

Episode: *Ethics Talk: Industrial Hygiene and Sustainable Health Care*

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[mellow music]

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.

Responses to Ebola outbreaks in the US between 2014 and 2016 incorporated dedicated treatment centers called biocontainment units. These facilities, some of which were built following the September 11th, 2001 attacks, are designed to control the most infectious diseases, including now SARS-CoV-2 and other emerging special pathogens. Strict personal protective equipment protocols, designated airflow and filtration systems, and even specialized building materials are among the many safety features used to reduce and eliminate pathogen transmission while enabling the safe, reliable care of affected patients.

Like most health care settings, biocontainment units generate a lot of waste, such as plastic from sterile equipment packaging and biohazardous waste requiring special disposal streaming and other management strategies. Biocontainment units with this dual identity as sites of both effective infection control and generative of large amounts of waste help illuminate how industrial hygiene practices are applied across more diverse and everyday health care settings.

On this episode of the podcast, we're joined by Dr Shawn Gibbs, Dean of the School of Public Health, Dean's Chair and Professor of Environmental and Occupational Health at the Texas A&M University. Dr Gibbs is an industrial hygienist with expertise in disruption of highly infectious diseases such as COVID-19 and Ebola virus disease. He's here to help explain what exactly industrial hygiene is, why it's important to the goals of the U.S. health sector, and how effective implementation can help build sustainable health care systems. Dr Gibbs, thank you so much for being on the show with me. [music fades]

DR SHAWN GIBBS: Well, thanks very much for having me. I'm excited to be here to talk about this topic and to talk about our paper.

HOFF: So, our issue this month considers effective health care organizational waste management, as you obviously know, as a contributor to this issue. This is one dimension of a wider field called industrial hygiene, as you also know, as an industrial hygienist. Would you please tell our audience about industrial hygiene, what it is, how it emerged, and why it's both domestically and internationally important for health care?

GIBBS: Happy to do so. So, the most basic term, the American Industrial Hygiene Association defines industrial hygiene as both a science and art that is devoted to the anticipation, recognition, evaluation, control, and confirmation of protection from those environmental factors or stressors arising in or from the workplace that may cause sickness, impair health and well-being, or significant discomfort amongst the workers or amongst citizens of the community.

HOFF: Mmhmm.

GIBBS: And honestly, it's just a very long-winded way to say that essentially, our field is devoted to identifying or predicting potential exposures in the workplace that may have a negative health impact.

HOFF: And so, that doesn't necessarily just include waste management. It includes what other sorts of things?

GIBBS: Oh. So, we'll be involved in biological exposures, chemical exposures, radiological, various physical exposures. Essentially, we utilize a variety of controls to reduce or eliminate that exposure. These controls can include physically removing or substitution of the exposure of concern, using engineering controls to isolate people from that exposure, often changing the way people work through administrative controls. And what people are probably most familiar with in regards to industrial hygiene is the use of personal protective equipment to protect workers from those exposures.

HOFF: Mmhmm, mmhmm.

GIBBS: Essentially, industrial hygiene has been around since the early Roman scholars recognized the toxicity of lead to miners.

HOFF: Hmm!

GIBBS: And ever since that time of those early exposure identifications, other industrial hygienists have been working to protect workers.

HOFF: You mentioned PPE as being one of the things that people are most familiar with as an expression of industrial hygiene, and a perhaps lesser known, or at least lesser known before the wide media coverage they received during the Ebola outbreaks in the last decade, are these biocontainment units. Biocontainment units became these easy targets for anyone looking for an example of how worker and patient safety comes at a cost of sustainability. But industrial hygiene in health care, as you were referring to in your first responses there, is now much more broadly applied in everyday health care operations. So, what did we learn from Ebola biocontainment units that now have everyday importance in health care?

GIBBS: So, you're correct. Industrial hygiene in health care has always been broadly applied and far more than just the response to highly infectious diseases.

HOFF: Mmhmm.

GIBBS: And you're also correct that there've been a lot of lessons learned from those biocontainment units addressing the Ebola virus disease that are being applied in everyday health care setting to the COVID-19 pandemic and just to disrupting hospital-acquired infections. In my opinion, one of the most important realizations was that as a whole, health care was not doing a great job at training personnel on the donning and doffing of that personal protective equipment that we were talking about earlier.

HOFF: Hmm.

GIBBS: And specifically, there had not been a great deal of training and education placed on the process, the rationale and importance of the sequencing, and better information to the end user on the capabilities and limitations of that personal protective equipment. And one of the things that I always highlight is the controls are only as good as those using the controls. And if you don't put the personal protective equipment on correctly or take it off correctly, you drastically increase your risk. And while people have been using this equipment for years and for decades, they haven't always been using it effectively.

One of the other lessons learned from Ebola virus disease response is a better understanding of the very important role that those involved in cleaning and decontamination play in infection control and worker safety. Very often when we talk about infection control or we're talking about the disruption of the spread of a highly infectious disease, all the focus goes onto the health care workers. And don't get me wrong, they're extremely important in that process and one of the key pivotal portions. But eventually, rooms have to be cleaned, decontamination, waste has to come in or go out. And I think many health care facilities have really stepped up their training and education of their cleaning staff so that they can have a better understanding of their role in preventing the spread of infection, and also so that health care workers have a better appreciation of the role that those individuals play. This is applicable well beyond COVID-19 and Ebola and other highly infectious diseases. Better training of that staff can have an impact in the future in regards to everyday hospital-acquired infections.

HOFF: You say that PPE effectiveness is reduced partially through donning and doffing techniques. And using that just as an example, it, I think, illuminates a pressure point in industrial hygiene's mission of, in part, implementing policies to effectively route safety hazards. So, where are these kinds of disconnect? That is, where there's potentially effective policy in place, but in practice, circumstances are such that it's just not being carried out well for whatever reason? Where's that disconnect coming from and how is it being addressed?

GIBBS: I think the disconnect is kind of how we've approached it systematically, globally, honestly.

HOFF: Mm.

GIBBS: It's kind of been an afterthought. If you take a look at when people are trained, health care professionals, when they're trained, very little time and thought is put into infection control or personal protective equipment outside of some very specialized programs. So, the general person coming out of their professional training and going into the hospitals has not received full understanding or a great deal of education on those limitations that we were talking about earlier.

HOFF: Mm.

GIBBS: And I think that's one of the things that we can do better within various professional training programs, whether it be in medicine, nursing, dentistry. There's a lot of room for improvement so that people understand how the personal protective equipment works, but also understand its limitations and that it's being utilized as part of a greater plan with multiple controls that aren't just around the personal protective equipment.

HOFF: Mmhmm. So, turning a little bit more to the sustainability angle, the need to implement stronger sustainability models in health care is obviously pressing for a variety of reasons. How should this need be balanced with the safety needs of health workers and patients?

GIBBS: So, the paper I authored with Dr Aurora Le at University of Michigan and Abbey Lowe at University of Nebraska Medical Center gets into exploring the need for this balance.

HOFF: Mmhmm.

GIBBS: It has to be a balance. It has to be a collaboration. One of the conclusions we reached was that human health promotion and environmental protection are values that sometimes complement each other, but sometimes conflict in biocontainment unit management. So, when these values conflict, stakeholders must mediate and balance their implications in terms of individuals' immediate, short- and long-term needs for health care, public interest, empathic control, and containment, and the environmental impact. And the default for many in biocontainment units is to go completely disposable. Conversely, the default for many in sustainability is to go completely reusable. And that balance you mentioned earlier on comes into play.

HOFF: Mmhmm.

GIBBS: I know containment unit leadership needs to work with the health care sustainability leadership to identify and to find compromises that limit the impact on the environmental sustainability but don't compromise health care personal safety.

HOFF: Mmhmm. The Journal's audience is likely familiar with the discussion around the obligation of health professionals in addressing social determinants of health that affect their patients, and it seems like there might be an analogous question here for industrial hygienists. So, given that the influence of climate change will drastically affect the health of populations and individuals, do industrial hygienists as a profession consider addressing these broader outside influencers of health while working on more narrow safety and sustainability efforts within a specific workplace?

GIBBS: I would say we're beginning to.

HOFF: Mmhmm.

GIBBS: We're moving in that direction. So, right now there are only about 7,000 certified industrial hygienists in the world. So, there aren't a lot of us, but I like to say we play an important role.

HOFF: Mmhmm.

GIBBS: So, domestically and internationally, your industrial hygienist will work to protect worker safety and health in accordance with laws and regulations, but beyond those laws and regulations, we're also working to identify new exposures that may not have been codified into those laws and regulations where the industrial hygienist will play a number of roles in this space for the U.S. health care system beyond biocontainment units and simply beyond infection control. So, whether the industrial hygienist is working to reduce noise exposure, chemical, biological, radiological exposure, or other exposure, it's critical

identifying these potentials for those exposures and then determining the best course of action to reduce the exposures and their potential negative impact on worker safety and health. So, industrial hygienists are well-versed at utilizing the hierarchy of controls, which includes elimination, substitution, engineering controls, administrative controls, and PPE, as well as many other tools to reduce those exposures.

As industrial hygienists, I think we need to do more to include environmental sustainability in our thought process. One example from the biocontainment units that I think highlights this and is applicable to all of health care is how we treat various types of packaging for various pieces of equipment or consumables when working in biocontainment units. In many cases, the waste generated from the units has to be treated as what's called Category A waste, which is very expensive to dispose of, takes a great deal of packaging. It's time consuming and takes a great deal of energy to dispose of. Early on, a number of us working in biocontainment units identified that when possible, if you remove excess packaging before it goes into the biocontainment units, then it does not become Category A waste, which reduces a great deal of burden both from the biocontainment units and the environment.

HOFF: Mmhmm.

GIBBS: So, also, this allows us to then process the unneeded package in the proper recycling bins when possible, so it doesn't end up either incinerated or landfilled as the various types of waste there. So, this is something that can be applied throughout health care to reduce items that are disposed of as medical waste unnecessarily that then don't make it into the recycling.

HOFF: I think you point out accurately that reducing waste, especially plastics, is key. But too many single-use plastics are the symbols of safe and sterile equipment use in health care settings. So, what should clinicians, purchasers, and the public relearn maybe about plastic use and sustainability programming in their own organizations?

GIBBS: So, I think single-use disposable items are the most difficult issue because of their real and perceived safety and convenience and the real impact to environmental sustainability.

HOFF: Mmhmm.

GIBBS: That currently, those making the selection of these disposables are not considering their impact to environmental sustainability and are only focused on other factors such as cost, safety, usability, and so on, which makes sense for them. We just need to broaden the discussion a bit. So, we need to have the sustainability team at the table to include the impact to the environment as one of the many inputs into the selection process. You may also go with a disposable option, but you could select one with less packaging or less unnecessary materials because of that environmental impact. In the biocontainment units when you're generating less waste, that's a huge cost savings. So, these also have financial benefits in addition to the environmental impacts as well.

HOFF: Mm.

GIBBS: Industrial hygiene and infection control can also look at the process for their usage, including when certain packaging can be removed from recycling, when it won't negatively impact safety and care.

HOFF: Mmhmm.

GIBBS: Also, one of the things I'd like to highlight is the disposable option is not always the option that provides the most protection to the health care worker. For example, at this point, we're all familiar with disposal N95 filtering face piece respirators. They're now common within the general public and have long been used in health care. However, the level of respiratory protection they provide the wearer is significantly lower than the respiratory protection provided by a reusable N95 elastomeric respirator, which has been used in non-health care industries for years. So, right now, researchers such as Lisa Pompeii and Janelle Rios and others have shown the feasibility of N95 elastomeric respirators for their use in respiratory protection in health care and how this can be feasible through education on how to use them properly and how to clean them between use.

HOFF: Are there other opportunities like that? Obviously, face masks have sort of become a symbol of this single-use mindset balanced with the need for both personal and public protection. Are there any other sort of striking examples that our listeners might be interested to know about?

GIBBS: Well, one of the examples I would always point to is selection of personal protective equipment. Are you using a disposable gown when a reusable gown may be more appropriate? Now, that's more an administrative decision.

HOFF: Mmhmm.

GIBBS: For the individual, of course, when disposable gloves are contaminated, you dispose of them as medical waste. But are you selecting a disposable face shield because of the convenience versus reusable goggles, which would provide the same protection or better without generating that same amount of waste?

HOFF: Mmhmm. So, I guess the sort of following question to that is what's the balance? Because you hinted at the fact that it's somewhat of an administrative decision. People can only make choices about their PPE based on what's available to them in their hospitals or clinics. How should individual clinicians approach their organizations to perhaps advocate for additional protections or additional options for PPE and things like that?

GIBBS: Well, there's a lot of factors that go into this. So, one of the things that we're looking at is we're assuming that the supply chain is stable, and the equipment is plentiful.

HOFF: Mm, mmhmm.

GIBBS: We know from the past two years that that's not always the case. We know from the past two years that when the supply chain gets challenged, people may have to be thinking outside of the box and going to disposable equipment that they previously hadn't used. That actually strengthens the argument to have more reusable equipment that you can have onsite and have a process to reuse versus relying on continual disposable equipment.

HOFF: Mmhmm.

GIBBS: So, while I think the large-scale changes needed will have to come from the administrative levels or through state or federal regulatory intervention to address the interplay between safety and sustainability, there's a lot we can do at the individual level. And for those professional students and trainees out there, I think one of the most important things that we can do at that individual level is simply to ask those that are training us, "Was environmental sustainability considered in this process?" And simply by asking that question, you're going to generate discussion. You're going to maybe get people who weren't considering it before thinking, "Should this be part of our thought process?" And then once you start that, then to advocate and get the conversation started for it to be part of the decision-making process.

I'd also like to highlight the needs for better administrative controls. And this is something that can be worked out in the process, and really understanding when you're responding to not only infectious disease but chemical issues or so on, if you've got administrative controls in place that help limit the individual's actual exposures to the substance that you're concerned about, this will reduce the need to rely on potentially disposable personal protective equipment. If you can utilize engineering controls so that you're reducing the volume of a chemical or a biological agent that's in the environment, that will reduce your need to rely on these personal protective equipment that are disposable. So, by relying more heavily on engineering controls and administrative controls, you can actually have a better environmental impact by reducing the need to utilize a lot of disposable personal protective equipment.

HOFF: Dr Gibbs, thank you so much for being on the podcast with me today and for your and your coauthors' contribution to the Journal. [mellow music returns]

GIBBS: Tim, Thank you for having me. And my coauthors and I were happy to be part of the Journal this month. I hope that this brings a little bit more familiarity to your readers about industrial hygiene and what we do. Unfortunately, when you're talking to me, you're going to get a focus of industrial hygiene and infectious diseases, but one of the things I always like to remind people is that industrial hygiene does so much more beyond infectious diseases and is an extremely important component to addressing worker safety and health issues in all industries.

HOFF: That's all for this episode of *Ethics Talk*. Thanks to Dr Gibbs for joining us. Music was by the Blue Dot sessions. To read the full October issue for free, head to our site, [JournalofEthics.org](http://JournalofEthics.org). For all of our latest news and updates, follow us on [Twitter](#) and [Facebook @JournalofEthics](#). And we'll be back next month with an episode on health care spending. Talk to you then.