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Health Care Linens: An Underrecognized Risk in Infection Prevention and Control

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Feature *Article*

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Health care linens are critical yet overlooked infection risks. Ensure proactive management by auditing laundering processes to prevent contamination and safeguard patient health across care settings. Read this article by Alexander Sundermann, DrPH, CIC, FAPIC.



Mucormycosis, Mucor mold

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In health care settings, identifying commonly used surfaces that require frequent disinfection to reduce the risk of health care–associated infections (HAIs) is often straightforward. However, managing health care linens (HCLs) is less so. HCLs have been implicated in multiple hospital outbreaks, primarily associated with mold contamination, leading to serious and sometimes prolonged adverse patient outcomes.[1-4] Despite their pervasive use—from outpatient settings and emergency departments to inpatient stays and operating rooms—HCLs are not directly regulated by any federal body, even though they come into contact with patients at every stage of care.[5] If not properly cleaned, these linens could pose significant infection risks. What are the best management strategies to ensure HCLs are safe? Has your facility identified any potential issues? This article aims to prompt a closer examination of your processes and encourage proactive measures to safeguard patient health.

Prior studies and reviews have highlighted the association of HCLs with large outbreaks in health care facilities. Perhaps most notably, a mucormycosis outbreak occurred in a New Orleans, Louisiana, children's hospital in 2008 and 2009; 5

children developed serious infections and died.[3,6] Mucormycosis is a severe infection caused by fungi in the order Mucorales; it mainly affects immunocompromised patients and has a high mortality rate.7 The CDC investigation identified multiple pieces of linen contaminated with mold of the genus Rhizopus, which was implicated in the outbreak.[3]

More recently, a CDC study documented a prolonged outbreak involving 16 patients with mucormycosis over 2 years at an Arkansas hospital.[4] The investigation revealed significant issues at the offsite laundering facility, including dust accumulation and a lack of airflow controls, which exposed the clean HCLs to the outdoor environment.

HCL-related outbreaks are not restricted to molds. Lynne Sehulster, PhD, published a 2015 review of previously detected HCL outbreaks involving multiple pathogens.[1] A more recent investigation into neonatal Bacillus infections further underscores the risks, revealing that despite meeting microbiological standards, laundered linens can still harbor harmful bacteria such as Bacillus cereus, where their presence on a piece of HCL allowed for bacterial growth and propagation under certain conditions.[8]

At our hospital, UPMC Presbyterian Hospital in Pittsburgh, Pennsylvania, we conducted an investigation prompted by an outbreak of 4 mucormycosis cases over 11 months.[9] Early in the investigation, environmental surveillance cultures and epidemiological data pointed to a possible HCL source at an offsite laundering facility. Stepwise cultures taken at various points in the HCL laundering process revealed a significant increase in fungal contamination after the drying step. A review of the offsite laundering facility's roof, where intake air for the dryer was sourced, revealed unfiltered air being drawn in next to lint accumulation on the roof that tested positive for molds. We remediated the issue by enhancing lint management and cleaning procedures within the offsite laundering facility, which resulted in culture-negative HCLs arriving at our hospital.[9]

The trend in HCL-related outbreaks challenges traditional infection prevention methods for detecting outbreaks. These outbreaks often involve only a few patients and are spread over months or even years.[10] Typically, infection preventionists (IPs) are trained to suspect outbreaks when clusters of cases appear within a few weeks, often confined to specific units. However, because HCLs are used throughout an entire hospital, these outbreaks may present in patients across different units, making them harder to detect. An outbreak is defined as any increase in cases over an established baseline. In the case of mucormycosis, which is typically rare and occurs

in immunocompromised patients, hospitals should expect no health care–acquired cases.[11] Therefore, even a single case or 2 should raise suspicion and prompt an investigation, with HCLs being a key area to examine.

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Recognizing the need to understand the scope of HCL contamination beyond our facility, we expanded our investigation with the Mucorales on Unclean Linen Discovery (MOULD) study.[12] This study examined the mold contamination rate of HCLs at 15 large transplant and cancer hospitals across the US in 2017. By culturing HCLs as they arrived at these facilities, we aimed to measure how often "clean" HCLs were delivered to high-risk patient environments. We found that 7 of 15 (47%) facilities had Mucorales present on their HCLs, and 3 of 15 (20%) failed to meet our greater than 90% HCL Mucorales culture negativity threshold.[9] These findings underscore the need for a closer examination of who oversees the management of HCLs.

The Association for the Advancement of Medical Instrumentation and the CDC provide HCL management guidelines.[5] However, The Joint Commission does not oversee HCLs within health care facilities.13 Professional societies, such as the Association for Professionals in Infection Control and Epidemiology (APIC), have developed best practice recommendations for HCL management.[14] Yet none of these guidelines come with direct regulatory oversight or the authority to enforce punitive measures if standards based on them are not met.

Some third-party organizations, such as the Textile Rental Services Association (TRSA) and the Healthcare Laundry Accreditation Council (HLAC), offer accreditation based on their developed standards.[15,16] These certifications aim to produce "hygienically clean" linens, meaning they are free of pathogens in numbers sufficient to cause human illness. However, the exact threshold of pathogens needed to cause an infection is unknown, making it challenging to define specific pathogen limits. Moreover, during our MOULD study in 2017, an HLAC or TRSA certification at the offsite laundering facility was not associated with meeting our threshold for Mucorales-free HCLs.[12] However, since our publication, both TRSA and HLAC have updated and enhanced their guidelines.

The journey of a piece of HCL may seem straightforward but is fraught with numerous opportunities for contamination. Take a washcloth, for example. The washcloth is considered

contaminated after being used on a patient and should be placed in a laundry bag (ideally not a biohazard bag). Once collected, these laundry bags are typically stored temporarily before being transported via truck to a third-party laundering facility. The bags are opened there, and the linens are sorted by type. The sorted items then pass through industrial washers, followed by drying, and are subsequently moved to a folding or packaging area. Once cleaned and packaged, the linens are shipped back to the health care facility, where they are often stored in a centralized area before being distributed to individual patient units and care areas. Each step in this process presents potential risks for contamination, emphasizing the need for stringent controls and monitoring.

What can an infection prevention and control department do to ensure that its health care facility's HCLs will not cause illness? In 2022, a study led by Janet Glowicz, PhD, and colleagues at the CDC provided a comprehensive review that compiled various guidelines and case studies, resulting in practical checklists for IPs.[5] This report identifies potential failure points of the HCL process that could lead to the contamination of HCLs, making it a valuable addition to the IP toolbox. In our experience, establishing a close partnership with your laundry facility is essential for successfully implementing any auditing process or changes. The first step in this process should be reaching out to your laundry or supply chain partners—if you have not already done so—to arrange a tour of your laundry facility. Bring along the checklist by Glowicz et al (see Supplementary Materials in the study) and walk through the entire process, identifying any areas of concern.[5]

Additionally, consider what contamination levels would be deemed elevated in the event of an outbreak. If you have not already, taking baseline cultures and samples will allow your facility to compare them to retrospective samples when no outbreaks or HCL-related infections are suspected, providing a valuable reference point for future investigations. It is important to ensure that these samples' locations are strategically chosen to provide meaningful data. It would be best to decide whether your facility or the laundry facility should be responsible for taking these samples. Consider the types of linens (eg, pillowcases, blankets) and the number and frequency of samples to be taken. These decisions, particularly regarding sample collection, should be made collaboratively with your health care facility team and the laundry facility to ensure a comprehensive approach to preventing contamination and safeguarding patient health.

In the future, many aspects of laundering HCLs can be addressed in infection prevention and control. First, scientific studies that associate the level of contamination in HCLs with the development of patient infections are crucial for establishing a more definitive threshold for what constitutes hygienically clean linen. Such studies would need to involve multiple facilities across various patient populations and regions. Second, stronger partnerships should exist between health care facilities, health agencies, laundering facilities, and third-party certification groups. Multidisciplinary collaborations could help develop best practices and standardize guidelines across cleaning,
storing, and using HCLs for patients. Third, some level of enforcement is necessary to ensure health care and laundering facilities adhere to these guidelines. The Centers for Medicare & Medicaid Services could drive this enforcement through reimbursement metrics like those used for reporting HAIs and antimicrobial use and resistance reporting. Lastly, health care facilities that suspect or investigate HCL-related outbreaks or infections should be encouraged to share their findings rather than discouraged from publishing them. Increased transparency and the sharing of experiences will allow other health care facilities to benefit from the aggregated findings of outbreaks, helping the field of infection prevention and control to more accurately measure the burden of HCL-related issues and improve practices across the board.

At the APIC 2023 Annual Conference & Exposition, Glowicz and I copresented on her report and our experiences at the University of Pittsburgh in investigating HCL outbreaks, identifying the causes of contamination, and ensuring an enhanced level of safety. Through sharing our work and the contributions of many others in this critical area, we aim to inspire and empower IPs to take proactive measures in their facilities to safeguard their patients. By fostering a culture of vigilance and collaboration, we can collectively advance the standards of HCL management and enhance patient safety across all health care settings.

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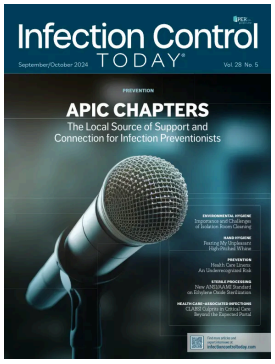
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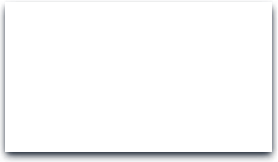
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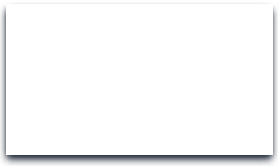
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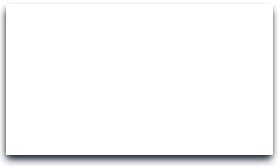


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