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No Treatment, No Vaccine: Infection Preventionists Must Hold Line Against Emerging 2019-nCoV

CDC issues full gamut of infection control precautions

By Gary Evans, Medical Writer

Rigorous adherence to infection control measures is critical as a novel coronavirus (2019-nCoV) continues to emerge globally, threatening to transmit in the community and hospitals in the absence of an effective treatment or a vaccine, the Centers for Disease Control and Prevention (CDC) emphasizes.

As this report was filed, the CDC reported the second case of person-to-person transmission in the United States and issued new infection control measures and travel restrictions. In addition, an American who was already in quarantine in Texas after returning from Wuhan, China, became the 15th case in the United States as of Feb. 13, 2020. China reeled under thousands of cases increasing daily as the virus spread out to some 28 countries globally. The World Health Organization (WHO) designated a new

name for the virus, changing it from 2019-nCoV to COVID-19. The CDC was in the process of updating its guidelines as this issue went to print.

Although there is more unknown than known at this stage, a theory emerging among some infectious disease experts is that the 2019-nCoV coronavirus seems to be more of a threat to spread in communities than be amplified in hospital outbreaks like its predecessors, severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS).

However, a recently published report of 138 hospitalized patients in Wuhan, China, may dash that hope, while underscoring the importance of hospital infection control.

“Of the 138 patients, 57 (41.3%) were presumed to have been infected in [the] hospital,” the authors report.¹ In addition, 40 healthcare workers

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carrying for patients were infected, including 10 who contracted the coronavirus from a single patient. That appeared to be a case of the “super spreader” phenomenon seen with SARS and MERS, meaning a highly infectious patient who may also be unsuspected and thus cared for without full precautions. Thus, hospitals face the continuous threat of incoming community cases that must be identified and isolated to protect patients and healthcare workers.

“We are using an aggressive and cautious approach to [infection] control practices,” says **Ryan Fagan**, MD, MPH, healthcare infection control team lead for the CDC response. “These [guidelines]² are aimed at protecting both patients and healthcare personnel. These recommendations are formed in part by our experience with healthcare-associated transmission of SARS and MERS. It’s important to point out though, that it is too soon to conclude the degree to which 2019-nCoV transmission [will be like] either of those viruses in healthcare settings.”

In addition to the new hospital infection control practices, federal health officials have implemented an aggressive travel protocol and screening for the coronavirus.

That includes ordering the evacuation of some U.S. citizens from China and placing those who had been in Hubei province — the epicenter of the outbreak — in 14 days’ quarantine upon return.

Asked at a Feb. 3, 2020, press conference about concerns expressed by China that the U.S. response may cause panic, **Nancy Messonnier**, MD, director of the CDC National Center for Respiratory Diseases, gave a forceful response.

“This is an unprecedented situation and we have taken aggressive measures,” she said. “A couple of weeks

ago there were 41 cases in China. This morning the numbers are 17,000 — 17,000 cases with a novel coronavirus that the population doesn’t have immunity to, and for which, because things have been moving so quickly, we don’t have the information base that we want. [It is a] largely expanding outbreak, with person-to-person and community transmission in China.”

In statistics that underscore Messonnier’s point, China updated the count on Feb. 10, 2020, reporting 42,638 cases, including 7,333 in serious condition and 1,016 deaths.³ At least 333 cases, including the 15 in the United States, have been reported in other nations worldwide, some of which also have reported person-to-person spread. In addition, the first two deaths outside of mainland China have occurred in the Philippines and Hong Kong.

“[There also are] concerning data suggesting that people who are asymptomatic or mildly symptomatic may be transmitting the disease,” she said. Given these disturbing developments, the CDC took aggressive steps to stop the 2019-nCoV from gaining a foothold in the United States, Messonnier said.

“Action now has the biggest potential to slow this thing down,” she said.

In a move that was widely anticipated, WHO declared the 2019 coronavirus outbreak in China a Public Health Emergency of International Concern⁴ on Jan. 30, 2020. (See “WHO International Emergency: A Great Wall Around China?”)

Case Definitions

Amid this growing sense of urgency, the CDC rolled out updated infection control recommendations and updated other aspects of its response at a training session for clinicians.

“Based on the early reports, we are seeing an incubation period of approximately five days — ranging all the way from two to 14 days,” says **Aron Hall**, DVM, MSPH, epidemiology task force deputy lead for the CDC response. “We are also seeing a basic reproductive number of about two, indicating that there are two additional cases resulting from each confirmed case [of 2019-nCoV].”

To prevent such transmission, the CDC issued guidance on identifying, testing, and isolating persons under investigation (PUI). (See Figure 1.)

The definitions to identify PUIs include clinical features combined with epidemiologic risk in the following definitions:

- Fever or signs/symptoms of lower respiratory illness (e.g., cough or shortness of breath) and any person, including healthcare workers, who has had close contact with a laboratory-confirmed 2019-nCoV patient within 14 days of symptom onset;
- Fever and signs/symptoms of a lower respiratory illness (e.g., cough or shortness of breath) and a history of travel from Hubei Province, China, within 14 days of symptom onset;
- Fever and signs/symptoms of a lower respiratory illness (e.g., cough or shortness of breath) requiring hospitalization and a history of travel from mainland China within 14 days of symptom onset.

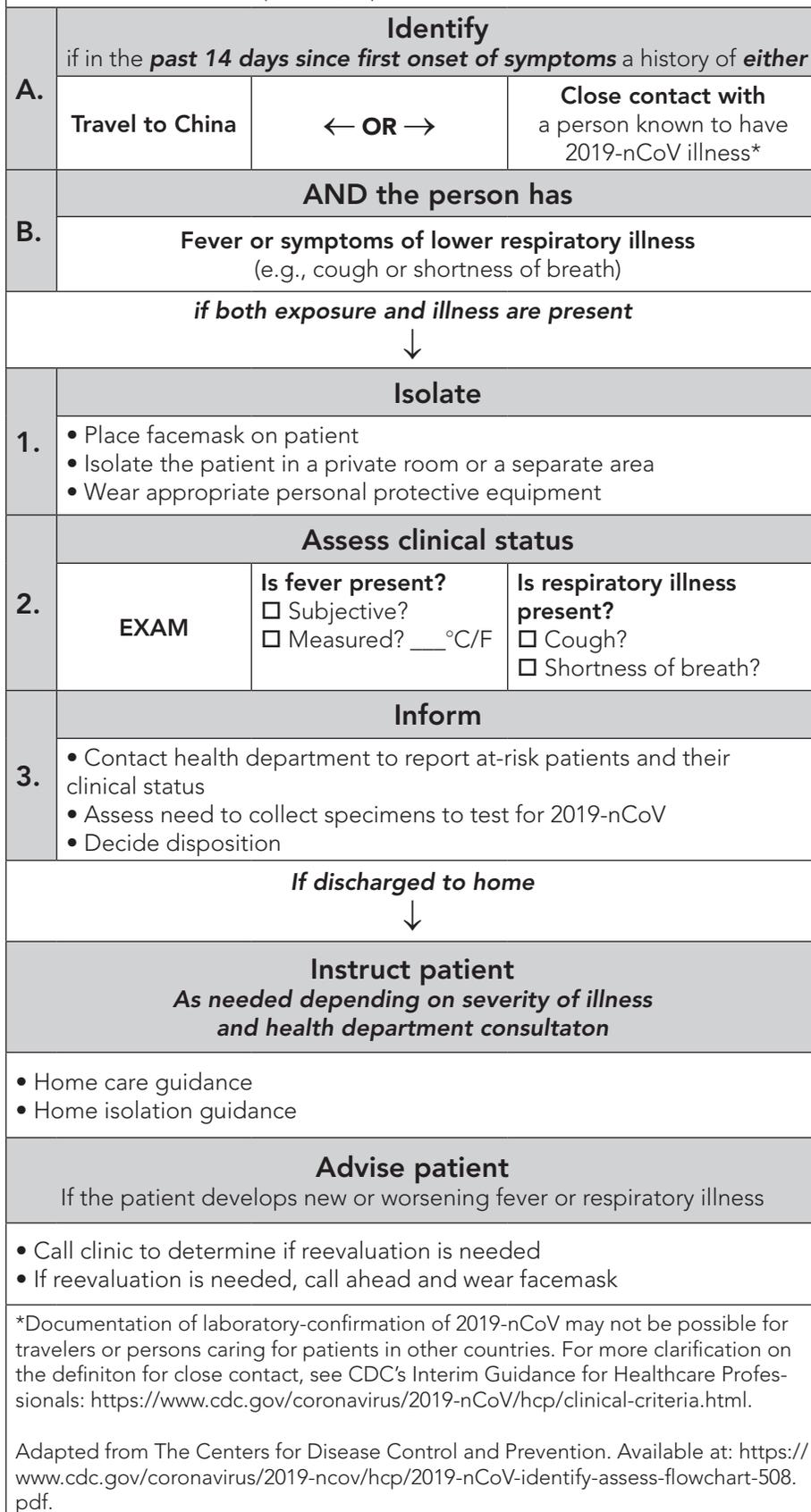
Note that given the reports of the virus spreading in China beyond the Hubei province, the CDC added the aforementioned new PUI definition for those hospitalized with fever and respiratory illness who have traveled anywhere in China in the last 14 days.

Thus, the CDC is trying to balance the severity of illness and the epidemiologic data to identify PUIs without undercount or overkill.

Those who meet any of the described case definitions should be

Figure 1. Flowchart to Identify and Assess 2019 Novel Coronavirus

For the evaluation of patients who may be ill with or who may have been exposed to 2019 novel coronavirus (2019-nCoV)



considered a PUI and referred to state and local public health officials for 2019-nCoV testing. The testing has been done by the CDC, but as this report was filed, the CDC was distributing test kits to state health departments to speed up the process. (See “Two U.S. Cases of Person-to-Person Transmission, More Expected.”)

Mask the Patient

“Infection control begins when [the patient] arrives at the facility and maybe even before arrival in terms of initial triage practices,” Fagan says. “Putting face masks on patients with respiratory illness is a standard precaution that we should all be prepared to do, including for influenza and other respiratory viruses.”

The recommendations apply to emergency medical services (EMS) and first responders transporting a suspected case of the new coronavirus.

“The specific situations will vary in that unique setting,” Fagan says. “We are in the process of developing some tools based on the guidance. That includes [adhering to] contact precautions, wearing a respirator, and covering their eyes for EMS workers who are riding in the compartment with a person under investigation for coronavirus.”

After donning a surgical mask, people under investigation for coronavirus infection should be evaluated in a private room with the door closed, ideally an airborne infection isolation room, the CDC recommends. “Healthcare personnel entering the room should use standard precautions, contact precautions, airborne precautions, and use eye protection (e.g., goggles or a face shield),” the CDC states.

The framework boils down to “identify, isolate, and inform,” Fagan

says. Immediately inform your infection control team and local public health department of these cases, he added.

“In our recommendations for healthcare personnel, we are specifically recommending the use of respirators,” he says. “Some respirators like N95s are filtering face piece respirators, so they cover the nose and the mouth. There are a variety of options that provide that and additional higher levels of protections. Any of these N95 respirators are effective in filtering out coronaviruses.”

That said, the CDC believes the primary routes of exposure for coronavirus are likely to be close proximity to a patient, droplet contamination, or direct contact.

“The respirators, we think, are important for the concern about inhalational risk, but we also want to [stress] that it is part of an ensemble where you are also protecting your eyes, which have vulnerable mucous membranes. Cover the eyes and the mucous membranes of the face from direct droplet spread. Part of the reason for this is to avoid accidental self-contamination from touching gloved hands to your eyes and face in patient care settings.”

Given the many documented instances and studies of healthcare workers contaminating themselves while doffing PPE, it may be helpful to have someone observe workers removing gear after treating a patient, says **Connie Steed**, MSN, RN, CIC, FAPIC, president of the Association for Professionals in Infection Control and Epidemiology.

“If they have a confirmed or suspect case, make sure there are observers that are watching as they don and doff PPE going in and out of the room to ensure the healthcare workers’ safety,” she told *Hospital Infection Control & Prevention*. “I have talked with our infection prevention team about doing

just-in-time-reminder competencies for frontline healthcare workers on how to put on and take off respirators. That seems to be the biggest issue as the hands [touch] the face.”

Emergency departments will bear the brunt of this if suspect cases descend on hospitals.

“Previous outbreaks have forced us to be more forward-thinking,” says **Shannon Sovndal**, MD, of Boulder (CO) Emergency Physicians. “New processes, such as updated triage questions and isolation techniques, have better prepared the ER [emergency room] to face new threats. We have a foundation in place which should aid us in addressing threats such as coronavirus from China, but vigilance, aggressive intervention, and constant modification will be needed.”

Masking symptomatic patients and getting a travel history can protect workers and guide triage. Infection control and PPE are critical because there is no antiviral treatment nor a vaccine for 2019-nCoV, says **Daniel Lucey**, MD MPH, FIDSA, FACP, an infectious diseases physician at Georgetown University Medical Center.

“Infection prevention is the best thing we have,” he said. “And that worked after a while with SARS.”

A Wide Clinical Spectrum

Patients with 2019-nCoV are presenting with a wide clinical spectrum from asymptomatic infection to life-threatening pneumonia, says **Timothy Uyeki**, MD, MPH, MPP, the clinical team lead for the CDC response to the outbreak.

“In those who are symptomatic, the initial clinical course consists of mild, nonspecific respiratory signs and symptoms that overlap with those caused by many respiratory pathogens

during the winter in the United States,” he says. “[The] most common onset of clinical illness in the China cases studied were fever and cough. The fever course with patients with this virus is not fully understood. Fever is not always present at illness onset. It may be intermittent, and it may be prolonged.”

The data that have been reported from China mainly are from hospitalized patients diagnosed with pneumonia and show a median time of about seven days from onset of illness to hospital admission.

“Complications that have been reported in hospitalized pneumonia patients include acute respiratory distress syndrome in about 17% to 29% of [cases],” Uyeki says. “Secondary infection has been reported in about 10%.”

About one-third of patients hospitalized with pneumonia have required intensive care for respiratory support, including invasive mechanical ventilation, he says.

“The case fatality rate in those hospitalized with pneumonia has been about 11% to 15%,” Uyeki says. “Understand that this estimate is only for hospitalized pneumonia patients. It is likely biased upward because it did not include mildly ill patients who were not hospitalized.”

The case fatality rate with SARS in 2003 was about 9% to 10%, he says.

“With MERS, [most] cases are hospitalized with severe disease — so the [mortality rate] is certainly biased upward. It’s approaching 35% to 40%.”

What patients are at greatest risk of developing severe disease with 2019-nCoV?

“At this time, we don’t really know all the risk factors,” he says. “Some early signals indicate older patients and those with chronic medical conditions seem to be at highest risk for severe outcomes. About one-third to one-half of reported patients with pneumonia

CDC Guidelines for Home Isolation for Coronavirus

The Centers for Disease Control and Prevention (CDC) has issued new guidelines for home care and isolation of patients with emerging 2019-nCoV.¹

The guidance is for infection preventionists, public health officials, and other healthcare personnel who are coordinating the home care patients with confirmed or suspected 2019-nCoV infection. This includes patients who are medically stable and do not require hospitalization, as well those who have been discharged from the hospital for home care.

“In general, people should adhere to appropriate transmission-based isolation precautions until the risk of secondary transmission is thought to be low,” the CDC states.

In consultation with state or local health department staff, a healthcare professional should assess whether the residential setting is appropriate for home care. Considerations include the following:

- The patient is stable enough to receive care at home.
- Appropriate caregivers are available at home.
- There is a separate bedroom where the patient can recover without sharing immediate space with others.
- Resources for access to food and other necessities are available.
- The patient and other household members have access to appropriate, recommended personal protective equipment (at a minimum, gloves and facemask) and are capable of adhering to precautions recommended as part of home care or isolation (e.g., respiratory hygiene and cough etiquette, hand hygiene).
- There are household members who may be at increased risk of complications from 2019-nCoV infection (e.g., people > 65 years of age, young children, pregnant women, people who are immunocompromised or who have chronic heart, lung, or kidney conditions).

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had underlying medical comorbidities, including diabetes and cardiovascular diseases.”

Several reports suggest the potential for clinical deterioration during the second week of illness, even in mild cases, Uyeki says. The implications of this milder spectrum of disease are complex, as patients do not need hospitalization for supportive care, but

should be monitored at home for signs of worsening illness.

Likewise, hospitalized patients could be discharged to home isolation, Fagan says, citing new CDC guidelines in this area.⁵ (See “CDC Guidelines for Home Isolation for Coronavirus.”)

“I wouldn’t equate discharge from the hospital with discontinuation of isolation,” he says. “What we

recommend right now for patients who are confirmed cases, who are getting better and ready for discharge — or PUIs awaiting labs results — is that on a case-by-case basis, determine if they [should] be placed in home isolation.”

Again, the CDC wants to balance medical care with viral containment. “If they are a PUI and we think they can potentially become infective, we are going to continue to recommend infection control precautions, whether it is in the hospital or at home,” he says.

There are still open questions about when patients are most contagious, as well as how long they remain infectious.

“We don’t have a good understanding of the duration of viral shedding, but it could be several weeks or longer, which has been observed with MERS and SARS,” Uyeki says.

There has been prolonged detection of viral RNA of 2019-nCoV in both the upper and lower respiratory tract. Detection of viral RNA does not necessarily mean detection of infectious

virus, but it certainly may suggest that, Uyeki adds.

“This highlights the need to adhere to infection control recommendations very closely,” he says. “It’s possible, that — like SARS and MERS patients — those patients that have more severe disease may have prolonged viral replication, particularly in the lower respiratory tract. But I think we are still in the very early days of learning about both the levels and duration of viral shedding — both in the respiratory tract and, potentially, outside of it.” ■

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Two U.S. Cases of Person-to-Person Transmission, More Expected

CDC tracking all contacts of first 15 cases

The second case of person-to-person spread of the emerging 2019 novel coronavirus (2019-nCoV) in the United States has occurred, raising concern that the community spread could continue, even as travel from China is being checked aggressively.

As of Feb. 13, 2020, there were 15 cases of the new coronavirus in the United States, with 13 of them infected travelers returning from Wuhan, China. The Centers for Disease Control and Prevention (CDC) updated the numbers in describing new cases at a recent press conference.

“One patient in California is a close household contact of another patient in

California,” said **Nancy Messonnier**, MD, director of the CDC National Center for Respiratory Diseases. “This is the second instance of person-to-person spread in the United States. We expect to find additional cases of novel coronavirus infection in the United States. We expect to see more cases of person-to-person spread among close contacts.”

The reasons for this expectation are twofold: the continuing explosive outbreak in China and the aggressive testing and contact tracing being done in the United States. As the CDC tracks down contacts of confirmed cases, 347 people have tested negative and

66 are awaiting results. Investigations have been conducted in 41 states and territories.

The first confirmed person-to-person transmission also involved close contacts, as a woman returning to Illinois from Wuhan infected her husband. The other U.S. patients live in Washington state, Arizona, and Wisconsin.

“We have seen a spectrum of illness among cases in the United States. Some of them seem pretty mild,” Messonnier said. “At least a few at some point in the course of their illness have been more severely ill. There are no deaths in the United States. Some of our patients

have had oxygen requirements during the course of their illness.”

The CDC has cautioned against overreaction, like wearing surgical masks in public, as the number of cases in the United States is still only at 15.

Limited person-to-person spread also has been seen in at least nine other countries, as people traveling from China infect their close contacts.

Although it was soon followed by other cases in the United States, the first case of 2019-nCoV in the United States was unusual in that a self-aware patient who became ill after traveling from Wuhan essentially self-diagnosed and reported for care.

The man returned from Wuhan on a connecting flight into Seattle-Tacoma International Airport in Washington, the CDC reported at a Jan. 21, 2020, press conference.

He had no symptoms of illness since leaving China, but was closely following his vital signs for the fever and cough that mark the onset of the coronavirus infection.

“This was a very astute gentleman who was looking at internet activity, had actually researched this, and shared this information with his provider on Jan. 19,” says **Scott Lindquist**, MD, epidemiologist for Washington state.

“We were in communication with the CDC Emergency Operations Center coordinating specimens that were shipped overnight and had the results the following day, incredibly fast,” he says.

The first patient has recovered and been discharged from the hospital, officials report.

Tests, Treatments, Vaccine

In a move that will greatly improve case identification, public officials have

distributed a polymerase chain reaction (PCR) test to state labs for 2019-nCoV.

Heretofore, testing of specimens was being done at the CDC, but the agency requested Emergency Use Authorization to distribute the tests. “Once approved, this will allow public health labs across the United States to use the CDC-developed diagnostic assay,” Messonnier said. “This will greatly enhance our national capacity to test for this virus.”

The CDC also has posted a “blueprint” of how to make the test for other countries.

Two widely available molecular viral respiratory panels are used in the United States to detect the four common human coronaviruses that usually cause mild illness and colds.

“Those assays do not detect this new coronavirus. There is no cross reaction,” says **Timothy Uyeki**, MD, MPH, MPP, Clinical Team Lead for the CDC response to the outbreak.

Better diagnostics can improve case identification and infection control, but there are no established treatment options for the novel coronavirus.

“Clinical management is really supportive care for any kind of complications,” he says. “At this time, there is no specific treatment for novel coronavirus infection. There is no approved or demonstrated antiviral treatment that is efficacious for this virus.”

Corticosteroids should be avoided for treatment of this virus, including for respiratory failure, he says. “With MERS [Middle East respiratory syndrome] and seasonal influenza, corticosteroids can actually prolong viral replication. There are antiviral drugs that have been used for other infectious diseases that are under investigation for potential treatment for patients with the new virus, but at this time there are no recommendations that can be made,” he says.

“In China, one clinical trial has been instigated of investigational therapeutics,” says Uyeki. “Other clinical trials are planned. When one uses investigational therapeutics for compassionate use that is uncontrolled — it is basically impossible to draw conclusions about that clinical treatment. We really need randomized, controlled clinical trials. Unfortunately, in the absence of in vitro data, we can’t make any comments about what drugs appear to be beneficial.”

The National Institutes of Health (NIH) have fast-tracked vaccine development to stop 2019-nCoV, but it will be months before it could be safely administered to an anxious public. **Anthony Fauci**, MD, director of the NIH National Institute of Allergy and Infectious Diseases, described the ongoing research at a Jan. 28, 2020, press conference.

“We already started at the NIH, with many of our collaborators, the development of a vaccine,” he said. “One [vaccine] has a messenger-RNA platform. When the Chinese isolated the coronavirus, they put the sequence on a public database. Given the technology of the 21st century, we are able to use that sequence, pull out the gene of the glycoprotein spike of this particular virus, and make that the immunogen to be used in a vaccine. Right now, it is being prepared.”

While promising, vaccine development and testing is a time-consuming process, both to ensure that it works and that it is safe in humans.

“I anticipate with some cautious optimism that we will be in a Phase I trial within the next three months,” he said. “I want to emphasize that does not mean that you have a vaccine that is ready for development. It will take three months to get it into the trial, then three months to get safety and immunogenicity data. Then, you move into Phase II. What we do from that

point on will be determined by what is happening with the outbreak over that time.”

Considering that current trends find 2019-nCoV expanding rapidly in China and reaching other nations near and far, the general consensus is that the vaccine will be needed. “We are proceeding as if we will have to deploy a vaccine,” Fauci said. “We are looking at the worst-case scenario: that this becomes a bigger outbreak.”

Diagnostics and therapeutics also are in development, promising treatment until there is a vaccine to prevent infection.

“With regard to diagnostics, the CDC has rapidly developed [a test] based on the published sequence of the virus,” Fauci said. “The NIH, along with the CDC, will be working on next-generation diagnostics more at

the point of care so we can get them to more people throughout the world.”

Despite the prior emergence of severe acute respiratory syndrome (SARS) and MERS, there currently is no therapeutic treatment for coronavirus infection. Ongoing studies were initiated because of those outbreaks, but treatment remains elusive. “Between those outbreaks and the current one, a number of antiviral drugs have been tested in vitro, in animal models, and even in the field anecdotally with historic controls,” he said.

One of them is the antiviral remdesivir, which once was used in a clinical trial against Ebola, he said. Another that is now being used by some clinicians in China is a combination of two antivirals, lopinavir and ritonavir, Fauci said.

“I must emphasize there is no proven efficacy of these, but they are being pursued together with a number of agents,” he said. “That is why it is so important that we get isolates of the virus, which we will soon have from the individuals in this country who have been infected.”

During the SARS outbreak, researchers developed monoclonal antibodies as a potential therapeutic. “They were only used in vitro and in animal models,” he said.

“Given the somewhat close homology between SARS and the new coronavirus, that could be utilized. However, what we are really trying to do — and it will happen soon, as we get specimens from individuals who are infected — is to clone their cells and make specific monoclonal antibodies against this new coronavirus.” ■

Assessing 2019-nCoV Risk to Healthcare Workers

Forty healthcare workers infected in Chinese hospital

In one of the first reports of the clear risk of 2019 novel coronavirus (2019-nCoV) to healthcare workers (HCWs), an outbreak in a hospital in Wuhan, China, resulted in 40 infections in clinical staff caring for patients.¹

In addition, about one-fourth of the HCWs contracted the coronavirus from a single patient. That transmission is reminiscent of the “super spreader” phenomenon seen with severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS).

“One patient in the current study presented with abdominal symptoms and was admitted to the surgical department,” researchers from Zhongnan Hospital of Wuhan University in Wuhan report. “More than 10 healthcare workers in this

department were presumed to have been infected by this patient.”

Workers on general wards, in the emergency department, and in the intensive care unit also were infected while caring for patients from Jan. 1-28, 2020. The clinical outcomes for the HCWs were not reported in the paper. As of Jan. 21, 2020, the World Health Organization (WHO) reported that 16 HCWs had been infected by 2019-nCoV.² No deaths were reported.

On Feb. 2, 2020, WHO reported: “In France, for the first time outside China, a healthcare worker was diagnosed as being ill with 2019-nCoV acute respiratory disease. The health worker treated two patients who were later identified as probable cases.”³

As this story was filed, no U.S. HCWs had been infected.

The rapidly emerging 2019-nCoV follows the SARS coronavirus outbreak in 2002-2003, which also emerged out of China, resulting in 8,098 infections globally and 774 deaths. Some of the SARS infections and deaths, particularly in hospitals in Toronto, were in HCWs.

The ongoing MERS outbreak centered in Saudi Arabia has been deadly to HCWs, but has not shown the ability to sustain spread to other countries. A recently published analysis⁴ of reported MERS cases between December 2016 and January 2019 revealed that 26% of 403 cases in the region were HCWs. The case fatality rate was a 16% among HCWs, compared to 34% among patients. Given these predecessors, the threat of 2019-nCoV to HCWs was a point of

emphasis at a recent Centers for Disease Control and Prevention (CDC) press conference.

“This is a hugely important issue and the health of our healthcare workers is very important to all of us,” said **Nancy Messonnier**, MD, director of the CDC National Center for Respiratory Diseases. “We are being proactive at all levels to make sure that, as much as possible, the people taking care of [these patients] are careful and cautious.”

Part of this effort is prioritizing HCW exposures to cases of coronavirus being investigated, says **Aron Hall**, DVM, MSPH, epidemiology task force deputy lead for the CDC response to the outbreak. “For contact investigations, we are taking an approach that assesses the risk and tries to put people into different categories based on the presumed risk they may have had for exposures,” he said. “At the highest level of potential risks are certainly HCWs that had unprotected exposure to a confirmed case. It is a relatively similar level of risk as household contact or intimate partners of confirmed cases.”

Voice of Experience

To get some insight into this issue, *Hospital Infection Control & Prevention* interviewed **Allison McGeer**, MD, director of infection control at Mount Sinai Hospital in Toronto. McGeer dealt firsthand with the SARS outbreak in 2003, and has consulted on hospital outbreaks of MERS in Saudi Arabia.

HIC: What is your impression of the report from China of 40 HCWs being infected?

McGeer: It’s hard to tell a lot from one event. I think this hospital is one of the hospitals that has had more transmission to healthcare workers than others. The good news, relatively speaking, is that it remains clear that the proportion of cases in this outbreak

that are healthcare workers is much smaller than SARS. It is not the same kind hospital issue that SARS was. This hospital appears to be the exception. The key issue is that healthcare workers are now protected because there are protocols in place. The risk of outbreaks of any infectious disease is always higher from unsuspected cases. At the beginning of an outbreak they are all unsuspected.

HIC: It appears at least 10 patients were infected by an unsuspected case.

McGeer: The challenge of this virus — if there is community spread — is that it is going to be much more difficult to separate [2019-nCoV] from everything else that causes fever and respiratory symptoms. That could present a very significant challenge to protecting healthcare workers. Say a case comes to a hospital — for a reason that is completely unrelated to novel coronavirus — but happens to be incubating it and develops illness in the hospital. Your go-to diagnosis in a post-op patient who develops fever is not novel coronavirus.

HIC: Having dealt with both SARS and MERS, can you comment on how this new 2019-nCoV compares to these other coronaviruses?

McGeer: It is very clear that the timing of when people are infectious with this coronavirus is different than SARS and MERS. With SARS and MERS, people are non-infectious before they have symptoms and non-infectious usually for the first few days of symptoms, and not as infectious if they don’t get severe illness. What that means is the time when people with SARS and MERS are most infectious is when they are more seriously ill, when they are admitted to hospitals, and particularly when they are admitted to intensive care units. SARS and MERS are viruses that primarily spread in hospitals. This new coronavirus is spreading more in the community. If

you look at the numbers, in SARS, more than 20% of infections were in healthcare providers, and a substantial additional fraction were hospitalized patients and in visitors to hospitals. Most cases of SARS were associated with transmission in hospitals.

HIC: Other than this paper, there doesn’t seem to be as much reported spread to HCWs with this new coronavirus.

McGeer: Yes, though it is clear that there is some hospital transmission. It may be that hospital transmission [of 2019-nCoV] is like what we usually see, for instance, with things like influenza. There is some significant paranoia among some American commentators about the Chinese hiding things. The Chinese have been remarkably open and very quick to get at this. If this was like SARS and most of [the cases] were big hospital outbreaks, we would know about it. They are talking about all sorts of things so there would be no reason why they wouldn’t tell us if they were having large hospital outbreaks. ■

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WHO International Emergency: A Great Wall Around China?

Emerging coronavirus could effectively put China in 'quarantine'

The World Health Organization (WHO) declared the 2019-nCoV outbreak in China a Public Health Emergency of International Concern (PHEIC) on Jan. 30, 2020. In doing so, WHO emphasized that China should not be isolated from the global community, which can happen after a PHEIC is issued.

"[Nations] implementing additional health measures that significantly interfere with international traffic (refusal of entry or departure of international travelers, baggage, cargo, containers, conveyances, goods, and the like, or their delay, for more than 24 hours) are obliged to send to WHO the public health rationale and justification within 48 hours of their implementation," the WHO announcement stated.¹ "WHO will review the justification and may request countries to reconsider their measures. WHO is required to share with other States Parties the information about measures and the justification received."

Unfortunately, that was already happening with the rapid expansion of cases, and China will likely become more isolated until cases begin to drop.

"The decision was anticipated. I think it makes formal what had been happening already," says **William Schaffner**, MD, an infectious disease physician at Vanderbilt University Medical Center. "Namely, travel to and from China was being interrupted informally in many circumstances. Our own university, for example, has let all students know that they were not to go to China on any kind of scholarly pursuit. That's prudent of course. This will have major economic implications

for China and it's unfortunate that it has been instituted. In effect, it puts a country in quarantine."

The WHO will dispatch a multidisciplinary team to China to review and support efforts that will investigate:

- the animal source of the outbreak;
- the clinical spectrum of the disease and its severity;
- the extent of human-to-human transmission in the community and in healthcare facilities;
- the current efforts to control the outbreak.

What Is the Source?

WHO particularly emphasized the importance of finding the source, to rule out hidden transmission and to inform risk management measures. As with SARS and MERS, 2019-nCoV is most likely from an intermediate animal host that contracted the virus from bats. WHO emphasized the need for enhanced surveillance in regions outside the epicenter in Hubei province, including pathogen genomic sequencing, to understand whether local cycles of transmission are occurring.

One infectious disease expert who is closely following the outbreak theorizes² that 2019-nCoV has been circulating for some time, well before the first cases were discovered in the city of Wuhan. A recently published study³ of 41 cases suggests infections were occurring earlier in November, and perhaps October, but there was no available

diagnostic test at that time, says **Daniel Lucey**, MD MPH, FIDSA, FACP, an infectious diseases physician at Georgetown University Medical Center.

"To tell you the truth, I think this outbreak started before the December outbreaks in the seafood and live animal market," he says. "That paper shows 41 patients and what day they became symptomatic. The very first patient became sick on Dec. 1. The most important thing is that patient had no exposure to that seafood market. In fact, 14 of the 41 patients had no exposure to the seafood market. It didn't start with the seafood market in Wuhan. It started somewhere else. How far back does it go? Is there a chain of initial cases that we didn't know about — maybe from other markets? Also, to me that explains why there is such rapid spread now to all the other provinces and other countries. Because the virus has been around for a while — maybe even since September."

In the absence of a test, prior cases were likely assumed to be pneumonia and flu that are common in the winter months in China, he says. "They developed the rapid diagnostic test after they first discovered the virus on Jan. 7," Lucey says. "And now they are testing all of these people in hospitals with pneumonia and they are finding positives. That's not because all of a sudden in December and January we have this mutated virus that is very contagious. It's because the virus has been circulating for months in Wuhan."

On Dec. 30, 2019, China reported an outbreak of respiratory disease in Wuhan City. Reports indicate that some of the first patients in China were

at a Wuhan seafood market, which also sold chickens, bats, snakes, marmots, and other wild animals.

The scientific consensus is that both SARS and MERS coronaviruses arose in bats, before transferring, respectively, to palm civet cats in China and camels in Saudi Arabia. The animal reservoir of 2019-nCoV has not been definitively determined, but China has closed all live animal markets in the wake of the outbreak.

A recently published genetic analysis⁴ by Chinese scientists reported that the 2019-nCoV may be of snake origin via bats. However, the most likely suspect, as this report was filed, was pangolins, scaly ant-eating mammals that are protected, but sold on the black market for presumed medicinal benefits.⁵

Identifying that the palm civet cat was the intermediary host for SARS led to a mass culling of the animals from markets where they were sold live as food. In addition to that and other aggressive actions, the SARS outbreak ended relatively quickly and the virus has not been seen again. In contrast, the Saudis have resisted culling camels, an animal central to their culture. Thus, MERS is still present in the region, though it has not shown the ability to sustain transmission to other parts of the world.

“Each of these rogue coronaviruses that jump species from animals to humans has its own characteristics and personality,” Schaffner says. “From a scientific point of view and a better comprehensive understanding, we would like to figure out the animal source for the people in China.”

Though the animal source may yet be found, the situation has evolved from a suspected point-source outbreak at the Wuhan market to general widespread transmission in the community, the Centers for Disease Control and Prevention (CDC) reported recently.

“When the outbreak began, there was an indication that many of the cases had been at a seafood and live animal market in Wuhan province,” says **Timothy Uyeki**, MD, MPH, MPP, the Clinical Team Lead for the CDC response to 2019-nCoV. “However, as the weeks ensued, fewer and fewer cases reported that exposure. So, increasingly, reports out of China do not indicate specific exposure to a market or animal markets in general. So this, coupled with some of the other available information, suggests the virus is spreading person-to-person in China.”

Unknowns

WHO acknowledged that there are still many unknowns, as cases now have been reported in five WHO regions in one month, and human-to-human transmission has occurred outside Wuhan and outside China.

“The Committee believes that it is still possible to interrupt virus spread, provided that countries put in place strong measures to detect disease early, isolate and treat cases, trace contacts, and promote social distancing measures commensurate with the risk,” WHO stated.

The committee emphasized that the declaration of a PHEIC should “be seen in the spirit of support and appreciation for China, its people, and the actions China has taken on the frontlines of this outbreak, with transparency, and, it is to be hoped, with success. In line with the need for global solidarity, the Committee felt that a global coordinated effort is needed to enhance preparedness in other regions of the world that may need additional support for that.”

Priority measures are rapid development and access to potential vaccines, diagnostics, and antiviral

medicines, which will be needed particularly if the virus spreads to countries with few resources.

“It is expected that further international exportation of cases may appear in any country,” the WHO stated. “Thus, all countries should be prepared for containment, including active surveillance, early detection, isolation and case management, contact tracing and prevention of onward spread of 2019-nCoV infection, and to share full data with WHO.” ■

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HOSPITAL INFECTION CONTROL & PREVENTION

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CME/CE OBJECTIVES

Upon completion of this educational activity, participants should be able to:

1. Identify the clinical, legal, or educational issues encountered by infection preventionists and epidemiologists;
2. Describe the effect of infection control and prevention issues on nurses, hospitals, or the healthcare industry in general;
3. Cite solutions to the problems encountered by infection preventionists based on guidelines from the relevant regulatory authorities, and/or independent recommendations from clinicians at individual institutions.

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CME/CE QUESTIONS

1. **According to Aron Hall, DVM, MSPH, what reproductive number is the Centers for Disease Control and Prevention (CDC) reporting for 2019-nCoV?**
 - a. 1
 - b. 1.5
 - c. 2
 - d. 3.5
2. **Given the reports of the 2019-nCoV spreading in China beyond the Hubei province, the CDC said those with possible coronavirus infection should be considered "people under investigation" if they traveled from anywhere in China and:**
 - a. are hospitalized.
 - b. have a fever that does not respond to medication.
 - c. become increasingly disoriented.
 - d. report difficulty breathing.
3. **Severe acute respiratory syndrome was originally transmitted via bats to which intermediate host?**
 - a. Camels
 - b. Palm civet cats
 - c. Snakes
 - d. Chimpanzees
4. **Daniel Lucey, MD MPH, FIDSA, FACP, an infectious diseases physician at Georgetown University Medical Center, theorized that 2019-nCoV:**
 - a. began with infections in seafood and wild animal markets.
 - b. passed into humans through uncooked food.
 - c. had been circulating for weeks or months before detection.
 - d. could be stopped by ending the practice of wild animal markets.