Shared Accountability
A Strategy to Reduce Infection Risk

Bug of the Month:
Battling a Scourge

Toilets: A Growing Pathogenic Risk

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When The Unexpected Happens: Are You Ready?

When the unexpected happens, are you ready for it? In today’s world, an outbreak or a catastrophic healthcare emergency seems far more likely to happen in this fast-paced, ultra-mobile world. The threat requires a constant state of readiness.

With that said, on average, U.S. colleges and universities with nursing programs offer only about one hour of instruction in handling situations such as pandemics, according to Roberta Lavin, executive associate dean and professor in University of Tennessee (UT) College of Nursing in Knoxville, TN.

Lavin investigated the subject with colleagues that included two surveys of students and faculty of nursing programs at U.S. colleges and universities, interviews, and a review of relevant data to gain a better understanding of healthcare's readiness when emergency strikes.

"Events that can cause greater impact, but are less likely to occur, usually receive less training hours," Lavin says.

Interestingly, most participating students reported they were not getting enough instruction in emergency response, while professors and lecturers said they were not prepared to teach delivering care during and after catastrophic situations.

"Emergencies are not just the exact moment a disaster hits; it is also the aftermath," Lavin says. "How do we evacuate a town? How do we carry out care for other chronic, sometimes life-lasting consequences that derive from these situations? That is the big challenge."

Study findings investigated the management of Zika fever and water contamination crises and was focused on nurses’ preparedness to attend pregnant women and children, two populations that are often overlooked in emergency plans. In addition to nursing schools, the same study also assessed the preparedness of programs in public health, in medical schools, and osteopathic programs in the United States.

"Even though all accreditation standards require this type of preparation, we are not putting enough emphasis on it," Lavin observes.

Lavin is collaborating with other authors to develop resources to help close that knowledge gap. One of the actions they are taking is to design educational modules for instructors to use in their classes. The units are licensed under Creative Commons and can be downloaded free of charge; users can adjust the courses to meet the needs of their communities.

The article "Zika and Flint water public health emergencies: Disaster training tool kits relevant to pregnant women and children," was written in collaboration with researchers at the Johns Hopkins University School of Nursing, the schools of Nursing and Medicine of Saint Louis University (Missouri), Louisiana State University School of Nursing, and the University of Missouri, St. Louis’ School of Nursing.

The article, "National nurse readiness for radiation emergencies and nuclear events: A systematic review of the literature," was prepared in collaboration with researchers in the Johns Hopkins School of Nursing; Johns Hopkins Center for Humanitarian Health; Johns Hopkins Bloomberg School of Public Health; the University of Missouri, St. Louis’ School of Nursing; the Johns Hopkins University School of Medicine; the Johns Hopkins Bloomberg Children’s Hospital; and the John Hopkins SPAN Program (Supporting Professional Advancement in Nursing).

Until next month, bust those bugs!

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EDITOR'S LETTER

We are putting people out there to attend these emergencies, and we owe it to them to prepare them right.
Roberta Lavin
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**PARTS AND ACCESSORIES**
I'm a Scourge, and I am Getting Stronger

Sorry I don't give autographs, as I simply haven't got the time. My claim to fame, you ask? Well, I'm a Gram-negative bacteria that has become one of the most difficult pathogens to treat! I know other bugs say they're tough, but they don't mess with me, and you won't want to, either.

I shouldn't claim all the credit for my status, although my sudden rise has gone to my head, if you haven't already noticed. Ah, vanity! My species was largely unknown several decades ago, but we have risen to power and prominence partly because of our clan's ability to trigger infections in immunocompromised patients. I can cause a spectrum of infections, but I most commonly affect the lower respiratory tract, followed by blood and wound invasion. If your patients develop ventilator-associated pneumonia or central line-associated bloodstream infection, I'm most likely the culprit.

I am primarily a healthcare-associated pathogen, thus the risk factors for colonization and infection by me and my kin are also healthcare-associated. Risk factors for acquisition include recent exposure to antimicrobial agents, presence of central venous catheters or urinary catheters, severity of illness, duration of hospital stay, location in an intensive care unit, larger hospital size, and recent surgery.

I am notorious in hospitals now because I have acquired resistance genes to virtually all antibiotics capable of treating Gram-negative bacteria, including the fluoroquinolones and the cephalosporins. Some members of our clan have accumulated resistance genes in sizable amounts within the bacterial chromosome, and the only conventional remaining treatment options were the carbapenems. But not so fast! We possess a specific 8-lactamase gene that has the awesome ability to confer carbapenem resistance.

There's been a lot of talk recently about this so-called antibiotic of last resort, colistin, which is now considered to be the final antimicrobial capable of treating infections caused by us. But guess what? Scientists are now isolating strains in our clan that are resistant to this potent antibiotic as well. I'm pretty proud to say that I rank up there with my good buddies, methicillin-resistant Staphylococcus aureus (MRSA) and Clostridium difficile as a threat to patients worldwide and a confounding factor in the global fight against antimicrobial resistance. I'm a scourge upon mankind, and I'm loving the attention!

Researchers who have studied me and my clan report that mortality for carbapenem-resistant infections ranges from 16 percent to 76 percent, as opposed to 5 percent to 53 percent for carbapenem-susceptible infections. So you tell me — aren't I worth fighting? To that end, you can try to wipe me out by administering antimicrobial therapy to patients, but you probably should pay some attention to environmental hygiene and good handwashing too.

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ICT spoke with Caroline Haggerty, RN, MSN, MBA, LSSBB, manager of quality and patient safety for Penn Medicine in West Chester, Penn., about the importance of shared accountability relating to environmental cleaning in the healthcare environment. At this year’s APIC annual meeting, Haggerty was the recent presenter of a talk titled, “Who Cleans What? Improving Cleanliness of the Hospital Environment,” in which she shared how her 700-bed hospital created a multidisciplinary-shared accountability model for cleaning the patient environment and equipment. Haggerty addressed the steps they undertook to ensure environments and equipment were clean, staff could speak to the cleaning process, and overall cleanliness was improved.

ICT: You shared with the audience how you developed a strategy to engage an interdisciplinary team to identify and address potential vulnerabilities in cleaning processes. What was the impetus behind this pilot project?
Haggerty: First and foremost, we wanted to provide our patients with a clean and safe environment. It was also driven by our desire to be survey-ready and compliant with regulations from the Joint Commission. We were about a year out from our survey, and we knew that the surveyors were asking frontline staff about cleaning processes, including how is equipment cleaned, who cleans it, and how do you know it was cleaned? We knew what was coming, and we wanted to be prepared for this process.

ICT: What was the level of readiness in your facility before launching the pilot study?
Haggerty: Before we conducted our study, we did not feel as though staff could speak to cleaning processes for all equipment. All the stakeholders were aware of this issue so we were definitely ready to address it. We have a unique position assigned to each nursing unit called a support associate. The support associate is charged with managing the equipment, including taking it out of the room and cleaning it. This process was being done, but how did staff know if the equipment was actually clean, and how did staff actually determine this? We also needed to ascertain who was cleaning what in the patient environment and in the unit environment. We suspected there were some gaps that needed to be addressed.

ICT: Your presentation at APIC drew a big crowd; what does that tell you about the size of the challenge for many healthcare facilities?
Haggerty: The large audience is indicative that many people are struggling with the issue of who cleans what. We shared the results of our pilot study with our local APIC chapter prior to the national meeting, and it was well received there, too, with many people wanting to adopt our program. We have seen some similar types of programs at other hospitals, but it wasn’t quite to the level of ours. The grid is highly visible for all staff on a daily basis and it is very clear who is responsible for what, in terms of cleaning. A clean environment has such an impact on overall health of patients and staff, but so many institutions are struggling with exactly how to achieve it.
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What we did want to emphasize was our shared accountability model and that everyone has a responsibility for a clean patient and unit environment.

ICT: Did you involve infection prevention in your efforts?
Haggerty: Infection Prevention was instrumental with the success of this project from start to finish. At that time I was a performance improvement adviser at the hospital who partnered with the Infection Prevention department. Our director was one of the team leaders. The level of knowledge and expertise our Infection Prevention department has and shares, in terms of cleaning and regulatory requirements, is incredible.

ICT: You and your team designed a detailed visual grid so staff could quickly and easily identify which team members hold primary accountability for maintaining clean equipment and frequency of cleaning. Tell us more about the work behind this effort, which seemed to be key to the program’s success.
Haggerty: We did so many iterations of the grid! Initially, the first edition of the grid had a column indicating who was responsible for cleaning but we felt that was not good enough. We felt people would still have questions about how a piece of equipment was supposed to be cleaned and how often it was supposed to be cleaned. That’s when we came up with the idea of adding columns to the right of that first column to convey information about frequency of cleaning as well as indicate the appropriate cleaning material to use.

We also color-coded columns in the grid to the colors of the scrubs worn by various hospital personnel, as an easy and fast visual cue to who cleans what. We thought that compliance could be boosted if people could simply refer to the grid to match the color of their scrubs to the kind of equipment that needed to be cleaned. The grid embraced the idea of shared accountability, a concept that we used on all of the program’s material. We had people actively use the grid and provide feedback, and incorporate that feedback, and that’s probably the reason why it has been so successful.

ICT: What were the objects that were falling through the cracks in terms of regular cleaning?
Haggerty: One of the pieces of equipment that was being neglected was the commodes in patient rooms. Environmental services personnel are responsible for cleaning the toilets in the bathrooms, but if a patient is using the commode it was unclear who was responsible. Typically patient care staff would clean the bucket but what about the surfaces of the commode? We identified cleaning of the seats and handles of the commode as a gap.

Now, EVS staff are responsible for cleaning the commode surfaces daily the same as they would be for cleaning the toilet. The other major challenge were the soiled linen hampers. When EVS personnel would turn over a room, they were not addressing the soiled hampers because they were kept just outside the room for easy access. These soiled linen hampers had the highest level of bioburden when we conducted our ATP testing. What surprised us was how high the level was on the hamper lids, and that was quite alarming. We also found that high-touch keyboards, which weren’t washable, had significant levels of bioburden. We were concerned about that, and it took a long time for IT to agree to pilot washable keyboards at the nurses station on one of our oncology units — and it made a big difference.

The cleaning process for the keyboards, which was questionable before, now has a solid process in place. The other surprising finding was the level of contamination of our workstation on wheels and cleaning them properly was a struggle. Now each workstation has a bracket that holds the appropriate wipes for cleaning them.

ICT: What kind of training and education around cleaning did you do as part of your pilot study?
Haggerty: Educating staff was a priority. Infection prevention constantly relayed to workers the importance of cleaning and disinfecting, including dwell times. At one point we switched from a product with a three-minute dwell time to a one-minute dwell time, which helped staff turnover rooms. We also addressed the overall competency relating to cleaning of equipment. Cleaning competencies of staff responsible for cleaning, including central processing, environmental services, and nursing, were solid. What we did want to emphasize was our shared accountability model and that everyone has a responsibility for a clean patient and unit environment. We were able to accomplish this by rounded shoulder to shoulder on every unit multiple times during day and night shifts to talk about the grid, share the toolkit, talk about shared accountability and answer any questions staff had. We wanted to talk to as many individual staff members as possible.

ICT: What happened after the pilot study was completed?
Haggerty: After the initial pilot study was finished, we continued our rounds and tested random pieces of equipment. Staff did not know what we were going to be testing. We focused on the ATP testing on pieces of equipment that we thought would have the highest level of bioburden, such as the tops and handles of isolation carts. Nearly everything passed; it was rare that something failed. At the end of rounds we would debrief staff. They could not wait to hear the results of the ATP testing, knowing the results was the most important piece of the whole program to them — how did they do, and could they keep improving?

ICT: Is your program scaleable to all kinds of institutions?
Haggerty: This effort is definitely transferable to all kinds of practice settings. The University of Pennsylvania is a very large institution, but I can’t say that we have a plethora of resources. The important thing is working with what you have. It is very important to work with your staff to figure out how this concept will work for them – that’s the key. How is it going to work for your frontline staff? You might not have the ability to put wipes into every patient room, as it increases your use of wipes, but isn’t that a good thing because it means more cleaning is being done. So, you must look at it that way. If you give staff the tools they need, where they need them, you are going to have a better outcome. Success is also about listening to staff, knowing what resources are available, and working with various stakeholders to make sure healthcare teams can do their very best — no matter the size of your institution.
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Healthcare-associated infections (HAs) are a well-identified complication associated with hospitalization. An estimated 648,000 patients are infected with 721,800 HAs in the United States each year in acute-care facilities (Magill, 2014). For some time, the impact of the environment on the risk of certain HAs was not well understood. It has become more evident that the environment plays a critical role in the transmission of certain pathogens. Environmental contamination in healthcare facilities is believed to be strongly related to HAI risk for certain pathogens associated with environmental routes of dissemination and may increase patient risk by up to six times for these HAs under certain conditions (Cohen, 2018).

Environmental surfaces and patient-care equipment (collectively referred to as surfaces) are frequently cleaned inconsistently in healthcare facilities. These surfaces, also known as high-touch surfaces, are believed to create an increased risk of cross contamination simply because they are frequently touched by patients, healthcare workers, and/or visitors. High-touch surfaces in the patient zone include the bed rail, overbed table, bed surface, bedside table, and the nurses call button. Carling (2008) found cleaning compliance for patient-room discharge cleaning was 49 percent when measured on 14 high-touch surfaces in a study across 23 acute-care hospitals with individual surfaces ranging from 20 percent to 82 percent compliance across the study, demonstrating the scope of the gap in consistent cleaning.

Studies attempting to quantify the risk for certain high-touch surfaces are frequently confounded by factors such as frequency of staff visiting the patient room, mobility and acuity of the patient, and sampling error. The patient is generally understood to be a source of pathogen dissemination. Frequent contamination of the surfaces near, or frequently touched by, the patient (both environmental surfaces and patient-care equipment) represent a likely risk of onward dissemination of pathogens originating from the patient. It is important to understand where and how environmental contamination occurs. Due to the time a patient spends in bed or out of bed in a chair within the patient zone, the surfaces within the zone are frequently found to be contaminated.

However, one area that may be overlooked is the patient’s bathroom. The high level of microorganisms present from feces during defecation and the ease with which environmental contamination occurs through toilet flushing suggests this is a significant risk. Currently, awareness of this risk is low and understudied. This article discusses the issue of pathogen dissemination associated with the use of toilets within patient and ICU rooms and/or bathrooms and attempts to shed light on this underappreciated risk.

**Feces as a Source of Bacterial or Viral Pathogens**

Feces in a healthy person is well known to contain high bacterial diversity and high numbers of bacteria per gram of feces. Gerba (1975) discussed that the average human stool weight is approximately 100 g and contains about \(1 \times 10^{12}\) (one trillion) bacteria. A study by Kelly (1994) similarly reports that the typical human colon contains \(>500\) species of bacteria and that healthy feces may contain \(>1 \times 10^{12}\) colony forming units (CFU) per gram of feces. A study by Stephen (1980) estimated that bacteria were 54.7 percent of the total mass of solid feces in a healthy person and a study by Sender (2016) estimated that the intestines, which contains a mix of liquid and solid material, may contain from \(1 \times 10^8\) to \(1 \times 10^{11}\) bacteria per ml.

These studies show the intestines and ultimately the feces that leaves the body contain high numbers of bacteria; however, the bacteria are not necessarily pathogenic as many of the bacterial species in the body have a benign or positive impact on the body. To address this question, studies of patients known to be colonized or infected with certain bacterial pathogens have shown that these organisms are shed in high numbers in feces including VRE at 7.5 log_{10} per gram of stool (Ray, 2002) and MRSA at 107 – 109 CFU/gram of stool (Boyece, 2007). Patient colonization or infection with certain bacterial pathogens is thus likely to result in toilet contamination with the pathogen, which then creates a risk of environmental contamination from toilet flushing.

Humans carrying viruses are similarly well known to shed them in feces. Guardabassi (2003) discusses that more than 130 pathogenic viruses are known to be shed in human feces including adenoviruses, astroviruses, enteroviruses, calciviruses (including norovirus), hepatitis A & E viruses, rotaviruses, coronaviruses, and respiratory viruses such as influenza. Contamination with blood can introduce HIV or HBV into feces as well, but these viruses do not survive as well in feces and may represent a lower level of risk of pathogen dissemination from feces than other viruses.

Thus, bacteria and viruses can contaminate toilets with high numbers of pathogenic bacteria or viruses during normal defecation. The presence of these pathogens in toilets has previously been identified as a risk of environmental contamination, but it is difficult to quantify the level of risk associated with toilet contamination since all the feces is presumably flushed after use.
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Toilets as a Source of Pathogen Dissemination

Using a toilet for defecation, or to empty bedpans/commode buckets, puts high numbers of bacteria or viruses into the toilet with each use. The same would be true for pathogenic viruses if the person using the toilet was infected or colonized with a pathogenic virus. The relationship between toilet flushing and the risk of environmental contamination has been studied in the past. When toilets are flushed, bioaerosols (airborne droplets containing microorganisms) are generated.

Verani (2014) discussed how a toilet flush generates a large number of droplets of different sizes. Whereas the largest droplets quickly settle onto surfaces close to the toilet, smaller droplets can remain airborne for long periods of time, making them more likely to be inhaled or to contaminate a person moving through the air space or to migrate to other parts of the facility before contaminating people or surfaces. Gerba (1975) reported on previous studies that found after flushing a toilet, bioaerosols containing Serratia marcescens were present for at least 12 minutes after flushing and concluded that flushing a toilet releases 1,000 to 10,000 potentially pathogenic bacteria into the environment through bioaerosol droplets.

Knowlton (2018) recently conducted a toilet flushing study to investigate the size and the bacteria level of bioaerosol droplets generated by toilet flushing and found that droplets < 3 µm were the predominant droplet size across several different tests with bioaerosol sampling. Toilet flushing with no fecal waste in the bowl created more droplets than when fecal waste was in the bowl, suggesting that feces and toilet tissue to some extent suppress the number of bioaerosol droplets created by slowing the speed of the water during flushing, which reduces bioaerosol droplet formation.

However, flushing with no visible waste in the toilet still spread bacteria into the air, suggesting that bacteria remain in the bowl after multiple flushes, which is consistent with other studies. Knowlton (2018) further reported that while toilet flushing with feces in the bowl produced fewer bioaerosol droplets than with no waste in the bowl, higher levels of bacteria were present in the bioaerosol droplets when there was feces in the bowl and even more bacteria and bioaerosol droplets when the feces was loose rather than solid.

Compared to a baseline air contamination rate of 210 CFU/m3, flushing with no waste in the toilet increased the number of bacteria in the air by 14 percent and flushing with waste in the toilet increased the number of bacteria in the air by 32 percent (Knowlton, 2018.) In general, there was little difference in number of bioaerosol droplets or number of bacteria at distances of up to 1 meter from the toilet in the Knowlton (2018) study, indicating that the spray from the toilet was relatively consistent. The same study also discussed prior reports that toilets with a high velocity flush have been shown to produce more droplets and bacteria than toilets with less flushing velocity, suggesting that water conserving toilets may represent more of an infection risk by producing more infectious droplets even as they reduce the water used from flushing.

The idea that bacteria are not completely removed from a toilet by flushing is supported by other studies as well. Johnson (2013) performed a literature search on toilet plume aerosol studies and reported that in one study, bacteria were still recovered from the bowl water 12 days after seeding and in biofilm below the waterline after 50 days. Barker (2005) sampled various parts of the toilet after intentional inoculation and repeated flushing and found that recesses under the toilet rim were heavily colonized. The number of bacteria on the bowl wall were consistent over several days despite repeat flushing. Use of a toilet brush and disinfectant was necessary to remove the bacteria from the bowl, but it was clear that bacteria found multiple sites to colonize the toilet bowl.

Sassi (2018) contaminated a toilet with a bacteriophage and flushed the toilet to determine which surfaces near the toilet were contaminated. The most heavily contaminated surfaces were the underside of the toilet seat, the top side of the toilet seat, and the toilet bowl rim with the virus detected 100 percent of the time in these sites, indicating much of the toilet surfaces are contaminated by viruses during toilet flushing when there are viruses in the bowl.

The brief review of the studies in this section demonstrate contamination of the air and surrounding areas near the toilet through normal toilet use. This is somewhat similar to how sneezing can spread large numbers of viruses and bacteria over a large area if proper cough/sneeze etiquette is not followed. At a young age people are taught the value of covering their mouth during sneezing, yet there is no similar concern around toilet flushing in commercial and healthcare facilities.

Human Inhalation Risk from Bioaerosols

Bioaerosols represent a significant inhalation risk to people. O’Toole (2009) reported on human inhalation studies which determined that while the human respiratory system filters 100 percent of particles >7 µm, droplets that reach the lower part of the lungs are generally between 1-3 µm. Droplets >3 µm are deposited mainly in the upper respiratory tract and generally end up being swallowed, while droplets of 10-200 µm in size are too large to be inhaled but may break up into smaller droplets and be inhaled. Larger droplets are likely to settle onto surfaces near toilets and contribute to indirect contact transmission.

Gerba (1975) discussed several studies which reported that bioaerosol droplets formed by flushing a toilet are of the size that can be inhaled into the lower respiratory tract in humans. The paper also discussed that for at least some bacterial pathogens it has been established that the infectious dose can be lower for inhaled bacteria than for ingested bacteria, making the formation of bioaerosols that contain pathogens a significant health risk for people and potentially more of an infection risk than contaminated environmental surfaces.

Environmental Surface Contamination

How flushing toilets containing bacteria or viruses may contaminate the environment has also been previously studied. Artificially seeding a toilet with viruses and flushing showed contamination on 78 percent of adjacent surfaces, 81 percent of aerosol droplets, and 89 percent of toilet water samples in a study by Verani (2014.) Similarly, Gerba (1975) seeded toilets with bacteria and viruses, flushed the toilet, and sampled the toilet bowl. While flushing lowered the overall number of bacteria and viruses recovered, there was a plateau below which the concentration could not be reduced. This suggests that the bacteria and viruses were absorbed/attached to the toilet porcelain and then released through multiple subsequent flushes. When sampling and culturing the bathroom after seeding, during the first two hours bacteria were usually only detected in a limited area around the toilet, but later testing found bacteria more randomly distributed around the room as the organisms were more broadly disseminated.

How far bacteria can spread and contaminate surfaces has been an important question for many years. Buchan (2019) studied the relationship between handwashing sink drain contamination with Klebsiella pneumoniae carbapenemase (KPC) organisms and toilet location for patients with KPC. While sink drains were positive 87 percent of the time for rooms with toilets located next to the sink, only 22 percent of sink drains were positive when the sink was located near the room door much further from the toilet. This suggests that bioaerosol contamination from toilet flushing can colonize sink drains, especially if the sink is close to the toilet.
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Contact precautions (CP) for MRSA colonized patients can:
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- lead to isolation fatigue
- adversely impact care

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but still represents a contaminate risk even for more remote surfaces. This also implies that position of the patient bed in relation to toilets located in the same room space, such as occurs in some ICU rooms, may be an important factor in contamination of the patient bed and equipment in the bed space by toilet flushing.

Barker (2005) seeded toilets with bacteria and a bacteriophage to determine the degree of environmental contamination from toilet flushing. They found that bacteria attached to the bowl wall and bacteria in the bowl water contributed to environmental contamination. The bacteriophage was also released into the environment from toilet flushing at levels roughly twice that of the bacteria, but toilet bowl contamination with either organism resulted in widespread environmental contamination. This study raises a question around the risk of pathogen dissemination from bedpan rinsing-spray arms/hoses, which are often located on the wall above the toilet. The typical water pressure of the sprayer is 20 to 80 PSI. Many healthcare workers do not use PPE when using the bedpan sprayer, further contributing to contamination risk from bioaerosols. While not addressed in the Barker study, the results of the study suggest that these sprayers are another underappreciated risk contributing to pathogen dissemination.

Toilet Lids and the Impact on Pathogen Dissemination

How well toilet lids might reduce environmental contamination has also been part of a few studies. Darlow (1959) studied the impact of standard toilet lids and found that the number of bacteria at seat level were 2.3 times higher with the lid open and that the mean droplet size was larger as well. Darlow also noted that closing the lid reduced, but did not prevent, bacteria from being released from the toilet during flushing.

Best (2012) studied the risk of aerosolizing Clostridiodes difficile (C. diff) during toilet flushing. With the lid open, C. diff was recovered from all settle plates but none, while with the lid closed C. diff was not recovered from any settle plate but was still recovered from room air. The number of C. diff bacteria recovered from airborne sampling was 10-fold higher when the lid was open during flushing than when the lid was closed.

However, is closing the lid of the toilet seat similarly protective to mimic covering a cough or sneeze with tissue, generating less bioaerosols? Barker (2005) found that closing the toilet lid had little impact on the bacteria levels in the air. In this study, there was a 15 mm gap between the bottom of the seat and the top of the bowl rim and a gap of 12 mm between the lid and seat top, both of which likely contributed to bacterial dissemination during flushing with the toilet lid closed. If toilet lids were designed to eliminate these gaps, they would be more likely to reduce environmental contamination versus traditional toilet lids.

Building Codes and Toilet Design

Environmental controls around the toilet to minimize the risk of pathogen dissemination are limited or non-existent. The use of lids on toilets to control pathogen spread is often prohibited by hospital (commercial) building code (CSA Group, 2017) or requires an additional approval from the local authority (U.S. Department of Justice, 2010), which decreases the probability of their use, despite their potential to reduce the pathogen dissemination risk from the use of toilets. This requirement may vary by local, state, or federal building code.

Summary and Future Recommendations

It is clear from the research discussed here that toilets are heavily contaminated with bacteria and viruses during normal use. The bacteria and viruses may be pathogenic. High levels of microorganisms are likely to be disseminated into the environment by flushing a toilet. Flushing a toilet creates bioaerosols that can spread high numbers of pathogens over a large area and the lack of toilet lids and use of high velocity flushing toilets are likely making this issue worse.

Research is clearly needed into how toilet design can prevent bioaerosol formation and how cleaning procedures for toilets can rapidly decontaminate a toilet. The potential presence of biofilms in the toilet bowl is potentially offering a protective effect that prevents routine cleaning from decontaminating the toilet. Hopefully this article will raise awareness of these important issues.

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References:

Current Processes and Challenges
Contamination incidents can be compounded by the operational/staffing challenges at healthcare facilities. As an industry, we are faced with an expectation of doing more with less – less staff, lower reimbursement rates, less inventory, and smaller budgets to name a few. Coupled with the ever-growing patient population requiring more extensive and specialized facilities, longer life expectancy, more uninsured and under-insured patients, higher expectations of the public for safer healthcare facilities and the reasonable demand for fewer Healthcare Associated Infections (HAIs), administrators are looking for options to meet the daily challenges they face. The implementation of the Patient Protection and Affordable Care Act and the Centers for Medicare and Medicaid (CMS) Hospital Value-Based Purchasing Program is a reality, and healthcare providers face new challenges never before seen. The CMS Roadmap for Implementing Value-Driven Healthcare in the Traditional Medicare Fee-for-Service Program explains:

The Concept Explained
A new concept and standard is in order: Environmental Services (EVS) infection prevention microfiber textile products should no longer be purchased and owned by that department. Instead, the facility laundry/linen (L/L) department or contractor must take on the responsibility of providing infection prevention microfiber products just as they do other healthcare textiles. In the case of a hospital operated laundry, they give the infection prevention textiles. In the case of a co-op laundry or a contracted healthcare laundry, ownership of the EVS textiles is theirs, just as they own all other healthcare textiles.
This general policy of Medicare cost reimbursement eligibility supports this new business model of Environmental Services (EVS) infection prevention textiles as reported as laundry operating costs in CMS cost reporting forms for these providers:

**SKILLED NURSING FACILITIES:**  
Form CMS-2540-10, Sections 4113, 4120, 4121, 4157 and 4160. See Worksheet A, B1, and B1, line 6. **Cost code 0600.**

**HOSPICES:**  
Form CMS-1984-99, Section 3810. See Worksheet A, lines 10 and 11. **Cost codes 1000 and 1100.**

**HOSPITALS:**  
Form CMS-2552-10, Sections 4013, and 4057. See Worksheet A, line 9 and Worksheet K, lines 7 and 8. **Cost code 0900.**

**RURAL HEALTH CLINICS:**  
Form CMS-222-92, Section 2904. See Worksheet A, p.2, line 32. **Cost code 3200.**  
See also Medicare Claims Processing Manual Section 40.

**RENAL DIALYSIS FACILITIES:**  
Form CMS-265-11, Section 4206. See Worksheet A, line 14. **Cost code 1400.**

**HOME HEALTH AGENCIES:**  
Form 1728-94, Section 3240. See Worksheet K, lines 7 and 8. **Cost code 500.**

In on-premises laundries, the L/L department historically has ownership of all other HCT products used by the facility. On-premises laundries have pushed back from purchasing microfiber EVS infection prevention textile products due to initial inventory and unrealistic replacement costs and healthcare laundry contractors, who own all of the stock, have also pushed back for the same reason. If pushed by client hospitals, healthcare laundries have preferred to rent infection prevention textile products due to initial inventory and dusters during the past 100-plus years are now recognized as inadequate, ineffective, inefficient, and a vector for organisms that directly cause HAIs. The question of shrinkage is always in the mind of an EVS director and laundry contractor; to be honest, shrinkage does exist. However, far less than the shrinkage of other HCTs. Bear in mind, replacement costs are part of the overall cost of a laundry operation, not a direct EVS expense, and CMS addresses operational laundry costs. If the point of this report has not become evident, then here it is: EVS textiles should not be in a separate category, EVS should not purchase them, they are healthcare textiles and, specifically, infection prevention textiles. In the same way that OR drapes, surgical huck towels, nursery items, patient linen, scrubs, cubicle curtains, and other textile products are charged to individual departments or units, EVS textile products should be included in the L/L inventory with the attendant costs involved in each department’s or unit’s costs. All textile products should be the responsibility of the L/L department or healthcare laundry contractor with appropriate departmental input about item specification, quantity, and efficacy.

When cubicle curtains changed from cotton-based to human-made fabric, when bed pads changed from cotton to cotton/polyester blends, and when bed sheets changed from cotton to cotton/polyester blends as well as synthetic knit fabric for fitted sheets, no change in the purchasing or ownership was made. When a new textile product was needed to meet healthcare’s needs, such as flame-retardant material or coating, or copper infused bedding, the product was incorporated by the L/L department or the contractor to fulfill the mission of improved patient care, outcomes, and safety. A textile product is a textile product, regardless of the department using it or the fabric content. There are two exceptions to this rule:

1. When an EVS department inexplicably continues to use discarded washcloths or other terry cloth items (a rag has no value, and cotton mops have no infection prevention properties)

2. When EVS uses disposable products

Cotton used in products used for mops, cloths, and dusters during the past 100-plus years are now recognized as inadequate, ineffective, inefficient, and a vector for organisms that directly cause HAIs. By taking the step to transfer ownership and cleaning costs of textile products to the L/L department or healthcare laundry contractor, costs would be absorbed by the entire facility and charged out to each department, and the purchasing, cleaning, and replacement costs of the
textile products would no longer fall inequitably on EVS.

As mentioned previously, there is the consideration of CMS reimbursement to keep in mind. CMS guidelines state that Environmental Services is chargeable based on a weighted square foot cost basis and, thus, must be part of the daily (patient days) reimbursement payment received based upon the patient diagnostic related group (DRG).

Reduce HAIs through a Non-Cotton Product

Studies have shown that a healthcare environment that has not been thoroughly cleaned and disinfected is a definite contributing factor in the spread of HAIs. When used correctly in the processing of patient care environments and other healthcare discipline areas, the use of microfiber and micro denier textile products can result in a six-log reduction of surface contaminants including microbes that contribute to HAIs. Cotton products cannot accomplish this task.

Proper Laundry Processing is Essential

First and foremost, the goals in patient care and treatment are patient safety and quality patient outcomes. Regardless of how good a microfiber or micro denier infection prevention product is, it is useless and a danger to the health of patients and staff if the product is not adequately processed and returned to a hygienic state. There is no greater potential exposure of a patient to bacteria than when they put on a gown and lie in a hospital bed.

Therefore, healthcare laundries and on-premises laundries must follow the Centers for Disease Control and Prevention (CDC) Guidelines for Environmental Infection Control in Health-Care Facilities, 2003 Edition. Other organizational standards such as the Healthcare Laundry Accreditation Council (HLAC) Standards may be implemented to receive accreditation to show they produce hygienic infection prevention textiles.

There has been talk that EVS textiles cannot be rendered hygienic during the laundry processing. If that was the case, then patient bed pads/incontinence pads, bed linens, towels, staff scrubs (when laundered by the on-premises or healthcare laundry contractor), towels, washcloths, or other reusable healthcare textiles could not be used by neonatal intensive care units, burn units, transplant units, chemotherapy units, and other critical-care units.

Fortunately, healthcare laundries effectively render HCTs sanitary and hygienic daily. Healthcare laundries – OPL, Co-op, or contractor – produce hygienic products that ensure, to the greatest extent possible, a hygienic environment and contribute to quality patient outcomes.

All healthcare textiles must be processed to the highest standards possible to meet patient needs. HCTs—bed sheets, towels, infection prevention textiles, isolation gowns or operating room textiles—need to be laundered to the exacting standards of the textile manufacturer, CDC, and CMS in the case of long-term care facilities, accrediting bodies, and healthcare laundry best operational processes to ensure a sanitary and hygienic product.

Summation

The U.S. government, through CMS, reimburses healthcare for many operating expenses. These Medicare reimbursement rules are described in the Provider Reimbursement Manual and detailed in CMS cost reporting forms (spreadsheets) for different types of healthcare facilities.

The Provider Reimbursement Manual – Part 1 states in Section 2102.2 Costs Related to Patient Care: “These include all necessary and proper costs which are appropriate and helpful in developing and maintaining the operation of patient-care facilities and activities. Necessary and proper costs related to patient care are usually costs which are common and accepted occurrences in the field of the provider’s activity.”

Cotton products have been proven to be a vector for organisms that directly cause HAIs as well as having a detrimental effect upon many hospital-grade disinfectants as organic matter (cotton) neutralizes many disinfectants.

The new paradigm of Environmental Services (EVS) is beneficial in the following ways:

- Lower exposure to HAIs and lower costs and patient dissatisfaction
- Improved patient outcomes
- Improved revenue stream by having infection prevention textile products owned by the on-premises laundry, co-op laundry, or healthcare laundry contractor
- Lower upfront costs
- Longer product life when compared to cotton products
- Reduced cost/use when compared to both cotton products and disposable mops and wipes
- Lower replacement costs
- Lower operational costs for the facility, the on-premises laundry, co-op laundry, or healthcare laundry contractor
- Ensures EVS that infection prevention textiles will always be available just as other HCTs are readily available
Numerous medical publications and articles in the consumer media have cited global health agencies’ growing concerns regarding the widespread overuse of antibiotics, especially as it relates to the high incidence of recurrent urinary tract infections (UTIs). Prevalence rates of these infections continue to rise, accounting for more than 10 million yearly office visits,\(^1\) and the number of antibiotic prescriptions associated with managing UTIs grows, too. The Centers for Disease Control and Prevention (CDC) reports that at least 30 percent of outpatient antibiotic prescriptions in the United States are unnecessary,\(^2\) a behavior contributing to the alarm over antibiotic resistance.

As healthcare providers, it is our responsibility to limit unnecessary antibiotic exposure, reserving these medications for culture-proven cases in combination with an abnormal urinalysis and lower urinary tract symptoms. This can be difficult in light of patients’ expectations and the demand for antimicrobials when they recognize symptoms associated with a UTI—especially if they have had previous occurrences.

We take a multi-disciplinary approach in my urology practice, often working with infectious disease colleagues to ensure the judicious use of antibiotics and to incorporate protocols that consider non-antibiotic alternatives for UTI management. We collaboratively promote prevention whenever possible.

The newest guidelines released by the American Urological Association (AUA) have added a non-antibiotic approach for UTI prevention for consideration that has been a significant part of my protocol for some time now—a medical-grade supplement that contains cranberry proanthocyanidins (PAC)—more specifically 36 milligrams (mg) of soluble A-type PAC. It is worth noting that the evidence-based guidelines substantiate this recommendation considering antibiotic overuse and the pressing need for proven alternatives. Only the benefits of PAC were highlighted as a non-pharmaceutical option for UTI prevention, providing an important opportunity for patients and healthcare providers to discuss and consider newer, natural alternatives supported by scientific evidence.

Dose-response data has determined that 36 mg of the bioactive PAC ingredient from cranberry is the minimum dose needed to prevent P-fimbriated uropathogenic bacteria from adhering to the epithelium of the urinary tract (also called bacterial anti-adhesion activity).\(^4\) Soluble PAC—found primarily in pure cranberry juice concentrate—confers maximum bioactivity and contributes to fewer UTIs.\(^5,7\) This 36 mg bioactive dose was effective for UTI prevention when compared to trimethoprim\(^8\) and prevented catheter-associated UTIs without the
side effects and resistance associated with antibiotics. This PAC dose was shown to be a dependable alternative to low-dose antibiotics for chronic UTI patients.9

Most commercial cranberry products are inexpensively made from the whole berry or dried skins, stems, and seeds left over from the juicing process, called press cake, and do not contain the sufficient amount of bioactive PAC necessary for UTI prevention.10 These agents contain mostly insoluble PAC that instead bind to cell wall components of the cranberry such as cellulose and therefore do not prevent bacterial adhesion to the bladder. As noted in the newest guidelines, many products used in studies were formulated for research purposes, therefore the true availability of commercial products may be limited.11 In the guidelines, the authors wrote, “Cranberry, in a formulation that is available and tolerable to the patient, may be offered as prophylaxis” but because of the different formulations seen, there was not sufficient evidence to support one formulation over another. “In addition, there is little risk to cranberry supplements, further increasing their appeal to patients,” the authors wrote.

When recommending cranberry prophylaxis, thereby, healthcare providers must be guided by the available clinical evidence. A pharmaceutical-grade supplement, for example, will be backed by research validating a minimum of 36 mg of bioactive PAC to ensure its efficacy of bacterial anti-adhesion for UTI prevention. The FDA does not closely monitor standardization or efficacy of products made from cranberry, making it even more imperative we do our homework. PAC can be tested via an internationally recognized standard, i.e., the DMAC/A2 microplate method, thereby allowing for comparison among formulations.12 13 Manufacturers should cite data on their 36 mg PAC content, as well as evidence of maximum anti-adhesion activity.

Ingredients should be suitable for use in UTI patients with comorbidities. An appropriate cranberry supplement would have little sugar for example, unlike traditional cranberry juice or other sugary products, which limits their use in patients with diabetes. Oxalates, which occur naturally in cranberries, should also be filtered out. A safe and effective cranberry product must also be easy to access and convenient for patients, allowing them to decide if they prefer daily or on-demand per-coital dosing for their lifestyle. I have also never had a patient unable to tolerate the PAC approach, eliminating compliance as a hurdle.

Managing recurrent UTIs in the setting of rising antibacterial resistance offers healthcare providers—and patients—an opportunity to refocus on prevention, prescribing these medications only when proper cause is determined. We should also keep in mind the surge in this country’s aging population that has already seen the U.S. population of seniors aged 65 and older top 50 million for the first time in history.13

UTIs are one of the most common infections diagnosed in older adults and the most frequently occurring infection in long-term care residents.14 A recent New York Times article was titled, “Older Americans Are Awash in Antibiotics.”15 The article begins with an anecdote about a 68-year-old woman being prescribed ciprofloxacin for asymptomatic bacteriuria, contrary to current guidelines advising against antibiotic treatment in this situation.16 Patients over age 65 have the highest rate of outpatient prescribing of any age group. A new CDC study, published in the Journal of the American Geriatrics Society, points out that doctors write enough antibiotic prescriptions annually — nearly 52 million in 2014 — for every older person to get at least one.17

As healthcare providers, it is our responsibility to limit unnecessary antibiotic exposure, reserving these medications for culture-proven cases in combination with an abnormal urinary and lower urinary tract symptoms.

As the population ages, the overall UTI burden will force us to improve the diagnosis, treatment and prevention strategies for optimal elder care in particular. A medical-grade supplement containing 36 mg of bioactive PAC from cranberry has proven clinical outcomes, can be used as an alternative for UTI prevention and supports antibiotic stewardship.

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References:
Latex-Free Scissor Tests
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oneSOURCE has launched its new Tissues/Implants database for use in healthcare facilities across the country. Adding to the current offerings in the biomedical, dental, surgical, and equipment sectors, oneSOURCE’s expansion arms sterile processing and operating teams with an efficient way to manage manufacturer IFUs for implantable materials and devices. By including exact and most recent versions of manufacturers’ IFUs for Implantable Tissues and Devices, oneSOURCE is empowering healthcare facilities with the tools they need to stay compliant in the most efficient and accessible way possible. Based on the recommendations of database users, new features such as a customizable option, where users can create lists of frequently used IFUs, have also been added. The diverse range of implants and devices that this database will serve as a resource for includes human tissue allografts, cardiac pacemakers, stents, vascular grafts, repair meshes and slings, devices, orthopedic joints, and more. With continued rapid growth, oneSOURCE plans to introduce a database for Facilities Maintenance in the coming weeks.

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