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...
## Table 1
**Studies on chlorhexidine bathing**

<table>
<thead>
<tr>
<th>Reference</th>
<th>No. of patients/population</th>
<th>Design/Intervention(s)</th>
<th>Central catheter-associated bloodstream infections</th>
<th>Acquisition/decolonization</th>
<th>Surgical site infections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Munoz-Price et al8</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 al9</td>
<td>836/MICU</td>
<td>Cross-over (concurrent control group)</td>
<td>+ CHG (after 5 days) vs soap/water</td>
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<tr>
<td>Popovich et al10</td>
<td>318/MICU</td>
<td>Quasi-experimental</td>
<td>+ 2% CHG cloths (vs soap/water)</td>
<td></td>
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</tr>
<tr>
<td>Climo et al11</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 al12</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 al13</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 al14</td>
<td>1787/MICU</td>
<td>Prospective sequential group (single arm) cohort</td>
<td>+ 2% CHG impregnated cloths (vs soap/water)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wendt et al15</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 al16</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 al17</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 al18</td>
<td>849/general surgery (clean-contaminated)</td>
<td>Randomized controlled trial</td>
<td>+ CHG-alcohola vs povidone-iodine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Veiga et al19</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 al20</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>Eiselt21</td>
<td>1463/orthopedics</td>
<td>Quasi-experimental</td>
<td>+ 2% CHG no-rinse cloth (vs povidone-iodine)</td>
<td></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.

In the reduction of acquisition or decolonization of multidrug-resistant organisms, current studies also support a rating of class IIb evidence (Table 2). The only RCT that did not show a significant reduction in MRSA eradication did find a decrease at the groin site after day 3 of treatment, but that reduction was no longer apparent at day 5. The chlorhexidine gluconate arm.8-11 In the fifth study,12 which was of patients in surgical intensive care units, significant differences were not found.

### 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 study15 in which MRSA was not significantly decreased.

### About the Authors

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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.26 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

Table 2

<table>
<thead>
<tr>
<th>Class</th>
<th>Criteria</th>
<th>Definition</th>
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<tbody>
<tr>
<td>I</td>
<td>Definitely recommended</td>
<td>Supported by excellent evidence, with at least 1 prospective randomized controlled trial</td>
</tr>
<tr>
<td>IIa</td>
<td>Acceptable and useful</td>
<td>Supported by good to very good evidence; weight of evidence and expert opinion strongly in favor</td>
</tr>
<tr>
<td>IIb</td>
<td>Acceptable and useful</td>
<td>Supported by fair to good evidence; weight of evidence and expert opinion not strongly in favor</td>
</tr>
<tr>
<td>Indeterminate</td>
<td>Preliminary research stage</td>
<td>Treatment of promise but limited evidence</td>
</tr>
<tr>
<td>III</td>
<td>May be harmful; no benefit documented</td>
<td>Interventions with no evidence of any benefit; often some evidence of harm</td>
</tr>
</tbody>
</table>

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