The Need for Infection Control Specialists and Designers to Build on COMMON GROUND

An Interview on Infection Control With Jesse Thomas Jacob, MD

INSIDE YOU WILL LEARN ABOUT:

The three main ways pathogens are spread in a healthcare facility.

Why infection control specialists and designers need to work as a team for best results.

Why more research is needed to determine the impact of specific design features on infection control.

This interview was created as a benefit for the Affiliate+ Program.
The Need for Infection Control Specialists and Designers to Build on Common Ground

How did you become interested in using design strategies to combat infectious diseases in the hospital setting?

As a physician and epidemiologist, I've spent a fair amount of time thinking about how design can help interrupt the transmission of infections, and how to prevent a pathogen from moving from one person to the environment to another person. I was also recently part of a multidisciplinary team that did a systematic literature review funded by the U.S. Agency for Healthcare Research and Quality (AHRQ) to understand the role of the built environment in the spread of pathogens and to try to identify what we don't yet know to help guide research efforts moving forward. The group's findings were presented at the 2012 Healthcare Design Conference, the Fifth Annual Agency for Healthcare Research and Quality Conference, and the Society for Healthcare Epidemiology of America's 2013 Annual Conference. They were also published in a special edition of Health Environments Research & Design (HERD) journal in 2013.

What were some of the challenges in bringing together experts with different backgrounds to try to synthesize the research on infectious diseases and design?

Some of the concepts meant different things to different groups (which included clinicians, researchers, and design experts) involved in this project. For instance, we had to examine the differences between evidence-based design and evidence-based medicine. We also had to learn a common language in order to make the research meaningful to people in different situations. We used this to create a conceptual framework to better understand how pathogens move through time and space. We also created a tool to rate each study in our review, and then had people from different backgrounds read the papers and identify what was important from their unique perspectives. Ultimately, one of our accomplishments was that our group, representing very different disciplines, managed to create something that synthesized all of our expertise.
Addressing infections in the hospital setting is complex. Based on the findings of your literature review, what are some of the ways that infections can spread in a hospital?

Through our workgroup, we named the three main ways that pathogens spread. The first is through contact. The majority of bacteria are spread through contact, and a lot of that contact occurs in patient rooms. For instance, if a patient has an infectious disease and the provider comes into contact with it and doesn’t adequately clean his or her hands, that provider can carry the pathogen into another patient room or nursing station, where patients, family, or staff members can come in contact with it. Numerous studies show that up to 80% of the time when healthcare providers go into a room, they will touch something in the environment—often without even realizing it. That’s one reason why hand hygiene is so important today.

The second way that pathogens can spread is through air. They can be transferred in both large droplets (such as when you sneeze and transfer the influenza virus) and small droplet nuclei (smaller particles, like tuberculosis, that can remain suspended in air). Clearly, preventing the spread of both influenza and tuberculosis is important in the hospital, so ventilation systems are important in considering design. Some variables to think about are natural ventilation versus negative pressure, the type of filtration and air exchanges, and the need for ultraviolet radiation of ducts. For large droplets, it’s almost a form of contact (the droplets land on a surface that someone touches), so you might consider selecting materials to minimize cross-contamination and the likelihood that pathogens can survive.

The third way infections are transmitted in the hospital is through water or the water supply. This has been a hot topic right now, with outbreaks of Legionella being linked to cooling water towers. There have also been two outbreaks linked to decorative water features in hospitals. Based on this, the ASHRAE guidelines for healthcare facilities now recommend avoiding placement of water features near people with compromised immune systems. We found that it’s not just the water feature itself that poses the risk, but also the maintenance process and any design details (such as lights in the water, causing higher temperatures favorable to the growth of Legionella, and materials like foam) that could increase the risk of Legionella growing.
Sinks are also an important consideration when it comes to germs being transmitted through water. You need to determine the best places to locate sinks for easy access, as well as where to place the faucet. The latter is essential, because if the faucet isn’t positioned just right, it can allow water that may contain bacteria to sit in the trap, and this can splash quite a distance.

**So, what should designers do to help minimize the risk of pathogens spreading in a healthcare facility?**

A major takeaway from our work is that involvement of a multidisciplinary team early in the design process is very important. Infection control brings a lot of expertise to the table that designers don’t have. We need to have that knowledge early on to help shape the design. On the other side, when infection control specialists are talking about their strategies, it’s equally important for them to talk to designers right from the start to determine what can be done with the resources available.

This means that designers and infection control specialists should work together right from the very beginning of the process of building a new facility or renovating an existing one before any major decisions have been made. The team should consider who the patients are, what design features they want, and what risks could come along with these features, to determine what makes the most sense for the situation.

Another essential aspect to consider when working on the design process is the benefit of investing in technology. It can be expensive up front but may end up being cost-effective. For instance, you might consider installing ultraviolet lights to kill bacteria, and selecting textiles that will be easy to sterilize and don’t have seams where pathogens can hide. You should also consider avoiding fabric curtains, which can be appealing to create a homey feel or provide a sense of privacy; they can also harbor bacteria. Designers can come up with alternatives to curtains that provide a similar function without the risk.

The key, then, is to design new spaces that incorporate creative ways to avoid some of the problems we’ve encountered in the past.
What were some of the gaps that your literature review revealed in terms of research into the role of the built environment in impacting the spread of pathogens?

We found that the level of evidence about the impact of design on infection isn’t that great. A lot of the work that exists has been done during outbreaks, is focused on small numbers, and has no control group. So there are lots of opportunities moving forward to try to fill in the gaps.

We also found that we need to do more studies that capture the effect of a design strategy on the outcome of this intervention. Most studies to date usually look at some kind of colonization study or sampling, and say, for instance, that design helped to reduce the bacteria in the water supply. But they don’t say if it reduced the number of patients contracting the infection. We need to find ways to get to this level of information.

One of the challenges, though, is that when there are spikes in infections, we take multiple approaches to try to address the problem. If we do five things and it seems to work, then we don’t know for sure if it was all five interventions that made the difference, or three of the five things, or whether the sequence of the interventions is significant.

What are the next steps in trying to use design to help reduce the spread of infections?

In our literature review, we tried to bridge the gap between infection control and the design community and find common goals. Now that the project is done, we are trying to keep the conversation going. We have lots of interested people from both disciplines trying to understand where to go from here.

The bottom line moving forward is to understand that there is no one single “magic bullet” to prevent infections from spreading. Rather, the best and most healthful designs should come out of a conversation among infection control specialists, designers, architects, and healthcare providers all working together toward common goals.