

In Conversation With... Anjali Joseph, PhD, EDAC and Molly M. Scanlon, PhD, FAIA, FACHA

June 30, 2021

In Conversation With.. Anjali Joseph, PhD, EDAC and Molly M. Scanlon, PhD, FAIA, FACHA. PSNet [internet]. 2021.

<https://psnet.ahrq.gov/perspective/conversation-anjali-joseph-phd-edac-and-molly-m-scanlon-phd-faia-facha>

Editor's Note: Anjali Joseph, PhD, EDAC, is a professor at Clemson University and a Spartanburg Regional Healthcare System Endowed Chair in Architecture and Health Design. Molly M. Scanlon, PhD, FAIA, FACHA, is the Director of Standards, Compliance, and Research at Phigenics, LLC. In her professional capacity, she serves as Principal Investigator for an AHRQ [Patient Safety Learning Lab \(PSLL\)](#) project focused on human-centered design in the operating room. She also volunteers with the American Institute of Architects, supporting their COVID-19 response. We spoke with them about how healthcare built environments have been temporarily modified during the COVID-19 pandemic and what learnings may be used moving forward.

Kendall Hall: Could you each tell us about yourself and describe your current role?

Anjali Joseph: I'm Anjali Joseph, and I am the Director of the Center for Health Facilities Design and Testing at Clemson University, and I am a professor of architecture. I am also an adjunct professor in industrial engineering and public health. I've been at Clemson about six years now. Prior to that, I worked at The Center for Health Design. I have a PhD in architecture, but my focus has always been on how the design of the built environment, otherwise known as the structure of the healthcare facility, affects different kinds of health outcomes. Over the last 10 years, my focus really has been on looking at systems approaches to improving patient safety, specifically focusing on the role of the built environment.

Molly Scanlon: I'm Molly Scanlon, and I'm an environmental health and public health scientist. I'm also a licensed and board-certified healthcare architect. I work for an environmental firm called Phigenics where I am the Director of Standards, Compliance, and Research. We specialize in water management and assist healthcare clients with patient safety topics related to waterborne pathogens inside the healthcare

environment. I work with healthcare clients daily, protecting against *Legionella*, *Pseudomonas*, non-tuberculosis Mycobacteria, and other pathogens that can spread and grow within building water systems. Before I received my doctorate as an environmental health scientist, I served in the traditional role as a licensed and certified healthcare architect working with healthcare practitioners to design and build hospitals in the United States.

KH: Anjali, could you please talk about the focus of your research and the work you've been conducting specifically as it relates to patient safety and the COVID-19 pandemic?

AJ: My work is around patient safety in the healthcare built environment. I have been leading an Agency for Healthcare Research and Quality [Patient Safety Learning Lab project](#) for the last five or six years. The focus of that particular effort is understanding how you can design safer and more ergonomic operating rooms [ORs] to improve patient safety and worker safety. We spent a long time observing operating rooms to understand the human factors at play and how people interact with each other. This led to the design of a prototype operating room that we then implemented in two ambulatory surgery centers, but then COVID-19 came along. All the assumptions that we made and interactions we observed became very different. So, we did a literature review and talked to people in our collaborative team at MUSC [the Medical University of South Carolina] to begin to understand how COVID-19 was impacting the operating room and made it part of our work.

Another COVID-related project that I worked on was a collaborative course between architecture and public health students, and some students from an interprofessional program at the Medical University of South Carolina. What we were trying to figure out was, what were the key considerations while setting up COVID-19 testing sites? What kind of data can you look at to be able to predict where those sites need to go and what they should look like? It was all about understanding community and local site-level factors that will determine where COVID-19 testing sites should be set up, and the characteristics of the site that might support testing. We also studied potential future uses of different types of testing sites once we move away from a widespread need for COVID-19 testing.

KH: Where you have the intersection of patient safety, COVID-19, and the healthcare facility design for operating rooms, what does that intersection look like?

AJ: Under normal circumstances, the OR air distribution systems are designed to maintain a clean-to-dirty pathway from the patient out, which means that the operating room is at a positive pressure in relation to adjacent spaces. The whole idea is to keep the patient safe and sterile and protect them from the people and environment around them. But with COVID-19, the issues have also suddenly become about staff safety. If a patient is contagious, then you are really worried about the staff inhaling aerosols and so on. There was a sudden shift that had to happen during the pandemic. First, cancel elective surgeries and restrict to emergency surgeries only. During the early days of the pandemic, the lack of PPE [personal protective equipment] and risk of staff exposure was a critical factor driving elective surgery cancellation. Then within the operating room itself, wherever people could, they shifted to negative pressure ORs and

considered things such as having anterooms outside the OR, and having HEPA filters and patient isolation hoods inside the OR. Surgeons and the anesthesiologist have also been wearing protective suits and shields on top of the usual PPE. Then there is also the whole issue of auditory communication and how it may be impacted. Operating rooms rely very much on a team-based approach. The surgical team members all have to work with each other, they have to communicate, and they have to be aware of the situation. With the additional PPE, and the extra noise from the HEPA filter, it has become really problematic to maintain that level of communication, which is not ideal from a patient safety standpoint. These human factors issues will suggest how the design of the OR itself needs to be adapted to support safe patient care while also protecting staff. There haven't been studies to show what the actual impact is on patient outcomes or even staff yet, but those are sort of the issues we were beginning to look at.

KH: So, Molly, is the COVID-19 pandemic going to fundamentally change how we think about design for safety?

MS: I think there's going to be a hybrid of changes, and I don't think we know what some of that is yet. One of the things I think about is, are we going to create an 'arms race' for the best hospital and is that really wise? Do we need to have the best OR? Or what do we need to prioritize, because it's going to be very expensive. Facilities were stressed to their max and frankly, I think they did exceptionally well under the current design standards. I agree with Anjali and think we need to look at much more specific human factors and what we can correct to make it better, as opposed to going to the extreme response that everybody needs to raise their game and have a hospital prepared for a pandemic at all times. I don't think that's practical or affordable. There's going to be a much more nuanced approach where we think about what other things we could learn from COVID-19 about PPE or other pandemic preparedness that can enhance the facility operations approach, as opposed to thinking that the built environment is the only response. There should be a complementary response between all those elements.

AJ: I would agree. I think there is a huge need for an understanding of the workflow issues that are happening in these ORs. I don't think anyone's really documenting what is going on there. We don't really have a lot of best practices on what needs to be done. Like Molly, I don't think all operating rooms need to be COVID-19 ready, but we need some more specific guidelines on what we should do in a scenario like this. It's not necessarily that the OR will look very different; it's just how all these resources are managed and how we adapt to human factors challenges.

MS: I think we also need to go back to our healthcare practitioners. They improvised during this pandemic, and they were very creative and strategic in developing alternative solutions. Practitioners want to be involved in the design of their built environment that supports their ability to provide quality care, and I think we need to do the research and not just look at it from the design professional's perspective. We have to really involve and engage the healthcare practitioners that lived through this pandemic response, to inform future design alternatives.

KH: I like this idea of the architecture being an adjunct to providing the care. I think it speaks to flexibility and having sites that are flexible in times of pandemics or surge. How do we take this, learn from it, without too much of a pendulum swing and feeling the need for every hospital to be the gold standard for COVID-19 at the expense of other care and patient safety needs?

AJ: You're absolutely right. I don't think we can overdesign all of these hospitals looking at COVID-19 as our example, as we don't know what the next challenge is that's going to come our way. COVID-19 is going to be just another scenario that we are going to have to look at when we do these [risk assessments](#) for future hospitals, or even adaptations in existing hospitals. And it may not be just the hospital itself. The solution may not even be fixing the one hospital, but designating another hospital as a COVID-19 hospital or an overflow space. We have to think much bigger than just individual hospitals and include public health and community health professionals as part of emergency planning.

MS: What I've been thinking about for the built environment is, what is our simple 'first do no harm' response? What is our version of wash your hands, wear a mask, and social distance? From public health, we know that basic measures will go a long way. What I've been trying to do is use my doctorate degree in exposure science for environmental health and think about the basic risk assessment, exposure principles you apply. Can we identify the hazard? Can we identify the boundaries of the environmental hazard? Can we characterize the risk? I believe there are fundamental building blocks to understanding how a team arrives at an anteroom, for instance, as the solution. Why is the anteroom the solution? Is this the correct problem to solve, and am I using the right model to solve the right problem? In healthcare design, sometimes we can fall into a routine that we think we know the answer, but we have to go back to the fundamentals to make sure that we really understand the science and epidemiology of the disease transfer. What is actually the transfer for the pathway of the disease, and what components of the built environment are contributing to it, and where is it not? I think we could find some simpler solutions.

KH: Anjali, maybe you could talk about moving beyond the OR. What have you been seeing throughout the rest of the hospital and outpatient clinics?

AJ: In the hospital, I think the other areas that are hugely impacted are the patient care units. Typically, if you have a contagious patient, you would put them in an airborne infection isolation room to prevent spread to other areas. Clearly, we didn't have enough of these negative pressure airborne isolation rooms. So, one challenge was how do we adapt our units so that we can take care of as many contagious patients as possible? If the whole unit is then designated as a COVID-19 unit, do we change the ventilation to make it a negative pressure unit? Then with the emergency departments [EDs], it's often hard to know whether a patient is contagious with COVID-19 or if they have another reason for being there. I think there's been a lot happening around triaging patients and workflows put in place so that patients suspected of being contagious are separated from non-contagious patients. I think that has been challenging to really implement because EDs are a very heavily trafficked, busy environment where it's hard to direct people.

In terms of the clinics, they are seeing less of the very sick patients primarily because many of these are elective appointments and, for the most part, people have been restricted to telemedicine visits. But we are seeing patients coming back into the clinics now and they are being screened to make sure they don't have a high temperature or other symptoms. One big change that is happening is the role of the waiting areas in these clinics and outpatient areas. Whether we need waiting areas in these settings, and even in the inpatient settings, will be an ongoing question. I don't think we can completely do away with them, but maybe there will be more efficient processes, as we've seen this can be done during COVID-19. What waiting rooms will look like moving forward, whether they'll need more screening centers or separate sections for potentially contagious patients, that remains to be seen.

KH: Let's kind of shift a little bit and talk about the patients that aren't infected that need to come to the emergency department. What do we have, or what do we need in place, to protect patients that don't have COVID-19?

AJ: I think it's challenging. Hospitals are trying to coordinate with patients and place patients who have a clear problem like a heart attack, who don't have symptoms, in a separate location from the ones who are coming in with COVID-19 symptoms. Some sort of spatial distribution of people, assuming the ED has the capability to do that.

MS: From my perspective, these are very busy environments. In the traditional design of a hospital, you set it up in a hierarchy of space from sterile to non-sterile, etc. But there's naturally some overlap in these areas, and when something like COVID-19 occurs, errors do happen and those boundaries become blurred. You want to avoid situations where there is a lot of cross-infection within a care setting. I think the healthcare system during the pandemic response needed more external support. For vaccinations, we're seeing the public health system reaching out and taking some of the onus. We're not sending everybody to the doctor's office or the hospital to get vaccinated, as we know that doesn't make sense. But why then would you send everybody to the hospital to be screened?

KH: Let's move on to talking about alternative care sites. Can you please describe what these are?

MS: In my volunteer responsibilities, I have been serving on national committees for the American Institute of Architects. They have subcommittees that focus exclusively on healthcare facilities, and they also have public health initiatives. I chaired a task force focused on understanding the built environment for COVID-19. One of the immediate things we looked at was alternative care sites and how we could transfer some appropriate levels of healthcare operations to non-healthcare settings, whether it's screenings, quarantine, or additional bed capacity, etc., to take some of the resource pressure off of the healthcare system. We synthesized healthcare codes and standards to create a 14-page checklist on how a community could evaluate facilities in their area that could be used for alternative care sites—specifically arenas, school auditoriums, community centers, etc., in either urban or in rural areas, depending on scale. WHO [World Health Organization] and CDC [Centers for Disease Control and Prevention] documents had mentioned alternative care sites, but they mentioned them just in the practical nature of bed surge capacity. They don't

really define what it is or how to implement one.

[Alternative care sites](#) are ultimately not something that gained a lot of traction in the United States but were very successful in other countries. For example, there's an excellent article published in China by authors Chen and Zhang et al. in *The Lancet*. In China, they put in place what they call a fever hospital, and it serves as a triage center. What the Chinese implemented in Wuhan was to not only designate certain hospital facilities for COVID-19 or non-COVID-19 patients who needed medical care, they complemented the system with these alternative care sites called fever hospitals (i.e. triage centers). They told the public to report to the triage center. No public person was to report to what we would call a traditional emergency center. In the triage centers, people would be tested and then designated as a COVID-19 or non-COVID-19 patient, and only patients that met certain medical criteria were transferred to the hospital. It enabled the public health and healthcare system to control hospital patient flow, rather than inundating the hospital with a rapid influx of people.

KH: Is there anything out there to support the notion that these approaches also serve to protect the patients as well as the staff?

MS: I don't know that we have the data on that yet. However, it has been successful in maintaining public confidence and public cooperation.

KH: Along those lines, Anjali, what have we learned over the course of this pandemic? For instance, assume it's time to put out the next iteration of facility design guidelines. What would you change to protect patients?

AJ: I think the new guidelines will have to focus on the ED and possibly the separation of spaces for contagious patients, more so than they already do. I also think there will probably be some updates for the operating rooms. I feel like there will need to be something about supporting these variable air flows in the operating room so that we don't have to shut down completely, as well as around workflow for moving the patient around. How do you take them into the operating room? Where do they go post-op? How do you separate workflows if you need to? Other than that, I think that healthcare facilities, more than any other kind of building type, have been prepared for infection. Handwashing compliance was always going to be important. Patients are more aware now of handwashing than ever before, so maybe that will help with improving compliance by health personnel. Having more alcohol-based hand rubs, having sinks in the room, those are going to be more important than ever. And of course, using surface finishes that are more microbial resistant or easy to clean in public spaces and in the patient room.

KH: With all this attention paid to sinks, surfaces, etc., now I'm just wondering has anybody been tracking what is happening with organisms such as CRE [carbapenem-resistant Enterobacterales] or MRSA [methicillin-resistant Staphylococcus aureus] in this time of COVID-19?

MS: If these are reported/reportable HAIs [healthcare associated infections], then there should be future data to track the increase or decrease of common HAIs over the course of the COVID-19 timeline. Yet, this brings to mind that a method of reducing HAIs associated with surface, water, or air transmission might be more environmental risk management programs with environmental sampling to complement clinical surveillance and sampling for HAIs. Water management, a required risk management program in healthcare settings, often includes environmental testing of water to validate the presence of pathogens. Now, just because a pathogen is present doesn't mean that it will transmit to a clinical disease case, but of course if it's not present, it certainly can't. Environmental testing allows the healthcare provider to take action to interrupt the epidemiological triangle of transmission. This is an area where I think there is going to be greater focus thinking about what can be done to test the environment and how that can enhance decision making about the built environment. We've already had clients that work with us on water management come back and say, "you know what we're going to do because of COVID-19? We're going to test our air." We should have been testing our air and surfaces as soon as we knew the pathogen was airborne. I think there is an opportunity for healthcare providers to enhance their patient safety by doing more environmental testing and being able to say that we're testing our surfaces, we're testing our air, we're testing it for the transmission of MRSA, COVID-19, etc. They can use that to demonstrate that their environment is within an acceptable measurement to reduce the likelihood of transmission. It goes back to the fundamental risk management and exposure science I was talking about.

AJ: Molly is reminding me of some other conversations I've been having about the use of technology in the future in hospitals in terms of tracking patient conditions. The building can be so much more intelligent than it is right now. There are so many ways you could integrate sensors to monitor changes in a patient's condition. Not just for COVID-19, there are so many applications. For example, is the patient getting up to go to the bathroom without calling a nurse and putting themselves at risk for a fall? We could have so much more active intelligence available to the healthcare provider and the family on what is going on with the patient and ensuring the patient is in a healthy environment. That's a little down the road, but that could be a way forward in the future, actively monitoring the physical environment.

MS: Related to that, technologies like UV [ultraviolet] light that are looked at in water transmission to kill bacteria and viruses, I think are going to start coming into the decision-making process. The architects and engineers of these healthcare environments are going to have to know much more about identifying hazards and application of architectural or engineering controls and be able to lean on the basic science of how viruses or bacteria spread and what kills them so that you can interrupt the chain of transmission.

KH: Is there anything that we haven't covered or anything else you'd like to add? I like how we've talked about the whole picture, from inside the hospital to outside the public health components to how we can bring in the engineering.

AJ: I think one area that we haven't talked about is telemedicine and what that means for hospital space and how much, and what type, of space needs to be allocated to telemedicine. What does that look like in rural areas? We need to start thinking about how healthcare spaces need to be designed to support the

teamwork and communication that needs to happen to support the kind of extensive telemedicine we've seen emerge during COVID-19. How does that impact patient safety and the communication that the members need to do to provide the right care? Do we have the right lighting available for effective video? Again, I think it's a systems approach, but we do need to be thinking about long-term implementation.

MS: Yeah, I've been the most worried about is the burnout of the healthcare professional. I am very, very concerned about the impact over staff burnout on patient safety or unintended consequences. Also, is there a potential of a lot of healthcare professionals with the COVID-19 experience leaving their profession? We all know that burnout is very prominent in the healthcare profession to begin with. How do we address healthcare professionals in their environments and alleviate the feeling of being unsupported? How do we make their careers in the hospital more sustainable? Following COVID-19 timeline, what is the impact on patient safety of all these unintended consequences that we don't know about just yet.

KH: Maybe COVID-19 will help push that forward in the design guidelines. Because you're right, I think that fatigue and burnout is something that we've all been thinking about, but how do we truly design healthcare facilities to support the staff? Without the staff, nobody's getting care, so it's inherently a patient safety issue.

AJ: Overall, I think healthcare organizations need motivation to start thinking about that because if they have to make a financial decision between patient care spaces and staff spaces, the staff spaces are the first ones to go. But that cannot be going forward. For example, I am working with this one ED and they're trying to figure out if they can carve out a space where they can put a staff break room. EDs are terrible spaces, and there's no space in that ED for people to stand, much less for them to create a staff break room that they so desperately need. In the future, that kind of thing has to always be part of the thinking in the design process. But I totally agree. Hopefully post-COVID-19 we will not only be thinking about what needs to change in our infectious disease preparedness, but also where we can do better when it comes to the built environment and its impact on burnout and staff safety.