Episode: *Ethics Talk: Health Care Space and Structure Designs as Interventions*

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[00:00:02] TIM HOFF: Welcome to *Ethics Talk*, the *American Medical Association Journal of Ethics* podcast on ethics in health and health care. I'm your host, Tim Hoff. Designs of spaces and structures in health care involve decisions about where to build, what to adapt, building materials, and the layout of settings in which health services are delivered to patients. Safety and efficiency can be promoted or undermined in these decisions, and we'd like to think that such important decisions about health care sites and interventions are based on evidence.

The notion of evidence-based design is one that acknowledges that the design itself is an intervention. Evidence-Based Design in Health Care emphasizes the use of data to drive design decisions and priorities that promote health. And while "evidence-based design" is a contemporary framing, the history of hospital design illuminates ways in which we have long thought about prioritizing some ethical and clinical values over others, and who has benefited from those design priorities over time.

This month on the podcast we'll explore the history of hospital design from the late 1800s to now. And later, we'll talk with human-centered design specialist John Meyer about which human-centered design strategies many health care organizations use to facilitate smooth interaction among patients, clinicians, and anyone else who inhabits health care spaces. But up first, health history and architecture researcher Dr Jeanne Kisacky is here to discuss the history of hospital design. Dr Kisacky, thank you so much for being on the podcast.

DR JEANNE KISACKY: Good morning, Tim. Thanks for having me. [music fades]

[00:01:48] HOFF: At the risk of starting with something a little bit too obvious, hospital design has changed over the past 150 years or so, quite dramatically. Sometimes those changes are motivated by advancements in our scientific understanding of disease like germ theory. Other changes are spurred by logistical changes in construction, material availability, and techniques, for example. Can you provide an overview of how hospital design has changed in response to a few key advancements like that through the 19th and 20th centuries?

KISACKY: I certainly can. I study the history of hospital architecture, and I started out reading everything I could get my hands on. And most of that was written by doctors or medical historians, and they would talk about hospital design through the 19th century, as it didn't change from basically the 1850s to the early 1900s. But germ theory kicked in, in the 1870s and 1880s. And so, the explanation was always that the architecture lagged behind the medical developments. And I'm trained as an architect, and so I

heard that and read that and was like, that's a really convenient explanation for a non-architect. So I got into studying what really was going on with the architecture during that period. And it's really interesting because the germ theory largely switched medical focus onto germs, and before that it had been on the air. So the expectation up until germ theory was that air itself caused and/or spread disease. And so, with germs, all of a sudden, you have little, minute physical particles that cause disease, and it shifts the entire focus. So why didn't hospital design change?

[00:03:38] Because hospitals in that era were made of large, open rooms, basically long hallways that had two rows of beds, one on each side and an aisle down the middle and windows on each side of them. That was a pattern for decades. It lasted into the 20th century. And that was a design that was made popular by Florence Nightingale. And the expectation was that the large windows and the narrow room would allow a lot of fresh air to flow in and flush out the bad air. Because Nightingale thought that the patients themselves generated the bad air: When they breathed out, they breathed out sickness. And so, if you got rid of that bad air, you would have healthy patients that wouldn't get sick.

And hospitals were dangerous because you would put a number of sick people, often with contagious diseases, in one room, and so the chances of getting a new disease when you were in the hospital was pretty high. So this design was made to prevent the spread of disease from patients. But there are photos of hospitals from around the same time that show the windows closed. And Nightingale's system wouldn't work with the windows closed. So, I did a lot of research into the actual designs of hospitals, and a lot of them were designed to function with the windows closed because the wind is a very fickle ventilator. It stops at times. There's calm days, there's hot days, there's cold days where you don't want it open. And so, that ventilation with the open windows was never constant.

So they would use thermal differentials. They'd have a big fire in the basement that would draw air in and then send it upwards. And so, it was a really contained, constant airflow system fueled by this fire. And they would duct the air in next to the patient beds, and then they would have an exhaust vent above the patient beds. So each patient was in their own isolated little room of air within this larger space.

[00:05:49] So, this is a long time getting to germ theory. But why didn't germ theory change this? Well, early germ theory saw germs as most likely being carried between people on dust particles. So that became the thing to stop in hospital ventilation. And so, the systems became more closed. They didn't want to open the windows and let in the dust-laden air, and they would have a central intake that had filtration systems. And then whether heat driven or early fan driven, they would send the air to the patients, again, isolating the patients into their own cubicles, and have a one-way airflow. So the air would come in, get sent to the patient, go up the, be exhausted, usually at the ceiling. And so, there was no rebreathing of air. And if germs were carried on dust particles in the air, this would've stopped them.

[00:06:51] So really, when the architectural change starts to happen and hospitals start having smaller rooms and a different layout for patient rooms, patient areas, is in the 1890s when asepsis and the theory of contact spread of disease kicks in. So, Robert Koch, in all of his investigations, showed that basically, you could spread disease physically by physical contact between an infected individual and an uninfected individual and that that was most likely the means of transfer of a lot of infections. So if contact is the way germs spread, and it's not through the air, doesn't matter how the ventilation goes. What you need to do is stop one sick patient from touching any other patients or touching objects that then get spread to other patients. And so, you have these big open wards that are still the layout, and all of a sudden, they would put up cubicle walls. And so, you'd have a physical barrier between the patients—even though they're still in this big open space—and that would reduce any chance of infection between the patients. So, the change in architecture really reflects this change in understanding of disease, and it sort of reveals the slow process of adopting germ theory and how germ theory itself changed.

[00:08:18] HOFF: Hmm. Yeah, it's interesting to hear you talk about the potential misguidedness of this hyperfocus on ventilation, especially from our contemporary position of having just experienced a pandemic that was due to an airborne pathogen. Presumably ventilation in early hospitals did incidentally end up keeping some people safe from certain pathogens, but do we have any idea of how effective it was versus good ventilation and good germ control? Or is that too difficult of a question to tease out because of a lack of data?

KISACKY: No, it's an interesting one. I think that there's data. I think it's really hard to interpret the statistics from decades, especially in the 1800s, because they would count everything. But it's not clear how relatable that is to how we would count it today. But stepping back from that, I can say that when there was an outbreak— And hospitals would have internal epidemics, I mean, literally people would, if typhoid entered a room, it might be half of the patient population that soon had typhoid. So, this was a real problem for hospitals. And when one of those happened, they would throw the kitchen sink at it. They would clean it to within an inch of its life. They would whitewash the walls. They would remove all the patients, first off, from the ward, because they thought that specific room had become infectious, that somehow germs or bad air was lodged in that room itself. And so, they'd remove the patients, they'd clean it, they would then whitewash it. They would often change the ventilation to try to make sure the airflow is better. And so, this multiple approach makes it really hard to judge what was the most effective feature. But the end result was when they did all of this, it typically ended the infection, cross infections within the ward.

[00:10:13] HOFF: I'd like to turn now and focus a little bit more on how the patients might experience all of these design choices. One ongoing problem in current hospital layout is that hospitals are organized by medical specialty and not necessarily by patient needs. While this can benefit some groups of patients who are having similar experiences, for example labor and delivery units, one shortcoming of this approach is that multidisciplinary care suffers for patients who require, for example, both general medical attention and care for serious mental illness. Clinicians in one unit might not be

well equipped or well prepared to respond to these patients. Does the history of hospital design offer any insights into how to solve this problem?

KISACKY: I love this question because I have come to talk about hospitals at some eras as basically sorting machines. And it's how do you organize the different people within the hospital? The earliest hospitals were called general hospitals, and they're very different than what we know of as general hospitals today. They were general in that they would provide general care. You would go there, and you would get treated by a physician or a surgeon. They were not specialists, and specialized medical treatments and specialist doctors largely developed outside of hospitals. Typically there would be a doctor with a very focused interest who would start his own small hospital. And I'm using "his" because back then there were not very many women doctors, although there are enough that I should use "them." The city would develop contagious disease hospitals, because the general hospitals would not admit patients that had a known contagious disease. So all of these specialties developed separately.

And as they became much more successful in treatment for eyes, for cancer, for children, for obstetrics, they became a big draw, and patients would often travel distances to get between multiple, at times, specialty hospitals. The general practitioners in the hospitals could see this happening, and you kind of want to reintegrate all these specialties. So, someone who has a problem that is better treated holistically, you can send them to five different hospitals, or you could say, what about if we use the general hospital as a way to reintegrate the specialties? So, hospitals become much more complex. They're general in that they provide any kind of treatment, but it's much more a grouping of specialties. Those hospitals tended to be bunches of small buildings, and each building would have a specialty or a specific approach to the patient. But they were all located on the same facility.

[00:13:12] There's an alternate version of how to reorganize care that would be more holistic instead of just gathering all the different approaches to medicine into one space. The Mayo Clinic is the best example of this alternate approach, and it's a more collaborative medical approach. So, the Mayo Clinic, when they built their new building in the 1920s, they built one building that included all the specialist practitioners. The patient would come in and go into a treatment, you know, a diagnostic room, and different specialists would come and do their diagnosis of the same patient and ask for different tests. And then they would, all the specialists, would come up with a single unified treatment plan. The patient was then treated based on this sort of more holistic approach. And it's an ideal version of how to have multiple specialties work on an individual patient, but it worked really well at that small scale. The Mayo Clinic was not a very large institution, and it's not necessarily so easy to scale that up to the size of the modern general hospital. I think there's still attempts to try to do that, but specialties tend to like to have their own space and develop on their own. So there's really a, it breaks down into separate buildings.

[00:14:45] HOFF: This month's issue is on evidence-based design in health care, which links hospital architecture and design to specific clinical outcomes and is currently a strong influence on hospital and health care facility design. But as you've already

suggested throughout this interview, this idea of using evidence to inform design decisions is really not completely new. So, what is the history of evidence-based hospital design beyond what you've already given us? And how can that history help us to understand current hospital design trends?

KISACKY: Evidence-based design has been getting a lot of attention, and it's really a growing approach to health care facility design. And anytime you try to find out, well, where did it come from, you usually end up in the 1970s or '80s with a couple articles that started to focus on the influence of windows that had a view onto trees or a brick wall. Roger Ulrich's work is usually cited as the first. After that, if anyone wants to look before the 1980s, they usually end up going, "Oh yes, and then there was Florence Nightingale in the 1860s." There's a lot that happened between the 1860s and the 1970s and '80s.

And my whole take—I'm coming from an architectural history point of view—is that none of the architectural designers of hospitals that I have researched ever wanted to design a hospital that wasn't going to help the patients in some way, whether it was reducing infection, whether it was making an environment that would actually increase the chance of positive outcome. And so, in my understanding, all hospitals that I've looked at are basically based on evidence because these designers would study what was happening, and they would take statistics, they would do materials research, they would look at everything they could think of to look at to try to make the hospital a safe place, a healing place, a welcoming place.

[00:16:46] But it's a lot of things to weigh between making it safe, which tends to make it a not very pleasant environment, to making it therapeutic, which can be very stressful in its own way. So during the period of fresh air cures, they would have patients on the rooftop in any weather. So almost like the tuberculosis cures with the fresh air cure. So, this approach to design, where you look at how does what we do—where we put the wall, where we put the window, what kind of materials we use—how does that affect the patient, that has been going on throughout hospital history. And I think it's kind of awful that we don't know this. [mellow music returns] I think it's a historical gap that leaves us thinking we're inventing everything new, when sometimes this has already been known and then forgotten. So, I think the history can really inform modern day health care design, but we have to know it.

[00:17:51] HOFF: Dr Kisacky, thank you so much for your time on the podcast today, and thanks for your contribution in a history of medicine article this month.

KISACKY: Oh, thank you, and thank you for having me. It's obviously my favorite topic.

[00:18:09] HOFF: Joining us now is John Meyer to discuss how human-centered design can help motivate design choices in health care settings. John, thank you so much for being back on the podcast.

JOHN MEYER: Oh, my pleasure. [music fades]

[00:18:20] HOFF: In our previous segment, we discussed architectural changes in health care setting design over the 19th and 20th centuries. But changes to the physical architecture of health care spaces are not the only way to influence the experiences of patients, visitors, clinicians, or other health care workers. So, which changes in service delivery or service delivery streams have you observed over the past two decades or so that express an evidence-based relationship between design and actual health care service?

MEYER: Well, there've been a lot of changes, and some of them are founded in evidence, and some of them could use more evidence-based design. The big changes, I think, that've come around that have impacted the patient experience that I see is where design either has or should have a more important role. First is the introduction of the EMR, which I think for the people involved has been a mixed blessing. I think physicians will recognize that this was a difficult transition and still may have some drawbacks. On the other hand, it has had a lot of benefits for patients, and it's been very important. Second is digital in general. You now have patient portals etc., so people have more access to their information, which I think by and large is a good thing and, in some ways, may have lightened the load of people providing care. Most recently, I think telehealth has become very important. And it's not only telehealth, but the ability to access care in different settings. I think it is, you know, the evidence for that probably lies in the finance departments. Can you provide care better in these other settings?

And I think all of these point to a shift that needs examination from a human-centered standpoint. And by that I don't mean only patient centered, but also considering the caregivers, the providers, the doctors, nurses, etc. There's been a shift from the idea that you have your doctor, and that's your tie to the health system. That's still true in some ways. But people, I think, over the last 20 years have been served more and more by the health system, and it's been a matter of having a good relationship with the health system, more so than only a relationship with your doctor, with that one person.

[00:20:59] HOFF: Mmhmm. Yeah, that makes sense. I'm just thinking through my own personal experience. I think I interact so much more with these online portals than I would ever interact with any individual clinician. But I wanted to quickly follow up with one thing you said about the evidence for expanding access to care in different settings lying in the finance department. I thought that was very interesting. I think it highlights this tension between the traditional definition of evidence-based design that focuses primarily on evidence of improved patient outcomes and other forms of evidence used to justify making changes to the health delivery system. So in this case, there might be evidence that changing the way care is delivered is more cost effective, but that might be a complement to or directly in odds with delivering good patient care. So, which lessons are there for human-centered design—this phrase that you've used a couple of times already—from evidence-based design concepts and ideas, or vice versa, that can help maintain focus on good patient care?

MEYER: So, yeah, this is a really big question. I'm not going to try to tightly define human-centered design. I will say that although all design is supposed to be human centered, much of the design that you encounter, if you hire a design firm, a designer,

this person may or may not be practicing evidence-based design. So there are plenty of design firms who operate more on an agency, like an ad agency, where they call their people “creatives,” and they churn out work without ever speaking to the people involved, speaking to users, looking at research that’s already out there, calling that secondary research: so, the evidence that’s already documented, case studies, etc. So not all design is evidence-based design.

[00:21:57] Human-centered design should always be evidence based in some way. And I think what distinguishes human-centered design a lot from some of the other evidence-based design is first, it’s a multidisciplinary approach. So you take into account evidence that’s already out there, case studies that are similar or have some bearing. And then one of the key parts of human-centered design is to go directly to the people involved and learn from them. And you can do that by talking with them, and you can also do that by observing them. And observing behavior may be by watching them, but it may also be by looking at data that has been collected. Observing is always a great way to do it, but speaking to people and observing people are complementary. And ideally you do both.

[00:23:54] HOFF: Yeah, the way that you’re talking about this reminds me of a phrase. Are you familiar with the phrase “participatory design?”

MEYER: Yes.

HOFF: Right, right. Yeah. In our podcast in the March 2024 issue, we spoke with an architect who was discussing the construction of mental health facilities in particular. And it sounds like this idea of participatory design is pretty complementary to this idea of human-centered design.

MEYER: Absolutely. Participatory design is the best way to learn from people involved by getting out there and speaking with them and observing them in the context in which they’re actually, in which...well, in which the system is actually working. Absolutely. That is, I think, the best way. And again, you need both observation and inquiry, so interviews. And when we say “people,” one of the key points is to learn from all the people involved. So you want to learn from the patients. You want to learn from the nurses, the doctors, people cleaning the rooms. All of this is very important.

[00:25:04] HOFF: Mmhmm. So, what’s the best way to make sure that this information from community members and stakeholders who perhaps aren’t as involved as, for example, the hospital board, what’s the best way to make sure that these folks are part of this participatory, human-centered design process?

MEYER: Well, the first thing to do is to try to identify all the people involved. You probably won’t get the entire list at first. So, as you go in and learn, you’ll find that there are more people involved. And you need to find out what they do. Designers, when we start our research, we ask not, “What do you want?” We ask, “What do you do?” And it’s not up for people to tell us what they want. It’s up for us to discern what their needs are. Now, sometimes they do tell us, you know, “It would be really great if that door were

unlocked." And then it's up to the designers to make the decision and those participating in design decisions. Well, is it okay to do that? There might be a reason the door is locked, but there might be some other solution. So, the best way is to identify all of the people involved and then go to those people and learn from them. Do that through inquiry, asking them questions, preferably while they're working, and also then to do some type of observation.

The other thing that's important to do is to look at what data is out there already. In fact, you do this before you go out to do observation or interviews. So you want to find out well, what have others said? What have others found? And that helps you to ask better questions and pay attention to things that are important when you hear them. I think the most, you know, when I'm working, I always talk with my teams about the most important thing or the most dangerous thing. The biggest risk is that we're going to miss something, and we're going to miss something important. So, you have to do your secondary research first. Do your homework. Go out, learn directly from the people involved, and then you go from there. You have to do a rigorous analysis.

Human-centered design then also involves the idea of prototyping, typically. So you don't just design and build—and some of your other articles mention this—full-room mockups. That's a pretty ambitious but great way to do things, full-scale mockups. Mockups might not be full scale, but the key to prototyping is that you don't have to build the whole hospital. You can test parts of your system independently and learn about them before you commit. So these are some of the ways that we do things.

[00:28:01] I think the other thing that's really important when doing the research and analysis is to try to understand the frame of the people involved. What is their perspective? What are they thinking is allowed and not allowed, is possible and not possible? What are these hidden assumptions that they may have? Those are very important. It's one of the key steps in human-centered design is to understand the frame.

[00:28:28] HOFF: I trust that our audience has already begun to identify and draw out specific lessons for their own practice from your responses of soliciting input and listening to stakeholders. But to wrap up here, which evidence-based design concepts and ideas are most important for health care students and trainees to learn about to facilitate good care and health experiences for patients and their loved ones?

MEYER: I think the first is that health care is a practice. Design is a practice. So it's not a machine. It's not put in a punch card and get out an answer. So, I think the most important thing is design thinking and remember that evidence is not only what's been in a formal study, and your experience counts. And what you're hearing and seeing with your patients is also very important. So, consider qualitative data as well as the strict published studies. And design thinking, overall, it has, in my opinion, five parts. But the first I think I've discussed: Learn directly from the people involved. That's number one. Number two, frame the problem from their perspective: What are their assumptions about how this works and what they can and can't do? The third one is, consider more

than one solution. The fourth is, make and test your solutions with real people. And the fifth is, as you implement, learn from what you have implemented.

[00:30:06] I think the other thing is to recognize what are deep values and surface values in your practice? So, what I call deep values are the things that you really want to accomplish: healing your patient. But the surface values are the ways that are available to you through the current system. But it's really helpful and part of design thinking to go back to the deep values and say, if I didn't have these constraints, or if all I wanted to think about was the real end goal, how would I go about this? And this can open up your thinking to other possibilities. So for students and learners, use the approach of design thinking. [theme music returns] Use qualitative as well as quantitative data. Consider all the data and experience available to you. And remember the five principles of design thinking.

[00:31:02] HOFF: John, thank you so much for your time on the podcast. It's always a pleasure to talk to you.

MEYER: Thank you very much for having me.

HOFF: That's all for this month's episode of *Ethics Talk*. Thanks to Dr Jeanne Kisacky and John Meyer for joining us. Music was by the Blue Dot Sessions. To read the full issue on *Evidence-Based Design in Health Care*, visit our site, journalofethics.org. Find us on X @journalofethics, and we'll be back next month with an episode on *Epidemiology and Clinical Practice*. Talk to you then.