 2). No RCTs have been completed at this time; however, good evidence, mainly from quasi-experimental studies, exists to consider this intervention an option to reduce CLABSI, especially in patients in medical intensive care units. Additional research is needed to determine the effectiveness of chlorhexidine gluconate in CLABSI reduction in surgical intensive care units and other settings.

**Acquisition/Decolonization**

In 1 RCT,15 2 quasi-experimental studies,11,17 and 3 nonrandomized trials13,14,16 acquisition or decolonization of multidrug-resistant organisms was examined. Cloths impregnated with 2% or 4% chlorhexidine gluconate were compared with plain cleansing cloths and/or soap and water. In 4 studies,13,15-17 use of either mupirocin or nasal chlorhexidine gluconate was added, and in 1 study,17 chlorhexidine gluconate powder was added in skin folds. All of the studies showed significant reduction in multidrug-resistant organisms, except for 1 study17 in which MRSA was not significantly decreased.

### About the Authors

**Deana Sievert** is an administrative director of critical care, intermediate care, and the emergency center at The Toledo Hospital in Toledo, Ohio. **Rochelle Armola** is the trauma nurse manager/clinical nurse specialist at The Toledo Hospital. **Margo A. Halm** is a clinical nurse specialist and director of nursing quality and research at the Salem Hospital in Salem, Oregon, where she leads and mentors staff in the principles of clinical research and evidence-based practice.

**Corresponding author:** Margo A. Halm, RN, PhD, ACNS-BC, Salem Hospital, Salem, OR 97301 (e-mail: margo.halm@salemhealth.org).

---

**Table 1 (Continued)**

<table>
<thead>
<tr>
<th>Reference</th>
<th>No. of patients/population</th>
<th>Design/Intervention(s)</th>
<th>Central catheter-associated blood-stream infections</th>
<th>Acquisition/decolonization</th>
<th>Surgical site infections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dizer et al22</td>
<td>82/abdominal</td>
<td>Experimental (non-randomized)</td>
<td>+ CHG bath/clippers (vs routine preoperative skin preparation/shaving)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swenson et al23</td>
<td>3209/general surgery</td>
<td>Randomized controlled trial</td>
<td>0 2% CHG (vs povidone-iodine, 70% isopropyl alcohol, or isopropyl alcohol)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Edmiston et al14</td>
<td>30/healthy volunteers</td>
<td>Randomized controlled trial</td>
<td>+ 2% CHG-impregnated cloth (vs 4% CHG skin preparation)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Webster and Osborne26</td>
<td>10,157/7 randomized controlled trials</td>
<td>Systematic review</td>
<td>0 4% CHG showering (vs placebo)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: CCU, coronary intensive care unit; CHG, chlorhexidine gluconate; CVSICU, cardiovascular intensive care unit; MICU, medical intensive care unit; MRSA, methicillin-resistant *Staphylococcus aureus*; SICU, surgical intensive care unit; VRE, vancomycin-resistant enterococci.

Key: 0 = no effect (P > .05); + = beneficial effect (P < .05).

*aSuperficial and deep incisional infections.

SSI One nonrandomized trial,22 1 quasi-experimental study,21 5 RCTs,18-20,23,24 and 1 systematic review25 of surgical site infections were retrieved. Chlorhexidine gluconate was compared with povidone-iodine, 70% isopropyl alcohol, isopropyl alcohol (DuraPrep), or routine skin preparation/shaving. More than half of the studies18,20,22,24 revealed significant effects of chlorhexidine gluconate on SSI rates in general surgery patients (ie, clean, clean-contaminated, or contaminated abdominal, orthopedic, plastic surgery).
remaining studies, although less rigorous in design, showed reductions in MRSA/VRE colonization.

SSI reduction after the use of chlorhexidine gluconate bathing had mixed research findings and would be considered a class IIb level of evidence (Table 2). Although results of 2 large RCTs19,20 and other experimental trials21,22,24 favored the intervention, the systematic review25 of 7 RCTs that involved more than 10,000 patients did not favor chlorhexidine gluconate bathing for SSI reduction.

Although strong evidence (class I) for chlorhexidine gluconate bathing does not currently exist, this technique may be considered a potential option for the reduction of HAIs. The few adverse effects of bathing with chlorhexidine gluconate are mainly related to contact dermatitis or irritation that subsides when use of chlorhexidine gluconate is stopped. However, rare reports of anaphylaxis and extreme allergic reactions exist.25 More serious adverse effects reported are related to accidental application of chlorhexidine gluconate to an organ or mucous membranes.27

Chlorhexidine gluconate must be allowed to dry on the skin before a dressing can be placed to prevent an adverse skin reaction. Pediatric and neonatal research related to use of chlorhexidine gluconate is lacking and needs further investigation. More rigorous research with adult patients outside of intensive care units is also clearly needed to document the efficacy of chlorhexidine gluconate interventions in reducing CLABSI, colonization of MRSA or VRE, and SSI rates in hospitalized patients.

FINANCIAL DISCLOSURES
None reported.

REFERENCES
17. Batra R, Cooper B, Whiteley C, et al. Efficacy and limitation of


To purchase electronic or print reprints, contact The InnoVision Group, 101 Columbia, Aliso Viejo, CA 92656. Phone, (800) 899-1712 or (949) 362-2050 (ext 532); fax, (949) 362-2049; e-mail, reprints@aacn.org.
Chlorhexidine Gluconate Bathing: Does it Decrease Hospital-Acquired Infections?
Deana Sievert, Rochelle Armola and Margo A. Halm

Am J Crit Care 2011;20 166-170 10.4037/ajcc2011841
©2011 American Association of Critical-Care Nurses
Published online http://ajcc.aacnjournals.org/

Personal use only. For copyright permission information:
http://ajcc.aacnjournals.org/cgi/external_ref?link_type=PERMISSIONDIRECT

Subscription Information
http://ajcc.aacnjournals.org/subscriptions/

Information for authors
http://ajcc.aacnjournals.org/misc/ifora.xhtml

Submit a manuscript
http://www.editorialmanager.com/ajcc

Email alerts
http://ajcc.aacnjournals.org/subscriptions/etoc.xhtml