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CDC Offers Healthcare Workers Online Infection Control Training

National program will bolster IP efforts

By Gary Evans, Medical Writer

In an initiative that should complement the efforts of infection preventionists (IPs), the Centers for Disease Control and Prevention (CDC) has launched on online interactive training network on infection control aimed at both frontline healthcare workers and other personnel.

"Project Firstline [is] a comprehensive infection control program designed to help prevent the spread of infectious diseases in U.S. healthcare settings," according to the CDC website.[1] "Project Firstline will reach healthcare workers in all healthcare settings, including hospitals, outpatient clinics, dialysis centers, and nursing homes. Core training is posted to address immediate workforce infection control training needs, delivered via short and accessible training videos. The site also includes practical tools to support everyone working in a healthcare facility as they implement infection control protocols and procedures throughout their workday."

In addition to supporting the efforts of IPs nationally, the training should help to clarify and reinforce CDC guidelines on COVID-19 and other infectious threats.

"It is exciting to see, because this content and information will go a long way to support and emphasize infection prevention across the continuum," says **Connie Steed**, MSN, RN, CIC, FAPIC, president of the Association for Professionals in Infection Control and Epidemiology (APIC). "Their focus is on frontline providers and staff, and I think that this is long overdue, quite honestly. It's hard and challenging, many times, to grasp the rationale of basic IP prevention practices."

The educational materials are designed to be concise 10-minute videos that do not require a certain level of training or educational background to

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MEDICAL WRITER: Gary Evans
EDITOR: Jason Schneider
ASSOCIATE EDITOR: Mike Gates
EDITORIAL GROUP MANAGER: Leslie Coplin
ACCREDITATIONS DIRECTOR: Amy M. Johnson, MSN, RN, CPN

understand. There are interactive features through periodic "knowledge checks" during training.

"If you look at what they have online, they have a general one on hand hygiene, and then their focus right now is long-term care and dialysis," says Steed, director of infection prevention and control at Prisma Health in Greenville, SC. "I think that, in the future, they will get into some other topics. Right now, their focus is on COVID and the basics of hand hygiene and things like that. If you look at the dialysis links, they put a lot of other things in there besides COVID — like central-line infection reduction — and they made sure that that material is available via easy links."

Steed has shared the training on long-term care and dialysis with those units in her facility.

"I see them using it as support and validation for what needs to be done," she said. "These short videos are excellent. They can be used at a staff meeting and are accessible from any computer. In my organization, we have a long-term care facility IP and director of nursing who already have the [site] access and the information. We have dialysis units and the information is being shared with them. I see IPs using this to help strengthen the messaging and the work that is being done at the frontlines.

The CDC established a coalition of healthcare and academic partners, as well as 64 state and local health departments and labs. Although the site already is online, a training session called "COVID-19 and Infection Control: The Basics," was expected to be released in mid-November.

Mike Bell, MD, deputy director of the CDC's division of Healthcare Quality Promotion, recently gave a preview of this topic in a webinar session hosted by one of the project's sponsors, the American Medical Association. Bell fielded questions on COVID-19 from clinicians. Some of his answers are included here and have been edited for length and content.

90% of Americans Susceptible

Question: Can you comment on droplet and airborne transmission of COVID-19?

Bell: We generate much more than big droplets when speaking and talking — and we are learning more and more about singing and shouting. We generate a wide range of small and big droplets. Many of those small droplets can float around for minutes. That is not the same with tuberculosis and measles, which can float around for hours and stay infectious. But even with something like COVID-19, [with] those small droplets that float around, minutes is long enough if I am face-to-face, within about six feet, for me to inhale something. It is probably a spectrum of exposure that includes a little bit of direct splashing, but also a bit of near-range inhalation. This is something you can't tease apart just by the epidemiologic data. When something is transmitted like measles, then an entire building will become at least seropositive or actively sick.

With these respiratory viruses, like the original SARS [severe acute respiratory syndrome], MERS [Middle East respiratory syndrome], and SARS-CoV-2, there's another factor that I want to underscore about how to think about transmission: That is that we don't have an effective viral treatment

and we don't have a vaccine yet. That means that there [is] a larger portion of people who could become very sick without resource to any very easy treatment. Also, the number of people who are still susceptible — we have seroprevalence even from heavily affected locations of about 5% — which means over 90% of Americans are still susceptible.

What that means for our hospital systems and those of you who are actually manning the frontline in acute care centers, emergency departments, and ICUs [intensive care units] — you are seeing that our healthcare system is already very stretched. So, we take more precautions when it comes to recommending respiratory protection, for example, for those types of infections where we don't have a safety net.

[In contrast], for seasonal flu, we tend to have residual population immunity, we have vaccines that vary in effectiveness, and also antiviral treatment. There is not much likelihood of seasonal flu absolutely stopping our health system or affecting huge numbers of people and not allowing us to take care of them. I wanted to give you that background of how we are thinking about this. This isn't a black and white, cut and dried, "We've changed our mind," kind of situation. This is an evolution of understanding. When something can be severe and untreatable, we are concerned. If you go back to these very concerning outbreaks, we are consistently recommending the use of something like a respirator when you are taking care of somebody who is infectious. That is because there is the possibility of inhalation with close range.

Question: Going from distance to time, is there any validity to limiting time spent in the rooms of these patients to minimize the likelihood of transmission?

Bell: Absolutely. The risk of infection is a combination of how much infectious material is being generated — this is a reflection of whether the individual who is ill is manifesting symptoms. We have data that some people are able to generate a lot more droplets and aerosols even when they are speaking quietly — not even from coughing. We have all seen the range of sneeze and cough behaviors. That's one factor — people generating a lot of [viral] material. Related to that is the pathophysiology of the infected individual themselves. Is there a large enough infectious virus being generated — are they making a lot and projecting a lot. That's the source piece.

The environment piece is the second step. Are you in a very ventilated outdoor location or are you in a small space with very little air exchange? Those are the two extremes. In the former, the risk is much lower; in the latter category, the risk is much higher. What we are seeing is that in enclosed places with poor air exchange, we are much more likely to see transmission from cases to multiple individuals. The examples we have seen so far include exercise classes that were in small, not well-ventilated locations, where one person who was shouting and breathing hard during exercise managed to infect a large proportion of people in that small space. We don't see that systematically, but we do when the conditions are right. Similarly, in a choir practice — we have seen this in a couple of examples now — places without great air exchange, somebody who is aggressively generating aerosols by singing was able to infect a large number [of people who] were nearby. So, the environment you're in is the second factor.

The third factor is what sort of mitigation actions are being taken. If the patient who is the source is wearing a mask, that vastly reduces the efficiency of [viral] release. Also, if you are wearing a mask — even if it is not a fit-tested N95 respirator — there is some effect. We are starting to see data that goes from really great [protection] with a respirator to something like 40% to 50% with surgical masks. There is some benefit to wearing protection as well as keeping from exposing others to your own secretions. There are other factors, like inherent susceptibility based on your genetic makeup, but those are the factors that I think about.

With these in mind, the time that you spend in that context is also related to your likelihood of receiving enough of a dose to initiate an infection. The longer you are in that exposed setting, the more likely you are to be infected. We use the number 15 minutes, and this was originally proposed as a 15-minute [exposure] time. There is this question now — and we will be saying more about this in the coming weeks — that is related to an outbreak that occurred at a prison setting. What we saw there was a relationship with time, but it wasn't just once. It was cumulative. It makes sense that cumulative series of exposures to shorter periods would add up to be a greater risk. It's not as if you breathe for 14.99 minutes and only once you cross that threshold you become infected — that's not how it works So sequential exposures — basically, if you think about it from a probability perspective — if you are spending two minutes with eight patients, there is possibility that one of those people [is] going to be shedding coronavirus and you might be unlucky enough to be infected in that two-minute segment. So, a lot

of segments are probably as bad as having one big one.

Fomites and Respirators

Question: Is there still concern about transmission from fomites?

Bell: In the beginning of this outbreak, we paid a lot of attention to surfaces and contaminated equipment — we still think it is important. The virologic evidence shows that COVID-19 can actually persist and be infectious for many minutes; in some cases, hours or longer. So that is true. On the other hand, if we think about what needs to happen for a surface contamination source to create a risk in terms of catching a respiratory virus, you would really need to pick that up and inoculate your eyes, nose, or mouth. We are not seeing anything like hantaviruses — where we know that sweeping or aerosol generation by hosing out the back of a truck [could be infectious]. We are not seeing examples of that kind of transmission. We believe it is possible if you touch a surface, don't clean your hands and rub your eyes, nose, or mouth you could self-inoculate. And frankly, because there are so many things that are transmitted that way as well and we really don't want to be picking up other cold viruses or anything else right now. So, breaking the transmission chain from the surface to your face is really all about common sense things — hand hygiene, proper glove removal. If you see colleagues wearing gloves and not taking them off afterward, that is an escalation of risk. They can touch their faces and contaminate surfaces around them and put other healthcare workers and patients at risk.

Question: What are the current recommendations for masks and respirators?

Bell: There are certain things where you should always be using an N95, assuming you have them. Full disclosure: We are painfully aware of the supply chain challenges that many of the facilities are experiencing. This is a very frustrating situation in the context of something like the COVID pandemic. There are currently recommendations that say if for any reason you are not able to use respirators in a single-use disposal kind of way, we have available crisis standards that are not intended to be normal practice. But if you are up against the wall and you are needing to do something, we have suggestions for how to extend the use of respirators. In other words, [keeping] them on and going from patient to patient, or if you are absolutely out, using surgical masks as a temporary alternative. They are not as good, but they are definitely better than nothing. We have some of those crisis recommendations on our website.[2,3]

Getting back to the current recommendations, we do recommend N95 respirators or powered air purifying respirators, elastomerics — whatever you are using and are fit-testing — for any aerosol-generating procedures like bronchoscopies, induced sputum, and that kind of thing. In addition, if you are taking care of a patient that you think or know has COVID, then we recommend an N95 respirator in addition to eye protection. That having been said, surgical masks for routine patient care when you don't think the person has COVID-19 are fine. If you are in a place where the community incidence has been high or the prevalence is high, then we recommend using eye protection as well, just because you are likely to bump into somebody who is not symptomatic yet but could be infectious. ■

REFERENCES

1. Centers for Disease Control and Prevention. Project Firstline. Aug. 10, 2020. https://www.cdc.gov/infectioncontrol/projectfirstline/index.html
2. Centers for Disease Control and Prevention. Strategies for optimizing the supply of N95 respirators. Updated June 28, 2020. https://www.cdc.gov/coronavirus/2019-ncov/hcp/respirators-strategy/index.html
3. Centers for Disease Control and Prevention. Strategies for optimizing the supply of facemasks. Updated June 28, 2020. https://www.cdc.gov/coronavirus/2019-ncov/hcp/ppe-strategy/face-masks.html

Healthcare Workers Await the First SARS-CoV-2 Vaccine

Trust issues, cynics, and an 'infodemic'

With the first vaccine for SARS-CoV-2 on the horizon and targeted for healthcare workers, there are safety concerns and trust issues that threaten to undermine immunization. However, all new vaccines are followed closely for adverse effects, and the oversight of COVID-19 immunization will include multiple systems of passive and active surveillance.

Addressing the widespread public mistrust in the vaccine development at "warp speed," an immunization expert and Food and Drug Administration (FDA) advisor said pressures, political and otherwise, to rush the process will not undermine stringent review for safety and efficacy.

"There has been so much attention on that fear that I just don't think it's going to happen," **Paul Offit**, MD, said recently at the IDWeek 2020 infectious disease conference. "I am optimistic that there are things in place now between the data safety monitoring boards and the FDA Vaccine Advisory committee that is not going to happen."

Offit is director of the Vaccine Education Center and an infectious disease physician at Children's Hospital of Philadelphia.

"I am a member of the FDA's Vaccine Advisory Committee as well as the data safety monitoring board," he said. "Both [boards] are composed of people who are academicians, clinicians, and researchers. These people are not associated with the government or the pharmaceutical industry. I think they will give a clear, unvarnished, honest opinion of what they think about these vaccines. So, I really don't think that a vaccine that is inadequately tested for safety and efficacy will be given to the American public."

Even if the vaccine is found safe, there will be people who refuse immunization. Historically, there are essentially two groups — vaccine skeptics and antivaccine activists, Offit said.

> PRESSURES TO RUSH THE PROCESS WILL NOT UNDERMINE STRINGENT REVIEW FOR SAFETY AND EFFICACY.

"Vaccine skeptics are people who are reasonably concerned that the speed with which we are developing this vaccine is unprecedented," he said. "We just had this virus in hand really in January and now within roughly a year we are going to have a vaccine. That's the fastest vaccine that has ever been made."

In addition, the messaging of doing something potentially dangerous at "warp speed," along with media descriptions of a "race to a vaccine," have "made people nervous," Offit said. "I do think we are going to have to explain these vaccines to people."

Antivaccine activists have adopted belief systems beyond science and reason, and therefore can't be reached using them, he added.

"These people aren't skeptics — I think they are cynics," he said. "They just believe the pharmaceutical companies control everything and they are not going to believe anything you have to say."

Science Denial, Neural Connections

In general, low public scientific literacy and accompanying conspiracy theories have undermined the COVID-19 response in the United States, the author of new paper noted. Although this effect tends to diminish with level of education, "low science literacy cause[s] otherwise rational and competent people to misunderstand the threat of COVID-19 and allow[s] them to feel more comfortable with false data," wrote **Bruce L. Miller**, MD, director of the Memory and Aging Center at the University of California, San Francisco.[1]

"Beliefs grounded in false information, just like those grounded in truth, have neural origins and reflect connections in dedicated brain circuits," Miller stated. "Individuals are organized to hold beliefs and to evaluate their merit based on facts and experiences. Studies of neurodegenerative disorders that target selective brain networks shed

light on the neural mechanisms that underlie the creation and sustenance of beliefs that are not based in reality."

To prevent such "science denial," the medical community should strongly emphasize science education beginning in childhood, he said. For now, scientists, clinicians, and public health experts should engage in dialogue on issues of public health, such as masks, vaccines, and medications.

"A systematic analysis of 'what went wrong' with COVID-19 policies during and after this pandemic is the responsibility of the scientific community," Miller emphasized.

Touching on this theme at IDWeek, **Michael Ryan**, MD, MPH, director of the health emergencies program at the World Health Organization, said an "infodemic" is occurring in conjunction with the pandemic. Part of the reason there is "this information and disinformation is [people] have had to face the endemic with the sense of being on their own," he said. "In fact, there is a sense of fatigue and in some cases hopelessness for the future in terms of what can be done to stop this virus."

Going forward, public health officials need to acknowledge publicly the information gaps and challenges, he said.

"We have to get much better at filling those channels with good information," Ryan said. "We need to work on our side to make it the place where people come to get information. The world has changed, and disinformation is part of that. We need to be aware and track that. We don't need to be turning this into another combat between us and the bad people who put out the misinformation. A lot of that misinformation is genuinely held belief and therefore can't be countered by scolding and censoring."

Social and behavioral sciences can help understand these attitudes and beliefs.

"It's not about who wins the information," Ryan said. "It's who wins the trust war, the behavioral war."

Although he did not criticize the Centers for Disease Control and Prevention (CDC) specifically, **Tom Frieden**, MD, MPH, former director of the agency under the Obama administration, described critical aspects of public health messaging that have been conspicuously lacking under current CDC leadership.

"Communication is crucial and at CDC, your principles are be first, be right, be credible," he said at IDWeek 2020. "It is so important to epidemic response. Tell people what you know and tell them how you know it. Tell them what you don't know and what you will do to figure it out. Consistent, sincere, transparent. Give people concrete, practical things to do to protect themselves, their families, and their communities."

The CDC has issued, revised, and recalled recommendations under political pressure, some believe.

"I think we have to recognize that there are some things we can control and some we can't control," Frieden said. "We need clear communication. We need to be speaking regularly to the public day in and day out in plain language, transparently, telling them what we know and don't know."

Close Follow-up on Vaccinations

That includes multiple systems of follow-up and surveillance after the first approved vaccines are administered. Healthcare workers have been designated by the CDC's Advisory Committee on Immunization Practices (ACIP) as the first group to receive a safe and effective SARS-CoV-2 (COVID-19) vaccine cleared for use in the United States. About 10% of healthcare workers with COVID-19 develop serious infections, with outcomes including hospitalizations, intensive care, and death. Beyond the clinical consequences, healthcare workers report for duty knowing that they may be endangering their own lives and those of their families, colleagues, and patients.

"Our healthcare workforce is exhausted," said ACIP member **Grace Lee**, MD, MPH, a frontline pediatrician and professor at Stanford University. "The constant worry about COVID is just hanging over us as we are caring for patients and [interacting with] their family members. It's going to be one really important strategy and it will give us a sense of enhanced protection. It won't take away the need for us to continue to use personal protective equipment (PPE), but I feel like it will give me an extra layer of confidence that if I don't do everything perfectly all of the time then I am putting myself and my family at risk. I think that is what gets exhausting."

Although the post-election nation still is divided on the issue, there has been prior suggestions that a Biden administration would attempt a mask mandate for the public. A recently published paper by **Anthony Fauci**, MD, said wearing masks will be critical if the vaccine efficacy is suboptimal or the uptake is low.

The director of the National Institute of Allergy and Infectious Diseases, Fauci recently coauthored a paper that said "multiple lines of evidence support the effectiveness of masks for the prevention of SARS-CoV-2 transmission.[2] Mandates for

the wearing of masks in public have been associated with a decline in the daily growth rate of COVID-19 cases in the U.S. The implementation of such mandates averted more than 200,000 cases of COVID-19 by May 22, 2020, according to modeling estimates."

Other "low-tech" measures to prevent SARS-CoV-2 include physical distancing, hand hygiene, and limiting crowds and gatherings. "If a vaccine has only moderate efficacy, or if vaccine uptake is low, these … modalities will be even more critical," Fauci and colleagues noted. "Wearing face coverings — masks — in the community setting to prevent the spread of SARS-CoV-2 is a key component of this combination approach."

The sheer size of the COVID-19 vaccine clinical trials will enhance prelicensure safety and efficacy evaluation, and a number of post-market evaluations are being put in place to bolster existing surveillance for adverse events.

"The FDA typically advises a minimum population size of approximately 3,000 individuals for prelicensure assessments of vaccine safety," Lee and colleagues said in a new paper.[3] "In contrast, Phase III clinical trials for COVID-19 vaccines are enrolling or plan to enroll between 30,000 to 50,000 individuals each, providing the largest databases on prelicensure vaccine safety to date and an opportunity to better understand safety profiles within and across vaccine candidates prior to approval."

"These are some of the biggest trials we have seen," she says. "The reason for the size of these trials is really for the speed [of vaccine development], because they need to detect an efficacy signal of at least 50% with a lower boundary of 30%. Because of the need for the high numbers, it actually is a great opportunity for vaccine safety."

Typical Phase III trials with a much smaller number of participants may take many years to parse this data out, she notes.

"One way to gain [statistical] power is by following people for a long period of time," she says. "And the other way is to really focus on high numbers and make sure you are in areas where they are at a high risk of infection, so they can challenge efficacy. It is an advantage for safety because, typically, we don't see trials of this size that capture safety data."

In the United States, eight vaccine candidates have received federal support under Operation Warp Speed, and four have entered Phase III trials.

"Vaccines will be critical for the prevention and control of COVID-19 in the U.S. and worldwide, yet these efforts cannot succeed without public confidence in a vaccination program," Lee and coauthors emphasized. "Demonstrating vaccine efficacy and safety during clinical trials and implementing a robust post-licensure vaccine safety monitoring system as the vaccine is deployed in larger, more diverse populations is central to public confidence and enabling timely and accurate policy decisions for population-level use."

FDA Follow-up Ratio Questioned

Lee questioned if the FDA fell short in requiring submitted vaccine data to include a median of two months follow-up for at least 50% of the population.

"I wish it were all of the population," she says. "[The FDA] means if you have 30,000 trial participants, 15,000 of them would have two months follow-up at a minimum."

One surveillance system that will be used is the CDC's National Healthcare Safety Network (NHSN), which primarily conducts surveillance for healthcare-associated infections in hospitals and long-term care facilities.

"NHSN routinely collects annual aggregate data on healthcare personnel influenza vaccination rates and is currently exploring the additional capture of COVID-19 vaccination rates," the authors noted. "Capabilities for enhanced monitoring of early COVID-19 vaccine recipients (e.g., essential workers) through smartphone or web-based surveys are also being developed to capture potential adverse events following vaccination."

Although the larger vaccine trials will capture a lot of prelicensure safety data for short-term adverse events, "they won't speak to anything long-term," Lee says. "As each of these trials go on, they will potentially be submitted to the FDA at different time points, so all of that data wouldn't be available immediately, but cumulatively over time we would start to see from the various vaccines that might come in."

Adverse events of special interest related to vaccines include allergic reactions, Guillain-Barré syndrome, transverse myelitis, myocarditis/pericarditis, vaccine-associated enhanced respiratory disease, and multisystem inflammatory syndrome in children. Vaccine safety systems include the longstanding Vaccine Adverse Event Reporting System (VAERS), which is passive surveillance in that it relies on clinicians, manufacturers, and public reports. "VAERS is comanaged by the FDA and CDC and serves as an early warning system for potential

safety signals that may be temporally related to vaccines," the authors noted. "The rapid identification of an intussusception signal after widespread use of rotavirus vaccines in infants exemplifies the essential role of passive surveillance in the U.S."

Active systems include the Vaccine Safety Datalink, a three-decade partnership between the CDC and nine healthcare systems. The system collects healthcare encounter data and electronic medical records to capture vaccine outcomes in more than 11 million patients. Datalink has "near real-time capabilities for signal detection, signal refinement, and signal evaluation … These well-established active safety surveillance systems form the foundation of monitoring COVID-19 vaccine safety," Lee and coauthors concluded.

Regardless, some level of risk is part of any medical intervention, and much of life for that matter, Lee says.

"There is the question of benefits and risks to a population, and there is the question of the benefits and risks to an individual," she says. "You have to weigh the benefits and the risks to make sure, and you try to mitigate those risks as much as possible. We also see, for example, that there are vaccines that have local reactions and systemic reactions. For example, zoster vaccine can be quite reactogenic. A lot of people get pretty significant local side effects, like tender and swollen arms at the site of the injection, or some people get low-grade [temperatures] and myalgias." ■

REFERENCES

1. Miller BL. Science denial and COVID conspiracy theories: Potential neurological mechanisms and possible responses. *JAMA* 2020; Nov. 2. doi:10.1001/jama.2020.21332. [Online ahead of print].
2. Lerner AM, Folkers GK, Fauci AS. Preventing the spread of SARS-CoV-2 with masks and other "low-tech" interventions. *JAMA* 2020; Oct. 26. doi:10.1001/jama.2020.21946. [Online ahead of print].
3. Lee GM, Romero JR, Bell BP. Postapproval vaccine safety surveillance for COVID-19 vaccines in the US. *JAMA* 2020; Oct. 16. doi:10.1001/jama.2020.19692. [Online ahead of print].

SARS-CoV-2 Mutates in Minks

Animal reservoir may undermine vaccine efficacy

Minks farmed for their fur are acquiring SARS-CoV-2 from humans and transmitting it back, a classic scenario for possible genetic mutation that could create a mismatch with vaccines under development, the World Health Organization (WHO) reports.

"Since June 2020, 214 human cases of COVID-19 have been identified in Denmark with SARS-CoV-2 variants associated with farmed minks, including 12 cases with a unique variant, reported on 5 November," WHO stated.[1] "All 12 cases were identified in September 2020 in North Jutland, Denmark. The cases ranged in people ages 7 to 79 years. Eight had a link to the mink farming industry and four cases were from the local community."

Although the clinical presentation in humans was similar to other COVID-19 infections, WHO reported a so-called "cluster 5" variant that had a combination of previously unobserved mutations.

"Preliminary findings indicate that this particular mink-associated variant identified in both minks and the12 human cases has moderately decreased sensitivity to neutralizing antibodies," WHO reported. "Further scientific and laboratory-based studies are required to verify preliminary findings reported and to understand any potential implications of this finding in terms of diagnostics, therapeutics, and vaccines in development."

To head off the threat, Danish officials are culling more than 17 million farmed mink and will conduct mass polymerase chain-reaction (PCR) testing of the human population in the Jutland area.

They also are increasing surveillance of the local population to detect all COVID-19 cases, including through population-wide mass PCR testing for the region of North Jutland.

They also will conduct genetic sequencing of human and mink SARS-CoV-2 to identify the mutated strain. Mitigation efforts include limiting transportation and movement between Jutland and other cities.

"Minks were infected following exposure from infected humans," WHO reported. "Minks can act as a reservoir of SARS-CoV-2, passing the virus between them, and pose a risk for virus spill-over from mink to humans. People can then transmit this virus within the human population. Additionally, spill-back (human to mink transmission) can occur."

At the time of this report, Denmark, the Netherlands, Spain, Sweden, Italy, and the United States have reported SARS-CoV-2 in farmed minks.

Animal Origins

Although the general scientific consensus is that epidemic coronaviruses arise from bats, the original severe acute respiratory syndrome (SARS) in 2002 found an intermediate host in palm civet "cats" sold at Chinese wet markets.

Similarly, Middle East respiratory syndrome (MERS) has established a reservoir in camels. Palm civets were aggressively culled, and SARS disappeared. The first MERS cases emerged in 2012 and the link to dromedary camels is now well-established. Because of their central cultural role in the region, camels have not been culled and MERS still spreads sporadically.

Finding SARS-CoV-2 in minks and, to a lesser extent, in other animals raises the possibility that coronavirus eventually will become endemic through an animal reservoir.

"The question is going to be, can we ever truly eradicate SARS-CoV-2 from the human population?" **Michael Ryan**, MD, MPH, director of the health emergencies program at WHO, said recently at the IDWeek 2020 meeting. "That's going to be a tough one."

Rather than eradication, the goal should be reining in the virus via vaccines, therapies, and other public health measures, he added.

"If health systems can recover, maybe we can reach a point where this virus may enter the pantheon of all those viruses that can affect us from time to time, but we have the therapeutics and we absolutely have control over what it does to us," Ryan said. "If we get there, I will consider that to be a public health success. Then we will decide whether we can eradicate this disease or not."

WHO Recommendations

Given the current situation, WHO recommended detailed analyses and scientific studies to better understand the reported mutations. The WHO made several other key recommendations in the report.

- The sharing of full genome sequences of human and animal strains will continue to facilitate detailed analyses by partners.
- This event highlights the important role that farmed mink populations can play in the ongoing transmission of SARS-CoV-2 and the critical role of strong surveillance, sampling, and sequencing SARS-CoV-2, especially around areas where such animal reservoirs are identified.
- The preliminary findings by Denmark are globally relevant and WHO recognizes the importance of sharing epidemiological, virological, and full genome sequence information with other countries and research teams, including through open-source platforms.
- All countries should enhance surveillance for COVID-19 at the animal-human interface where susceptible animal reservoirs are identified, including mink farms.
- Farming biosafety and biosecurity measures around known animal reservoirs should be strengthened to limit the risk of zoonotic events associated with SARS-CoV-2. This includes infection prevention and control measures for animal workers, farm visitors, and those who may be involved in animal husbandry or culling.
- WHO advises against the application of any travel or trade restrictions for Denmark based on the information currently available on this event. ■

REFERENCE

1. World Health Organization. SARS-CoV-2 mink-associated variant strain – Denmark. Disease Outbreak News. Nov. 6, 2020. https://www.who.int/csr/don/06-november-2020-mink-associated-sars-cov2-denmark/en/

COVID-19 Hospitalizations and Deaths in Healthcare Workers

Analysis of COVID-19 hospitalization data from 13 sites indicated that 6% of adults hospitalized with COVID-19 were healthcare personnel (HCP), the Centers for Disease Control and Prevention (CDC) reports. Moreover, 4% of healthcare workers died with COVID-19 during hospitalization.

The database included 6,760 adults hospitalized March 1 to May 31, 2020, for whom HCP status was determined by the COVID-19–Associated Hospitalization Surveillance Network (COVID-NET). The median age of hospitalized HCP was 49 years, and 90% had at least one underlying medical condition.

"Among HCP hospitalized with COVID-19, 36% were in

nursing-related occupations, and 73% had obesity," the CDC found.[1] "Approximately 28% of these patients were admitted to an intensive care unit, [and] 16% required invasive mechanical ventilation."

Of course, healthcare workers are at risk of COVID-19 both at work and in the community.

"Similar to the distribution of the U.S. healthcare workforce overall, a majority of hospitalized HCP in this report were female," the CDC reported. "However, compared with previously reported demographic characteristics of U.S. HCP with COVID-19, HCP identified by COVID-NET were older, and a larger proportion were Black. Given that COVID-NET conducts surveillance specifically for hospitalized patients, these differences might reflect the association between increased age and severe outcomes associated with SARS-CoV-2 infection as well as disproportionate effects among Black populations."

HCP were defined as persons working in healthcare settings, home healthcare services, or healthcare occupations within other settings (e.g., school nurses) who have potential for exposure to patients or infectious materials. HCP were stratified into two groups for analyses according to presumed level of patient contact (i.e., those generally expected and those generally not expected to have direct patient contact) based on reported occupation.

From March 1 through May 31, 2020, COVID-NET received reports of 28,972 hospitalized adult patients, 8,515 of whom were sampled for complete chart abstraction. HCP status was documented for 6,760 sampled patients, 438 of whom were HCP. The median age of HCP hospitalized with COVID-19 was 49 years and 72% were female; 52% were non-Hispanic Black (Black), 27% were non-Hispanic White, and 9% were Hispanic or Latino persons.

"More than two-thirds (67%) of HCP hospitalized with COVID-19 worked in occupations in which they were generally expected to have direct patient contact; 36% of HCP hospitalized with COVID-19 worked in nursing-related occupations, including nurses (28%) and certified nursing assistants (CNAs) (9%), the CDC said. "Patient aides and caregivers (7%) accounted for the next largest proportion of HCP hospitalized with COVID-19."

Overall, 90% of HCP hospitalized with COVID-19 had documentation of at least one underlying condition. In addition to obesity, reporting underlying conditions were hypertension (41%) and diabetes (31%). Upon hospital admission, 97% of HCP reported COVID-19-associated signs and symptoms: shortness of breath (80%), cough (77%), and fever or chills (74%).

The median length of hospitalization among HCP with COVID-19 was four days (range, three to nine days). COVID-19 investigational treatments were administered to 48% of hospitalized HCP hospitalized. Overall, 28% of HCP were admitted to an ICU for a median of six days (range, three to 20 days), and 16% required invasive mechanical ventilation. Pneumonia was a documented discharge diagnosis for 57% of HCP hospitalized with COVID-19 and acute respiratory failure for 43%. ■

REFERENCE

1. Kambhampati AK, O'Halloran AC, Whitaker M, et al. COVID-19-associated hospitalizations among health care personnel – COVID-NET, 13 states, March 1-May 31, 2020. *MMWR Morb Mortal Wkly Rep* 2020;69:1576-1583.

Beyond Healthcare Workers, COVID-19 Immunization is Ethically Complex

By Philip R. Fischer, MD, DTM&H, Professor of Pediatrics, Department of Pediatric and Adolescent Medicine, Mayo Clinic, Rochester, MN

There is optimism about the coming availability of SARS-CoV-2 vaccines. However, supplies are likely to be limited, at least initially. Thus, various groups have suggested prioritization schemes to allocate limited vaccine supplies.

In a viewpoint article, Persad et al suggest that three main ethical issues relate to vaccine allocation, and they discuss these issues in light of COVID-19.[1] First, they claim that providing benefit while limiting harm is a universal value and that a vaccine could reduce illness and death while also mitigating unemployment, poverty, and educational deprivation. Second, they believe that it is fundamental to prioritize disadvantaged populations, including the medically vulnerable who risk

earlier death if infected, as well as those who have been subject to socioeconomic deprivation and oppression. Third, they suggest that differences of race, gender, and religion should not enter into consideration in simplistic ways that could actually harm or de-prioritize disadvantaged population groups — while, of course, not ignoring relevant differences.

The authors believe that their main ethical principles support individual and societal benefit when prioritized immunization is targeted for healthcare workers, people in high transmission settings, and medically vulnerable individuals who have medical conditions that put them at risk of poorer outcomes if they were to be infected with SARS-CoV-2. Focusing on healthcare workers would reduce iatrogenic spread of illness and provide reduced risk for patients with risk factors who frequent healthcare settings and live in medical housing situations. Focusing on people working in high transmission settings would reduce direct harm and minimize spread; this would include school personnel, childcare providers, and food supply workers. It is reported that 200 million people in the United States have high-risk medical conditions, so further prioritization within the high-risk groups also will be necessary.

Thus, the authors urge that COVID-19 vaccines be allocated to prevent harm, prioritize those who are disadvantaged, and achieve equal treatment. They caution against simplistic schemes that prioritize only the elderly or those of certain racial groups without considering the individual's actual risk factors for becoming infected or suffering extreme illness if infected. They then practically propose that the vaccine be allocated so that half the supply goes to frontline healthcare workers, with one-fourth of the initial vaccine supply going to people living and working in high-risk settings, and the final fourth going to other people. Within those categories, priority would be given to individuals with high-risk medical conditions.

Beyond Safety and Efficacy

Believing in individualized medicine, we often select diagnostic testing and therapeutic interventions based on what is deemed best for each individual patient. Early in the COVID-19 pandemic, however, it became shockingly clear that resources were not infinite and that even resource-rich societies needed to think through priorities of allocating limited resources. With at least 25 vaccines currently being evaluated, and even as we anticipate the availability of COVID-19 vaccines, our consideration of vaccine delivery systems must go beyond infection and immunity, beyond safety and efficacy.[2] We will need to consider the ethics of allocation of limited vaccine supplies. In the medical field, we often espouse a "do no harm" approach. Of course, risks and benefits must be balanced carefully. Almost no medical intervention carries zero risk of harm, and new rapidly produced interventions should be recognized as inherently risky.

Persad and colleagues wisely look beyond race in considering the prioritization of vaccination. Clearly, race is related to poor outcomes with COVID-19, and new data confirm this finding.[3] But race is, to at least some degree, a marker for risk factors, rather than a fully independent risk factor. Even in the county where I live, recent pre-publication epidemiologic data suggest that COVID-19 is, indeed, more common in minority racial groups, but the geospatial clustering of cases reveals that the risk actually is associated with living in crowded housing (apartment buildings and trailer parks) and with neighborhoods with lower socioeconomic levels. Race is a statistical marker for risk, but considering race alone would lead decision-makers to inappropriately include many low-risk individuals (those of racial minority groups who have high socioeconomic status and live in single-family dwellings) in the "high risk" category.

Another ethical issue has been raised about a few of the candidate COVID-19 vaccines. As with some routine childhood vaccines, some of the adenovirus vector-based COVID-19 vaccines have used decades-old cell lines from aborted fetal tissue during the manufacturing process. "Moral complicity" is the notion that using the products of an unethical act, as some see abortion, makes one complicit to the initial act. Does the use of abortion-derived vaccines make vaccinators and vaccine recipients complicit with and "guilty of" the initial abortion? A similar issue was raised when the popular press realized that researchers were benefitting from studies involving HeLa cell lines that had been used without the patient's consent. Most of us do not see the moral complicity argument as a limitation to the use of specific vaccines any more than we see a kidney transplant recipient who received an organ from a deceased murder victim as being complicit with or guilty of the murder of the organ donor.

Already, governments of some wealthy countries have purchased huge stocks of not-yet-produced COVID-19 vaccines, with more than

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2 billion doses already bought. The World Health Organization recommends that richer nations ensure that resource-limited countries receive early access to vaccines, too. It is hoped that national and international law will serve as a means, rather than as a barrier, to just and equitable distribution of vaccines around the globe. ■

REFERENCES

1. Persad G, Peek ME, Emanuel EJ. Fairly prioritizing groups for access to COVID-19 vaccines. *JAMA* 2020; Sept. 10. doi:10.1001/jama.2020.18513. [Online ahead of print].
2. Poland GA, Ovsyannikova IG, Crooke SN, et al. SARS-CoV-2 vaccine development: Current status. *Mayo Clin Proc* 2020;95:2172-2188.
3. Goyal MK, Simpson JN, Boyle MD, et al. Race and/or ethnic and socioeconomic disparities of SARS-CoV-2 infection among children. *Pediatrics* 2020;146:e2020009951.

CME/CE QUESTIONS

1. According to Mike Bell, MD, what percentage of the U.S. population is susceptible to SARS-CoV-2?

a. 25%
b. 49%
c. 75%
d. 90%

2. Regarding COVID-19, Bruce L. Miller, MD, said beliefs grounded in false information:

a. are easily changed by scientific data.
b. are extremely rare.
c. reflect connections in dedicated brain circuits.
d. are common in people with post-traumatic stress disorder.

3. According to the World Health Organization, 12 humans infected by minks with SARS-CoV-2 had:

a. rapid onset of clinical symptoms.
b. decreased sensitivity to neutralizing antibodies.
c. no symptoms of illness.
d. greater ability to transmit to contacts.

4. Overall, 90% of healthcare workers hospitalized with COVID-19 had documentation of:

a. an unprotected patient exposure.
b. caring for a sick family member.
c. working at hospital capacity in a coronavirus hotspot location.
d. at least one underlying health condition.