

Military to Civilian Transition-Slammer Problems - Pediatric Grand Rounds-7-31-2026-Meeting Recording

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1h 4m 23s

● **Calderon, Delia** started transcription

 **Alice Gong** 0:30
Yeah.

 **Calderon, Delia** 0:36
Ready to go?

 **Sutter, Deena E** 0:38
Okay, alright, let's get started.
Good morning, everyone. Welcome to the first pediatric Grand Rounds of the academic year. If you don't know me, my name is Dina Sutter. I'm A peds infectious disease specialist. I've been here now at UT Health for about a year, and I'll be serving as your Grand Rounds course director.
I just want to thank Dr. Ranch for passing the torch, Dr. Kamat for his ongoing leadership, and Delia Calderon, our Grand Rounds coordinator. So a couple of things for those who are on, a few things to start the academic year. If you're a faculty member who receives an e-mail inviting you to speak, please let us know. And then for any other faculty, if you have ideas for speakers,

 **Alice Gong** 1:01
Yeah.

 **Sutter, Deena E** 1:24
inside or outside the institution, please contact me or Delia. We're interested in your input. A few housekeeping notes, please ensure that your devices are muted and the CME code is going to be in the chat. So it supposedly works and you should go ahead and apply for CME.
Okay, so I'm going to get started. It is my honor to introduce Dr. Ted Ceslack, Colonel, retired, United States Army, who is a pediatric infectious disease physician

with over 30 years of experience in the field of biosecurity. He received his undergraduate medical degrees at the Ohio State University. He completed his pediatric residency at Baylor College of Medicine. He did his ped ID fellowship at the Uniformed Services University of the Health Sciences in Bethesda, Maryland. operational medicine at the US Army Medical Research Institute of Infectious Diseases. He was the consultant to the Army Surgeon General on biodefense matters, led the US delegation to NATO's Biomedical Advisory Committee, and served as the Defense Department's liaison to the Centers for Disease Control. During his career, he also served as a chief consultant to the US Army Surgeon General, and he deployed to numerous countries, including Panama, Iraq, and Jordan. And of note, he also served on the Advisory Committee for Immunization Practices back when it was a thing. After his military retirement in 2015, he became the executive director of health security for the University of Nebraska Medical Center and was the medical director of UNMC's quarantine unit where he led preparedness operations until retiring in 2021. He's an adjunct associate professor of epidemiology at UNMC in his ongoing research and advisory roles in both biodefense and pediatric disaster preparedness missions. And on a personal note, I vividly remember him teaching me in the hallway, Wilford Hall, 1999, on my ID rotation. He served as our department chairman subsequently. And I was lucky enough to be able to call him my partner at Brook Army Medical Center for his last two years on active duty. So please welcome me in joining Dr. Ceslak, who's going to talk about quarantine, isolation, and biocontainment.

T **ted.cieslak** 3:54

Well, thanks so much, Dina. And it's very much an honor to be asked to kick off this year's Grand Rounds. A couple of caveats here, as Dina indicated, I retired from the military in 2015 and took a faculty position at Nebraska. And then I retired from that job four years ago. And so anything I say about recent events is gleaned from speaking with my former colleagues and stuff. My own experience at Nebraska ends four years ago. My other caveat is that not too much we're going to discuss today is really specific to children, but I will point out where it is. And so I think all of you are at least loosely familiar with the fact that there have been some serious infectious disease outbreaks in the news lately. The

Andes virus outbreak in the South Atlantic Ocean on a cruise ship and then the ongoing Ebola outbreak in the Democratic Republic of Congo, which if you look at the trajectory of cases in that ongoing outbreak, if it continues along as it has, it will soon dwarf the 2014 outbreak that resulted in 40 some thousand cases. So couple of very important things going on in the world now that are relevant to this discussion. So we're going to talk about quarantine and isolation and a little bit about the ultimate form of isolation, namely biocontainment. So when we talk about infection control and biocontainment, we can actually talk about laboratory containment, and clinical containment. So I'll just outline those here, but then we'll spend the rest of this morning talking specifically about clinical containment. But when we talk about laboratory containment, and this hopefully is review for most of you, we divide microbiology laboratories into four levels, and we call those

biosafety level one, two, three, and four. And so biosafety level one labs are, you can think of a high school biology lab. Obviously, we don't want 14-year-old high school freshmen playing around with anything that's pathogenic, anything harmful to humans. So these laboratories work

with benign organisms to demonstrate to high school students what little red and blue things look like under a microscope. But they don't deal with anything harmful to humans. So BSL-2 lab does deal with things that are harmful to humans. But they're the common garden variety sorts of things that we see in clinical medicine all the time. Strep and staph and gonorrhea.

syphilis, and a whole lot of other things. So most of your clinical labs in this country at small community hospitals and stuff would be BSL-2 labs. A BSL-3 lab is a lab that works with highly hazardous human pathogens. And most medical centers and all 50 state public health labs would have at least a BSL-3 laboratory. BSL-4 lab is also a lab that works with highly hazardous human pathogens. But the difference between BSL-3 and BSL-4 is that for the BSL-4 pathogens, there are no effective countermeasures. And for many decades, we had two of those labs

labs in the United States, one at the Centers for Disease Control and one at USARMY, the US Army's Medical Research Institute of Infectious Diseases. But after the terror attacks of 9-11 and the anthrax attack that followed a few weeks later, Congress did what Congress does. They threw money at the

problem of bioterrorism, and many academic institutions won grants to open up their own BSL-4 laboratory. So we now have 13 of those in the United States, and

two of those are in Texas, one at the University of Texas Medical Branch at Galveston, and the second right here in San Antonio at the Southwest Foundation for Biomedical Research. So again, that's all I'm going to say about laboratory containment, and I want to focus most of this talk on clinical containment. So I think all of you, hopefully, are familiar with basic clinical infection control practices. So we speak of standard precautions and who should we approach using standard precautions? Well, obviously everybody, and I think you all know what those are. That's common sense stuff. So we as infectious disease docs, for example, we recommend, it's only a recommendation, but we recommend that if you're doing a rectal exam, you wear gloves. So standard precautions are, again, those common sense things that we do when we approach any patient in a clinical setting. But you also realize that some patients require something more. They require transmission-based precautions, and we have 3 levels of those, contact, droplet, and airborne precautions. And airborne precautions are ideally applied in a special facility, an airborne infection isolation room. So that's a negative pressure room. Most medical centers will have a couple of those rooms. Most small community hospitals probably won't. So if you have a patient that requires airborne isolation, those patients you would ideally transfer to a facility that could provide that. But then beyond those transmission based precautions, there's this very specialized kind of ultra high level containment care that we call biocontainment. And I'm going to talk a little bit about that, because that's, again, been in the news quite a bit lately with respect to the Andes virus patients and the Ebola patients. So the birth of biocontainment, I think is a fascinating story. It occurred in 1969 with a complex number of events all coming together at the same time. So first of all, Richard Nixon in 1969 renounced the use of biological weapons. And some of you may not know this, but the United States from 1943 until 1969 actually had an offensive biological weapons program. So that program started in 1943 in response to active German and Japanese programs in the United States decided that it had better get into the business as well. Most of the work done in that program was defensive, was aimed at coming up with countermeasures for things like anthrax and smallpox. But we did have a small offensive capability. It was dwarfed by that of our Cold War adversary, the Soviet

Union. But in 1969, Nixon made the unilateral decision to get rid of this program. And we can argue about his rationale, but basically he said to one of his advisors that, you know, if anyone tries to use biological weapons against us, we'll just nuke the hell out of them. So I think he felt those weapons were ineffective. anyway, and there was no great loss getting rid of them. And the reason that's important to us is because back in 1969, all of the media coverage of this decision brought a lot of these diseases out into the public, and they became household names. So it was the first time a lot of Americans heard of things like anthrax. and plague and smallpox and tularemia and things like that. Then at the same year, an investigator, Jordy Casals at Yale University, discovered one of the first highly morbid viral hemorrhagic fevers, namely Lassa fever. And one of his nurses in the course of doing work with this virus in Nigeria. One of his nurses contracted the disease. She recovered, fortunately. Then Dr. Casals himself caught the disease. He recovered only after a transfusion of convalescent plasma from his nurse. And then one of his technicians caught the disease. and unfortunately, succumbed to that disease. And so that frightened Dr. Exalls quite a bit. He decided it wasn't safe to work with viruses like Lassa in conventional laboratories. And he moved his work to what was then the Communicable Disease Center, now the Centers for Disease Control in Atlanta. And that was the birth of BSL-4 laboratory containment. That same year, I think all of you realize Apollo 11 landed on the lunar surface and Buzz Aldrin and Neil Armstrong walked on the moon. And it seems a little silly now, perhaps. But back in 1969, there was a palpable fear that these astronauts would bring back with them space pathogens, moon viruses. And so there was a lot of interest in quarantining these astronauts when they got back. And so NASA built a lunar receiving laboratory at the Johnson-Mann Space Flight Center in Houston. And they did that in consultation with Army experts from Fort Detrick. And at the time they made that decision to build the Lunar Receiving Laboratory, they also made a decision to build a facility at Fort Detrick. And that's where I spent some of my career, and we'll talk about that in a minute. So again, it seems a little silly now, but back in 1969, there was this palpable fear of the astronauts bringing back space pathogens. And that fear was amplified when Michael Crichton published his fictional work, The Andromeda Strain. And that was clearly fictional, but it caught the attention of a lot of politicians and news media

people. And wrapping all these things together,

In 1969, there was this strongly perceived need to do something about these new emerging pathogens, such as Lassa fever. So the Apollo 11 astronauts, when they splashed down in the Indian Ocean, they were picked up by the aircraft carrier Hornet.

And they were immediately put into this mobile quarantine facility, which is a converted Airstream trailer. And they were taken to the Johnson Mann Space Flight Center, along with all of the other detritus from the space capsule. So the capsule itself, the moon rocks, the samples that were collected,

were all taken to the lunar receiving laboratory and quarantined for three weeks. And that was done partly because of, again, fear of space pathogens, also to give the astronauts some time away from the media and time to recover from prolonged weightlessness. The same thing was done with

Apollo 12 and Apollo 14. And after those three missions, after none of them revealed the presence of any moon pathogens, it was decided they didn't need to do this anymore. So Apollo's 15, 16, and 17, they didn't bother to quarantine the astronauts. So I said the

work that NASA did was done in conjunction with the military. And the military, at the same time they were building the Johnson Mann Space Flight Center, the military was building its new research laboratory, again, the U.S. Army's Medical Research Institute of Infectious Diseases at Fort Detrick, Maryland. So

This was the plans were drawn up, the blueprints in 1969, construction started then, and it was opened in 1972. And when it opened, it had a two bed clinical facility, which we used to call a BSL 4 facility. Now remember that terminology of BSL 1, 2, 3, 4.

was designed to apply to laboratories, not to clinical facilities, but we kind of bastardized it and applied it that way anyway. But this two bed hospitalization facility had the same sorts of controls that you would expect in a BSL 4 laboratory. And this, the facility was

affectionately called the slammer, presumably because the very heavy steel airlock doors made a nice slamming sound when they were locked behind you and you were locked into this facility. But you can see the doctors, nurses and technicians are working in space suits with air hoses,

supplying external air. You can see in the lower right hand corner there an air transportable isolator. That's the device we would use to transport patients from the

place we picked them up to the slammer at Fort Detrick. In the lower left hand corner,

You can see the air transportable isolator actually docks to a docking port in the external wall of the building, and the patient is passed through a plastic sleeve into the slammer and never needs to leave the isolation capability. And there in the upper right-hand corner,

That was my job as I was the flight surgeon for this team. And my job was to lay there and let all the medics practice starting IVs on me and drawing blood and those sorts of things. So again, a unique facility, but it was two beds. That was our nation's entire

BSL 4, if you will, hospitalization capacity. Nowadays, things have advanced somewhat. We've gone from a system where the theory was enveloped the patient to a system where the theory is now enveloped the inside of the aircraft.

So this is the transport isolation system, which the Air Force has developed over the last few years. And this is what we would use now to transport a patient. So it wouldn't be quite as claustrophobic, although I think being in this and having that fear that you've been exposed to Ebola, you know, a potentially highly lethal, pathogen, still pretty unsettling. But again, at least this takes away a little bit of the claustrophobia from it. So there were some problems with this slammer besides the fact that it was only two beds. First of all, it was underutilized. We admitted 21 patients to the slammer between the time it opened in 1972 until 1985. And then we didn't admit a single patient for 20 years from 1985 to 2004. And I think part of that is luck. Part of that is the fact that laboratory infection control procedures got better and better and fewer and fewer scientists got exposed to their experiment.

But all of these admissions, all 21 of them, were for quarantine. They weren't for isolation. And we're going to talk about the differences between isolation and quarantine. But basically, none of these patients were sick. They were all people who got exposed to highly hazardous diseases.

like Ebola and Lhasa. And the military made a decision to put them into this facility for quarantine and wait and see if they got, if they caught their experiment, so to speak. And fortunately, none of them did, and they are all able to walk out the front door. But because this slammer was very underutilized, that obviously caught the attention of the budget people and congressmen who were appropriating funds for this. And a decision was made that maybe we don't need to

fund this. And then the company that supplied a lot of the equipment for this. Its owner died in Britain and the company folded and it was getting difficult to get repair parts. And then probably most importantly, there were some serious issues with the Joint Commission. So back in 1972, when this facility opened, the fact that there was a two bed clinical facility in what was otherwise a research laboratory really didn't bother too many people. But by 2000, the fact that there was no significant clinical support within 35 miles, our support was at Walter Reed Army Medical Center, 35 miles south of Fort Detrick. And that didn't sit very well with the Joint Commission.

And then you all probably are familiar with the military and how things work in the military. There's rapid turnover. And so a lot of these highly trained technicians were constantly turning over and that made it difficult to continue to staff this. And then finally, civilians got into the business of providing biocontainment. And again, After the anthrax attacks of October 2001, Congress did what Congress does. They appropriated a lot of funds, a lot of academic institutions sought grants for those funds. And so we started building civilian counterparts to this military and NASA biocontainment apparatus. So the picture here is of my mentor and former boss, Phil Smith. He was chief of infectious diseases at Nebraska. And after the anthrax attacks, Congress appropriated money to the CDC, who partialled it out to the 50 states. And all 50 states got grants of some degree. Most states use that to buy drugs and vaccines.

For stockpile, Phil had the idea to build a civilian biocontainment unit. I met Phil when I was still on active duty. He sounded like he would have a great place for me to work after I got out of the military. So I started sucking up to him. many years before I retired and it worked. And so I left to join Phil at Nebraska upon my retirement from the military in 2015. So why a civilian biocontainment unit? Well, we've already talked about the fact that the terrorist attacks on the World Trade Center in September of 2001

obviously caught the attention of the world. That was followed three weeks later by the mailing of anthrax. 22 people were sickened by those. 11 had inhalation of anthrax and five of those died. That caught people's attention. In December of 2002, there was a huge

tabletop exercise called Dark Winter that involved a lot of officials at the very highest levels of government. And they used smallpox as a potential bioterrorist agent. I think the outcome of this tabletop exercise was so grim that it scared a lot of

congressmen and senators.

And that led to the appropriation, again, of funds. And that was followed closely by SARS outbreak in Canada and by a monkeypox outbreak in the United States. And so I think that's what led to Phil winning his grant. And you can say that our biocontainment unit in Nebraska traces its origins to the problem of bioterrorism. So why Nebraska?

Well, we're located in the center of the country and we're co-located with Offutt Air Force Base, which is the headquarters for U.S. Strategic Command. So we've got 12,000 foot runway. We can take evacuation planes from anywhere in the world. And we've got easy coordination with the military there. This was at the time when a new federal agency, the Department of Homeland Security, was stood up. They had money. They were appropriating funds. And of course, we were interested in obtaining some of those funds. I told you the monkeypox, there was a big monkeypox outbreak in the upper Midwest. We had no cases in Nebraska, but our surrounding state, neighboring states, had

many. There were 71 total cases. Fortunately, no one died. But there was some problems with health care workers being afraid to take care of patients. And I'll talk about that a little more in a second. Again, this was the time when SARS emerged. And then finally, we were lucky. We had a very, very active emergency preparedness community.

an EMS department and stuff. So at this time, many cities, EMS departments were kind of shying away from this notion that they would ever transport an Ebola victim, for example, or a Lassa fever or a smallpox victim. For some reason, our community in Omaha kind of embraced this and they embrace it to this day. They're proud of the fact that they are one of the few departments that is expert in managing some of these highly hazardous communicable diseases. So Phil got his grant and we built the biocontainment unit in Nebraska that kind of took the place of the military's facility at Fort Detrick. So this is just a story of a little 10-year-old girl, Rebecca McLester. She got monkeypox in Wisconsin back at that time. And the doctors there at her facility refused

to care for her, fearful of bringing monkeypox back home to their own families and stuff. And so, again, this is what one of the things caught Phil's attention. And a lot of the appropriators vowed that this wouldn't happen again, that we needed a facility that could treat and who had

Physicians and nurses who were willing to treat patients with these highly hazardous

communicable diseases, so...

Deena told you I spent 3 1/2 years at the CDC. I was the military's liaison there. This is my CDC boss, Julie Gerberding. She was the director at the time, and she came down and cut the ribbon for the opening of our biocontainment unit there. So we now have spread

our capability throughout the nation through NETEC, the National Emerging Special Pathogens Training and Education Center. That's a second degree acronym, an acronym within an acronym. The military would be proud of that. So you could see #7 there, that's our facility in Omaha.

We divide the nation up into FEMA regions and DHHS regions. They mirror each other. And so we are the facility for Region 7. Region 6, which includes Texas, now has its own facility at UTMB Galveston. And you can see the rest of those facilities scattered throughout the country there. The three in black

are the ones that are the three facilities that actually received Ebola patients during the 2014-2015 Ebola outbreak there. So they're the three with actual experience in managing some of these highly hazardous communicable diseases. And they're the ones that have trained up a lot of the people that staff the other facilities, including ours here in Texas. So we've now, as a result of a lot of this thinking, divided the nation into various tiers of clinical capability based on their ability to deal with highly hazardous communicable diseases. So all health care facilities

would fall in Tier D, they ought to be able to safely isolate patients who they suspect of being infected with a highly hazardous condition. They should be able to safely isolate them, not necessarily treat them, but isolate them until they can get them out of there. Tier C are the assessment centers, the ones that can

initiate care and initiate diagnostic testing. And then tier B are those capable of delivering specialized care throughout the course of illness. And the tier A are the ones that are strategically positioned, the ones that you just saw that have access to a lot of sophisticated laboratory testing can

do genetic analysis on strains and stuff like that. So we'll talk a little bit about our unit here. If you saw it in Nebraska, you'd be very, very underwhelmed. It looks like a normal, very small hospital ward. All of its magic lies in the invisible aspects.

of it, but it's basically a five-room ward. Each of those rooms is potentially a double room. So in theory, we could take care of 10 patients in this facility. That assumes you could double them up. They would have to have the same disease.

in order to be doubled up. We also learned in taking care of Ebola patients here, how much waste they generate and how much nursing care is required to care for them. And there's no way we could take care of 10 Ebola patients. So in fact, we probably couldn't take care of more than two at the same time, just because of all the resources they consume. We'll talk a little bit more about that in a minute. But I guess if you had 10 patients with an airborne disease, because airborne disease patients don't generate as much soiled linen and all that sort of stuff, In theory, we could take care of 10 patients. So we have a separate air handling system from the rest of the hospital. We have serial negative pressure gradation throughout it. So when you go from the outer hallway into the inner hallway, you go, you get into more, a more negatively pressurized environment. When you go from that inner hallway to the nurse's station, from the nurse's station to the back hallway, and from the back hallway to the patient room, you're going through serial negative pressure gradation and all air out is double HEPA filtered. The standard is 15 air exchanges per hour. Every time I tested it, we'd have 26 to 28 air exchanges per hour. So very negatively pressurized, very frequent air exchange, the air is again, HEPA filtered out. And one of the advantages we had, we have a BSL3 laboratory on our campus because the Nebraska State Health Lab is actually on the University of Nebraska campus. And then we had a little lab, point of care lab in the biocontainment unit. So a lot of basic laboratory tests could be done without ever having to break containment, without ever having to take a specimen out of the facility. But those specimens that didn't need to leave the facility for, for example, for more sophisticated analysis, we had the ability to bag, double bag, triple bag those specimens and then pass them out. through a secure airlock to a transport system that would take them to the regular laboratory. And we drilled regularly with both civilian and military agencies. So when we talk about trying to control infection in this environment, we kind of borrow the Occupational Safety and Health Administration's hierarchy of controls. Not all of these apply necessarily in every case, but OSHA would say that the best way of dealing with a hazard is to eliminate the hazard. So obviously, as a biocontainment unit, we can't do that. It's our job to take care of some of the most dreaded infectious diseases in the country. But when we talk about elimination, we can tell you, if you work at a community hospital, that that's what you should do. You should eliminate the hazard by sending the patient to us and not try to care for an Ebola victim in a small community

hospital.

Talk about substitution, replacing the hazard, that really doesn't apply in most cases here. But the bottom three are where we as a biocontainment unit differ from conventional hospital settings. So we have a significant number of engineering controls. We'll talk about those in a minute. We have a significant amount of administrative controls. We change the way

We limit who can enter the facility. We stipulate the type of training they need to have, et cetera, et cetera. And then finally, the bottom line is personal protective equipment. That's actually the bottom of the pyramid, the least effective way, but it does add

protection to the other four mechanisms of protection. So just show you a little bit of our facility. So our air handling system vents out to the roof through double HEPA filters. There's no recirculated air. The exhaust air is more than 25 feet from any building intake.

And we have, again, dual redundancy. And there's dual, not only dual redundancy of the HEPA filters, but of the exhaust fan. So if one goes out, the other automatically kicks in. We've got a lot of digital equipment in the unit, inside the room, outside the room, at the nurse's station, we can monitor.

ambient temperature and humidity and air pressure, the negative pressure in the room, et cetera, et cetera. This is some of our, again, specialized equipment. So the thing there on the left is an isopod. On the upper left is the isopod. That's how we would transport patients throughout the hospital if they needed to move throughout the hospital. Now,

We try to limit that movement. And in fact, we never had to do that for any of our patients. We do have in suite radiography and ultrasound. So we cannot do CT scan or MRI in the unit. And if we ever decided that that was absolutely critical, we would move the patient down to

CT scan or MRI in this device. But again, we try to not do that if we don't have to. We try to get by with standard radiography and ultrasound. On the lower left there, that's the military's version of the Isopod. It's painted green and it costs 10 times as much, but there you go. And then on the bottom right,

is the device that we seal remains in. So we had one patient succumb to Ebola that made us the world's expert based on an N of 1, I guess. And so we were constantly asked, you know, how to deal with potential deceased bodies. And that's a device for triple sealing them in plastic bags and stuff. So we've activated our biocontainment

unit three times. The first was for the Ebola outbreak in West Africa, in Guinea, Liberia, and Sierra Leone. So these were all

You all probably remember the outbreak with about 42,000 cases and 11,000 some deaths. But a number of American expatriates were affected by that. We had a lot of missionary doctors and nurses working.

in West Africa, and some of them caught this disease. And so we felt that we owed it to these people to get them back to the United States for care. We brought 10 patients back. We took care of three of those at Nebraska, and I'll talk about them a little bit in a second. And then

In the very earliest days of the COVID pandemic, we took care of some SARS-CoV-2 patients. This was at a time when we still thought we had a shot at containing this pandemic. That soon, it soon became obvious that the horse was way out of the barn, and we weren't going to be able to do that, but I'll talk about that in a minute. And then just recently, we admitted one patient with Andes virus. So you can see in the picture there, one of our Ebola patients in the room talking to his wife. I don't know if he's

she's reading to him or she's reading because she's bored and he's complaining. But anyway, whatever, we have a facility where spouses and family can talk via Zoom to their loved ones in the unit. So getting to this unit, the aircraft lands either at Offutt Air Force Base or at Eppley Airfield in Omaha. And

I don't know if you know much about the geography here, but I think it's fascinating. The Missouri River separates Nebraska from Iowa. But back in the 1870s, there was a big flood shifted the course of the Missouri River, and it left this little enclave called Carter Lake, Iowa.

completely surrounded by the state of Nebraska. I actually lived in Carter Lake when I was living, when I was working in Omaha. So you can see in the upper right hand corner of this map, there's Eppley Airfield. That's where the aircraft lands. And it travels down Abbott Drive there to get to downtown Omaha to the medical center. And you can see Route 165 there is 500 meters long. It crosses 500 meters, half a kilometer, of Iowa territory. Well, the governor of Iowa said that no Ebola patient would be transported through her state. And so that was a big political controversy, and we eventually ended up having to drive several miles around this little enclave so that we'd stay in Nebraska when we deliver these patients to the biocontainment unit. And then we take them in through the back door, through the side doors. We're not sneaking in the back door of the hospital,

this is a side door. And then they're transported up to the biocontainment unit. And you can see here, it's a fairly unimpressive looking facility. This is the outer hallway there. And I'm joking about the Ebola viruses not being permitted to cross the line. But the line is there just to warn people that they're entering a hotter zone. There's again, serial negative pressure gradation.

as you go down this hallway and as you go into patient rooms and stuff. So again, we activated in 2014. We had three patients admitted to this facility. None of them were there at the same time. So all were there in series rather than in parallel.

So the first one was admitted on day eight, discharged on day 21, and you can see the rest there. The third one, unfortunately, was in extremis in multi-organ failure before he even got on the aircraft in Africa, and unfortunately didn't stand much of a chance.

passed away on day three. That's the only death we've had so far. Okay, so that's a lot about the history and the show and tell of what we're doing in Nebraska. Now I want to talk a little more scientifically about this, though. So the question comes up, so who is a candidate for admission?

you know, which diseases would we put in that type of a biocontainment unit? And the way I like to look at it is there are five criteria that we use. And the first three are illustrated in this diagram. So diseases that are highly infectious, highly contagious, and highly hazardous are those that are our big candidates for admission. So there are diseases that are very infectious, like brucellosis and Q fever. Both of those diseases, as little as a single organism can infect you. There are diseases that are highly hazardous. Anthrax, inhalational anthrax has a mortality rate.

approaching 100% in untreated patients. There are some diseases that possess a couple of these criteria. Tularemia is very hazardous and highly infectious. But it's the diseases that possess all three attributes, like Ebola, highly infectious, highly contagious,

and highly hazardous. And those are the ones that are the targets for admission to the biocontainment unit. And I provide a little bit of data here. So Ebola, as little as one bio particle, one plaque forming unit can cause infection. Anything with an R naught value, R naught is a number of secondary cases that emanate from a single primary case. And that figure applies only in the absence of any interventions or any herd immunity. So anything with an R not greater than one is capable of causing an outbreak, a pandemic, if you will. And

And so Ebola is highly infectious. It is communicable enough to cause an outbreak.

And it's clearly highly hazardous. And we measure that by morbidity and mortality. And you can see the rest of that here. So there are certain influenza strains that would meet our criteria, you know, H7N9, H5N1.

influenza in a human could potentially be a candidate for admission to the biocontainment unit. And you'll see Andy's virus has an R_0 well under one. We don't know what it is. No one's ever done the study, but it's clearly well under one. So it's not

particularly communicable. And in all likelihood, we wouldn't need to admit an Andes virus patient to the biocontaining unit. We did one. I suppose some of that is you've got it, you might as well use it kind of thinking. But certainly that type of facility wouldn't be necessary to safely manage one of these patients. So I said there were five

criteria that we use. And I showed you the first three, but here's the 4th and a very important one, and that's the presence or absence of countermeasures. And so polio, which this article is talking about, certainly meets the first three criteria. It's very infectious, it's very communicable,

And I would argue it's pretty hazardous. But we can protect ourselves against polio.

We have a very, very effective vaccine. So nurses and caregivers wouldn't need to worry about contracting polio from one of their patients should they ever be required to take care of a patient with polio. So we would not need to admit a polio victim to the biocontaminia unit. The same argument would apply for measles.

Very infectious, very contagious. I would argue pretty hazardous. 200,000 children in the developing world still die every year of measles. But we certainly wouldn't need to admit a measles patient to the biocontaminia unit. We would need to admit them to an airborne infection isolation room if we needed to admit them at all. Obviously, we try to keep patients with highly communicable diseases out of the hospital if we can. So when you apply those four criteria of infectivity, communicability, hazard, and presence or absence of countermeasures, what are you left with?

So these are the highly hazardous communicable diseases of concern. These are the kind of things that, you know, we might admit to our biocontaminants. Smallpox, for sure. Plague, I put a question mark, because you definitely would not need to do that for bubonic plague. You might consider it for pneumonic plague. Certainly pneumonic plague has been managed successfully in conventional hospital settings, but you could say the same thing about all of these diseases. You could also say that all of these diseases have been unsuccessfully managed in

conventional hospital settings. So that's one where we would consider it. Certain viral hemorrhagic fevers, monkeypox, you know, we have monkeypox in this country.

We have not put those patients in a biocontainment unit. I suppose you could if you wanted to, but that is not a particularly infectious disease or contagious disease. It requires close body contact in order to contract it. SARS-MERS, certainly SARS-CoV-2,

met the criteria early on in the pandemic. We'll talk about that in a minute. We now have relatively effective countermeasures and so on. And obviously the horse is so far out of the barn there. We don't have the beds to admit SARS-CoV-2 patients to biocontainment units.

I'll just say a little bit about children in biocontainment units. The good news is we've never had to do that. We have not had a single admission of a child to a biocontainment unit yet in this country. We have put a lot of thought into it. This is a review of a lot of the issues.

that would come up when you consider managing children in a biocontainment unit. If you're interested in that, you know, I would urge you to look this up or I'm happy to send you a link to the paper. There are some very troubling issues that would come up.

presence of parents in the room with a sick child with Ebola, for example, the wisdom of cohorting. If you had two children in a family with Ebola, you know, would you cohort those patients in the same room, et cetera, et cetera. And the time doesn't permit us to talk about the specifics of these today. If you want to invite me back, Dina,

We could talk, we could spend a whole hour talking about, you know, how these issues apply to children in a biocontainment unit. Suffice it to say, those are all problematic issues and there's not unanimity of opinion as to how we would deal with that. So let's move on to talk about isolation and quarantine specifically now. So I just want you to be aware, these are two very different things. The terms are often used

inappropriately, but the CDC defines isolation as the mechanism by which ill persons with a communicable disease are separated from those who are healthy. And quarantine, on the other hand, separates well persons who may have been exposed to a disease but have not yet

become ill with it. And that's an important distinction. We'll talk about that in a minute. So quarantine happens all the time. It's usually under the radar. It usually

happens at a local level, and it's usually quasi-voluntary. So if you get exposed to measles and you're not vaccinated, the local health department will likely tell, if they become aware of your case, they will likely tell you to stay home and don't go to school for the length of the incubation period. Same with chicken pox. If you get exposed to chicken pox and you're not immunized against chicken pox, The health authorities will tell you not to go to school until you complete your incubation period. This stuff happens all the time. It goes on all over the country. Local public health departments deal with this, and it's usually dealt with under the radar. But with that said, there are a small, and

By the way, local health departments and state health departments are free to prescribe which diseases they feel are worthy of quarantine. But federal law establishes the diseases subject to federal quarantine. And there are three executive orders written by

President Bush and President Obama that specify the diseases that are subject to federal quarantine. So the federal government, the CDC, cannot order you into quarantine for other diseases. States can add to this, to the list and do that. And I like to divide these nine diseases into three categories of three each. And I divide them based on what would happen

if I put you in quarantine and you actually got your disease. So remember, you're being quarantined because you've been exposed to something. You're not yet sick. And our hope is that if you're put into federal quarantine, you won't get sick. You won't catch the disease that you were exposed to. But what happens if you do? Well, if the disease in question is a viral, is a certain viral hemorrhagic fever like Ebola, then I'm going to put you in a biocontainment unit. I would do the same for SARS or MERS. I'm lumping those two diseases together. And I would do the same for smallpox. And then there are diseases for which I would definitely not put you in the biocontainment unit. And the three there are cholera, diphtheria, and yellow fever. And those are, I think, on the list of federally quarantinable diseases.

mostly as an anachronism. The fact that they're on that list dates to an earlier time in public health and stuff. But clearly diphtheria, we've got effective countermeasures. Yellow fever, we've got an effective vaccine. Yellow fever is not transmissible from person to person anyway, except through the bite of a mosquito. So the only reason to put them in isolation would be to protect the local mosquitoes.

So again, those are diseases that are theoretically subject to federal quarantine. I can't imagine they ever would be ordered into federal quarantine, but they certainly

wouldn't need to go into biocontainment either. And then there are the three in the middle, the maybes. So XDR TB, a particularly nasty strain of extremely drug resistant TB.

I might put them in the biocontamia unit. Pneumonic plague, we already talked about, and certain strains of highly pathogenic avian influenza, maybe. Okay, now, this whole notion of quarantine is built upon the fact that we're going to put you into a situation

until your incubation period has passed. But the dirty little secret is that if I trust you for the vast majority of diseases, we probably don't even need to do that. If I can trust you to take your temperature and watch your symptoms, and report to medical authorities as soon as you become sick, then I don't need to put you in quarantine. I can let you go home and go about your lives. And that would be true for Ebola. So if I could trust you, if you got exposed to Ebola, and I could trust you to let me know as soon as you develop the temperature, you don't need to go in a quarantine unit. And there really are only very few diseases that become contagious before they're symptomatic. And you can see those five here, flu, yellow fever, chickenpox, measles, and COVID-19. So those are the diseases where you may feel well, but you could actually be walking around in public spreading the disease. Ebola is not one of those.

So let's talk about our quarantine unit a little bit. This is the outside of the Davis Global Center at the University of Nebraska. Beautiful building and the quarantine facility occupies one floor of this building. The rest of it's training and education center. So I ran this quarantine unit and we've activated it three times.

So the first was in December of 2018, and we had a high-risk Ebola exposure. And this person was a physician named Patrick. He's given me permission to tell his story. He's interesting because he's also been put into quarantine a second time during the current

Ebola outbreak. He's A Christian missionary working in Democratic Republic of Congo. He was working one day and a woman was wheeled into his clinic in Extremis. She was delivering a dead fetus. She was bleeding all over. He reached out to help her, examined her quickly before they realized she probably had Ebola. So he had a very high risk exposure. Again, if I trust him, I can let him self quarantine. I certainly trusted him. He was a physician. But there was a lot of political unrest in Congo at the time. There were threats made against this Ebola treatment center.

He was due to come home for rest and relaxation anyway, but he didn't have a home to come home to because he lived permanently in the Democratic Republic of Congo. So we thought it was best to put him into a federal quarantine unit.

Incidentally, he was the first person ordered into federal quarantine.

since smallpox roamed the earth in 1963. When I say ordered, he came voluntarily, but when I picked him up at the airport, we had an order in my back pocket in case he objected to it. He didn't. And he never caught his disease and walked out the front door to go back to Congo eventually.

Then in early March of 2020, in the very earliest, early February and March of 2020, in the very earliest days of the COVID pandemic, we started to get patients being repatriated from China. So in early February, shortly after the pandemic was diagnosed. We had a plane flight, a voluntary repatriation of 57 U.S. citizens from Wuhan. Our quarantine unit, which had just recently opened, was 20 beds. So right out of the gate, we exceeded the capacity of our

quarantine unit. And so we moved them to a place called Camp Ashton. And I'll talk about that in a second. And then we got 15 Diamond Princess cruise ship passengers. You probably remember the story of the Diamond Princess cruise ship was stuck in a harbor in Tokyo. The passengers spent two weeks confined to their state rooms on that cruise ship in the earliest days of the COVID pandemic before a plan was finally arranged at to move some of them back to the quarantine unit here in the United States. And then more recently, and I was not involved with this, but got this information from

my colleagues there. We had some of the patients from the MV Hondias cruise ship that were exposed to the Andes virus. So this is the aircraft that brings them to Omaha. We were very, very fortunate when we got these passengers because we had an empty

DHL warehouse at the airport. Just happened to be empty, happened to be in good condition, reasonably clean. And so we were able to triage the patients here in this facility and not have to take them all to the medical center. Again, the first wave exceeded our capability. We were lucky again in that

The Nebraska National Guard had a facility 20 miles west of Omaha, which was empty. They use it for training and there just didn't happen to be a training audience there at the time. So we were able to house these patients in the barracks at Camp Ashton. Same was not true with the Diamond Princess cruise ship when we got 15 patients from there. So 13 of these patients were actually positive for COVID,

SARS-CoV-2. Back then, if you'll recall, we didn't know what that meant. We didn't know how long a positive test was relevant. You know, did that indicate active infection? Did that indicate

residual bits of DNA that were harmless, et cetera, et cetera. But we had a tiger by the ears. Once we had these patients in quarantine, it was going to be difficult to let them go. And we kept eight of them remained positive for more than a month, the longest for 43 days.

The 2 who were negative were discordant spouses. So they had spent a month with their positive spouse in the same room and yet never caught COVID. And we still don't know why that is, but we suspect they had some pre-existing T cell immunity, probably as a result of some

coronavirus infection earlier in life. So this is what the quarantine unit looks like. It's very unimpressive. It looks more like a Holiday Inn than a hospital facility. So I'm moving ahead quickly because I know I'm running out of time. We learned a lot of lessons by putting these 15 Diamond Princess cruise ship

passengers in the quarantine area. First of all, people rally when they need to. These people, they were, it was an honor taking care of them. They were great. Note that none of them were children and I'm a pediatrician. It's probably a bad idea for me to take care of them. But again, I was more a hotel manager than I was a clinician. And anybody that got sick was quickly transferred to my adult

infectious disease colleagues. We learned a lot about PCR and how it can be too sensitive because we were getting positive test results long after these patients were well and ready to go home. I say act as if the media are everywhere. They are one of our patients.

couple, husband, wife couple from the cruise ship actually owned a radio station in Santa Clarita, California. They were broadcasting live via their iPad every day from our quarantine unit. So that was at first a little unsettling to know that every decision you made clinically was being broadcast to the country. But we got to be friends with them and actually turned out pretty well.

I'll just close by saying, you know, we've talked about isolation, we've talked about quarantine. There is kind of a gray zone between isolation and quarantine that we call recovery care. And that's what Leprosaria and Sanitaria are. And the facility there in the upper left is actually our very own Texas Center for communicable diseases down on the south side of town. A lot of ethical issues obviously raised by quarantine. One of my colleagues, Rachel Lookadoo at Nebraska,

has written a legal and ethics reference guide if any of you are interested. We also have an isolation quarantine manual that goes over all the ins and outs of isolation and quarantine. Happy to send you one of these if you want. Just feel free to e-mail me and I'll be glad to get the book to you. So I said in the beginning that there are five criteria we use to decide when a patient needs to go into biocontainment. And I showed you the first three. infectivity, communicability, and hazard. And we talked about the 4th, and that's the presence or absence of countermeasures. And then finally, the 5th and final one, is there a heavy metal band named after it? So you can see here, diphtheria, anthrax, Ebola, and plague. Those are all real punk rock bands. It was only a matter of time, but there's now a band called coronavirus. And then finally, there's just a generic band called virus. But I'd heard last I heard they were actually thinking of changing their name to Andes virus. So there you have it. These are some of our Nebraska patients finally getting to go home after 28 days. leaving at the Omaha Airport and not turning back to look at us with the camera. But anyway, I thanks. Thank you for your attention. I apologize for going up to the very, very last minute and not allowing much time for questions, but I'll leave that up to Delia and Dina as to whether we want to take questions or not. Thanks for your attention.



Sutter, Deena E 1:00:52

Thanks so much, Dr. Ceslak. Yeah, if anybody wants to stay on and ask a question, yeah, we can. We have a couple minutes that we can just go over. So I'll open it up. If you unmute yourself, if you have a question, that's fine.



ted.cieslak 1:01:13

New text.



Sutter, Deena E 1:01:18

Otherwise, I just have one quick question. Given what's been going on with the public health system, the funding issues, and then specifically the fact that it's been in the news that Americans working around Ebola patients have been put into a biocontainment of, I'm not sure which quality, I guess the Americans were involved in Kenya as opposed to bringing them home.

Is there a feeling that these, depending on what happens in our political future, that

these facilities may be less relevant if there's hesitancy to bring even American citizens back and let them enter to the United States and be put into quarantine? or cared for here.

 **ted.cieslak** 1:02:04

Yeah, no, it's a good question and I don't have a good answer. I don't know exactly how robust those facilities are in Kenya. You know, and obviously we talked about the fact that isolation and quarantine are two very different things. Quarantine can be done in a hotel room, basically. Our quarantine unit is little more than a glorified hotel that you can't get out of. But so quarantine could theoretically be done in Kenya without sacrificing quality or compromising quality. On the other hand, if they do get, if the patient does catch his disease, the disease that they're quarantined for, then you need a plan.

 **Sutter, Deena E** 1:02:41

Ye.

 **ted.cieslak** 1:02:49

as far as what are you going to do with them? Where are you going to take them from there? And I would worry about the quality of any biocontainment unit or the ability to care for them there. I mean, the advantage, there is an advantage of keeping them in Kenya, and that's shorter transport distances.

You know, our one of our Ebola patients back in 2015 had to was in extremis before they even got on the plane and then had to endure 17 hour transport back to the United States. And that that obviously isn't ideal. So there is some advantage to trying to put care

far forward, but I share your concern. If it were me, I would certainly feel a lot more comfortable going home to a facility in the United States rather than being left at some facility of questionable ability in Kenya. So yeah, I don't know what else to say about that.

 **Sutter, Deena E** 1:03:31

Yeah.

Yeah.



ted.cieslak 1:03:49

If I knew the specifics of the, you know, what exactly what care they can provide, I might be able to comment a little more intelligent.



Sutter, Deena E 1:03:59

Okay, thanks, Doctor. Anybody else with a question?



ted.cieslak 1:04:01

Yeah, thanks.



Sutter, Deena E 1:04:04

Going once, going twice. Okay, thank you so much, and thank you guys for attending Grand Rounds today. We will resume next week, and I appreciate everybody being here. Thanks A lot.



Calderon, Delia stopped transcription