JOHNS HOPKINS MEDICINE

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Will This Be Us?

Picture it: a pandemic hits the United States. Your husband or wife falls ill, and health authorities force you to stay home. Schools and universities are closed, movie theaters shut down, Ravens and Orioles games are banned—even Little League is suspended.

Policemen in Seattle during the 1918-1919 influenza epidemic wear masks made by the Red Cross. (PHOTO COURTESY OF THE NATIONAL ARCHIVES AT COLLEGE PARK, MD.)

Such drastic "social distancing" measures were the norm during the devastating 1918-1919 Spanish influenza pandemic. But Hopkins-trained medical historian Howard Markel says that if this country is slammed by bird flu or another massive contagion, we would be "jerked back to 1918" and have to resort to those tactics again—at least until there's a vaccine.

In a new study of the 1918-19 pandemic, Markel and a team of researchers at the University of Michigan and the Centers for Disease Control contradict long-held beliefs about the effectiveness of social distancing measures during such a crisis. Their research shows that these old-fashioned, non-pharmaceutical interventions did in fact have a significant impact on the number of flu deaths in the American cities that applied them simultaneously and rigorously.

Earlier studies concluded that quarantines, bans on public gatherings and school closures had not reduced the spread of Spanish flu, which claimed 550,000 U.S. lives and 40 million worldwide.

Horrific as those numbers are, Markel's thorough review of census data, mortality reports, newspapers and handbills from that period showed that without these measures, the toll would have been worse. The critical factor, the study found, was how and when a city imposed them.

"Those cities that reacted earlier and in a layered fashion—doing more than one of these measures and for a sustained period of time—did better than those that did not," says Markel, who is director of the University of Michigan Medical School's Center for the History of Medicine.

"That really mirrors the situation we would find ourselves in today if a pandemic flu were to strike, because it would take at least six months to get an effective vaccine on board and distributed."

As a medical historian, Markel has severely criticized quarantines for most of his career, saying they often were "misused against people more for political, social or rhetorical means than actual microbial ones." He notes that quarantines are also frequently flawed, citing the observation of Hopkins' founding medical school dean, William Henry Welch, that a "quarantine is like a leaky vessel on a stormy ocean—water always manages to get in."

Although no measures are perfect, Markel's data show that even complying only 30 percent of the time may substantially reduce the spread of flu and its resulting death rate.

The study, published in the *Journal of the American Medical Association*, analyzed the actions taken by 43 U.S. cities, each with populations exceeding 100,000, over the 24-month Spanish flu period. The cities that initiated social distancing measures earlier had more success in decreasing their excess death rate—the number of pneumonia and flu deaths greater than the amount expected for the period—than those cities that imposed the measures later.

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GETTING THE GO TEAM READY TO GO

Labor Day weekend in 2005 became a Jerry Lewis-style telethon in the CEPAR offices. Some of the highest-level officials from the institution gave up their weekend and manned the phones to organize the largest Hopkins Medicine deployment team in its history. The team was designed to staff, in its entirety, one of the 10, 250-bed mini-hospitals that the federal government was setting up to assist the Gulf Coast victims of Hurricane Katrina.

Shortly after Katrina slammed into New Orleans and the scope of the Gulf Coast devastation became clear, I received a call at home on Saturday afternoon from Elias Zerhouni, director of the National Institutes of Health and a former Hopkins colleague, asking if we could help staff an emergency medical center with the NIH. The day before, I received a request from the state of Maryland to put together a small clinical team to replace fatigued workers in Jefferson Parish of New Orleans.

We had anticipated the potential need for major assistance, and in the days preceding these two calls, we began to request and log potential volunteers from among the Hopkins community. By the time the call came a few days later, we had catalogued more than 600 volunteers of various skill sets in our database.

The telethon on Labor Day weekend occurred because NIH gave us 24 hours to have an entire hospital staff (pharmacists, nurses, physicians, dietitians, administrators, IT specialists, security, etc.) ready to go from Andrews Air Force Base. Vaccinations needed to be arranged and government volunteer papers signed. Legal issues related to volunteerism, Hopkins' obligations and liability, and multiple human resources issues all needed to resolve quickly.

Ultimately, a 15-member team deployed to Jefferson Parish and 109-member team was created to be sent to Meridian, Miss. The latter team stood on alert, sometimes hour-to-hour for 96 hours, but deployment never occurred. The government overestimated the need for highly acute medical services. The Jefferson

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Big Brother Is Watching—for **Disease Outbreaks**

The National Aeronautics and Space Administration (NASA) plans to use 14 weather satellites to keep tabs on the Earth's changing environment—so scientists can get a head start on tackling possible pandemics.

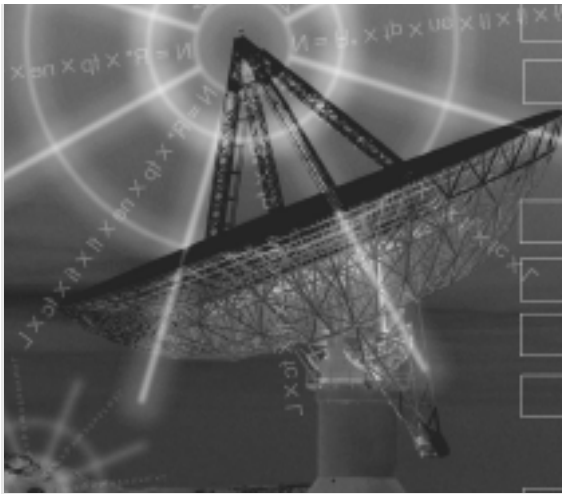
The Centers for Disease Control and Prevention and the Department of Defense will receive a daily stream of data that experts can use to predict and track infection outbreaks caused by such deadly viruses as Ebola and West Nile.

NASA's Applied Science Program revealed its satellite project at the annual meeting of the American Society of Tropical Medicine and Hygiene in Philadelphia this November.

Climate, rainfall and vegetation play a critical role in whether infectious diseases—and the vectors that spread them—can thrive. NASA already has a project to monitor outbreaks of malaria, which sickens 300 million to 500 million people and kills between 1 million and 3 million around the world each year.

The Armed Forces Research Institute of Medial Sciences in Thailand and the U.S. Naval Medical Research Unit in Indonesia combine NASA's satellite reports on their regions to monitor the environmental conditions that affect malaria transmission in Southeast Asia, as well as other tropical and subtropical areas.

NASA's eye-in-the-sky malaria surveillance gives public health organizations additional time to respond to outbreaks and helps focus the use of pesticides to



control the spread of drug-resistant strains of the disease.

The remote sensing technology in NASA's satellites also supplies data about possible plague vectors, such as insects or rodents, in areas around the world and in Western U.S. states such as Colorado, New Mexico, Arizona and Utah that are susceptible to outbreaks of plague and Hantavirus, a potentially deadly disease spread by rodents. With satellite-provided information on the rainfall, vegetation and topography of these areas, scientists can forecast the food supply of disease-transmitting vectors within the region and their potential for threatening humans.

Since plague also is seen as a potential bioterror weapon, the NASA surveillance program helps scientists determine if an outbreak is the result of natural causes or bioterrorists. ■

Will This Be Us?

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Eighteen of the cities had two surges of flu-related deaths—one before the social distancing requirements went into effect and one after they were dropped. In some cities, if the measures were restored, deaths again went down.

Letter carrier in New York wearing mask for protection against influenza. New York City, October 16, 1918.
(PHOTO COURTESY OF THE NATIONAL ARCHIVES AT COLLEGE PARK, MD.)

Docs in Black

At the vanguard of tactical medicine, life-saving "SWAT docs" like Nelson Tang are poised for peril.

Nelson Tang dresses in black for a reason: If he's called into a nighttime sniper situation, he'll blend in with the shadows. "We try not to carry bright, shiny objects," he says, flashing the glint of a steel surgical tool. "Something like this can get you killed. You're lit up in a field somewhere. You'd be the first target." Increasingly, explains Tang, makers of instruments intended for "tactical medicine" tailor the devices for the "light discipline" so valued by police SWAT teams—all-black stethoscopes, scissors and scalpels. "Stealth is an important consideration," says Tang.

As a physician who heads up special operations for emergency medicine at Johns Hopkins, Tang occupies a unique place in tactical medicine's vanguard. With armed violence on the rise, emergency responders have sought ways to combine firepower with quick life-saving skills, prompting SWAT teams to include physicians when responding to hostile incidents. Hopkins has emerged as a leader in this new approach, hosting a modern training center on the Mt. Washington campus where physicians and police groups at every level of government can share skill sets.

After completing his medical residency at Hopkins and joining the medical faculty in 1997, Tang found himself serving part time with presidential Secret Service units by 1999. The war on terror then spawned the Department of Homeland Security, which selected Hopkins as one of its key centers two years ago. Hopkins is now one of the nation's only academic medical centers to specialize in tactical medicine, with five faculty members and two full-time paramedics.

Taking their cues from combat medicine, tactical physicians don protective gear and deploy with "entry teams" made up of four to six people. The only distinction for the team's physician—always the last to enter any hot spot—is that the doctor carries a medical "go bag" instead of a weapon.

Traditionally, physicians or paramedics would wait at a mobile unit some distance from the danger zone until given the all-clear signal from police. The lag time inevitably raises the risk of losing lives to blood loss. Skilled SWAT docs are on the scene instantaneously—potentially shrinking the long-revered "golden hour" of trauma medicine to mere seconds.

Tang displays his "go bags."

When Tang needs to travel light, he favors the "M-9" go bag, which contains "all the immediate essentials," he says. These include packets of powder designed to quickly stanch bleeding on multiple victims—a terrific asset when the injured can't be moved, "as in a barricade situation," he explains. The bag is also equipped with a small skin-stapling kit for closing wounds, along with the basic items for restoring fluid levels via IV lines.

Though Tang has donned his gear countless times, he has not yet been exposed to an active shooting case. Yet you get the sense he'd keep his cool under fire. ■

For example, St. Louis simultaneously closed its schools and prohibited public gatherings and had an excess mortality of 358 per 100,000. New York strictly isolated flu sufferers and quarantined those who had contact with them, but did not close its schools. Its excess mortality rate was 452. Pittsburgh banned public gatherings during the pandemic's second wave in October 1918 but didn't immediately close schools. When it did, the public gathering ban was lifted. Its excess mortality rate was 807.

The Markel team's findings already have been incorporated into the federal government's guidelines for community action in the event of a pandemic.

Baltimore City is working with Hopkins' Bloomberg School of Public Health to devise plans for responding to a flu pandemic. "This would involve social distancing and quarantine," says Joshua Sharfstein, commissioner of the city's health department.

CEPAR has helped coordinate a master pandemic response plan for the Hopkins Health System. It includes screening all patients who enter Hopkins Hospital, Hopkins Bayview and Howard County General Hospital once a pandemic has been declared, isolating pandemic patients, and requiring those who treat or visit them to wear special protective gear. ■

PACER PROJECTS

SPEEDIER, MORE ACCURATE BIOTHREAT DETECTION

Within weeks of the Sept. 11, 2001, terrorist attacks, letters mailed to news organizations and U.S. senators—and laced with deadly anthrax spores—infected 22 people. Five of them died. Physicians, not expecting such a rarity as anthrax, initially diagnosed these patients as having symptoms of pneumonia and other mundane respiratory illnesses, causing a tragic delay in proper treatment.

Quick, correct diagnosis of a serious illness followed by fast action to treat it and stem its spread can save lives, but it's tough for family physicians or even specialists to do that if the illness is unfamiliar or mimics other diseases.

After 2001, that concern compelled scores of scientists to invent faster, more accurate devices for diagnosing unfamiliar and possibly epidemic illnesses, following their spread and alerting health officials to them.

Yet until now, no one has compiled a complete picture of the progress made—or what still needs to be done.

Richard Rothman, associate professor in Hopkins' Department of Emergency Medicine and Department of Medicine, is tackling just that with several Hopkins colleagues and associates at other institutions. Under Rothman's direction, the CEPAR-led national Center for the Study of Preparedness and Catastrophic Event Response (PACER) launched a three-pronged project this year to analyze the ways physicians can recognize such unusual outbreaks and come up with faster methods to control their spread.

One of the team's studies is a survey of the most promising new technologies for rapid diagnosis of all so-called biothreat agents—including bacteria, viruses and poisons.

These include a microchip that contains the DNA sequences of all 22,000 known viruses and can quickly recognize them in human samples; and the adaptation of a mass spectrometer, a machine that can identify something by the weight of its molecules, to test the breath of infected individuals for virus or bacteria.

"Traditional diagnostic testing involves obtaining cultures," explains Rothman, "but often takes several days before the results come back. There are all these new techniques that can produce almost immediate results, with some tests coming back within minutes or just a few hours."

When Rothman's team completes its survey of hundreds of academic institutions and biotechnology companies, its findings will highlight the best new diagnostic technologies and may encourage clinicians, public health officials and the Department of Homeland Security to push for faster production.

A second team is looking for ways to improve the nation' s existing Laboratory Response Network, an integrated system of medical laboratories organized by the federal Centers for Disease Control. The network process spots and reacts quickly to disease outbreaks.

First, "sentinel laboratories"—local hospital labs that provide routine diagnostic services—refer unusual germ specimens up to state health department labs. These "reference laboratories" then forward highly infectious biological specimens up to the national CDC labs. Finally, these labs analyze the disease strains and figure out where rare illnesses may have originated.

"We're looking at what challenges there may be to bringing new diagnostic technologies into use," says Rothman. "We're also trying to understand what capacity the Network has for handling large numbers of samples in the event of an outbreak."

The third focus of Rothman's team is the effectiveness of each state's current "syndromic surveillance" systems for recognizing disease outbreaks—including bioterrorist attacks—and for alerting health authorities around the country.

"In the past five years, there's been a tremendous growth of the effort and resources going into these fields," says Rothman. "Whether it's sufficiently structured and organized to make a clear, quick diagnosis and response when there's a true, large-scale outbreak is yet to be tested." ■

Getting the Go Team Ready to Go

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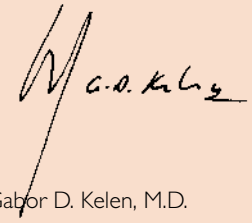
Parish team treated more than 300 patients, and a second team was sent to replace the first after 16 days.

As successful as we were—under the circumstances—in assembling, preparing and deploying the medical "Go Teams," the logistics were extraordinary because it was unplanned. Now that we know we can respond at this highest level, we wish to develop a permanent plan and maintain a trained Hopkins volunteer medical force to respond to major disasters.

Accordingly, we are devising plans to create the Johns Hopkins Go Team, a multidisciplinary, stand-ready reserve of Hopkins Medicine personnel specially trained to deal with calamities. Once created, the pool of potential respondents can be readily assembled into a "Go Team" and deployed for quick dispatch to the site of any natural or manmade disaster.

Training of the volunteers would include instruction in such subjects as the principles of basic disaster life support, team building, communication and the use of emergency equipment. We envision modular-sized, flexible teams of as few as 10 to as many as 100 or more, depending on the requirements.

Although basic costs for a 10-person team are likely to be as little as $3,500 per assignment (assuming transportation is paid by a government agency or requesting entity), costs associated with logistics, administration and human resources could be considerable.



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