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INSIDE

RELIAS MEDIA

Measles Breaks Case Record, Hits 22 States and Big Apple

Healthcare facilities get creative to prevent exposures

By Gary Evans, Medical Writer

A record resurgence of measles in 2019 includes two large, ongoing outbreaks in New York, where the Centers for Disease Control and Prevention (CDC) is helping hospitals and outpatient clinics prevent transmission from incoming cases.

"We have been working with all types of healthcare facilities in New York when there have been patients suspected of having measles," says **Karen Alroy**, DVM, MPH, an officer in the CDC's Epidemic Intelligence Service (EIS). "Measles virus is particularly challenging because a person can shed the virus four days before the rash develops."

> "THE LONGER THESE OUTBREAKS CONTINUE, THE GREATER THE CHANCE THAT MEASLES WILL AGAIN GET A FOOTHOLD IN THE UNITED STATES."

By April 29, 2019, the CDC already had reported a record 704 measles cases for the year, the largest number of cases in a year since measles was declared eradicated in the U.S. in 2000. The CDC estimates about 4% of measles cases in outbreaks are acquired in healthcare facilities, Alroy says. Applying that estimate to the 704 cases means some 28 people have acquired measles in a healthcare setting in the ongoing outbreak.

In light of several international outbreaks, the CDC is advising measles immunization for traveling children less than one year old while re-emphasizing the safety of the measles, mumps, and rubella vaccine. *(See related story, page 64.)* In the pre-vaccine era, measles

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EDITOR: Jesse Saffron
(919) 377-9427
jsaffron@relias.com

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killed some 400 to 500 children annually and caused serious but survivable conditions.

"Of the 704 cases in 2019, 9% have been hospitalized and 3% have had pneumonia. At this time, there have been no deaths," **Robert Redfield**, MD, CDC director, said at a recent press conference. "There is no way to predict how bad a case of measles may be. Some children may have very mild symptoms, but others may face more serious complications like pneumonia or encephalitis."

A large outbreak in Washington state has ended, but outbreaks are continuing in New York, said **Nancy Messonnier**, MD, director of the CDC's National Center for Immunization and Respiratory Diseases.

"The outbreaks in New York City and New York state are the largest and longest-lasting since measles elimination in 2000," she said.

From October 2018 through April 29, 2019, there have been 423 confirmed measles cases in Brooklyn and Queens. Just north of the city, Rockland County, NY, had 214 cases as of May 3, 2019. Many of the New York cases are in members of the Orthodox Jewish community. The index case is thought to be an unvaccinated child who traveled to Israel, where there is a large measles outbreak.

Measles cases have been reported in 22 states, showing how travelers from outbreak areas domestically and internationally can lead to geographic disbursement. If someone with measles arrives in a susceptible community with low vaccination levels, another outbreak can begin.

"The longer these outbreaks continue, the greater the chance that measles will again get a foothold in the United States," Messonnier said at the press conference.

It has been generally estimated that dipping below a 95% vaccination level in a population could undermine herd immunity and lead to ongoing transmission and sporadic cases.

"That is an important thing to be talking about," says **Shruti Gohil**, MD, director of infection control in the University of California, Irvine Medical Center. "If we lose enough of the people who are [typically] vaccinated, we could roll this backward."

First Case

Having dealt with measles outbreaks in 2014 and 2015, Gohil was ready when her first measles case of 2019 was recently admitted. Among the immediate priorities was reinforcing the signs and symptoms of measles to ensure case identification.

"There are a whole host of doctors who are on the front lines who have never actually seen a real measles case," she tells *Hospital Infection Control & Prevention*. "We need to make sure we understand the signs and symptoms of measles and how to recognize the syndrome."

Suspect cases should be put in isolation in a negative pressure room and tested for measles. Remind clinicians that measles is a true airborne pathogen, reinforce policies with signage, and set up a triage plan, she recommends.

"Triage patients at the earliest opportunity to minimize exposures in the hospital," she says.

All these measures are key to prevent an undiagnosed case sitting in the ED, exposing staff and other patients and triggering a labor-intensive follow-up.

"If you do have an exposure in

your hospital, you must assess your common area air space and decide how big the group is that could have been exposed," Gohil says. "Then identify whether everybody has blood titers [showing immunity] or has been vaccinated."

Those exposed who have no immunity should be vaccinated or administered IGIM (immune globulin intramuscular) post-exposure prophylaxis (PEP), depending on their risk factors. Generally, measles PEP must be administered in less than 72 hours and is usually reserved for infants, pregnant women, or the immunocompromised.

Healthcare workers at Gohil's hospital must have evidence of measles vaccination or show immunity through blood titers.

"We require ... you show evidence of prior immunization — you received two doses of MMR," she says. "If you do not have hard documentation of that, we require titers that show if you are immune."

Clinics Overwhelmed

The ongoing outbreak in New York City has resulted in a high volume of incoming suspect cases in both hospital emergency departments and outpatient settings. Hospitals generally have negative pressure rooms to isolate suspect or confirmed cases, but clinics and outpatient setting have had to get creative to prevent transmission from incoming cases.

"The virus can stay in the air for up to two hours," says Alroy, the EIS officer fighting the outbreak in New York. "Often, a hospital will generate a list of who was exposed."

The current guidance from CDC is that exposures could occur to anyone who shared a common space with a patient later confirmed to have measles — and anyone who entered that space for up to two hours afterward. This policy became overwhelming for outpatient facilities, which have little resources to track and alert potentially exposed patients.

"You can see a lot of patients in two hours in an [outpatient] practice," she says. "So, we were seeing this large number of people potentially being exposed to the measles virus."

Some of the outpatient facilities began adopting workarounds like asking patients with measles symptoms to call ahead or be evaluated by clinicians in an outside area.

"We heard of them doing some really creative low-cost strategies to help minimize the risks of exposing other patients," she said. Alroy and colleagues surveyed[1] facilities to see what was working so they could disseminate best practices to other sites.

"CDC recommends these outpatient facilities try to control droplet transmission by putting a mask on the patient, examining them in a private room, and then [leaving] that room unused for two hours after the patient leaves," she says.

That approach directly controls droplet transmission, but there still is the possibility of airborne transmission depending on variables like how long the patient was unmasked in a common area.

"Somebody infected with measles can be sick with somewhat non-specific clinical signs such as cough, fever, and runny nose," she says.

Call First

Some sites are screening patients by phone if possible, assessing symptoms and designating arrival plans. A sign in front of a clinic may say "call rather than enter if you have measles symptoms or have been exposed to someone who has measles."

"The screening is super important — either by telephone, signs, or somebody standing outside the front door," Alroy says. "Make sure to ask every patient if they are experiencing signs consistent with fever, cough, runny noses, and rash."

Recent travel to an area that was experiencing a measles outbreak also is an important piece of information.

In addition to designating an outside assessment area, facilities with access to a separate nearby building may set up exam rooms there.

"In New York City, all healthcare providers are required to have immunization against measles virus," she says. "If other staff members are in those buildings, they should be already protected."

Other strategies being used include having a suspect measles case use specific entrances and exits designed to minimize exposure.

"Ideally, it would be in a place that was not in the same building or air space because the virus can travel by ventilation systems," Alroy says. "Some facilities also are seeing suspect measles patients after normal hours or even doing home visits if possible."

Even with signage posted, some hospitals have placed a staff member outside the emergency department entrance.

"The signs are great, but unfortunately in our society — where people are being bombarded with information all the time — people miss the signs and walk right by them," she says.

The CDC is using serological tests for measles immunity and genetic tests that inform patterns of

transmission. Results are generally available in one or two days.

"Another important thing is that staff members at these facilities — from the front desk to the doctors — should really be well versed about measles and know the signs and symptoms," Alroy says.

"They should find out if transmission is happening in their area. Are there any particular parts of the city that they need to be aware of? Patients coming from those areas may pose a higher risk."

The legacy of the 2019 measles outbreaks could be that it was a teachable moment that underscored the need for vaccination.

"I think that we are very fortunate in the U.S.," she says.

"In 2000, endemic measles transmission was declared eliminated. That is largely because of the incredible power of the vaccine. We haven't had to deal with our children or family members getting sick. We might have forgotten how serious of a disease this is." ■

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CDC Recommends Measles Shot for Travelers

Infants under 12 months should receive one dose of MMR

Lowering the age of measles immunization for travelers due to international outbreaks, the Centers for Disease Control and Prevention (CDC) "strongly recommends" that infants six months through 11 months receive one dose of measles, mumps, and rubella (MMR) vaccine before travel.

"Normally, we don't recommend the measles vaccine begin in infants until 12 months of age," **Robert Redfield**, MD, CDC director, said at a recent CDC press conference. "But because of the current situation globally, we recommend these infants get a dose of the MMR vaccine prior to travel."

Children 12 months of age or older need two doses separated by at least 28 days, he added.

"People traveling internationally should try to be fully vaccinated at least two weeks before traveling," he said.

"But even if your trip is less than two weeks away, you should still get a dose before you depart."

Overall, 44 measles cases this year were from other countries.

"Among those cases, over 90% were in people who are unvaccinated or whose vaccination status was unknown," said **Nancy Messonnier**, MD, director of the CDC's National Center for Immunization and Respiratory Diseases.

The top three countries where importations are coming from are Ukraine, Israel, and the Philippines, she added.

"When measles is imported into a community with a highly vaccinated population, outbreaks either don't happen or are small," Messonnier said.

"However, once measles is in an undervaccinated community, it's difficult to control the spread of disease."

Two MMR vaccine doses are roughly 97% effective at preventing measles (one dose, 93% effective). But measles is resurging in recent years as parents decline to vaccinate their children.

There may be religious objections, unfounded fear that vaccines are linked to autism, or the perception that vaccination is unnecessary because measles is so rarely seen in the U.S.

There is even false nostalgia pushed by the national antivaccine movement, as evidenced in the recent controversy over an old TV show that portrayed measles as a comic rite of passage.

The issue spilled over into politics at the CDC press conference as reporters recalled President Trump linking vaccines to autism when he was a candidate in the presidential debates. (See *Hospital Infection Control & Prevention*, November 2015.)

He has changed his position on this, emphasized **Alex Azar II**, Secretary of the Department of Health and Human Services.

"The president was very firm last week that people need to get their shots, vaccinations are so important," Azar said.

"The scientific community has generated new and definitive information that there's no association between vaccines and autism."

Azar cited a recent large study in Denmark of some 650,000 children that found no link to MMR vaccination and autism.

"MMR vaccination does not

increase the risk for autism, does not trigger autism in susceptible children, and is not associated with clustering of autism cases after vaccination," the authors concluded.[1]

(Editor's note: For IPs needing an educational resource, the Infectious Diseases Society of America has issued a myth-busting fact sheet on measles vaccine safety. It is available at: https://bit.ly/2PpaM2d.) ■

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CDC Investigators Report *Pseudomonas* Superbug

Two frontline reports from the CDC's recent EIS conference

An emerging strain of *Pseudomonas aeruginosa* with a novel mechanism of resistance to most antibiotics has been detected in healthcare outbreaks in Lubbock, TX, and Tijuana, Mexico, the Centers for Disease Control and Prevention (CDC) reports.

The outbreaks were described at the CDC's recent Epidemic Intelligence Service (EIS) conference by two of the agency's EIS officers, the vaunted "medical detectives" who traditionally have investigated the first cases of emerging pathogens. The etiologic agent in both outbreaks is Verona integron-encoded metallo-beta-lactamase carbapenem-resistant *P. aeruginosa* (VIM-CRPA).

Genetic analysis thus far shows no epidemiologic link between the ongoing regional outbreak in Lubbock and an outbreak among U.S. patients who traveled to Tijuana for weight loss surgery.

As carbapenems are typically last-line drugs, organisms like VIM-CRPA that develop resistance to these antibiotics are an immediate threat to proliferate. For example, in 2001, only one state reported *Klebsiella pneumoniae* that had acquired carbapenem resistance. In 2018, all 50 states had reported cases of this resistant strain.[1]

"Resistance like VIM is found in mobile genetic elements and can be transferred horizontally among different bacteria," said **Christopher Prestel**, MD, a CDC EIS officer. "They are almost exclusively found in healthcare settings, and so we consider this an important healthcare threat. Internationally, similar antibiotic-resistance elements and detected rates of carbapenem-resistant isolates can skyrocket from 5% to close to 30% within two years."

VIM-CRPA is spreading among hospitals, skilled nursing facilities, and other settings in Lubbock, with 33 clinical infections confirmed, and three deaths. With little more than 100 cases detected nationally, Lubbock has a disproportionate number of infections but no clear reservoir for the pathogen.

"Essentially, this town of 250,000 people makes of one of every three VIM-CRPA detections in the U.S.," Prestel said.

The outbreak was discovered because two hospitals in Lubbock were routinely sending isolates to the CDC Antibiotic Resistance Laboratory Network. The network has participating labs in all states, as well as seven regional labs that can perform cutting-edge genetic analysis of pathogens.

"In June of 2017, an 84-year-old woman developed clinical infection in her abdomen following abdominal surgery for pancreatic cancer," Prestel said of the index case. "The culture grew *Pseudomonas aeruginosa*, and it was resistant to all common antibiotics, including carbapenems. Over the next 13 months, 24 more people developed infections with VIM-CRPA. There were no clear epidemiologic links."

The case count had increased to 33 when Prestel presented the findings[2] at the EIS meeting. In the ongoing investigation, facilities with VIM-CRPA patients were offered infection control consultations and screenings of patients for colonization. Screening of a selected sample of 265 patients from seven hospitals showed no colonization with VIM-CRPA.

Whole genome sequencing showed the Lubbock cases form a distinct cluster when compared to isolates in other geographic cases.

"From the genome sequencing, it's clear that the isolates kind of cluster among themselves but don't really appear to be related to other parts of the country," he said.

That said, the genetic analysis shows signs of nosocomial transmission from one patient to another. "Some of the snips [single

nucleotide polymorphisms] are so close they suggest transmission within the same healthcare facility," he said.

In the absence of a clear environment reservoir, is it possible the mobile plasmids in VIM-CRPA could be transferring resistance to susceptible strains of *P. aeruginosa* and potentially to other gram-negative bacteria?

"I think that is the million-dollar question," he said. "One thing that we are looking into is the community cases that were cultured close to the time of admission. We are trying to find out if there are common risk factors or exposures that these individuals have."

P. aeruginosa already is one of the most common hospital-associated infections, and mortality can approach 60% in bloodstream infections, he said.

The majority of the cases are wound infections, urine cultures, and respiratory infections. Although no environmental reservoir has been found, the connection to hospitalization and healthcare is clear. Overall, 48% of cases were hospitalized three months prior to positive culture, he said.

"Going a year out increases that to 80%," he added.

In other risk factors in infected patients, 64% underwent surgery in the previous year and 33% lived in a nursing home.

"These exposures happened at multiple different facilities across Lubbock," he said. "We identified 15 different locations for patients receiving care."

These included acute care hospitals, long-term acute care facilities, and skilled nursing facilities that included one with patients on ventilator support.

Infection prevention assessments included hand hygiene observations, and environmental cleaning assessments using fluorescent markers on high-touch surfaces in random rooms. These assessments were performed at seven facilities in the city.

"All but two facilities had someone in charge of their infection prevention that had received accredited training," he said. "All but one facility had written policies for things like hand hygiene and contact precautions for patients with multidrug-resistant organisms."

The hand hygiene observation results seemed fairly typical of historical examinations in the absence of a major quality improvement push.

"About 50% of hand hygiene compliance was carried out at these seven facilities, and that ranged from zero to 77% of hand hygiene observations at different facilities," Prestel said. "Similarly, we found about half of the rooms were appropriately cleaned with a range of 16% to 84%."

The CDC and clinical partners provided on-site training at each facility to engage staff to improve hand hygiene and environmental cleaning. Communication between facilities transferring and receiving patients across the continuum also was called into question.

"We identified some gaps in communication," he said. "All seven of the facilities indicate that they talk to the receiving facility when they are transferring a patient out. However, when asked if they were given the same information when receiving a patient, only three out of seven facilities reported receiving that information."

The CDC worked with the local health department and clinicians to create a patient transfer form that calls for identification of the pathogen, personal protective equipment needed, and other key information for the receiving facility.[3]

Considering the assessment findings, Lubbock health officials and infection preventionists formed a collaboration to "BOOT VIM Out of Lubbock." The "BOOT" acronym generally stands for these concepts:

- Be prompt in the response to new cases;
- Obtain isolates from screening and laboratories;
- Optimize infection prevention;
- Transfer form should be used for cases.

"That was really a grassroots effort intended to engage the local people, and it was mostly attended by infection preventionists," he said of the launch of the campaign.

Prestel and CDC colleagues were preparing to return to Lubbock after the EIS conference for a six-month follow-up visit. A 12-month follow-up also is planned, as well as ongoing consultations with facilities and educational webinars.

"We are continuing to do some investigations to see if there is an underlying reservoir, but I think it is clear that this is regional transmission," he said. "Whether we find a reservoir or not, we want to ensure that the infection prevention practices that we know work are being carried out to prevent further transmission."

Denise Cardo, MD, director of the CDC division of healthcare quality promotion, was the moderator of the EIS session. Infection prevention is being emphasized in hospitals but tends to diminish in other facilities across the healthcare continuum, she said. Handwashing is generally better in hospitals and worse in lower-resourced skilled nursing facilities, Cardo noted.

"It is a shock to us to see how care is being delivered in these places," she said. "We don't have a baseline, but know that everywhere we go — especially for skilled nursing facilities with ventilators — practice is very bad."

Skilled nursing facilities for ventilated, high-acuity patients have been implicated in outbreaks of other pathogens, including multidrug-resistant *Candida auris*. (See *Hospital Infection Control & Prevention*, January 2019.)

South of the Border

The other outbreak of VIM-CRPA described at the EIS meeting was traced to a healthcare facility in Tijuana, where the CDC received reports of 31 cases of the emerging infection from September through November of last year. Six of these cases were in U.S. patients who had traveled to the facility for bariatric surgery.[4]

With the cooperation of a travel agency that set up the medical tourism program, the CDC was able to identify many more cases.

"In March [2019], the travel agency voluntarily provided CDC with a list of 741 individuals that they had referred for surgery since August of 2018 to the identified facility," said **Ian Kracalik**, PhD, MPH, a CDC EIS officer.

"In total, we identified 30 patients with highly resistant *Pseudomonas aeruginosa* infections in 17 states."

Of those patients, 26 underwent surgery at the same facility. Almost half of all 30 patients were hospitalized upon returning to the U.S. No infections have been reported in patients who underwent surgery after Feb. 1, 2019.

"Mexican authorities visited Facility 1 and identified multiple infection control breaches, including failure to adhere to standard practices of reprocessing surgical equipment," Kracalik and colleagues reported.[4] "This investigation highlights the potential for persons to acquire highly antibiotic-resistant organisms not commonly found in the U.S. when receiving healthcare abroad."

In addition to bacterial infections, the assessment identified infection control lapses that potentially put patients at risk for acquiring bloodborne pathogens, Kracalik said.

Mexican health authorities closed the surgical suite of the facility.

"Patients with subsequent U.S. hospitalizations present opportunities for VIM-CRPA transmission," he said. "Providers evaluating patients with healthcare exposure abroad should be vigilant for infections and colonization with antibiotic-resistant bacteria."

People considering elective medical care abroad should consult with a travel medicine clinician at least a month before leaving, and be aware of the risk of antibiotic-resistant bacteria, he added.

"There was one patient death, but this patient also had several underlying risk factors, and it was not clear whether [mortality] resulted from the infection," Kracalik said.

Patients who become ill after returning to the U.S. following medical treatment abroad are advised to report any hospitalizations, he said.

"Providers should take a travel history and screen patients with recent hospitalization abroad for resistant organisms on admission to a U.S. hospital."

In response to questions from *HIC*, Kracalik said he was not aware whether any of these travel patients went to Lubbock. "[The outbreaks] are not related," he emphasized. "They are different strains. [VIM-CRPA] is emerging." ■

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Mutant Strep Shows Resistance to Beta-Lactams

A threat to the mainstay strep drugs

Capable of causing invasive infections, *Streptococcus pyogenes* (Group A strep) has been susceptible to beta-lactam antibiotics for more than a half century.

Ominously, researchers investigating an upsurge of Group A strep cases in Seattle found a mutated strain that confers resistance to ampicillin and other beta-lactam drugs.

"Our results suggest the potential for emergence of clinically significant beta-lactam resistance in Group A streptococcus," **Kirsten Vannice**, PhD, MHS, said recently in Atlanta at the

CDC Epidemic Intelligence Service (EIS) conference.

Commonly associated with strep throat, *S. pyogenes* also can cause invasive disease in vulnerable populations.

"Group A strep is not a benign disease, with severe manifestations like sepsis and necrotizing fasciitis," Vannice said. "Fortunately, severe morbidity and mortality from Group A strep is preventable with widely available antibiotics."

Penicillin and amoxicillin are the first-line antibiotics used, with clindamycin often added for invasive disease to suppress bacterial toxins.

"While resistance has been seen in Group A strep for clindamycin and other antibiotics, [it] has remained susceptible for beta-lactams for over 50 years," she says.

Other bacteria that are resistant to beta-lactams like penicillin and ampicillin have acquired a way to protect the cell walls these antibiotics typically bind to and break down.

"An intact cell wall is essential for cell survival," Vannice said. "When a beta-lactam binds to the cell wall, synthesis is inhibited, and [this] leads to bacterial cell death."

After repeated exposures to antibiotics due to recurrent infections, a medical aide (Patient A) at a homeless shelter and a homeless person (Patient E) were infected with a novel strain of Group A strep.[1] Genomic analysis showed a "first-step mutation" that conferred resistance to ampicillin.

However, it could not be determined whether one of the cases transmitted to the other or whether both were infected by another source.

"The mutation could have developed in one of those patients or it could have developed elsewhere and then was transmitted within the community," Vannice says. "What we do know from this cluster is that this mutation developed within a very short time frame, within the last one or two years."

The old axiom of "use it and lose it" speaks to the historical trend of antibiotic use eventually selecting out bacterial resistance that renders the drug ineffective.

However, the case was unusual in that it represents the first report of emerging Group A strep resistance to the time-honored beta-lactam class of antibiotics.

The mutation was found when investigators were contacted about an upsurge in infections with Group A strep at an area hospital.

They conducted whole-genome sequencing and antimicrobial susceptibility testing on a convenience sample of strep isolates recovered from sterile sites or wounds of patients at Hospital A during June 2017 to March 2018.

Fifty-two of the 267 isolates were genetically sequenced and subtyped, revealing two "nearly identical isolates" identified as emm43.4, she said. These isolates had a point mutation predictive of resistance.

"This mutation was located within the pbp2x gene at the same site that is known to reduce beta-lactam susceptibility in other strep species, including *S. pneumoniae*," she said.

Indeed, the isolates were eight times higher than the minimum inhibitory concentration (MIC) susceptibility breakpoint for ampicillin and two times higher for cefotaxime compared to control strains without the mutation.

Both patients had received multiple courses of beta-lactams in the preceding three years due to recurrent strep infections.

"Patient A repeatedly received beta-lactam and other antibiotics courses, including ampicillin," she says. "Patient E had three culture-confirmed infections with streptococcal species in 2017 alone."

An IV drug user, Patient E had a history of wound and skin infections.

"We identified this concerning mutation in two patients whose complex medical histories predisposed them to repeat antibiotics," she said.

Patient E was treated so often that he was sometimes prescribed antibiotics empirically, and his adherence to completing a course of treatment was unknown.

"These are precisely the kind of situations where we are most concerned about developing antibiotic resistance," Vannice says. "Our findings suggest that the novel mutation identified in two Group A strep isolates was responsible for reduced ampicillin susceptibility."

The mutation was more of a warning, as no other similar cases were found and there were no reports of treatment failure and waning immunity.

"We need to reduce infections such as Group A strep among people experiencing homelessness within the broader goal of reducing homelessness itself," she said.

"This includes educating individuals at high risk about ways to prevent disease transmission, ensuring easy access to wound care, and, most importantly, improving the conditions that lead to skin breakdown and susceptibility to pathogens."

Fortunately, the resistance mechanism revealed by whole genome analysis is not on an *S. pyogenes* plasmid that could be transmitted to other bacteria.

"This resistance mechanism is a point mutation. So, theoretically, this bacteria developed a slight advantage, and it could proliferate and spread from person to person," said **Jeffrey**

Duchin, MD, health officer for Seattle and King County. "But it is not a plasmid-borne resistance mechanism, so it won't be spreading readily from bacteria to bacteria or across species."

The research had limitations, but it appears there was no transmission within the hospital that prompted the investigation by reporting the increase in cases. Nor was the mutation responsible for the increase. It was serendipitously revealed by the investigation.

"To address antibiotic resistance, we need to be ahead of the bacteria. I think that is the importance of this investigation," said **Denise Cardo**, MD, director of the CDC division of healthcare quality promotion. ■

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Drug Diversion, Resulting Infections on Rise

ED nurse in Washington state infects a dozen patients

Infection preventionists should be vigilant in detecting and preventing drug diversion by healthcare workers, as outbreaks linked to this crime appear to be increasing, says **Kimberly New**, JD, BSN, RN, founder of Diversion Specialists.

"We are seeing a very substantial number of cases of people tampering with injectables," she says.

"We hear from facilities all the time that they have had a case either recent or in the past of someone who was caught replacing an opioid with saline or something like that."

Beginning well before the ongoing national opioid epidemic, drug diversion by addicted healthcare workers has caused repeated outbreaks exposing thousands of patients to bloodborne pathogens.[1] These incidents have raised awareness, meaning the increase could in part reflect better case identification and surveillance. Still, some healthcare facilities do not seem to have diversion on their radar.

"I find it very concerning because many times I think that facilities simply aren't aware of the risk of bloodborne pathogen transmission in these types of cases," New says.

"So they don't take precautions that could help protect patients and at least limit the extent of an outbreak."

As reported[2] recently by the Centers for Disease Control and Prevention (CDC), the latest outbreak involves an ED nurse in Washington state who admitted to stealing opioids and other drugs intended for patients.

The investigation is ongoing, but the nurse has been linked to hepatitis C virus infections in at least 12 patients who sought care in the ED, the CDC reports.

As with many other diversion outbreaks, the case may have been missed if not for the local health department, which identified two HCV infections in people with no typical risk factors (e.g., IV drug use) in the first few months of 2018.

"The only risk factor was the fact that these patients had been going to this emergency department and receiving injections," says lead investigator **Henry Njuguna**, MBChB, MPH, an officer in the CDC Epidemic Intelligence Service. The outbreak could have been missed in part because "not all patients with HCV present with the same symptoms," he says.

The nurse apparently was originally infected by diverting drugs from a patient with HCV, then infected other patients through contaminated syringes, needles, or vials, the CDC noted.

"This is purely our hypothesis," he said.

"The nurse told us that she was stockpiling medication for future use. She did not elaborate further as to what she actually did."

The hypothesis is based on the distribution of infected patients, he explains.

"It is possible that nurse A acquired the virus from [a] patient with chronic HCV infection during [a] Nov. 8 visit and was infectious during Nov. 22–Dec. 26, 2017, during which time at least 12 patients that she treated became infected," the CDC reports.

The first two patients infected with HCV received treatment from the nurse at the ED on separate visits on Dec. 6 and Dec. 16, 2017.

Upon CDC testing, the HCV infecting both patients was genetically similar, suggesting a common source.

Investigators found the nurse had accessed the automated drug dispensing system much more often than the typical staff. The nurse

subsequently tested positive for HCV antibodies.

"This nurse, who had tested anti-HCV–negative and HCV RNA–negative with a blood donation in 2013, admitted diverting injectable narcotic and antihistamine drugs from patients for personal use during current employment at the hospital ED, though she did not specify the mechanism," the CDC found.

The investigation is continuing, with some 90 additional patients being contacted and recommended for bloodborne pathogen testing. State nursing officials suspended the nurse's license to practice.

New was not involved in investigating the case, but she commented about IPs and drug diversion in the following interview, which has been edited for length and clarity.

HIC: Should IPs be more proactive and get involved in this issue?

New: Absolutely. In fact, I am speaking at a number of regional APIC [Association for Professionals in Infection Control and Epidemiology] conferences this year. There is increasing awareness among infection preventionists of what their role should be in these type of cases because historically they have been excluded. My recommendation is that they need to insert themselves into the diversion program. If there is one at their facility, they need to make sure that they are an active part of that. It may require them presenting to the committee the risks, and getting people to understand why their role is so important.

HIC: This recently reported outbreak certainly shows it is an ongoing problem.

New: Healthcare facilities really need to take any kind of drug diversion seriously, and always — in every single case — consider the risk that there has been tampering and substitution. Across the country, in my experience, sometimes infection preventionists have a hard time selling that we need to really look at this. It potentially can expose healthcare facilities to a fair amount of liability. It is something that every single facility needs to consider at the beginning, when they realize that they have had injectable diversion.

HIC: This problem historically has been driven underground by hospitals concerned about liability following patient notifications. Do you see that changing now?

New: A lot of facilities now are promoting being more open about medical errors. Trying to promote that type of approach obviously would be a better way to handle these. I think the potential for harm to patients is so significant, it is not something we can ignore. For example, Stanford developed an approach to medical errors where they are very candid and open with patients about problems that occurred and that they may not otherwise be aware of. They feel that the candid approach has decreased their litigation from patients in the long run. [Drug diversion] should be approached in a similar fashion. Instead of being overly concerned about liability, really look at the risks to patient harm at the front end and err on the side of caution.

HIC: This hospital apparently had some drug diversion oversight and saw that the nurse was taking out more medications than her colleagues. Unfortunately, that was after the patients were infected.

New: I am not speaking to this facility, but in general, a lot of facilities still do not have a formal drug diversion program where they have someone who is ensuring there is ongoing effective auditing and making sure that anomalies in drug cabinet transactions are followed up on. That type of auditing and work is very labor-intensive. In most facilities, it really does warrant having a full-time person in charge of that. I think the cases like this are making that more common.

HIC: More facilities are adopting formal drug diversion programs?

New: We have seen a huge number of facilities that have begun to put a diversion program manager in place and really have turned to approaching diversion with a more formal program, policies, committees, and oversight.

I think this type of case underscores the need to have someone who is looking at that data, an objective person who has this assignment and accountability. Many times, a facility does not have dedicated resources. Pharmacy may look at these reports and they send them off to clinical leaders who will try to look at the reports when they have time. It is a disjointed effort, and we have people who have full-time jobs trying to add in some auditing. That is a setup for missing something.

HIC: Realizing you were not involved in this investigation, do you have a theory on the type of diversion that may have led to the outbreak in Washington?

New: We see a number of different things in these types of cases. We see individuals who go into the PIXIS [machine], take out these syringes, inject themselves, fill them up with something else, and then put them back. In that way, she could have transmitted bloodborne pathogens because there are tampered syringes — filled with something other than the opioid — now tinged with her blood.

Another way we see them doing

this is that they draw up the contents of a vial, give themselves half of it, and then fill the [syringe] back up with something like injectable diphenhydramine. It makes the patient feel like they have gotten something by having a sedation effect. They are diluting what the patient is given, but they are using the same needle. People who are doing this are desperate. They are not paying attention to what they have been taught as a healthcare provider in terms of safe injection practices. ■

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CDC Narrows In on Viral Cause of Paralytic Syndrome

Enterovirus D68 seems to be playing some role

Acute flaccid myelitis (AFM) — a paralytic condition in children that appeared mysteriously in 2014 — is almost certainly of viral origin and most likely an enterovirus, an investigator with the Centers for Disease Control and Prevention (CDC) recently reported.

"There is growing evidence to suggest enteroviruses as the leading etiologic agent for acute flaccid myelitis," **Susannah McKay**, PhD, MPH, told *Hospital Infection Control & Prevention*. "Nearly all patients with AFM reported some symptoms suggestive of viral illness before developing AFM. About half of the patients with AFM who had specimens tested have evidence of an enterovirus."

An investigator with the CDC's Epidemic Intelligence Service (EIS), McKay spoke at press conference at the recent EIS meeting in Atlanta. AFM emerged in 2014 during a large national outbreak of Enterovirus D68 (EVD-68) and has peaked and ebbed in alternate years every fall since then. However, the CDC has not been able to ascribe most of the AFM cases to EVD-68 or any other specific enterovirus.

"We know that enterovirus infections are very common, and it is not clear why in rare instances some individuals develop AFM," she said. "CDC is working hard to get in front of this."

There is angst along with urgency, particularly from parents of children stricken by the syndrome.

"Very few patients with AFM had detectable virus in their spinal fluid, a finding that would confirm which pathogen is causing the problem," McKay said.

Part of the CDC effort to solve the case is a new surveillance network to track respiratory infections caused by EVD-68 at seven sentinel hospitals.

"The surveillance system for EVD-68 is set up for acute respiratory illness," said **Stephanie Kujawski**, PhD, MPH, a CDC EIS officer. "But the AFM team here at CDC is working with the surveillance sites to retrospectively and prospectively look into AFM."

Indeed, it seems intuitive that EVD-68 is somehow linked with AFM, since the first cases coincided with the large 2014 outbreak.

"EVD-68 annual trends and circulation are not fully understood because testing in clinical settings is limited," she said.

Kujawski and colleagues looked at 2017 and 2018 data from the seven geographically dispersed hospitals, finding a pattern that reflects in part the trends with AFM.[1] In 2017, when AFM had a down year, only two of 2,433 specimens for acute respiratory infection were caused by EVD-68. In 2018, investigators identified EVD-68 in 358 (13.9%) of 2,579 children tested. Almost half the EVD-68 detections occurred in September — which was also the peak month for AFM in 2018. The EVD-68 infections were severe, with 262 (68%) of patients requiring hospitalization.

In updating the AFM situation, McKay and colleagues reported "symptoms include limb and bulbar (neck and throat muscles) weakness, similar to poliomyelitis."[2] Polio is the historic disease that casts a long shadow over AFM. Now vaccine-preventable, polio was a much-feared, crippling virus that struck children in the first half of the 20th century.

"In 2018, CDC confirmed 227 cases of AFM in 41 states," McKay said. Overall, "94% of confirmed cases were in children less than 18 years old, with a median age of 5."

In a subset of 175 confirmed cases,

onset of AFM was preceded by a respiratory or febrile illness 95% of the time.

"For all patients who meet the clinical definition of AFM, we are asking for multiple specimens to be sent [to CDC] — not just the spinal fluid," McKay says. "Most of the enterovirus-positive specimens that we have are from respiratory specimens."

CDC has established an AFM task force comprised of leading experts from multiple medical disciplines to help find the cause of the paralytic syndrome and to determine prevention and treatment measures. If AFM follows its established pattern, cases will be lower this year, with an upsurge again in the fall of 2020.

"Parents and caregivers should seek medical care right away for a child who develops sudden limb weakness," she said. "Clinicians should be vigilant for acute flaccid limb weakness, and immediately report these cases to their health department."

For now, the generic recommendations for prevention are washing hands, avoiding contact with people who are sick, covering coughs and sneezes, and staying home when sick. ■

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CME/CE QUESTIONS

1. **According to the CDC, what percentage of a record number of 2019 measles cases have been hospitalized?**
   a. 1%
   b. 4%
   c. 6%
   d. 9%

2. **The CDC reported two outbreaks of an emerging pathogen, carbapenem-resistant Verona integron-encoded metallo-beta-lactamase:**
   a. *Acinetobacter baumannii.*
   b. *Pseudomonas aeruginosa.*
   c. *Klebsiella pneumoniae.*
   d. *Serratia marcescens.*

3. **According to CDC investigator Henry Njuguna, MBChB, MPH, an emergency nurse linked to hepatitis C infections in at least 12 patients admitted to:**
   a. stockpiling medication for future use.
   b. self-injecting half a syringe and giving the rest to a patient.
   c. replacing medication with saline solution.
   d. repeatedly accessing single-dose vials.

4. **Which is true about cases of acute flaccid myelitis (AFM)?**
   a. The median age of afflicted patients is 11.
   b. Cases have steadily increased annually since 2014.
   c. Few patients with AFM have detectable virus in their spinal fluid.
   d. AFM is rarely preceded by a respiratory infection.