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Environmental Testing of Patient Bath Basins Drives Quality Improvement Efforts in the Prevention of Bacterial Cross-Contamination

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ABSTRACT

Title: Environmental Testing of Patient Bath Basins Drive Quality Improvement Efforts for Preventing Bacterial Cross Contamination

Issue: The prevention of hospital-acquired infections (HAIs) is a major public health concern. The high incidence of patients contracting HAIs during hospital visits implicates the presence of bacteria and dangerous pathogens from common sources within the hospital. Bath basins have been reported to be a potential source for cross-contamination of these organisms to patients and should be examined as a possible etiology for bacterial colonization and increased risk for HAIs.

Project: Twenty-four patient bath basins from a single institute were sampled from patients who were not in isolation, had been admitted ≥48 hours, and were bathed at least twice. Patient caregivers were blinded to the study. Twelve samples were obtained by an outside source and analyzed by an external lab. The external lab also analyzed 5 environmental cultures obtained from unused basins in designated rooms and from the delivery dock. At a separate time, nurse researchers on the unit mirrored the swabbing technique used by the external source, and the hospital's internal lab analyzed 12 additional samples. The patient primary diagnosis, location of the basin in the patient's room, and unit designation were recorded in a spreadsheet. A standard enrichment procedure allowed for detection of low level or stressed organisms, and organisms recovered on selective plates were analyzed through standard techniques.

Results: The environmental basins tested negative for bacterial contamination. Of the 12 patient basins tested by an external source, 50% tested positive for Gram-negative bacteria, 8% for Staphylococcus aureus, 8% for methicillin resistant Staphylococcus aureus, 67% for Enterococcus, and 67% for vancomycin resistant Enterococcus (VRE). Similarly, 42% of the 12 patient basins tested by the internal lab tested positive for Gram-negative bacteria, 8% for S. aureus, 17% for Enterococcus, and 8% for VRE. A random sampling of stool from 53 patients upon admittance to the hospital indicated that only 2 of the 53 patients, or 4%, were positive for VRE.

Lessons Learned: Environmental testing revealed patient bath basins can harbor HAI-causing pathogens and are a likely source of cross-contamination to patients during their hospital stay. As a result of our findings, we removed the patient bath basins from the room and now provide a pre-moistened rinse-free washcloth for all medical surgical patients.

ISSUES

Hospital-acquired infections (HAIs) are a major source of patient morbidity and mortality, accounting for an estimated 99,000 deaths annually.[1] Contamination of surfaces in hospital rooms contributes to the transmission of multidrug-resistant organisms (MDROs) such as Methicillin-Resistant *Staphylococcus aureus* (MRSA) and Vancomycin-Resistant *Enterococcus* (VRE).[2] Hospital bath basins have been identified as a reservoir of pathogens such as MRSA, VRE, *Pseudomonas aeruginosa*, and *Candida albicans*.[3] Studies have indicated that water serves as a conduit for biofilm-forming pathogens.[4,5] Bath basins that are improperly stored or inadequately disinfected can become contaminated with biofilm-forming pathogens and can act as a source for the transmission of HAIs.[3] Contamination of basins can also arise from contact with the caregiver's hands or from the patient's flora released during bathing.[6,7]

The prevention of HAIs is a major public health priority. Identification of sources of cross-contamination in the hospital is an important step in the prevention of HAIs. In a quality improvement effort initiated in 2009, Delnor Hospital examined patient bath basins for the presence of bacteria to determine if bath basins are a reservoir of bacterial contamination. The bath basins were tested at multiple stages—upon receipt at the hospital delivery dock, after stocking in central supply, and after 2 or more baths in the patient rooms—to identify the stage at which bacterial contamination occurs (Figure 1).

METHODS

This study was a prospective, non-randomized, single institution infectious disease study. Twenty-four patient bath basins were sampled.

Sample Set:

- 2 unused basins sampled from hospital delivery dock
- 3 unused basins sampled from unit storage room
- 12 patient samples, collected by an external infectious disease specialist and analyzed by an external laboratory (March 2009)
- 12 patient samples, collected by registered nurses trained in swabbing technique and analyzed by an internal laboratory (June 2009)

Eligibility requirements for basins sampled from patient rooms:

- Patient admitted ≥48 hours
- Basin utilized for whole body bathing ≥2 times
- Patient eligibility was confirmed through patient record review
- Caregivers were blinded to the study
- Patients not in isolation

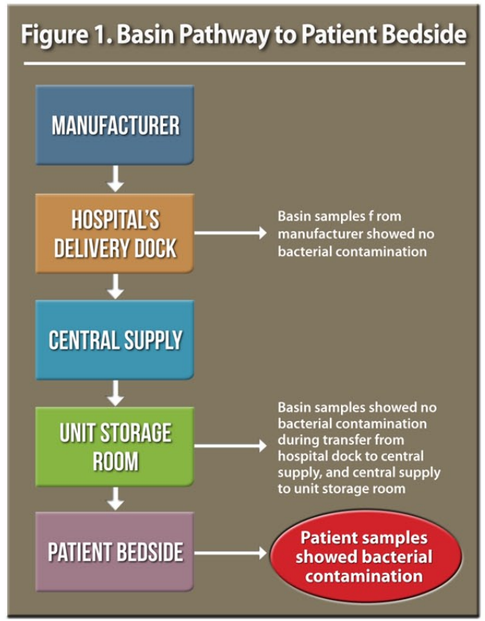
Sample Collection Procedure:

- Upon removal from a patient's room, the entire basin (interior, base, walls) was swabbed with a culture sponge prewetted with 10 mL sterile diluent.
- Culture sponges were packaged in a sterile bag and delivered to the laboratory performing the analysis on the same day the samples were gathered.
- Patient primary diagnosis, location of basin in the patient's room, and unit designation were recorded in a database.

Sample Analysis Procedure:

- A standard enrichment procedure was implemented to detect low level or stressed organisms in the test fluid.
- Samples were streaked onto selective agars after a 48-hour incubation period.
- Identity of colonies recovered from selective plates was confirmed through standard techniques.

Figure 1. Basin Pathway to Patient Bedside



RESULTS

The 2 unused basins from the hospital's delivery dock and the 3 unused basins from the unit storage room tested negative for bacterial contamination. Basins collected from patient rooms tested positive for bacterial contamination (Figure 2).

Of the 12 patient basins tested by an external lab, 50% tested positive for gram-negative bacteria, 8% for Staphylococcus aureus, 8% for MRSA, 67% for *Enterococcus*, and 67% for VRE. Similarly, 42% of the 12 patient basins tested by the internal lab tested positive for gram-negative bacteria, 8% for *Staphylococcus aureus*, 17% for *Enterococcus*, and 8% for VRE. (Figure 2)

A random sampling of stool from 53 patients, both inpatient and outpatient, indicated that only 2 of the 53 patients, or 4%, were positive for VRE.

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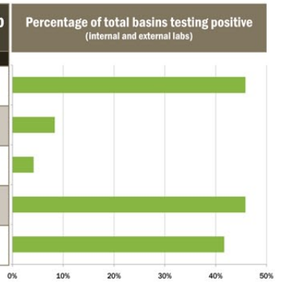
Figure 2. Basin Sampling Results

Organism	Internal Lab (n = 12)	External Lab (n = 12)
	N = 24	
Gram-negative bacilli	42%	50%
Staphylococcus aureus	8%	8%
MRSA	0%	8%
Enterococcus	17%	67%
Vancomycin-resistant *Enterococcus*	8%	67%



LESSONS LEARNED

Environmental testing revealed patient bath basins can be a reservoir for MDROs and other HAI-causing pathogens. The progressive stages of testing confirmed the basins received from the manufacturer were not contaminated. Furthermore, no contamination occurred as basins were moved from the hospital delivery dock to Central Supply and from Central Supply to the unit storage rooms. Contamination appears to have occurred while in the patient's room, confirming basins are a potential source for cross-contamination of bacteria to patients during their hospital stay. Our study prompted the following practice changes:

- Removal of bath basins from patient rooms
- Provision of pre-packaged bathing cloths for all medical/surgical patients

Improvement in caregiver hygiene, staff education of potential sources of cross-contamination in the hospital, and replacement of bed baths with disposable baths are important steps in the prevention of HAIs.

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