Patient Bath Basins Are a Potential Risk Factor for HAIs in Acute Care

Justine O'Flynn, R.N., Infection Control Liaison, Kosair Children's Hospital

Background & Overview

Despite progress in hospital care, healthcare-associated infections (HAIs) in the U.S. are a growing problem:[1-3]

- They affect an estimated 1.75 to 3.5 million U.S. patients (5-10%) annually, resulting in nearly 90,000 annual deaths.[4-6]
- HAIs are ranked as the fifth leading cause of death in acute care hospitals.[4-6]
- The U.S. annual financial impact was estimated to exceed $6.5 billion in 2004.[4-6]

A number of factors contribute to the frequency of HAIs: increasing age of patients; increasing use of extensive surgical and intensive medical therapies; immunocompromised patients; development of resistant microbial flora; and transmission of microorganisms among patients.[7]

In healthcare, contaminated water supplies can spread infection among those whose health is already compromised.[1,8-11] Researchers have identified hospital water supplies as likely sources for many HAIs, such as pneumonia, bacteremia, and urinary tract infections.[2, 12, 13] Biofilm-forming pathogens can create potent biofilms in hospital pipes, hot water tanks, sinks, and even touchless faucets, contaminating water upon contact.[1,14,15]

Although infection control measures, such as water chlorination, filtration, and disinfection are known to decrease hospital water microbial counts, often water serves as a mere conduit.[1,2,9,16,17] Hospital staff can also transmit pathogens both into and via water.[18,19]

Mechanical friction during bathing releases skin flora into water; therefore, basins can become a source for cross-contamination, and serve as a potential reservoir for the transmission of HAIs.[16,18,20] Traditional patient bathing techniques increase the potential to cross-contaminate patients by reusing bath cloths, which can pick up harmful bacteria during bathing. In turn, these bacteria can be transferred to the basin and then returned to the patient via the bathing process (or remain on an environmental surface). Shannon et al[21] sampled patient bath water and found all samples (n=23) to be positive for bacterial growth.

The following study's purpose was to identify pathogens in dry basins to determine if they can be a source of bacterial colonization and increase patient risk for HAIs.

Methods

In this nonrandomized, blinded, prospective study, basins from critical care units (CCUs) and medical-surgical (med-surg) units in a community-based hospital were sampled over a 30-day period. Caregivers were blinded to the study.

Basins were in rooms of patients admitted >48 hours and used at least once. An infectious disease specialist swabbed the interior perimeter of each basin utilizing 2 swabs.

Data were reported on 25 basins. Samples were streaked on a 5% blood agar Petri dish and cultured, and results were recorded. Specimens were sent to the Microbiology Department, who conducted qualitative culturing.

The following data were recorded:

- confirmation of bathing regimen;
- basin unit location;
- patient comorbidities;
- results of microbiological cultures.

Results

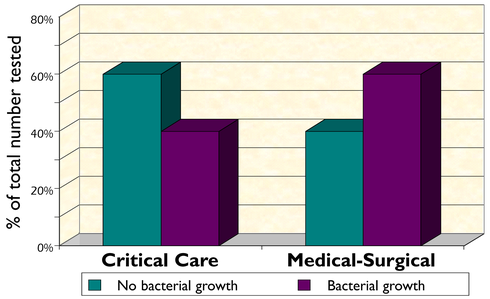
A total of 25 basins were swabbed.

- **Over half of the basins were positive for organism growth**
  - Overall, 13 (52%) of the 25 total basins swabbed were positive for organism growth on culture.
  - Of the basins that showed organism growth on culture, 8 (62%) demonstrated growth of multiple organisms.
- CCU basins were less likely than Med-Surg basins to show organism growth overall (40% [4/10] vs 60% [9/15], respectively), but were more likely to show growth of multiple organisms (75% [3/4] vs 56% [5/9], respectively). Neither of these differences were statistically significant, but this small study lacked sufficient power to determine differences between groups.
- When organism growth rates in the basins from both units were analyzed with respect to a basin showing no bacterial growth, the increased bacterial growth rates were all statistically significant at both the 0.01 and 0.05 level ($P<0.0001$ for all results).
- The 3 most common organisms cultured were coagulase-negative *Staphylococcus*, *Bacillus spp*, and *Micrococcus spp* (Table 1). All basins belonging to asthma (n=5) and postsurgical (n=3) patients demonstrated organism growth (Table 2).

Table 1. Organisms cultured from basins

Organism	# of basins (n=13) CCU	Med-Surg
Coagulase-negative *Staphylococcus*	3	4
Bacillus spp	1	4
Micrococcus spp	1	2
Corynebacterium spp	1	1
Enterococcus spp	1	1
Streptococcus		
Alpha-hemolytic	1	--
Nonhemolytic	1	--
Unidentified gram-negative bacillus	--	2
Pseudomonas spp	--	1
Staphylococcus aureus		
Methicillin-resistant	--	1
Nonmethicillin-resistant	--	--
Streptomyces	--	1

Results of Basin Swabs



"We worried about the potential to cross-contaminate patients by using regular bath cloths, which could pick up harmful bacteria during bathing that could be transferred to the washbasin and then could be returned to the patient via the bathing process and/or could remain on an environmental surface." [22]

Table 2. Patient diagnosis of cultured basins

Patient Diagnosis	No. (%) of basins showing organism growth, per diagnosis
Asthma	5/5 (100)*
Postsurgical	3/3 (100)*
Respiratory distress	2/4 (50)
Respiratory failure	1/1 (100)*
Seizure	1/1 (100)*
Trauma	1/2 (50)*

* At least one basin belonging to a patient with this diagnosis demonstrated multiple organisms on culture.

Conclusions

Based on the statistical analysis in this study, it is probable that basins are a source of bacterial colonization and increase the potential for HAIs.

There is ample documented evidence for microbial colonization of patient skin and healthcare facility water supplies. Additionally, Bryant and Rolstad[23] determined that traditional bathing presents threats to the skin due to the drying effect of soaps and hot water, and the force and friction introduced by harsh, rough washcloths and towels.

In light of these findings and as a result of this study's results, this institution investigated alternative bathing options, such as a prepackaged bath. Studies conducted by Larson[20] and Vernon[24] determined that there were lower microbial counts on patients' skin after a prepackaged bath when compared to a basin, although these studies did not reach statistical significance.

Kosair Children's Hospital now uses prepackaged bathing washcloths made with USP purified water, surfactants, aloe, and Vitamin E to eliminate the use of basins for patient bathing purposes. The benefits provided with prepackaged bathing are as follows:

- **removes the risk of basin and waterborne contamination**
- **reduces the transfer of organisms and environmental cross-contamination**
- **helps maintain skin's natural barrier (due to softness of material and mildness of cleanser)**

To further document basins as a source of bacterial colonization, additional basin sampling studies should be performed in larger quantity, and should demonstrate both qualitative and quantitative results of microorganism growth.

References

1. Exner M, Kramer A, Lajos L, et al. Prevention and control of health care associated waterborne infections in health care facilities. *Am J Infect Control.* 2005;33:526-540.
2. Anaissie EJ, Penzak SR, Dignani MC. The hospital water supply as a source of nosocomial infections: a plea for action. *Arch Intern Med.* 2002;162:1483-1492.
3. Panhotra BR, Saxena AK, Al-Mulhim AS. Contamination of patients' files in intensive care units: an indication for strict handwashing after entering case notes. *Am J Infect Control.* 2005;33:398-401.
4. Stone PW, Braccia D, Larson E. Systematic review of economic analyses of health care-associated infections. *Am J of Infect Control.* 2005;33:501-509.
5. Weinstein RA. Nosocomial infection update. *Emerg Infect Dis.* 1998;4:416-420.
6. CDC. Public health focus: surveillance, prevention, and control of nosocomial infections. MMWR Morb Mortal Wkly Rep.1992;41:783-787. Available at: http://www.cdc.gov/mmwr/preview/mmwrhtml/00017800.htm. Accessed May 31, 2007. (No authors available at this website).
7. World Health Organization. Prevention of hospital-acquired infections: A Practical Guide. 2nd edition. Editors Ducel G, Fabry J, Nicolle L. 2002. Available at: http://www.who.int/csr/resources/publications/drugresist/whoodscsrph200212.pdf. Accessed on May 31, 2007.
8. World Health Organization. Guidelines for drinking water quality. 3rd edition. Geneva:WHO; 2004. Available at: http://www.who.int/water_sanitation_health/dwq/GDWQ2004web.pdf. Accessed on May 31, 2007. (No authors available on this website).
9. Emmerson A. Emerging waterborne infections in healthcare settings. *Emerg Infect Dis.* 2001;7:272-276.
10. Tercelj-Zorman M, Seljak M, Stare J, et al. A hospital outbreak of Legionella from a contaminated water supply. *Arch Environ Health.* 2004;59:156-159.
11. Trautmann M, Lepper PM, Haller M. Ecology of Pseudomonas aeruginosa in the intensive care unit and the evolving role of water outlets as a reservoir of the organism. *Am J Infect Control.* 2005;33:541-549.
12. Hunter P. National disease burden due to waterborne transmission of nosocomial pathogens is substantially overestimated. *Arch Intern Med.* 2006; 163:1974.
13. Anaissie E. In reply: National disease burden due to waterborne transmission of nosocomial pathogens is substantially overestimated. *Arch Intern Med.* 2006;163:1974-1975.
14. Leprat R, Demzot V, Bertrand X, et al. Non-touch fittings in hospitals: a possible source for Pseudomonas aeruginosa and Legionella spp. *J Hosp Inf.* 2003;53:77-82.
15. Assadin O, El-Madini N, Seper E, et al. Sensor operated faucets: a possible source of nosocomial infection? *Infect Control Hosp Epidemiol.* 2002;23:44-46.
16. Clark AP, John LD. Nosocomial infections and bath water: any cause for concern? *Clin Nurse Spec.* 2006; 20:119-123.
17. Sheffer P, Stout J, Wagener M, et al. Efficacy of new point of use water filter for preventing exposure to Legionella and waterborne bacteria. *Am J Infect Control.* 2005;33:520-525.
18. Sehulster L, Chinn RYW. Guidelines for environmental infection control in health-care facilities: recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC). *MMWR Morb Mortal Wkly Rep.* 2003;52:1-42.
19. Larson EL, McGinley KJ, Foglia AR, et al. Composition and antimicrobic resistance of skin flora in hospitalized and healthy adults. *J Clin Microbiol.* 1986;23:604-608.
20. Larson EL. Comparison of traditional and disposable bed baths in critically ill patients. *Am J Crit Care.* 2004;13:235-241.
21. Shannon R, Allen M, Dutton A, et al. Patient bath water as a source of nosocomial microbiological contamination: an intervention study using chlorhexidine. *J Healthcare Safety, Compliance, and Infect Control.* 1999;3:180-184.
22. Volman K, Garcia R, Miller L. Interventional Patient Hygiene: Proactive (Hygiene) Strategies to Improve Patients' Outcomes. *AACN News.* 2005 Aug;22(8):12-26. Available at: http://www.aacn.org/AACN/contducr.nsf/Files/AND805CE/$file/AND805CE.pdf. Accessed May 31, 2007.
23. Bryant RA, Rolstad BS. Examining threats to skin integrity. *Ostomy Wound Manage.* 2001;47(6):18-27
24. Vernon MO, et al., for the Chicago Antimicrobial Resistance Project (CARP). Chlorhexidine gluconate to cleanse patients in a medical intensive care unit: the effectiveness of source control to reduce the bioburden of vancomycin-resistant enterococci. *Arch Intern Med.* 2006;166:306-312.

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