COVID-19 On the Frontlines of Pandemic

Many physicians are worried about equipment shortages, physical and mental exhaustion, difficult triage decisions, losing colleagues, all in addition to the infection risk **By Delia O'Hara**

MID-MARCH, as COVID-19, the emergent coronavirus that has sickened hundreds of thousands and killed tens of thousands of people around the world, rolled out across the Chicago area, the medical community stepped up to meet it amid a welter of mixed messages from the federal government and grave scarcities of critical equipment. At the same time, with one voice, physicians called on area residents to do their part by staying away from one another as much as possible.

"In my 26 years of practice, by far, this is the biggest challenge we have ever faced in infectious disease. The situation is evolving rapidly—in fact, by the day. What we told you last week may not apply today," Robert Citronberg, MD, told reporters on March 18. He is director of infectious diseases at Advocate Lutheran General Hospital in Park Ridge.

On March 18, Illinois reported 288 cases of COVID-19, and one death, but the exponential nature of the disease transmission assures that thousands are infected here now, and that the number of deaths will keep rising. With estimates of the overall fatality rate running between 1% and 4%, COVID-19 is most menacing for people older than 60 or with an underlying health condition, but many younger adults are becoming very ill as well. Of 508 people hospitalized for COVID-19 in the U.S. as of March 16, 29% were aged 20 to 44; 18% were 45 to 54. Fewer than 1% were younger than 20.

The U.S. Centers for Disease Control and Prevention (CDC) started warning the healthcare system about COVID-19 weeks after it appeared in Wuhan, Hubei Province, China, late in 2019, said Omar Lateef, DO, chief executive officer of Rush University Medical Center in Chicago. "In early March, we set up a command center to prepare for 'What if?' scenarios. What felt like over-preparing then rapidly became essential for every hospital in America," he said. "Every hospital has heroes who come to work every day who have to get organized around the reality that this is what we're going to be dealing with for the next several months."

Rush Erects Command Center

Rush's Near West Side hospital has 40 "negative pressure rooms" that retain infectious droplets in the room itself, to avoid infecting the rest of the hospital. Its emergency department has a covered entry bay for ambulances that can be further compartmentalized to isolate infected patients. Inside, the ED has three 20-bed units that can be isolated from one another in terms of air circulation, and every ED bed is in a room with a door. If infectious patients begin coming to Rush's ED in larger numbers, it can be swiftly fitted to accommodate rapid triage and screening, and it can expand to take in an additional 100 patients per day.

Other area hospitals now have at least some of these capabilities as well. Ernest Wang, MD, chief of emergency medicine at NorthShore University HealthSystem, said, "When you come to our emergency departments, you'll have a different experience from what it was like in the past. You'll be directed to a different area. I don't want to see infectious respiratory patients commingling with people who don't have those symptoms. And our triage algorithm is working quite well. We track the people we send home without treatment" and give them instructions for how to self-quarantine, and to make sure they don't get worse; the emergency department will admit people who need interventions.

Hospitals were discouraging people concerned

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Rush University Medical Center set up tents to use as special isolation bays for suspected coronavirus patients. The patients are given a mask, seated in chairs six feet apart, and assessed by staff wearing full protection.

LEFT TO RIGHT: Drs. Robert Citronberg, director of infectious diseases at Advocate Lutheran General Hospital; Michael Hanak, associate chief medical officer for population health at Rush; Omar Lateef, chief executive officer of Rush; Ernest Wang, chief of emergency medicine at NorthShore University HealthSystem; Lijun Rong, PhD, a virologist at UIC.

about symptoms from showing up at their emergency rooms, though. "Virtual visits are available" for Advocate patients, Dr. Citronberg said, and that was true at other healthcare centers as well.

Health Professions Whipsawed

Hospitals and health care workers (HCWs) have been whipsawed as the crisis expanded in scope, and a lack of preparation and direction on a national level took their toll. As case numbers ticked up, it became clear that there wouldn't be enough test kits, secure N95 masks, and other personal protection equipment (PPE). The Illinois Health & Hospital Association issued a plea to the construction industry, veterinarians, dentists and others to donate face masks and N95s to the state's 200 hospitals.

Many groups developed their own test kits and, in some cases, the labs to process them. Two suburban Advocate hospitals briefly offered drive-through testing centers for people authorized by doctors, but by March 19, the Illinois Department of Public Health had taken testing in a different direction, conserving kits for the demonstrably vulnerable and hospitalized, and Advocate shut down its drive-through centers, at least for the time being. Most people who contract COVID-19 will have only mild symptoms, including fever, cough and perhaps shortness of breath, but at its worst, the disease ravages the lungs with interstitial pneumonia, an especially corrosive type. Those very ill patients need a high level of care, including

Rush's special isolation bay follows a "forward triage" concept designed for many types of emergencies but in this case is being used for conronavirus. The tented space limits hospital staff contact with sick patients.

access to ventilators.

U.S. hospitals own a total of 160,000 ventilators, according to a report from Johns Hopkins University's Center for Health Security, and about 62,000 of them are full-featured, plus 98,000 less-than-optimal devices that could be used in an emergency. A 2005 federal report estimated that in a serious pandemic, the U.S could need as many as 750,000 ventilators.

Dozens of American health care workers had tested positive for COVID-19 by mid-March, a few have become very ill, and many more are quarantined. Whole health care systems will likely be pushed beyond capacity for months.

"Healthcare workers, unlike ventilators or wards, cannot be urgently manufactured or run at 100% occupancy for long periods," notes a recent *Lancet* editorial. In other countries, "reports from medical staff describe physical and mental exhaustion, the torment of difficult triage decisions, and the pain of losing colleagues, all in addition to the infection risk," the editorial states.

Meanwhile, healthcare workers' kids are home from school, and their own parents are at risk.

Michael Hanak, MD, a family medicine physician, and the associate chief medical officer for population health at Rush, agrees that even health professionals who have and wear protective gear seem to be bafflingly vulnerable to COVID-19. "There are small mistakes it's possible to make putting on PPE and taking it off that can allow for transmission. That's probably not the only reason, but it may be more common than we think," he said.

Dr. Wang said he has made his peace with the fact that he may contract the disease himself. "Some percentage of us are going to get it," he said. As has happened elsewhere, a cluster of dozens of cases emerged at a nursing home in suburban Willowbrook, Illinois, and that included a number of staff members.

According to the CDC, the incubation period for COVID-19 is two to 14 days. Infected people transmit the disease primarily through respiratory droplets coughed or sneezed onto others or into the air. One recent study shows that about one in eight infections come from people who have not yet developed symptoms, and posits that the time between infections is relatively brief, less than four days on average, about the same as the flu.

"Asymptomatic transmission definitely makes containment more difficult," Lauren Ancel Meyers, a professor of integrative biology at the University of Texas at Austin, and one of the study's authors, told EurekAlert. It means that not even the host knows she's infectious.

Experts agree that, at this point, social distancing is the key to preventing an explosion of cases. "It really works," Dr. Citronberg said. "It starts limiting infections the first day you put it

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in place. But it only works if we can get everyone to participate."

Illinois Governor J.B. Pritzker and Chicago Mayor Lori Lightfoot took aggressive measures mid-March, closing restaurants, schools and other public gathering places, eventually requiring people to stay at home and keep their distance from one another—and other local communities did, too. But not everyone has taken the threat seriously.

Dr. Hanak said a "lack of a clear national directive," and the fact that test kits have been in drastically short supply, has muddied the message to the public. "A positive test is the greatest motivation for keeping somebody off the street. I'm worried we won't have the tests and the tools we need in time to flatten the curve," he said.

Race to Find a Vaccine

Sufficient quantities of a vaccine could stop the crisis; an effective treatment could save lives. The first phase I clinical trial for a potential COVID-19 vaccine from Moderna, a Cambridge, Massachusetts-based biotechnology company, began mid-March in Seattle, Washington. And while a drug combination used to treat HIV/AIDS, lopinavir–ritonavir (Kaletra) yielded disappointing results in trials, hope is still alive for remdesivir, originally developed by Gilead Sciences of Foster City, California, to combat Ebola (but later eclipsed by other treatments). Decades-old malarial drugs are also being dusted off and tested. Re-purposing an existing drug would save precious time.

Lijun Rong, PhD, a virologist at the University of Illinois at Chicago, who works to identify the kind of small drug molecules that might keep SARS-CoV-2, the virus that causes COVID-19, from attaching to cells, said it will likely take at least several months to develop and test drugs that can stop or at least mitigate this pandemic.

"You can make a vaccine but that doesn't mean it will work. Wishful thinking is very common" in disease outbreaks, Dr. Rong said. SARS-CoV-2, the seventh coronavirus to be identified, has blindsided the research community, he adds. "We were not expecting a pandemic from a coronavirus." Four types of coronavirus, so called because of their spiky exteriors, together cause one-third of common colds; two others are responsible for the murderous SARS and MERS diseases. "We thought the next pandemic would be a flu," Dr. Rong said.

Dr. Hanak said that his role as a primary care provider—he is the acting president of the American Association of Family Practitioners—makes him worry that as health care systems pivot to fight COVID-19, patients with everyday concerns, some of them quite serious, may not get the care they need. "It's important that we don't forget about them," he said.

At the same time, Dr, Hanak thinks this is a teachable moment for the country. "Health literacy in this country is very low. That has been a major contributor to this crisis," he said. "I can't remember when something medical has gotten this kind of attention. This is a time people are apt to listen."

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Pregnant Women and COVID-19

LIFE GOES ON even in a pandemic. Babies will be born as Chicago providers battle their corner of the worldwide COVID-19 outbreak. The good news is that a happy outcome is entirely possible, even likely, for mothers and babies both.

The American College of Obstetricians and Gynecologists has developed an algorithm for assessing and managing pregnant patients who have symptoms associated with COVID-19. Brenna Hughes, MD, worked on that guidance directive for ACOG.

A woman's physiology changes while she is pregnant. More of the lungs are used to breathe, said Dr. Hughes, a maternal-fetal specialist at Duke University, and the vice-chair for obstetrics and quality. "The other thing we see is that viral infections can be more severe because of alterations in maternal immunity," Dr. Hughes said.

So far, that doesn't appear to be what happens with COVID-19. Reports of 147 pregnant women who had the virus in China "suggest that they did as well as or better than the general population—not worse." About 8% had severe symptoms, and 1% were critically ill. "This is limited data, and we haven't seen cases from the U.S. yet," Dr. Hughes said.

COVID-19 generally spares children, and Dr. Hughes said it does not appear to pass to babies in utero. "The limited reports we have are that the babies have done quite well," she said.