ASPR TRACIE Webinar Transcript

Infection Prevention and Control: Incorporating Lessons Learned in Managing Special Pathogens

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Rachel Lehman: Good morning, or good afternoon, depending upon where you are in the country today. On behalf of the U.S. Department of Health and Human Services, Administration for Strategic Preparedness and Response, I'd like to welcome you to ASPR's Technical Resources, Assistance Center and Information Exchange webinar titled, Infection Prevention and Control: Incorporating Lessons Learned in Managing Special Pathogens. Before we begin, we have a few housekeeping items to note. First, the webinar is being recorded. To ensure a clear recording everyone has been muted. However, we encourage you to ask questions throughout the webinar. If you have a question, please type it into the "Questions" section of the GoToWebinar console. During the question and answer portion of the webinar, we will ask questions we receive through the console. Questions we are unable to answer due to time constraints will be followed up directly via e-mail after the webinar.

To help you see the presentation better, you can minimize the GoToWebinar console by clicking the orange arrow. Lastly, today's slides and speaker bios are provided in the handouts section of the GoToWebinar console and will be posted, along with the recording of the webinar within 24 hours on the ASPR TRACIE website. The opinions expressed in this presentation on the following slides, by nonfederal government employees are solely those of the presenter and not necessarily those of the U.S. government. The accuracy or reliability of information provided is the opinion of the individual organization or presenter representative.

My name is Rachel Lehman, and I'm the acting director of ASPR TRACIE. I want to thank you for joining us today. I also want to thank you for what you do on the daily to enhance preparedness, response, and recovery activities for your healthcare entities and communities still facing a myriad of challenges. Your role is so vital to addressing the daily arduous challenges being presented. Your willingness to spend the next 75 minutes with us to further advance your knowledge is noteworthy.

I also want to convey my heartfelt thanks to our amazing lineup of panelists for the webinar and continue collaboration and partnership with the National Emerging Special Pathogens Training and Education Center, or NETEC. Your willingness to lend your precious time and share your substantive expertise so others who might benefit is commendable and extremely appreciated. Lastly, many thanks to the ASPR TRACIE crew for coordinating this session.

Next slide. To meet the nation's health and medical needs, ASPR is focused on three key priorities: extend capabilities to respond well and emerge quickly from the COVID-19 pandemic, restore resources and capabilities diminished during the pandemic, and prepare for future emergencies, whether natural or man-made.

Next slide. For our new friends to ASPR TRACIE on the webinar today, this slide depicts the three domains of ASPR TRACIE: Technical Resources, the Assistance Center, and the Information Exchange. If you need technical assistance, or you cannot find the resources you are looking for on the ASPR TRACIE website, simply e-mail, call, or complete an online form, and we will respond to your inquiry.

Next slide. It is now my pleasure to introduce our moderator for today's webinar and ASPR TRACIE Senior Editor Dr. John Hick. Over to you Dr. Hick.

John Hick: Thanks so much, Rachel, and thanks, everybody, for taking time out of your super busy schedules and to our speakers for taking time out of their super busy schedules to be with us today.

The goal of today is to talk a little bit about what hospitals have experienced and can experience with infectious disease emergencies, and also talk a little bit about some of the lessons that we've learned over the previous years. Remember that our speakers are speaking for themselves and their hospital experiences. And if you're looking for specific infection prevention guidance for different pathogens or in general, don't forget to reference CDC.gov.

The first speaker we'll start with is Dr. Alex Isakov, who's Professor of Emergency Medicine at Emory University, as well as director for the Critical Event Preparedness and Response Group there, who will be speaking about the COVID-19 pandemic and Lessons Learned. Following that, we'll have Justin Chan from New York City talking about lessons about respiratory virus transmission, James Lawler from University of Nebraska, talking about some lessons from COVID-19, and then Syra Madad back in New York City, talking about adopting some of the lessons learned and best practices going forward. So, we'll get right started with Alex and Alex, thanks again for being with us today.

Alexander Isakov: Thanks, John. I appreciate it. It's great to be together with you and with the esteemed panelists. So, I'll just introduce myself and give a perspective on how I want to address COVID-19 pandemic lessons learned for special pathogens and patient management. It partly comes from my experience during the pandemic as an emergency medicine physician. It's partly also coming from many years working on a multi-disciplinary team at Emory University and Emory University Hospital and other partners at Emory Healthcare to be better prepared to manage patients infected with special pathogens. And it also comes from my knowledge and what I've learned from colleagues at the National Emerging Special Pathogens Training and Education Center. And so, let's go into the slides, John.

Next slide, please. So, first, let me also frame the question. Clearly the title of the slide and for this webinar is what lessons we may have learned from the COVID-19 pandemic as it relates to special pathogens management and we are going to explore that. But I do want to say that I, I

would, I frame this even more broadly to say that the foundations for our infection prevention practice are anchored in a hierarchy of controls and are anchored in our understanding of standard and transmission-based precautions. That was true, let's say, before 2014, when a number of us got very active across the nation, to be better prepared for travelers that might have returned from West Africa, infected with Ebola virus disease, and what policies, procedures, education, training, and infection prevention measures were necessary to best care for those patients. They were certainly different than how we were managing infection prevention, measures for patients on a day-to-day basis.

Then, we were using what we understood about a hierarchy of controls and infection prevention measures and applying it to that situation, a patient with a high consequence, infectious disease, one that's trans, highly transmissible and highly pathogenic, causing morbidity and mortality. I would say that what we learned about managing patients during the COVID-19 pandemic, again, was an evolution of our understanding of implementation of standard and transmission-based precautions and the implementation of a hierarchy of controls. But now, with a need to do that at scale.

This slide describes some of the take home points that I think were important in 2014, through 2016 as we were preparing the nation to manage a patient with a high consequence infectious disease that might have traveled from elsewhere and then also implemented during the course of our pandemic, and that is the identify, isolate, and inform paradigm. Probably, most people on this call are familiar with it.

It's, it actually was born from the need to identify patients who may have traveled from other parts of the world infected with a high consequence infectious disease, but it was also used during the pandemic, even when the geographic isolation of this novel coronavirus was no longer a distinguishing factor. It was important for us to identify patients at that or that we were encountering that we had need to care for, so that we could take the necessary measures to protect ourselves from inadvertent exposure to infectious bodily fluids, and then inform other partners about how to best engage again, without having exposure to infectious bodily fluids. Let me start, in part, by acknowledging the partnership that all of our health systems have with, with the Emergency Medical Services (EMS) community, as it relates to identifying someone based on signs and symptoms, and, in some cases, geographic location. EMS is actually truly on the frontline; they have an opportunity to do that screening through their 911 Call Centers. They have an opportunity to do that screening when they make first patient contact in the field and before they ever make it to the hospital or the Emergency Department and engaging our partners in EMS, I think, was important during COVID-19, will continue to be important going forward, as it relates to identifying patients that we need to take special precautions to provide infection prevention measures to protect ourselves when we care for them. Other ways that that's done is through signage. This was utilized well during the 2014 through 2016 West Africa epidemic to identify patients who had traveled from there. And, again, during the COVID-19 pandemic, so too have patients recognize the need to identify themselves to staff as having a fever, cough other signs and symptoms of COVID so that they could be properly managed.

And providing just in time education and training for all our staff throughout the health system, whether that's prehospital, in the hospital ambulatory care centers is important so we all understand what measures are needed to identify, isolate, and inform. Isolate is largely to prevent

exposure to infectious bodily fluids through the implementation of a hierarchy of controls through identification of isolation space. What this pandemic showed us is something that we knew already but now we know it even better. We don't perhaps have enough airborne isolation rooms or as many as we'd like, and that's something, as it relates to engineering controls, that we should consider trying to improve moving forward. We learned a lot about our work practices. Let's talk about bifurcated flow as an example. We identified patients that were presenting for care with fever, cough, myalgias, all those signs and symptoms of COVID-19 and put them into a bifurcated workflow, having separate work, sorry, waiting rooms for patients that had COVID-19 symptoms as opposed to those that didn't, not a perfect system but important practice for infection prevention and having visited hospitals overseas in the wake of the 2003, SARS epidemic, we've seen bifurcation of patients at the point of arrival implemented during that time. And then retained actually for many years afterwards as a way to improve infection prevention. It's something that requires further study, and it should be considered as we move on beyond the pandemic. We learned a lot about aerosol-generating procedures and what risks they pose to healthcare personnel. And of course, always emphasizing the importance of cleaning and disinfection. We'll talk a bit on the next slide about personal protective equipment (PPE), on the Identify, Isolate, and Inform paradigm. It's important for us to inform partners that we're working with, that someone may be suspected of having an infectious or communicable disease and that certain precautions need to be taken.

I think what the pandemic really showed us is that we need to have a routine irregular dialog with our infection preventionists and our public health partners to be best prepared for management of less frequently identified cases that might travel from overseas or be ready for the next step in epidemic/pandemic.

Next slide please. As it relates to lessons learned for PPE, I think what we recognized clearly during COVID-19 is that people need to first understand what the appropriate standard and transmission-based precautions are, and then we need to provide enough education and training on the use of PPE to implement those standard and transmission-based precautions.

In contrast to what we experienced in 2014, through 2016, it's not enough to just have a small team or a small group of individuals trained in the use of the appropriate PPE ensemble but also to broadly have an ability to provide education and training to all our staff.

Supply chain is something that we need to be exceptionally conscious of moving forward. Our supply chain isn't diversified enough in terms of origin of supplies and materials and it's not robust enough.

We experienced the shortcomings of supply chain during this COVID-19 pandemic. And we learned a lot about the need to make that more resilient.

Donning and doffing practices were well described after our experience preparing for patients from the 2014 through 2016 West Africa Ebola epidemic and early in the COVID-19 pandemic, the meticulous approach to donning and doffing of PPE with checklists and knowledgeable assistance was implemented, but as we got into overwhelming numbers of patients, we know that while PPE works and the importance of a donning and doffing procedure checklist is still

important that we started to get into some complacency about the implementation of good donning and doffing procedures.

And I think it's important to underscore that management of patients with COVID-19 safely, given certain PPE ensemble and donning and doffing procedures, is not equal to what is required for management of a patient's—a patient with a high consequence infectious disease like Ebola virus disease, which has much higher morbidity and mortality.

Next slide, please. As it relates to testing, I think what we learned is that testing needs to be available as soon as possible. As soon as it's evident that patients with a communicable disease put us at risk as health care providers or in the general community, is there we need to have testing that's available and that testing needs to be scalable, which is very dependent then on supply chain. And we need to understand also that has more tests come online, through emergency use authorization, or otherwise, that the performance characteristics of those tests, for example, a PCR test versus an antigen test, really needs to be well understood and well communicated, so clinicians understand how to interpret the results in the context of the patient's condition.

Test results will inform infection prevention procedures, will drive PPE consumption, and may yield an alternate diagnosis. It's really important to have testing available and to implement it judiciously. For additional information on lab tests for special pathogens and clinical labs that might be needed for patients suspected or confirmed to have, especially, to be suspected or confirmed to be infected with a special pathogen, I direct you to the URL on the right for more information about processing of samples.

Next slide, please. Regarding lessons learned for special pathogens, for the monitoring of our health care personnel, you know, we all remember days when, as healthcare personnel, we all just came to work, whether we felt well, or we didn't feel well. It was important to just get to work and get the job done. I think what we started to see in management of patients suspected or confirmed to have Ebola virus disease was the importance of health monitoring of the healthcare personnel, so that should they have become inadvertently exposed to someone with the body fluids of someone infected with a high consequence infectious disease, they didn't get ill themselves so that that illness could be caught early for assessment and management and they didn't carry out in the community. What a very different environment working in the pandemic environment and the need for health monitoring. Now, we want it to be sure that our healthcare personnel were as healthy as they could be so they didn't put at risk patients at greater risk. Those that had solid organ transplants are otherwise immunocompromised. So, health monitoring continues to be important whether it's for management of patients during a pandemic or for management of patients and special pathogens situations.

Having very cogent, quarantine, isolation return to work guidelines was important during the COVID-19 pandemic and understanding what the quarantine isolation or return to work guidelines and the management of any special pathogen is important.

One way that health systems have mitigated the risk of transmission from provider to provider during a pandemic is to implement universal masking. We know that CDC has relaxed its

requirements a bit based on COVID-19 activity in the community. Many health systems are still implementing universal masking. We know and we'll hear again from one of my co-presenters later about the effectiveness of two individuals being masked at preventing transmission of illness. I think that's this is a practice that may continue in our health systems moving forward. The issues of vaccine, and vaccine hesitancy are critical to examine.

Research done in the spring of 2021, when vaccine was available, showed that roughly 15% of healthcare personnel that were surveyed were hesitant about getting the vaccine. And there were disparities in the type of profession represented too. Where in this survey, 99% of physicians were planning on getting vaccinated if they hadn't yet already. I'd only 82% of nurses were. We need to, as a community, better understand what drives vaccine hesitancy and answer the questions that need to be answered to increase uptake of this important medical countermeasure.

Next slide, please. Behavioral and mental health consequences, significant. According to a survey done in summer of 2020, 93% of healthcare workers reported being stressed out and stretched too thin, 82% shared being emotionally and physically exhausted. And 45% of nurses reported that they weren't getting enough emotional support. There were also a number of surveys that suggested that people were prepared for turnover in their jobs and that in fact, in one survey there, of nurses, 32% of nurses said that they might give up their profession within the next year. And most critical is of physicians that were surveyed. Up to13% thought they had thoughts of suicide—tremendous impact of the pandemic on behavioral and mental health consequences. I think the pandemic just actually brought that into greater relief. Healthcare personnel and the general community are under a lot more mental stress than we probably acknowledge, and the pandemic brought that to light, and we need to as a community take steps to manage it.

Next slide. With regards to lessons learned related to operationalizing crisis standards, we know that managing patient surge implementing contingency and crisis standards when needed, due to limited availability of resources, is not a new concept. But how it was implemented in so many heroic ways during the pandemic, I think, was it can be well described in an article that we'll touch on the next slide as well as the article that reviewed the stressors on health systems as it relates to implementation of crisis standards. We all know that we are: that the principle of crisis standard is to manage patients and do the best we can with the resources that we have for the most number of patients.

Consequences for that can be pretty dire. Looking at the link for this study here in a, in a study reported to include over 140,000 patients in 558 reported hospitals.

Because of surge, one in four patients could possibly have died as it related to the surge and strain on resources all by themselves. And that's something that as we're implementing our crisis standards, we need to recognize that there are serious consequences associated with that even as we try to do the greatest good for the greatest number.

The other thing this pandemic really brought into sharp relief was the fact that crisis standards don't just impact patient and patient outcomes but can impact us as healthcare providers too. PPE supply chains were a good example of that, and it's actually important that when we start to

implement crisis or contingency standards of care, especially as it relates to the protection of healthcare personnel, that we, along with the recommendation, provide, the best evidence base to demonstrate why it's safe, why it's feasible, so that we don't have an erosion of trust or foment mistrust between the healthcare personnel and the public health authorities, who are making those recommendations.

Next, slide, please. In terms of maintaining standards of care, it's important to develop regional structures, whether it's through healthcare coalitions, regional special pathogens treatment centers, regional disaster health response systems, to develop information, sharing methods, resource management, common policy development, dissemination of training and education. The development of plans that will facilitate surge capacity, the redeployment of staff, making them more capable through education and training for various roles across the health system. Rapid onboarding, and then mentoring, and supervision of those staff, identifying space for expansion of critical care facilities, as well as for cohorting of patients, environmental controls to optimize air exchange, and then, for supplies, ensuring the integrity of the supply chain.

Next slide, please. A lot of what we learned during the COVID-19 pandemic is heroic, as our efforts were successful, as they were, in our communities caring for our patients. It still revealed gaps, and those gaps are in care delivery models, communications and coordination, research and knowledge generation, supply chain and others. And spearheaded by NETEC and with the support of the Administration for Strategic Preparedness and Response, a national special pathogens system of care is evolving, which includes the 10 special pathogens treatment centers and the 10 HHS regions in addition to state and other jurisdictional designated treatment centers. Together, this group will provide a coordinated standardized healthcare network of high-quality patient and community centered care for patients suspected or confirmed to be infected by a special pathogen in the US, while also protecting the health care workforce.

And, finally, next slide, please. I want to again acknowledge the work of our EMS colleagues in this space working side-by-side with us and management of patients, with high consequence infectious disease, as well as through the COVID-19 pandemic. They worked in the field, screening patients to identify those that were at greatest risk for the illness, implementing their own hierarchy of controls for which they have their own challenges. They are working together with health system partners to identify where patients should best be transported frontline versus assessment versus treatment centers. They're also heavily involved in load balancing patients and through inter-facility transfers getting patients to the right place at the right time and they've also been involved in the delivery of alternate care models. We need to work together with the EMS community to ensure good evidence-based guidelines for 9-1-1 communications and EMS personnel are always posted on our public health and resource websites, conduct formal, prospective validations of studies of infection prevention practice in the EMS work environment, and that includes the appropriate utility of personal protective ensembles in that EMS work environment. We also should embark on examining ambulance design and engineering controls aimed at preventing transmission of disease during patient transport.

We need to, for the EMS community also address mental health consequences of COVID-19 and occupational stressors for the EMS workforce, fund the Behavioral Science and Health

Education Enterprise to examine vaccine hesitancy in the EMS workforce, and develop tools to overcome it. And we should ultimately review how EMS is reimbursed so that we can continue to develop growth in telehealth and other innovations for alternate care models that include our EMS partners. And with that, John, I'm going to turn it back over to you.

John Hick: Great. Thanks so much, Alex, for outlining kind of a foundational set of issues that we'll begin to pick apart a little bit with subsequent speakers, as well as reminding us about the need to consider carefully hierarchy of controls and the prehospital environment. It's unique and vulnerable. So, with that, we'll transition over to Justin Chan who's Director for Infection Prevention and Control from New York City Health + Hospitals and an Assistant Professor of Medicine at NYU Grossman School of Medicine. He's based at Bellevue. Dr. Chan, Thanks so much for joining us today.

Justin Chan: So, I'm going to talk about some of the lessons we've learned about respiratory virus transmission.

Next slide. I'm going to start with describing a couple of important case studies of outbreaks of respiratory viruses. The first was a well-publicized outbreak that occurred in Washington State in March 2020 of SARS-CoV-2. This was an outbreak where 61 members of a choir attended a choir practice in March of 2020. This lasted 2.5 hours in an indoor environment and subsequently one case was recognized as having symptomatic COVID. This led to 53 secondary cases, or 87% secondary attack rates, and the epidemic curve that you see on the bottom right, shows a classic point source outbreak.

Next slide. If we go back nearly 45 years, this is another outbreak, which involved influenza virus. In this situation, there were 53 passengers on board an airplane in Alaska where the engine failed during takeoff. And subsequently, the ventilation system was shut off, and the people on the plane waited in this plane for 4.5 hours, with doors closed and ventilation system off. They identified that there was one index case of influenza, who became symptomatic about 15 minutes after boarding, and later on 38 cases became infected with influenza leading to 72% secondary attack rates. Interestingly, they found that the longer duration of time that the individual spent in this plane was significantly associated with the higher attack rates.

Next slide. So, when epidemiologists reviewed these outbreaks, it was very clear that aerosol transmission of respiratory virus played a role. And this led to a high attack rate due to a crowded indoor environment, lack of good ventilation, prolonged duration of exposure, and then at least in the first case, loud vocalizations. So, these factors are modeled in terms of the relationship in this Wells-Riley equation, where the probability of airborne infection is increased by the infectious dose generation by the infectious source, the volume of ventilation of susceptible individuals—how much they're breathing in the infectious pathogen—and the time duration of exposure. Conversely, increasing room ventilation reduces the probability of airborne infection.

Next slide. I just want to remind everyone of what we are referring to when we talk about droplets versus aerosols. These are two types of respiratory particles. Aerosols are smaller at less than 100 micrometers. They can travel beyond one meter, remain suspended in the air for up to hours, and can be inhaled by potential hosts. The graph on the right demonstrates that

relationship between an aerosol with a smaller diameter can remain suspended in the air for longer periods, up to several hours. In contrast to that droplets are larger at greater than 100 micrometers. They generally are not inhaled by potential hosts because they travel less than a meter and they fall to the ground in under 5 seconds. And differentiating between these two types of droplets, sorry, respiratory particles is really important for infection control measures.

Next slide. So, what sorts of situations generate respiratory aerosols? So, it turns out that almost all expiratory activities generate some degree of aerosols. Relative to quiet breathing, talking increases aerosol production by 35-fold. Exercise with heavy breathing leads to a 60-fold increase and coughing can generate up to 3,000 aerosol particles per cough or 400-fold increase compared to quiet breathing. Importantly, these sorts of routine respiratory/expiratory activities can often generate more aerosols than what we traditionally consider aerosol generating procedures such as noninvasive positive pressure ventilation.

Next slide. So, with aerosols being produced with many routine expiratory activities, what sort of pathogens can be carried by aerosols and lead to airborne transmission? Traditionally, the big three that we think about are tuberculosis, measles, and varicella. But it's—we have accumulating evidence from multiple avenues that many, if not all, respiratory viruses can be carried by respiratory aerosols and be transmitted in the airborne route. These include influenza, rhinovirus and even respiratory syncytial virus. And this is important because, for some of these pathogens, the traditional transmission-based precautions have recommended medical masks, which may not be sufficient in some situations.

Next slide. So, I'm going to switch over to how do we control exposure to aerosol infectious agents? So, this is the classic hierarchy of controls. And we all know that elimination/substitution are the most effective strategies. If you can avoid physical proximity or exposure to infectious source that that is the most effective strategy. However, assuming that you do need to have direct contact or provide patient care, there are engineering controls and PPE strategies that have evidence of effectiveness.

Next slide. So, throughout the COVID pandemic we have accumulated more and more understanding that PPE use and more importantly and also the right type of PPE use can mitigate exposure to a respiratory pathogen. This was a case control study looking at the look, trying to look at the effect of different respiratory PPE on the odds of testing positive or negative for SARS-CoV-2. These were reported respiratory PPE use in indoor settings the two weeks prior to an individual testing either positive or negative, for SARS-CoV-2.

Next slide. And what we found was that while cloth masks did lower the odds of testing positive, that was not statistically significant in this study. Surgical masks were more effective in lowering the odds at 66%, and then respirators, including N95s and KN95s were the most effective reducing the odds of testing positive by 83%. So, using the appropriate PPE, especially in the setting of indoor environments, is very important for protecting against exposure to COVID and other respiratory pathogens.

Next slide. And we've seen examples where lower-level PPE could fail. These are well described case series of examples of healthcare workers that contracted COVID during the care of patients despite using either a medical mask or medical mask and eye protection.

Next slide. So beyond using the right PPE, we have several engineering strategies that can mitigate exposure to aerosols. Broadly speaking, these encompass ventilation strategies, which can be natural ventilation from opening windows and mechanical ventilation from existing HVAC systems, these are systems that remove contaminated air and replace it with either fresh or outdoor air. In addition to that, there are strategies for air filtration such as use of portable HEPA filters or filtration systems in HVAC systems, and then lastly, disinfection using UV germicidal irradiation can be effective at augmenting engineering controls.

Next slide. So, putting this together, it does appear that combining both PPE strategies and engineering controls is most effective. This was a recent experimental study that tried to demonstrate the effect of differential PPE use, along with the presence or absence of engineering controls. So, the investigators set up a sealed patient room, where a nonhazardous virus was aerosolized from the head of a bed. And an individual was seated either just under three feet or around eight feet away from the aerosol source. The individual either wore no PPE, or a surgical mask, or an N95 that had failed fit testing, or as a well-fitted fit test passed N95 respirator. So, after being exposed to these aerosols, they swabbed inside the nostril to look for any viable virus. What they found was that in settings with no ventilation or filtration, the N95 that had passed fit testing did provide protection over poorly fitting N95 or surgical masks, but this was not statistically significant. However, when they turned on a portable HEPA filter, which resulted in effectively changing the air 13 times an hour in that room, along with a well fitted fit test passed N95 respirator, which dropped the ability to isolate virus in the nares to close to zero. So, combining the appropriate fitting and type of PPE along with good engineering controls is really the most effective strategy for protecting against aerosol transmission.

Next slide. So, what do we take from all this? Some of the lessons that we're learning are that this dichotomy of categorizing pathogens into droplet versus airborne is really incomplete. Most if not all respiratory viruses have the ability to be carried by aerosols and transmitted through the airborne route. So, we need to think more about developing a uniform respiratory precaution strategy for all respiratory viruses. It's clear that N95 respirators provide better protection against aerosols than surgical masks. So, during times of high community transmission for SARS-CoV-2 or other respiratory viruses, we should think about the standard use of N95 respirators for all face-to-face patient encounters. And this is a strategy that New York City Health + Hospitals has developed, which my colleague, Dr. Madad, will also mention. We also know that prolonged duration of exposure in poorly ventilated spaces increases the risk for both short- and long-range transmission of aerosolized pathogens. So, we need to really reinforce minimum ventilation standards for both clinical and non-clinical spaces. And then for places with poor ventilation, we can consider other engineering strategies such as UV germicidal disinfection or HEPA filtration. And then lastly, we do have good evidence that many of the routine expiratory activities can generate significant quantities of aerosols. So, we need to think beyond just the concept of aerosol generating procedures for the risk of exposure. True risk is really a function of several factors, including the source patient's viral load, how severe the illness is, the duration of exposure to the source, and proximity. Next slide.

John Hick: Justin, Thanks so much. Sorry to hear no more singing in the hospital, apparently. So, I appreciate all that great information. And so, as Audrey reminds us in the chat, if you have

questions for any of our speakers, you may type them into the chat function, and we will get to as many questions today as we have time for. We now go to James Lawler, Executive Director for International Programs and Innovation at the Global Center for Health Security at the University of Nebraska Medical Center who is actually joining us from Uganda today. Thanks, James and again, apologies for any moral distress inflicted by the Minnesota Gophers beating the Huskers last weekend.

James Lawler: Thanks, John. I appreciate it and hopefully my internet signal will remain strong throughout.

Next please. I wanted to highlight a few lessons learned that that I've reflected on from the COVID-19 experience today and they really reiterate lessons that I think I consistently take away from outbreak response where I'm involved. And I think that—I at least hope—that they are lessons that we will do more than observe this time with COVID and really think about how we address them in the setting of the continuation of the pandemic, and also what we should anticipate with future pandemics or emerging infectious diseases. And these five principles, you see listed here. The first is we shouldn't continually fight the last war, which we frequently do. We should remember the basics and get back to the basics as our foundational principles for how we practice IPC. We should anticipate problems, especially problems that we encounter over and over again. We should really focus on innovation to fix some of those problems and to push our capabilities forward. And finally, part of all of that is incorporating research into response early and consistently.

So next, please. We'll go into each of these in a little bit of detail. When I say we shouldn't fight the last war, again, this is something I've consistently seen an outbreak response where we finish with one outbreak, and we take stock of the lessons learned and we implement those lessons. But it ends up stove piping us into very specific mindsets and sometimes with specific solutions that don't necessarily work in the next outbreak. And I think we're already seeing this in COVID. Thankfully, as you've heard from Dr. Chan there's, I think, irrefutable evidence about the predominance of airborne transmission in COVID and probably underappreciated in other respiratory viruses. But I worry that are our takeaway from COVID, and particularly because other modes of transmission, especially in the hospital setting, appear to really have been somewhat minimal in impact that we've been focusing more and more our lessons on how to stop transmission of respiratory viruses, particularly with airborne and droplet transmission. And you can see here in the WHO's infection prevention and control updated guidance. It really focuses quite a bit on things like masking and the prevention of airborne aerosol or droplet transmission, at least. And I think we may end up ruing our focus on, on that, if we are faced with another emerging disease that may have predominant modes of transmission that are quite different.

Next. In fact, I think you could, next slide, sorry. Oh, there we go. Thanks. I think you could argue that we've already encountered that recently in the emergence of monkeypox and the global outbreak that's been going on since the spring, and probably beforehand, just not recognized.

But this is a good illustration. I thought this paper that was published just recently, looking at a small cluster of cases, two health care workers, but who appear to have been infected based on

their encounter with a patient in the patient's home, and really almost certainly because of environmental contamination that they encountered. And then, the unfortunate result of inoculating themselves with the virus, either in the home from environmental contamination, or perhaps later, when doffing, just to give you the quick highlights in case you didn't see this, two health care workers visited this patient with symptoms of monkeypox back in July and spend 45 minutes in the in the home interviewing the patient.

Now, they had PPE on, except for their gloves, which for some unexplained reason, they decided not to wear for the 45 minutes that they were in the patient's bedroom. Now, they were not in close contact. They didn't come within six feet of the patient, but they did touch things within the room, now, afterwards, in order to collect samples. They did use hand sanitizer, put on gloves, and followed the appropriate procedures for taking specimens and then removed gloves and did hand sanitization again, after packaging the specimen. However, the other thing that they inexplicably did not do is doff at exit from the high-risk area. And in fact, they kept their gowns, respirators, and glasses on until they arrived back at their office And only donned at that point and the details of how they donned were omitted.

But this, clearly, I think, is a case where these folks were infected because of environmental contamination, and the fact that they did not follow good contact precautions for a hazard that is retained in the environment and can have significant roles for fomite and environmental transmission. Other instances from monkeypox include a large outbreak that occurred in a tattoo parlor in Spain with a couple of cases occurring a couple of weeks after the index case was tattooed in that facility, showing, again, the probability of very long-lasting environmental contamination and inappropriate decontamination and infection prevention control procedures used there. So, we see this is fortunately for this particular outbreak, of monkeypox, not necessarily a high consequence exposure, but if this were Ebola or something else that we know has a predilection for environmental contamination and transmission, this could be a very different story. And again, I think this is a lesson that we need to make sure we acknowledge, don't just base our future plans on what we most recently experienced

Next. This second lesson that I think we need to address is so important, and I know that we've already seen the hierarchy of controls, but I purposefully wanted to put it back up here just to reinforce it for folks. You have to focus on the basics all the time. And again, we so commonly go down to the bottom of that inverted pyramid to PPE when we're discussing IPC for high consequence infections, or even for routine day-to-day infection prevention and control. And we really need to start at the top. And obviously, elimination and substitution aren't always possible and infectious diseases, but those next two are. And I think Justin's discussion of how environmental controls in terms of changing air handling system and ventilation can have huge impact in the transmission of respiratory viruses. And we need to really focus on that across the board, on all of the things we do for infection control and especially for IPC related to high consequence pathogens.

Next. The next thing I think that is really important to understand is the same problems are going to continue coming up again and again. So at the very beginning of the COVID-19 pandemic in January as things were unfolding, many health security experts looked back at the planning and the experience of 2009 H1, and many other exercises in between and knew that we didn't have

nearly enough personal protective equipment, nearly enough respirators, to be able to manage the IPC demand that was coming. We also knew that health care worker shortages were inevitable given not only the number of patients that we could anticipate but also problems with staff, absenteeism either due to illness or illness in families, or reticence to come to work when they knew that they didn't have enough PPE.

So, these things were absolutely predictable at the beginning of the pandemic and yet seemed to catch many folks by surprise. And I can guarantee you that in the next major emerging disease outbreak, we are going to not have enough PPE. And we're going to have problems with health care staffing shortages, absenteeism, and overwhelming numbers of casualties related to the number of healthcare workers we can put to them. We're going to have communication problems in terms of understanding hospital load at the time. Balancing all of these things, which again, we continue to see over and over again we need to start planning for those beforehand and figure out how we're going to address those problems rather than just either acknowledging them and moving on or just ignoring them

Next. And part of the way I think we addressed that is through innovation. I think that there are many of these problems that the current approaches and current paradigms we have for addressing IPC just are never going to be able to close the gap. Right, we're probably never going to have enough stockpiled PPE and supplies for IPC requirements for a large-scale pandemic as we've been experiencing with COVID. It's just not feasible to have a national stockpile, and an inventory control system that's able to manage that with life cycle, maintenance, and everything that's involved. I think it's also true that we're never going to have enough staff to be able to support a large surge in demand of medical attention for very sick patients, right? Our health care system is just not built that way. It doesn't have access and capacity running along at any given time, because of the economic pressures to make things lean and mean.

It is also true that we're going to have, again, new, potentially new pathogens, or at least new modes of transmission or dominance and in different modes of transmission that are potentially going to catch us off guard. But there are things we can do now, innovations we can do to change the paradigms of how we work to make us less reliant on those PPE supply chains to make each healthcare worker’s capability go farther and be able to manage more ill patients at any given time, to build in better engineering controls to our hospitals, but also into our communities, into businesses, and into public spaces. So that we mitigate the need to or mitigate the supply side of so many sick patients getting sick and our communities.

And so, these new innovations, and I point to one here that we've been working on in our global center for health security, which is a patient envelope that allows for care without the use of PPE and so eliminates that supply chain demand. It also makes each nurse and healthcare worker able to care for many more patients in any given set period of time because of increased access to the patient, doing things like this that really changed the paradigm, can get us out of this cycle of, again, either acknowledging and ignoring problems or just trying to do the same things bigger or faster, which never is going to work.

Next. The last thing I'll point out is, is how to get there is to make research an important component of preparedness, but also to make it an essential function in response and one that's implemented not as an afterthought, up front, immediately just as important as delivering truckloads of PPE and supplies. If we had been able to do more research earlier in the pandemic, I think we would have had a much better appreciation of the role of airborne transmission and mitigation efforts that. We and our facility had already documented the high likelihood of airborne transmission, certainly, the presence of airborne virus in many different spaces. And contamination across patient care spaces that led us to implement airborne transmission protocols very early during the pandemic and kept it that way. All of our patients have been in respiratory isolation because of those very early findings. Many other examples of where real-time on the ground research has made a huge difference in how we approach IPC, not only for COVID but in other outbreaks. But it's something that we don't do frequently enough for in a coordinated fashion. And it's certainly not something that's often held at the same high priority as many of the other activities of early response. And until we can do that, we're never going to be able to learn fast enough in the course of an outbreak. So, thanks a lot. I think that's my last slide, and, John, I'll turn it back over to you.

John Hick: James, thanks so much, and I appreciate the work you're doing in Uganda. I'm glad your Internet allowed you to connect with us. Finally, last, but not least, Syra Madad, who's the Senior Director for System-wide Special Pathogens Programs with New York City Health + Hospitals, joins us to talk a little bit about adopting some of the lessons learned from COVID-19 into our infection prevention programs. Syra, thanks for being here today.

Syra Madad: Thanks so much, John, for that introduction. We can go to the next slide. So, I'm going to start off by just mentioning some of the different special pathogen outbreaks that have been occurring just this past year. So, while we're covering lessons learned from COVID-19 and in particular, infection prevention control lessons learned, is also important to contextualize the growing threat of special pathogens in general.

So, outbreaks of special pathogens are becoming increasingly more common, and this slide shows, you know, we've had at least 14 to 15 outbreaks of various special pathogens that have been reported to the World Health Organization just this past year. And currently, as James pointed out and as he is also in Uganda, Uganda is experiencing an Ebola outbreak of the Sudan virus, you know we're up to 132 confirmed cases with 39% of confirmed cases being fatal, and CDC sending out another health alert today, just giving an update on that. And so in a nutshell, it's really important that we maintain an ongoing state of readiness and taking all the lessons learned and the innovations, from COVID-19 and applying it to future epidemics and pandemics and James did a really great job with the five principles that are very thorough that needs to be applied to all outbreaks that moving forward.

Next slide, please. So, I'm going to just talk about a couple of different strategies and innovations that, you know, we've learned from COVID-19 and how we're essentially applying it to future you know infectious disease threats, if you will. The first is healthcare system syndromic surveillance, and I think everybody probably has a newfound, you know, tool of words and vocabulary from this pandemic, particularly the general public and so they may be a little bit more, you know, understanding of what syndromic surveillance means. But this is something

that's been happening obviously for many years. Just take the, you know, the ILI net that we use for seasonal flu every year. And so, what we've done here at New York City Health + Hospitals, is basically, you know, seeing what we built for COVID-19 and thinking, you know what? Let's build something very specific to our health care system. And so just, you know, high level, as we know, there are over 6000 hospitals in the United States. And we can't rely on that rare astute clinician that rings a bell when a pathogen of public health concern is suspected. Rather, we have to build surveillance tools and health care settings, in particular, not just in public health settings, but in healthcare settings where patients present to help with detection, and even early warning signals when there may be something brewing in our communities, and so we can kind of get a head start looking at what's happening and how we can make early decisions fairly quickly.

So, about a year and a half ago, we began developing a New York City Health + Hospitals specific syndromic surveillance dashboard. And this was, again, you know, kind of the brainchild of what we learned from COVID. And the purpose is to capture relevant patient information for syndromic surveillance in four specific categories. One category is ILI, the second is GI, the third is asthma, and the fourth is rash. So, we look at both chief complaints and ICD-10 codes to enable a couple of different things. One, we take both the chief complaints and the ICD-9 codes, and we break into the four categories I just mentioned. And one, it helps with early warning signals and helping us identify potential health threats by discerning patterns and anomalies in clinical data from our Epic electronic health system record. And then two, once we have, you know, this information, it basically empowers us to make better decision making and earlier. And it gives the leadership, you know, more evidence-based data to say, “Hey, you know, we are seeing a higher volume of patients present with rash.” And typically, we only see 5 or 6 across the system, and now we're seeing 15, What's happening? You know, obviously, monkeypox is a great example. You know, when you started seeing more patients coming in, complaining of, for example, rash than you typically would at any given time in the year.

Similar to RSV, I'm sure everybody is aware we're seeing a huge surge of RSV. So, looking at some of the data early on, you're able to see, OK, when do you start seeing a higher uptake of ILI in the pediatric population? And we know that this is more of a mid-winter virus when you're seeing it earlier on, you know, OK, if something is happening, we need to investigate and see how we can do better decision making, you know, at the system and at the local facility level. And so, this essentially gives us a really good early indicator and platform to just see what is happening. It's not a standalone tool, obviously, you can couple it with a number of different things. But it just gives us some early warnings of there's something happening and we need to kind of investigate and look more into it. And maybe we need to bulk of staffing, and maybe we need to look at ordering more supplies or seeing how we need to make a plan for, you know, level loading and surge capacity.

Next slide, please. So, the next really great innovation that came out of COVID-19 is wastewater surveillance. And this is not something new, I'm sure many of you are also familiar with, you know, wastewater, particularly now as being used for surveillance purposes for the SARS-CoV-2 virus. So, this is a new addition to New York City Health + Hospitals with really real promise and results. So, as we learned from COVID-19 wastewater surveillance, and monitoring wastewater can contribute to infectious disease surveillance, situational awareness of outbreak curve over time and really serve as a great early warning system. So, very similar to our

syndromic surveillance dashboard and we're looking at chief complaints in ICD-10 codes. This is obviously looking at it much earlier.

So, during pre-COVID, wastewater monitoring was used to monitor some you know, enteric pathogens, especially polio in endemic areas. And now obviously it's front and center with COVID-19. So, as we all know, many pathogens are shed in feces, urine, sputum, vomit, and appear in wastewater. So, a couple added benefits of wastewater surveillance is that it evaluates community with less bias when individual testing may be challenged or when people are just not seeking out testing or it's not being reported, you know, in a public health forum or by healthcare systems. So, wastewater surveillance also helps promote health equity by inclusion of underserved groups, which is really great. So, here, Health + Hospitals, you know, it's a new biosurveillance program that was launched February 2022 of this year. It's across all of our 11 sister hospitals that we have within our health care system. And the program has successfully predicted changes in COVID-19 and flu rates 10 to 14 days before those results are seen clinically on some of our clinical dashboards in the hospital. And so, now the program has actually expanded to include testing for polio and monkeypox. So, this is just one way of taking a lot of that innovation, and impetus from COVID-19 and applying it to future health threats.

Next slide, please. So this is something that Dr. Chan earlier mentioned, which is looking at potentially, you know, tying in COVID-19 healthcare guidance to community transmission levels and not just for COVID-19 but other respiratory illnesses like seasonal flu. But, particularly for COVID-19 one of the things that we've done early on, and this is with you know, the expertise with Dr. Chan, is really developing updated clinical guidance for our health care system and we're constantly updating our clinical guidance. First of all because we know obviously COVID-19 continues to be an evolving situation.

But in particular, we built in two specific trigger points for infection prevention control escalation based on community transmission levels of SARS-CoV-2. And this is in addition to, you know, transmission-based precautions. And this this is something that we have been doing for a while, so before any CDC updates or guidance came out. And so, what this includes is that when we look at our transmission levels, we have high, medium, and low. And so, when we're in times of high to medium levels of community transmission of SARS-CoV-2, we have N95 and eye protection for all clinical care encounters. And then during times of low, you know, transmission levels of COVID-19, then it's wearing a well-fitting mask including N95 and eye protection being voluntary. This has been our guidance for, you know, I would say almost you know a year and a half, maybe two years and the like, so way before CDC updated their guidance. And in addition to that, we have another trigger point when we have higher median levels of community transmission of SARS-CoV-2. And that is basically admitted patients are being tested for SARS-CoV-2 within 48 to 72 hours after admission to mitigate hospital onset of COVID-19 infection. So, you know, this is a way for us to kind of, you know, ensure that our IPC measures escalate depending on what is happening from a community transmission perspective of this virus. And very similar, as Dr. Chan mentioned, looking at applying it to other respiratory pathogens as well, like influenza.

Next slide, please. So the last thing that I want to mention is, you know, a lot of health care systems have tried to build up a lot of, you know, communication and resources on promoting

COVID-19 vaccinations and you know, as our current bivalent booster doses are any indication, we're not doing a really great job in ensuring that folks stay up to date with their vaccinations. And so, particularly here at Health + Hospitals, you know, we early on, you know, launched a COVID-19 vaccination and community outreach work group that I lead. And we started developing a number of different resources and one of the programs we launched early in 2021, in February of 2021, is COVID-19 vaccine champions and ambassador programs. Where we basically taught effective communication, how to break the ice, everything you need to know about the COVID-19 vaccines for these folks to go out in the community and help promote vaccines, build confidence, answer questions, and really help people make informed decisions. So, we actually have this cadre of, you know, about 6,000 COVID-19 vaccine champions that we trained in addition to over 500 COVID-19 vaccine ambassadors. And so essentially, we were thinking, you know what? We have this amazing cadre of individuals; how can we use it for other infectious disease threats? And so, seasonal flu is something we see every year. We want to make sure that we have high rates of seasonal flu vaccination. So, we're looking at leveraging the expertise of these vaccine champions and ambassadors and, you know, having them, you know, be, you know, supporting some of our seasonal flu campaign. And, again, for future infectious disease threats, as well, we can piggyback and use the expertise of this cadre of individuals that we've trained in effective communication strategies for addressing vaccine hesitancy and building confidence in increasing vaccination rates, you know, moving forward.

Next slide. So, with that, John, that's my last slide. I will hand it over to you.

John Hick: Thanks so much, Sarah. I appreciate your last point. Prevention is always superior to PPE. So, I appreciate your stress on that. We've got a number of questions here, which I'm excited about. And Justin, we're going to start with you. There's a question about using UV light in HVAC systems in general and is that effective in helping with reduction in pathogen load in buildings?

Justin Chan: Hi, this is Justin. Can you hear me?

John Hick: Yes. All good.

Justin Chan: OK. Great. Yes, it is definitely one of the options for engineering controls. It particularly should be considered in areas with poor ventilation. And this has been a strategy used for decades now. There are extensive guidelines for the use of UV germicidal irradiation for control of tuberculosis. And the evidence with coronaviruses is that it is effective at inactivating these respiratory viruses. So certainly, should be considered as an alternative strategy where there's poor ventilation. There are definitely implementation issues in terms of consulting the right engineering experts to ensure the appropriate coverage of UV irradiation given the particular environment. And there are cost considerations, because these systems can be somewhat expensive. There, and the other kind of like emerging UV technology is the UV irradiation in the far UVC spectrum, which is, there is accumulating evidence that this could be an adjunct strategy to disinfect air in the environment. The benefit, the potential benefit of this is that UV in this spectrum is not damaging to human cells, and because of the level of penetration

that this UV light can take. So that's an area to keep an eye on, and maybe a safe and effective strategy for augmenting infection control.

John Hick: Great. Thanks. And just a follow on, and I think this is more of a comment, but if you have any thoughts on it I would love to hear them. As we try to balance energy demand, you know, versus improved ventilation and disinfection. That's challenging. Any thoughts or comments on that?

Justin Chan: I think that's sort of beyond this, my scope of expertise, in terms of the relative energy demands of these different systems. I would defer to my engineering colleagues to weigh in on that. I don't know if the other panelists have thoughts on that tradeoff.

John Hick: Difficult choices, and certainly a lot of it may depend on the specifics of the building. So, I agree, it's definitely a good question for engineering, but it always is a tradeoff because better filtration or more fresh air or UV irradiation now, all introduce considerations for additional energy consumption.

Alex, a question for you or more just to get your thoughts. You know, so much was done prior to COVID-19 to make sure we had our regional systems for special pathogens, especially for viral hemorrhagic fevers built out with our frontline and assessment and treatment facilities. A lot has happened between then and now, and now, sometimes those regional systems either aren't functioning exactly as predicted or require a little bit of refreshing. Any comments that you have both from an EMS and hospital side on that?

Alexander Isakov: Well, thanks John for the question. You know, so as it relates to how the regional special pathogens treatment centers weighed in during the pandemic, I think they were all very active across the 10 regions as well as collectively through NETEC. In part to serve as a resource for education and training, to serve as a means by which model practices like let's say, patient proning, could be disseminated and some of those procedures better described so that they could be implemented locally. I think in some cases the regional special pathogens treatment centers were available to assist when certain types of PPE or other supplies weren't available locally and they could be shared in that fashion. So, I actually think that in in some ways the challenge of the pandemic really caused the regional special pathogens treatment centers to not only respond to the need to manage the patients that were in their community that needed to be cared for. But also, you know, take on the charge of, serving as a lead in their region or for in NETEC's respect nationally to disseminate best practices. What I can also observe, though, is that, because the entire health infrastructure, whether it was ambulatory care centers, hospitals, public health, the EMS community, was so consumed with responding to the challenges of COVID-19. You know, some of the other, I don't know if I want to call them routine, but some of the other planning exercises that might have taken place to, to really just flex the programs that might be implemented for, let's say, management of a traveler returning back to the United States from Uganda today, just haven't been exercised probably in, you know, 1 to 2 years, and in some cases, not since before the pandemic. And so, I think, as we're, you know, emerging from COVID-19 and these teams are looking to see where they left off in that planning, especially given the events in Uganda that everyone's, you know, turning their

attention to that, to refresh plans and get back to doing those exercises to be certain that we're absolutely ready.

John Hick: Great, good, good time to refresh those relationships recheck those policies and supplies for sure. So, thanks, Alex. Question for James. University of Nebraska pioneered a lot of disinfection techniques for N95 masks. A question came in, “Are we aware or are other speakers aware of any issues with medical damage or conditions for frontline workers that used either disinfected masks or from expired product that was used. Any comments you have on that, or thoughts that others have?

James Lawler: Yeah. Thanks, John. Tough question. I don't know that we have any evidence of that. I think that, you know, obviously there were a number of parameters that were placed around some of these reuse protocols and understanding that reusing with the ultraviolet germicidal irradiation as we did, you know, that did not have and indefinite lifespan associated with the respirators. And so, they were only cycled through, you know, a handful of times before they were retired, and new respirators were required. So, I think where those types of recommendations were adhered to so far. I don't think we have evidence that there was any significant problems that, you know, I clearly think that people who were forced to reuse respirators over and over who may not have been able to do appropriate decontamination procedures or expired, or what was another significant problem I think especially early on in the pandemic was substandard or counterfeit products, obviously probably did encounter some hazards but I'm not sure we've quantified that very well.

John Hick: Thanks, James. Any comments from any other panelists about that topic?

Justin Chan: This is Justin at Health + Hospitals. At least in the recent periods, we have, because of improved supply, we have not encouraged re-use. But extended use has been used over the past year, where a healthcare worker would keep the same PPE on over serial patients during a shift, without taking the mask off. So, what, as long as the structural integrity is retained and it's not contaminated, there is, there are a couple of studies out there that looked at level of contamination of virus on extended use PPE that were fairly reassuring. So, while we don't, we don't recommend any reuse in ours in our health care setting, extended use has been employed.

John Hick: And just one last question for you before we close. Just a quick answer, as best you can. You presented some good evidence from asking your providers any thoughts on masking of patients?
Justin Chan: Yes, masking, source masking for source control, is definitely, can reduce risk and, and I think there's some evidence, at least in influenza, that it reduces the error aerosol production by about half. So, wherever possible, especially when patients are outside of their rooms, our hospital policy is that patients should be masked in congregated areas.

John Hick: Great, Thanks so much. We've got a couple of other questions that we’ll respond to offline and the answers to those questions will also be posted with the archived version of this broadcast on asprtracie.hhs.gov. I'm going to turn it over to Audrey Mazurek for closing administrative comments, and I just want to thank our panelists and our audience once again for a great discussion.

Audrey Mazurek: Thanks, thank you, everyone, for joining today, and John you stole my thunder. So, we'll have our recording posted and we will send it out to everyone who participated on today's webinar. And we'll have that up on our website. And we will also send it out via our next Express, so if you are not already signed up for ASPR TRACIE's distribution list, please do so at asprtracie.hhs.gov. And we will follow up with all the folks who asked questions that we were not able to answer during today's webinar in the following days. Thank you so much, everyone. Have a wonderful day.