

# Cleaning Up the Mess: Could a New Type of Patient Bath Basin Turn the Tide of HAIs?

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Providing safe and effective personal hygiene for hospital or long-term care patients who are unable to bathe themselves should be a simple enough matter. But over the years, bedside bathing has been fraught with serious — even deadly — problems.

Care providers have traditionally bathed bed-bound patients using a basin, water, soap, and washcloths. However, multiple studies have demonstrated that reusable bath basins can be a source of hospital-acquired infections (HAIs), especially when infectious microorganisms are transferred between surfaces during bathing, the facility's water contains pathogens, or a patient's personal items — from medical supplies to bottles of hand lotion and toothbrushes — are stored in the basin between uses.

One nationwide survey of infection preventionists showed a “puzzling” lack of standardization in bathing procedures and products used in bathing patients, and in cleaning protocols. Few respondents (13.9%) reported using an antiseptic solution in the bathing water.<sup>1</sup> Other research has shown that basins are not always cleaned or dried properly and are often stored haphazardly — on dusty bedside tables, in patient bathrooms, or even on the floor.

The dangers are increased by the fact that in addition to daily patient bathing, basins are used for indwelling catheter care, emesis collection, and incontinence cleanup. The basins are often not replaced during a patient's stay but instead are rinsed, left to dry, and later reused — making an HAI all the more likely.<sup>2</sup>

But there are novel products in development that have the potential to be game changers. Employing technology that was previously developed in an effort to boost the effectiveness of antibiotics against bacterial infections, an Irish-based company's silver ion-impregnated reusable bath basin and disposable cover is offering new hope for a solution to the HAI conundrum without the drawbacks associated with other types of bathing products.

## **A Vexing Issue**

As most people in the healthcare profession know too well, HAIs can lead to increased morbidity, longer hospital stays, and higher hospital costs for affected patients. Writing in the *American Journal of Critical Care* in 2009, Debra Johnson, RN, BSN, OCN, CIC, FAPIC, provided some perspective on the scope of the problem, stating that an estimated 1.75 to 3.5 million Americans — representing 5-10% of all patients admitted to hospital — contract HAIs each year.<sup>3</sup>

Even more sobering is the death rate. “Healthcare-associated infection is linked to nearly 90,000 deaths annually, is ranked as the fifth leading cause of death in acute care hospitals, and results in an annual financial burden thought to exceed \$6.5 billion,” noted Johnson and her team.<sup>3</sup> Although the statistics have fluctuated over the years and improvement has been seen in some areas, the US Centers for Disease Control and Prevention reported that “about 72,000 hospital patients with HAIs died during their hospitalizations” in 2015, the most recent year for which these statistics are available.<sup>4</sup>

Johnson, along with colleagues Lauri Lineweaver, RN, BSN, CCRN, and Lenora Maze, RN, MSN, CNRN, conducted a multicenter sampling at 3 acute care hospitals to assess whether, and to what extent, bath basins might be contributing to the problem. The team used sterile culture sponges to take samples from 92 “clean” bath basins that had been emptied after patient use and allowed to air dry for at least 2 hours. Each sponge was then placed in a sterile bag and sent to an outside laboratory for evaluation. The result? The lab reported that some form of bacteria grew on 98% of the sponges, including enterococci (54%), gram-negative organisms (32%), *Staphylococcus aureus* (23%), vancomycin-resistant enterococci, or VRE (13%) and methicillin-resistant *Staphylococcus aureus*, more commonly known as MRSA (8%).<sup>3</sup>

The investigators concluded that “bath basins are a reservoir for bacteria and may be a source of transmission of hospital-acquired infections.” They said that the use of traditional bath basins — even disposable ones that were used for only 1 patient — could promote the spread of HAIs, noting that during their study, “VRE and MRSA were cultured from bath basins of patients who had not been previously identified as carriers” and “most nurses disposed of used bath water in hand-washing sinks, which could then contaminate the sink and surrounding areas.”<sup>3</sup>

Other studies yielded similar results, including a larger sampling of 1103 basins from 88 hospitals in the United States and Canada, which showed a contamination rate of more than 62% and positive results from all participating hospitals. The authors of the study, which was published in the *American Journal of Infection Control*, stated that basins may be contaminated by the patients’ own flora during the bathing process, but also by the soap, the soap tray, or the tap water used to clean the basin. “Basins should be approached and handled in the same manner as patients known to be carriers of [multidrug-resistant organisms (MDROs)],” they added, noting that the use of gloves “seems prudent” when contact with basins is anticipated, and hand hygiene should be performed after handling them.<sup>5</sup>

In 2013, the American Association of Critical-Care Nurses (AACN) updated its patient bathing practices, stating that the use of traditional bath basins was “no longer the recommended standard of practice,” and instead endorsed a daily bathing protocol that included 1-use disposable basins, disposable cloths impregnated with a solution of 2% chlorhexidine gluconate (CHG), and sterile, distilled or filtered water.<sup>6</sup>

## Seeking Solutions

A number of studies have shown that using prepackaged disposable washcloths treated with a chlorhexidine solution can reduce the incidence of HAIs.

An Illinois-based investigation found that cleansing patients with CHG-impregnated cloths was associated with a significant reduction in VRE contamination of patients' skin, healthcare workers' hands, and environmental surfaces, compared with the soap-and-water patients.<sup>7</sup>

A year-long study of a 22-bed medical ICU at a public teaching hospital, also in Illinois, found that daily bathing with CHG cloths lowered the incidence of primary bloodstream infections (BSIs) by 61%, compared with patients bathed with soap and water. The investigators noted that patients bathed using the CHG protocol did not have a decreased incidence of UTIs, and experienced "a nonsignificant increase in the rate of clinical sepsis."<sup>8</sup>

A more recent case-crossover study published in the American Journal of Infection Control found no statistically significant reduction in HAIs or MDROs in patients bathed with prepackaged disposable washcloths, although researchers did find less deterioration of patients' skin in the disposable washcloth group than in those bathed using the traditional basin method.<sup>9</sup>

Many healthcare institutions have adopted disposable chlorhexidine cloths for patient bathing purposes. However, there are some concerns that disposable wipes, along with a myriad of other items that are flushed down the toilet, may be contributing to "fatbergs" — what one article published in National Geographic described as "huge blobs of fat and trash," some larger than 10 double-decker buses placed end-to-end — that are reportedly clogging sewer pipes across the globe.<sup>10</sup> This phenomenon, which has so far affected cities like London, Baltimore, and Detroit, has led governments to advise against flushing disposable wipes. Unlike toilet tissue, wipes generally do not dissolve in the sewer.

Cost and patient satisfaction are also concerns, since CHG wipes for a single bath, depending on the source, may cost more than \$5.50.<sup>11</sup> Anecdotal evidence shows that patients don't always consider this approach to be "a bath," with many of those who were bathed with CHG wipes reporting that they were not bathed during their hospital stay.<sup>12</sup> Other patients dislike the "sticky feeling" that wipes leave on their skin.

## Rethinking the Basin

Despite the prevalence of CHG cloths for patient bathing in the healthcare marketplace, the bath basin has not been thrown out with the bathwater.

An article that appeared in the journal *Critical Care Medicine* detailed a multistate study in which 6 intensive care units (ICUs) at 4 academic centers using bath basins found a 32% reduction in MRSA rates and a 50% decrease in VRE rates in a group of patients

bathed daily with 4% CHG solution for 6 months, compared with a cohort of patients bathed with soap and water over the previous 6-month period.<sup>13</sup>

A small study of patients at a 40-bed mixed med-surg ICU at a large Indiana hospital in 2012 found that just 4.4% of the 90 basins tested showed bacterial growth when 2 fluid ounces (60 mL) of 4% CHG solution diluted in 3 quarts (2.85 L) of water was used in the basins instead of plain soap and water. This represented “a 95.5% reduction in cultures of bath basins positive for bacteria,” according to the article’s lead author.<sup>14</sup>

Daily bathing with CHG has been linked in some studies to a decrease in various types of HAIs, including catheter-related bloodstream infections, catheter-associated urinary tract infections, ventilator-associated pneumonia, and acquisition of MRSA, S aureus, and VRE. But investigators have had mixed results, with reductions in infection varying widely from one study to the next.<sup>15</sup>

There are other drawbacks to this approach as well. Certain patients are not able to have a 4% CHG bath because of skin breakdowns or allergies, although others may refuse to be bathed using CHG. A 4% CHG solution must also be rinsed from the skin, adding more time to the bathing process.<sup>16</sup>

The use of CHG is associated with a range of potential side effects, including skin rash, skin dryness and, more rarely, anaphylactic reaction. In 2017, the FDA issued a warning that “rare but serious allergic reactions have been reported with widely used skin antiseptic products containing chlorhexidine gluconate,” adding that “the number of reports of serious allergic reactions to these products has increased over the last several years.” Several deaths have been reported, according to the FDA.<sup>17</sup>

Use of the disinfectant also presents other problems. Some skin creams and lotions are incompatible with CHG, and the Mayo Clinic has warned that this type of cleanser should not be used near the eyes, nose or mouth, in the genital area, or for children under the age of two. Some CHG products contain as much as 70% alcohol and are flammable.<sup>18</sup> CHG has also been shown in some studies to be toxic to aquatic life.<sup>19</sup>

## **A Silver Bullet?**

Scientists have long known that silver can be used to fight infection — but weren’t sure exactly how. Then in 2013, Boston-based biomedical engineer James Collins and his team published a paper in *Science Translational Medicine*, showing that dissolved silver ions can effectively attack and destroy bacterial cells. The ions make the cells more permeable and negatively affect their metabolism, leaving them up to 1000 times more vulnerable to antibiotics than they would be otherwise.<sup>20</sup> This breakthrough was also written up in *Nature*.<sup>21</sup>

Since then, work has been underway to harness that discovery and apply it to the field of infection prevention.

A new FDA-registered medical device consists of a reusable basin and a latex-free, single-use liner, both embedded with silver ion technology to inhibit the growth of microbial organisms. The silver ions bind to the cell walls of the pathogens to disrupt their growth and enzyme production, and also interrupt the cells' DNA so the bacterial cells can't reproduce.

Made of recyclable materials, the system can be used with a wheeled basin holder to make the bathing experience more comfortable for both the patient and the caregiver. The basin support also makes it less likely that the basin will be stored on or under bedside tables, or on the floor.

Laboratory and clinical studies have shown a "proven kill rate of 99.99% against commonly occurring problematic species of pathogenic bacteria, including *Escherichia coli*, *S aureus*, *Pseudomonas aeruginosa*, MRSA, VRE, and *Klebsiella pneumoniae*," according to researchers.<sup>22, 23</sup>

R.J. Russell, BA Mod, PhD, an associate professor of microbiology at Trinity College Dublin who was involved in the testing, said high counts of bacteria were able to survive in viable form and were recoverable from standard polypropylene surfaces after 3 days. However, this was not the case for surfaces impregnated with silver ions, which were shown to reduce bacterial counts by more than 99% at 24 hours and by 99.99% at 72 hours.<sup>23</sup>

Roy Sleator, BSc, MA, PhD, CBiol, FRSB, a senior professor at the Department of Biological Sciences at the Cork Institute of Technology in Ireland, said the product limits the exposure of the basin to potentially infective material and makes it easy to safely dispose of contaminated materials, thus significantly reducing aerosol formation as the basin is transported and sanitized. Aerosol formation is a significant cause of infectious disease transmission in healthcare facilities.<sup>23</sup>

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