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INSIDE

RELIAS MEDIA

Antibiotic-Resistant Threats: CDC Report Cites Progress, Peril

A coming post-antibiotic era? 'It's already here'

By Gary Evans, Medical Writer

A combination of public health, antibiotic stewardship, and infection control efforts over the last six years have managed to beat back the devil of multidrug-resistant bacteria. Yet all still hangs in the balance.

There are surging new threats like *Candida auris*, the continuing emergence of carbapenem-resistant *Acinetobacter* and the ongoing death toll of *Clostridioides difficile* — about 13,000 patients in 2017, the Centers for Disease Control and Prevention (CDC) reports.[1]

In a 2019 update of its 2013 report on the threat of antibiotic-resistant infections, the CDC reveals some progress and much remaining peril. In a forward to the report, CDC Director **Robert Redfield**, MD, opens with a dire assessment of the current situation and a call to action.

"Stop referring to a coming post-antibiotic era — it's already here," he notes. "You and I are living in a time when some miracle drugs no longer perform miracles and families are being ripped apart by a microscopic enemy. The time for action is now and we can be part of the solution."

Infection preventionists (IPs) have been and must remain a very large part of that solution. Four of the top five pathogens that pose an "urgent" threat — the highest level of risk — are healthcare-associated infections (HAIs). These include carbapenem-resistant Enterobacteriaceae (CRE) and the aforementioned *C. auris* and *C. diff*.

"All together, unfortunately, the U.S. toll of all the threats in the report exceed 3 million infections," **Michael Craig**, MD, of the CDC's Antibiotic Resistance Coordination and Strategy Unit, said at a recent press conference. "[However, since 2013], we've reduced the number of deaths from antibiotic resistance by 18% overall and by nearly 30% in hospitals alone."

Speaking at the press conference, Redfield credited some level of success to nationwide efforts that include "using

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infection prevention and control to stop transmission in healthcare facilities." However, bacteria and fungi will continue to develop resistance to the drugs designed to kill them, he warned.

For example, the gains cited in the report could be undone by the rapid global emergence of *C. auris*, a drug-resistant fungus that was not even on the watchlist in the 2013 report. *(See related story, p. 5.)*

"To underscore the challenge we are facing, *Candida auris* emerged on five continents at the same time," Redfield said. "One in three patients infected by invasive *Candida auris* dies, and some samples have been shown to be resistant to all three classes of antifungal drugs."

C. auris Rises, VRSA Falls

Antibiotic resistance is multifactorial and mutable as drugs are used — often indiscriminately — on people, plants, and animals across the globe. The results can be unpredictable. In contrast to the rapid emergence of *C. auris*, for example, another pathogen that once was feared as the harbinger to the post-antibiotic era has fallen completely off the list of 18 pathogens in the new report. Vancomycin-resistant *Staphylococcus aureus* (VRSA), considered an ominous superbug when it first appeared, was listed as "concerning" in the 2013 report, and then removed in the 2019 update.

"Since 2002, 14 cases of VRSA have been identified in the United States," the new CDC report states. "These are isolated cases and spread from patient to patient has never been documented."

One theory is that VRSA paid a price in terms of transmissibility by acquiring resistance to vancomycin, which has been the mainstay against potentially deadly staphylococcus infections for decades. The hope is that *C. auris* will fade out in similar fashion, but right now it threatens to become endemic in some healthcare facilities.

"This is a pathogen we didn't even know about when we put out the last report in 2013, and since then, it has circumnavigated the globe and caused a lot of infections and deaths as it has spread," Craig said. "We are still trying to figure out its origins."

Other changes in the report include carbapenem-resistant *Acinetobacter*, which was categorized as a "serious" threat in 2013 but has been elevated to "urgent" in 2019.

"It has been listed as a new urgent threat because it is spreading in healthcare and is often resistant to many antibiotics," Craig said.

The number of estimated hospital infections due to this pathogen actually declined from 10,300 in 2013 to 8,500 in 2017, but this is a multiple-threat bug that can cause a lot of problems. Once called "Iraqibacter" due to infections in soldiers returning from the Gulf wars, carbapenem-resistant *Acinetobacter* is hard to eradicate in the healthcare environment and can carry mobile genetic plasmids that can be transferred to other bacteria.

"Some can make a carbapenemase enzyme, which makes carbapenem antibiotics ineffective and rapidly spreads resistance that destroys these important drugs," the CDC report states. "Overall rates of carbapenem-resistant *Acinetobacter* cases have decreased. However, carbapenem-resistant *Acinetobacter* that can produce carbapenemases, which can spread to other germs and amplify the problem of resistance … appear to be increasing."

That is a troubling sign, because some *Acinetobacter* strains are already resistant to nearly all antibiotics, carbapenems are a last-line choice, and

few new drugs are in development. Carbapenem-resistant *Acinetobacter* generally strikes intensive care unit patients with pneumonia, wound, bloodstream, and urinary tract infections (UTIs), the CDC reported.

There has been some progress against *C. diff*, but it still causes about 220,000 infections annually. *C. diff* emerges as a byproduct of antibiotic use, which disturbs the microbiome in the gut and sets up the infection.

"A common strain of *C. difficile* (ribotype 027) that can cause more serious disease can be associated with use of certain antibiotics, such as fluoroquinolones," the CDC report states.

Reducing fluoroquinolone use through antibiotic stewardship efforts has been shown to reduce *C. diff*, which can linger in the environment in spore form unless eradicated with sporicidal disinfectants.

"More than half of *C. difficile* cases among long-term care facility residents happen in those who were recently hospitalized," the CDC reports. "Improving antibiotic use may have contributed to the decrease in long-term care facility-onset *C. difficile* cases in 10 U.S. sites [studied]."

Recommendations

With the release of the CDC report, The Joint Commission underscored its standards on antibiotic stewardship, including Medication Management (MM) standard MM.09.01.01, which requires "hospitals, critical access hospitals, and nursing care center organizations to have an antimicrobial stewardship program based on current scientific literature." *(See editor's note.)* Also, effective Jan. 1, 2020, standard MM.09.01.03 will apply to accredited ambulatory care settings. This standard may impact some infection preventionists with outpatient responsibilities, as it specifies that "the organization identifies an individual(s) responsible for developing, implementing, and monitoring activities to promote appropriate antimicrobial medication prescribing practices."[2]

The CDC-recommended actions for healthcare providers in the report include the following:

- Follow infection prevention and control recommendations, including screening at-risk patients when indicated.
- Ask patients if they recently received care in another facility or traveled to another country.
- Alert receiving facilities when transferring patients colonized or infected with antibiotic-resistant pathogens.
- Educate patients on ways to prevent spread.
- Follow clinical and antibiotic treatment guidelines.
- Consider fungal infections for patients with respiratory infections who do not respond to antibiotics.
- Watch for signs and symptoms of sepsis. If you suspect sepsis, start antibiotics as soon as possible and reassess antibiotic therapy.
- Perform appropriate diagnostic tests to guide antibiotic therapy, including correct drug, dose, and duration.
- Be aware of infections and resistance patterns in your facility and community. Ensure you are notified by the lab immediately when antibiotic-resistance pathogens are identified.
- Know when to report cases and submit resistant isolates to public health.

Community Threats

Beyond the hospital, there are resistant threats in the community that include increasing extended spectrum β-lactamase (ESBL)-producing Enterobacteriaceae, which was previously found more often in healthcare, Craig said.

"It is one of the leading causes of death from resistant germs, and is making common infections like UTIs harder to treat," he said. The report cites 197,400 estimated cases in 2017, including 9,100 deaths.

"ESBLs are enzymes that break down commonly used antibiotics, such as penicillins and cephalosporins, making them ineffective," the CDC report explains. "[They] often cause infections in otherwise healthy people. About one quarter of patients with these infections had no known underlying health conditions."

The Enterobacteriaceae "family" of microorganisms includes *Escherichia coli*. "Certain strains of *E. coli*, such as ST131, have quickly spread in the community and among healthcare settings," the CDC reported. "These strains often cause more severe infections and spread more easily. Additionally, a particular ESBL enzyme, called CTX-M, appears to be spreading in the United States and around the world."

This enzyme can be transferred genetically to different types of Enterobacteriaceae. "When CTX-M and ST131 combine, they are a dangerous combination that can rapidly spread resistance," the CDC notes. "Almost half of ESBL-producing Enterobacteriaceae infections occur in people who have not had recent inpatient healthcare exposure or an invasive medical procedure."

Of course, that no longer remains the case when patients infected in the community present for care. The level of drug resistance in some normally routine infections like UTIs can be hard to treat at outpatient facilities, Craig said.

"With the ESBLs we're seeing, harder-to-treat ultimately means these

patients have to be hospitalized," he said. "They go on to more aggressive, stronger antibiotics that might have more side effects, and that can be very challenging."

Another urgent threat in the community is drug-resistant *Neisseria gonorrhoeae*, a sexually transmitted pathogen that has developed resistance to all but one class of antibiotics. Given this panoply of threats, Craig emphasized baseline prevention.

"Infection prevention and control in healthcare facilities works," he said. "Improving the use of antibiotics we already have works. Proper food handling works. Safe sex works. Vaccines and keeping hands clean works."

48,700 Families Affected

"This report is dedicated to the 48,700 families who lose a loved one each year to antibiotic resistance or *C. difficile*, and the countless healthcare providers, public health experts, innovators, and others who are fighting back with everything they have," the CDC states.

One element of the report that caused some confusion at the press conference is that the CDC updated the 2013 "conservative estimate" of mortality with better data, finding that the original estimate of 23,000 deaths from antibiotic-resistant germs was a severe undercount. Recalculating the data revealed that the 2013 report should have listed 44,000 deaths, Craig said. The CDC highly values messaging, and one can only speculate if the higher number would have redoubled prevention efforts as well as mortality.

"There were nearly twice as many deaths," Craig said. "When we look at the trends of that data, moving forward, we see actually, though, that we've made progress. That 44,000 number from 2013 for overall antibiotic resistance deaths has declined to around 35,900 today."

Craig estimated that 85% of the deaths were caused by HAIs. While the previous report was based on extrapolations from 180 hospitals, the new data comes from more than 700

Murderers' Row: Resistant to Drugs, Threats to Humans

Projected increase over next decade part of pathogen assessments

In a recently published report on antibiotic threats in the United States, the Centers for Disease Control and Prevention (CDC) classified pathogens as urgent, serious, concerning, or put them on a "watch list."[1]

The pathogens were assessed and categorized according to factors that include the following:

- Clinical effect
- Economic effect
- Incidence
- 10-year projection of incidence
- Transmissibility
- Availability of effective antibiotics
- Barriers to prevention

"The assessment focused on domestic impact, but the international context of antibiotic resistance was taken into account in the 10-year incidence projection," the CDC noted. "Threats assigned to the urgent and serious categories require greater attention and action."

Urgent Threats

- Carbapenem-resistant *Acinetobacter*
- *Candida auris*
- *Clostridioides difficile*
- Carbapenem-resistant Enterobacteriaceae (CRE)
- Drug-resistant *Neisseria gonorrhoeae*

Serious Threats

- Drug-resistant *Campylobacter*
- Drug-resistant *Candida*
- Extended-spectrum beta-lactamase (ESBL)-producing Enterobacteriaceae
- Vancomycin-resistant Enterococci (VRE)
- Multidrug-resistant *Pseudomonas aeruginosa*
- Drug-resistant nontyphoidal *Salmonella*
- Drug-resistant *Salmonella* serotype Typhi
- Drug-resistant *Shigella*
- Methicillin-resistant *Staphylococcus aureus* (MRSA)
- Drug-resistant *Streptococcus pneumoniae*
- Drug-resistant Tuberculosis

Concerning Threats

- Erythromycin-resistant group A *Streptococcus*
- Clindamycin-resistant group B *Streptococcus*

Watch List

- Azole-resistant *Aspergillus fumigatus*
- Drug-resistant *Mycoplasma genitalium*
- Drug-resistant *Bordetella pertussis*

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hospitals and represents millions of patient records.

However, the 35,900 number apparently does not include *C. diff*, which usually is not resistant to antibiotics, but arguably is most harmful to antibiotic use. ■

Editor's note: Joint Commission antibiotic stewardship standards and resources are available at https://bit.ly/2rYBLdo.

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C. auris: A Bad Bug With a Worst-Case Scenario

Three pan-resistant isolates detected in the United States

Imagine if a common healthcare-associated infection became impossible to treat.

The nightmare scenario public health officials are contemplating is that an emerging strain of multidrug-resistant *Candida auris* will displace treatable strains of Candida, which are already a leading cause of bloodstream infections.

C. auris has shown this ability in other countries, becoming endemic in some healthcare systems and occasionally generating strains that are completely resistant to all antifungals.

"Clearly, the pan-resistant part of this is what we are worried about," said **Tom Chiller**, MD, MPHTM, chief of the mycotic diseases branch at the Centers for Disease Control and Prevention (CDC). "And I think what keeps us up at night is *C. auris* leapfrogging over other *Candida* species and becoming a major cause of candidemia that also can acquire resistance and become really hard to treat."

Chiller updated the threat of the emerging fungus at the IDWeek 2019 conference, held Oct. 2-6, 2019, in Washington, DC.

There have been three pan-resistant isolates of *C. auris* confirmed in the United States. Other isolates impervious to all three classes of antifungals have been reported in at least four other countries on several continents globally. The U.S. isolates were already resistant to fluconazole and amphotericin B, then developed resistance to echinocandin while under treatment with the drug.

"They developed echinocandin resistance while on echinocandin, which is concerning," Chiller said. "All of these cases were unrelated, and we didn't see any transmission."

Fortunately, *C. auris* resistance to echinocandin remains relatively rare, he said.

From May 2013 — when the first *C. auris* was identified in the United States — to July 2019, there have been about 800 clinical infections and 2,350 colonized patients. New York, "ground zero" for this emerging pathogen, as Chiller termed it, had 388 clinical cases as of Aug. 31, 2019.

Illinois had 227 cases, followed by New Jersey with 137 and Florida with 24. Nine other states reported a range of *C. auris* clinical cases from one to eight.

As prevalence increases, so does the concern that *C. auris* will become a leading source of fungal infections. Outbreaks in India and Spain showed *C. auris* displacing other *Candida* strains like *C. albicans* and *C. parapsilosis*, he said.

"Also, in South Africa, the second most common cause of candidemia is *C. auris*," he said. "This thing can get into a system and take over — and these are invasive infections."

Again, candidemia has been a leading cause of bloodstream infections for years, but the source is often the patient's gut microbiome, which is disrupted during invasive medical care.

"That is different in this *Candida auris*," Chiller said. "This is really a paradigm shift from what we have thought of as *Candida* infections. This is a yeast that is acting like a bacteria. Resistance is the norm. It thrives on skin and contaminates patient rooms — not your GI tract. It is transmitted in healthcare settings because of this [contamination]."

Reservoirs

In particular, *C. auris* is spreading in skilled nursing facilities for ventilated patients (vSNFs), and long-term acute care hospitals (LTACHs), he said. Indeed, a study[1] presented at IDWeek 2018 revealed that Chicago healthcare facilities are struggling to contain *C. auris*, primarily because it has established reservoirs in these step-down sites. *(See* Hospital Infection Control & Prevention, *January 2019.)*

"How is it spreading in these settings? One hypothesis we are looking into is the idea of a 'super shedder,'" Chiller said. "In other words, patients

are shedding skin cells with *C. auris* on them by the millions in their rooms. That's how it is spreading and contaminating surfaces."

For example, CDC experiments thus far have shown a strong correlation between *C. auris* on patients' skin and environmental contamination on their bed rails.

"We find a ton of *C. auris* on bed rails when we do sampling," he said.

Compounding the problem, *C. auris* can remain viable in the environment for up to a month, requiring strong disinfectants to eradicate. There are three cleaning products now with EPA claims for efficacy against *C. auris*. Sporicidals used for *C. diff* also will kill the bug, but quaternary ammonia compounds are not effective, he said. In addition to environmental cleaning, the threat of *C. auris* warrants vigilance with hand hygiene and contact isolation precautions for infected or colonized patients, Chiller emphasized.

"Once it sets up shop it tends to begin to spread in facilities from patient to patient," Chiller said. "We have seen this [pattern] across the globe as well. In the [United States], these patients are usually the sickest of the sick."

They may be on mechanical ventilation, have tracheotomies, are often colonized with other resistant pathogens, and may have a recent history of receiving antibiotics and antifungals.

Testing, Decolonization Woes

Complicating detection and control measures, rapid *C. auris* tests are not currently available in most hospitals but are in use in the seven regional sites that comprise the CDC's Antibiotic Resistance Laboratory Network (ARLN). The CDC is working on testing protocols for colonization, but *C. auris* can be as difficult to detect as it is to treat or decolonize. For example, *C. auris* can evade lab detection without specialized equipment, as standard clinical testing may misidentify the pathogen with more benign *Candida* strains like *C. haemulonii*, the CDC reports.[2]

The CDC is concerned that *C. auris* will become widely dispersed nationally, similar to what happened with carbapenem-resistant Enterobacteriaceae (CRE). "There are institutions [in endemic areas] who are screening everyone [that] comes into a hospital so that they know whether to put them into contact isolation," Chiller said. "We are trying to take a very aggressive stance. I don't think we were as aggressive with CRE, for example, and now we know CRE is everywhere."

There have been cases where a *C. auris* patient was identified and promptly isolated, the environment was cleaned rigorously, and no subsequent transmission occurred.

"That's our strategy, but we need a better, quicker screening test in hospitals so that they can do it on site," he said. "That is obviously one of our limitations. And of course, how to decolonize someone — we really don't know how to do that."

Some have tried chlorhexidine bathing, with mixed results, he said.

"These patients seem to be colonized indefinitely," Chiller said. "We have patients document now as being colonized for years — not just months. They can be intermittently positive — so we are saying if you are ever positive on the skin you are colonized [and must be in contact isolation]."

This is reminiscent of the phrase "isolation for life" infection preventionists have applied to other multidrug-resistant pathogens.

"For this organism, the environment is really the major problem," Chiller said. "I don't think there is a lot of person-to-person transmission. I think it is person-to-environment, then environment back to person. This sucker is hard to clean and hard to kill." ■

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Human Factors: Drug Stewardship in the Emergency Department

The challenge of changing human behavior in the workplace

Applying human factors engineering to the chaotic and intense environment of the emergency department (ED) shows promise in reigning in routine overprescribing of antibiotics, said **Michael Pulia**, MD, MS, an ED physician and researcher. Pulia is the director of the emergency medicine antibiotic stewardship research program at the University of Wisconsin in Madison. "Human factors engineering is not something we really talk about in medicine very often, and it was definitely not incorporated in my training to start thinking about

these things," he said at the IDWeek 2019 conference, held Oct. 2-6, 2019, in Washington, DC.

Broadly classified as ergonomics in much of the world, human factors engineering ultimately may lead to changes in practices and behaviors entrenched in healthcare that endanger patients with infections and other harms.

"Why do we have such a hard time moving the needle on antibiotic stewardship [in the ED], and more globally, why do we have such a problem with patient safety in healthcare as compared to other complex industries like the airlines?" Pulia said. "The one word that I would boil it down to is 'design.' We don't think about things in healthcare from a design point of view and building better systems."

Instead, healthcare is prone to so-called "fundamental attribution errors," which is targeting individuals or a group of providers "who are doing the bad behavior — vs. just understanding human nature," he said. "We [need to] design better systems around this to accommodate those behaviors. That is the different lens that systems engineers use."

In general, human engineering design puts the person in the middle of a paradigm that extends out to all of their interactions and decision points in a complex system. To put it simply, it is "the study of factors that make work easy or hard," Pulia said. A good overview of the approach as it applies to antibiotic stewardship in ambulatory care is a 2018 review article[1] by a different research team, he recommended.

Downstream Effects

A human factors assessment must consider the effect on patients and healthcare workers. A design change for patient well-being that increases clinician burnout is self-defeating.

"If we don't design good interventions, we have adverse effects in other areas," Pulia said. "Even if we change the behavior we were looking for, there can be downstream impacts that are not good."

An emergency physician, Pulia offered humorous advice to anyone contemplating taking on antibiotic stewardship in the ED: "First of all, good luck to you. I think this is where the term 'herding cats' came from."

Indeed, by the measures of human subject behavior, the ED is one of the most rapid-decision, high-consequence systems imaginable.

"It is high-pressure, high-density decision making," he said. "It has the most decision-making density than any other field of medicine, and some would argue in any occupation known to mankind. There are more decisions per minute in this setting."

The general perception is that emergency clinicians use antibiotics liberally because they are not necessarily involved in patient follow-up and they want to "hedge their bets," Pulia said. That contention is vastly oversimplified, as human behavior research shows.

"ED overprescribing of antibiotics is actually quite complicated," he said. "There are a lot of different factors and it is probably even specific to local institutions in some regard."

Barriers to system change include staff burnout, turnover, lack of equipment and IT support, and weak leadership structure, he says, describing the ED as the "juxtaposition of chaos with the need for judicious and expeditious thinking." Thus, rigorous design principles, with some notable exceptions, really have not been applied to ED settings, Pulia said.

Blank Slate

If you seek to change behavior in the ED — antibiotic stewardship or otherwise — it is best to begin with a "blank state," he said, underscoring the point by showing a blank slide.

"Forget what you know or think that you know about even your own discipline or area," he says. "You have your own clinical biases [formed by] a lifetime of practice, education, your mentors and teachers."

Pulia said he was fortunate to have non-clinical human factors engineers working with him on the stewardship research.

"They ask the basic questions that we sort of gloss over, like, 'Why are [practitioners] doing it that way?'" he says. "They see things that we don't see."

Try to partner with engineers if possible, but if not, begin with an open mind when you look at processes and patterns in the ED, he said.

"We had human factors engineers come to our emergency department and shadow our clinicians," he said. "They documented every part of the care process like they were exploring an alien world for the first time. They are incredibly meticulous in figuring out the care process and all the things involved."

Another aspect of the research is to have confidential conversations with emergency providers. "I am usually not involved with that because as an emergency physician, I am biased," Pulia said. "Research staff and other non-clinicians interview these people because they are not introducing bias."

Clinicians talk to them anonymously about work problems, then they try to address common themes through design change. In research, Pulia studies these changes and then continues to get feedback for any necessary redesigns in a rigorous, iterative process.

"It has to be really informed by the frontline providers — the people using it — and by systematic observation," he said.

Too often ED guidelines and recommendations fail to consider issues such as diagnostic uncertainty, concern over access to care and follow-up, and patient expectations. Resource and environmental factors include available tests and diagnostics, crowding, and time pressures.

"They are actually quite concerned about patients when they leave, [concerned that] they are going to fall through the cracks," he said. "There are quite a bit of drivers of antibiotic prescribing."

The key is to focus change on the most "salient" barriers, which may require a high level of specificity to identify.

"What exactly are you trying to target — is this a pneumonia thing, a UTI [urinary tract infection], or skin and soft tissue?" he said. "What is the professional culture — the people that are working there?

Studies show the "uptake of an intervention is drastically different at various sites. That implies that the level of local barriers to implementation were not addressed," he added.

Over-Testing Equals Over-Treatment

In a project to reduce over-testing and unnecessary treatment, Pulia and colleagues specifically looked at UTI issues in the ED.

Research has shown that, in general, older adults with nonspecific symptoms (i.e., confused mental state) frequently get a urinary analysis (UA), are diagnosed with asymptomatic bacteriuria, and then are put on unnecessary antibiotics.

Indeed, there is a "perverse incentive" in EDs to get some kind of diagnosis, and in an elderly patient that often ends being an asymptomatic bacteriuria that gets treated with antibiotics only needed for a UTI.

"And it is often an education piece, too, that they don't know that an [asymptomatic bacteriuria] should not be treated," Pulia said. "But there is this perverse incentive — if you label something a UTI, the tracks are just greased for you. [Start some antibiotics] and we're good to go — no pushback. That's really what is going on."

Educating emergency clinicians about this problem will help, but that is not going to be as effective as "designing something that truly accounts for that behavior."

An unidentified community hospital taking part in the research developed a simple but ingenious solution, Pulia said.

"They developed a protocol where an adult with these vague symptoms and a positive UA can get admitted without antibiotics — no questions asked," he said. "They could watch as long as they were clinically stable, and they wouldn't feel that pressure to give them antibiotics."

Though the protocol used at a small hospital — linked to one long-term care facility — may not be applicable to larger healthcare institutions, it clarifies that patients can be admitted without administration of antibiotics for 24-48 hours "while the hospitalist evaluates for more likely causes of altered mental status in this population."

If patient is still in an altered state after 48 hours — with no other explanation of the symptoms, the policy calls for beginning antibiotic treatment for UTI.

"There is a vast amount of over-testing or urine analysis in older adults," Pulia said, adding that he noticed at his own facility that virtually every UA from the emergency department included an order for a reflex culture.

"On every single patient — we found a tremendous amount of over-culturing going on, and basically eliminated that order from the ED," he said. "We saw a 40% decline in cultures out of the ED."

A Problem Arises

These findings are not yet published, but Pulia revealed a problem in removing the routine order for culture: Some cultures that really should be done fell by the wayside.

"So, I'm getting pressure from one side, knowing this is vastly overused, and the pressure from the [infectious disease physicians] saying we need cultures," he said.

The reflex culture order was revised and restored after getting buy-in from urologists, infectious disease clinicians, and others, he said. "There were some process instructions but basically we said, 'Do not send this test for anything other than suspecting a UTI, and you have an appropriate indication.'"

Under the new policy, the following were not considered indications for a UA with reflex culture:

- Abnormal urine quality, such as color and order, without another indication;
- Abdominal pain without suspicion for UTI;
- Routine component of "pan-culture";
- Screening for UA for patients with nonspecific complaints, such as fatigue, weakness, or falls.

The idea is to eliminate unnecessary testing while not missing cultures that need to be done. The work is still in process, but a 20% reduction in treating asymptomatic bacteriuria has been achieved thus far, Pulia said.

When trying to make design changes, you have to make sure they are

integrated into the system — specific actions, not just a link to hospital policy, he said. The information must be accurate, and it must get to the right people in the right format, for example, text, computer, or electronic medical records.

In addition, the design change must kick-in at the precise point of care, not too early or too late. Expect challenges. "In systems engineering, sometimes building a better mousetrap makes a smarter mouse," he said. "Human beings are quite interesting in their ability to overwhelm really well-designed systems. You don't want to get to a point where you are doing a lot of hard stops and you are making work hard for everybody else because of an outlier."

If the behavior change needs to be made with an outlier, it is probably better to try to do that face-to-face rather than redesigning a system that is working for everyone else, he said. ■

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Mass Flu Vaccinations Serve as Emergency Drills

Using annual worker shots to prepare for mass response

Infection preventionists may one day be faced with a pandemic flu or the release of a bioterrorism agent that calls for mass vaccinations or post-exposure prophylaxis of healthcare workers. One novel way to prepare now is to stage annual flu vaccinations as an emergency drill. A healthcare system in Delaware did just that, vaccinating a staggering 8,035 employees in a single day.

Such an effort takes considerable planning and administrative support, but there are a multitude of positives — not the least of which is getting a large amount of facility staff ready for flu season before the annual virus starts circulating.

ChristianaCare healthcare system in Wilmington, DE, started its "#HitMeWithYourFluShot" campaign in the 2018-2019 influenza season, mass vaccinating 7,868 employees. In October 2019, they followed suit for the 2019-2020 season, topping the prior total in an 18-hour vaccine marathon from 3 a.m. to 9 p.m.

The one-day blitz included vaccinating onsite at two hospitals and sending out mobile vaccination units to affiliated institutions in neighboring states. Overall, the outreach included 100 nearby locations in Delaware, Pennsylvania, Maryland, and New Jersey. That included the two hospital campuses in Wilmington and in Newark, NJ. Mobile teams dropped off vaccination kits or administered vaccines, so caregivers in remote sites could be vaccinated quickly and easily. These locations included primary care, specialty care, medical aid units, imaging, laboratory, rehabilitation services, and nonclinical sites.

A novel addition this year was a drive-thru option, allowing workers who were not on shift to come by and be vaccinated without leaving their cars. Employees were encouraged to preregister for their flu shot in the weeks leading up to the drill, which improved the efficiency of the exercise. Those not vaccinated during the one-day campaign were slated for follow-up immunization.

Q&A

Hospital Infection Control & Prevention asked for more detail about the mass immunization campaign in an interview with **Marci Drees**, MD, MS, FACP, DTMH, FSHEA, chief infection prevention officer and hospital epidemiologist.

HIC: Why did you decide to go to this mass vaccination approach for healthcare worker annual flu shots?

Drees: We have had a pretty intensive flu campaign prior to the last two years, but basically it was spread out over three weeks. We had put into place a tracking system so that we knew who was vaccinated [in-house and at affiliated sites and clinics]. We had that in place for five or six years prior to this event. There have been other hospitals that published similar plans to kind of dual-purpose your flu campaign into a vaccination drill. We took some lessons from what we read and put our own spin on it as well.

We are pretty geographically diverse. So, having everyone come to one spot to get vaccinated — which is what some of the other institutions have described — was not going to be very feasible for us. So we did it our own way by having several different locations plus a traveling team that went out to all of our outpatient and ancillary sites across four states. They brought vaccines if there were staff that were able to vaccinate at the location. We also had a traveling vaccination team that went around to the nonclinical sites, where there was no one physically there who

could administer the vaccine. Most folks that were vaccinated got it on campus because that is where most of our staff are on any given day. Delaware is a pretty small state. We are right at the juxtaposition of the four states. It's a complex system in terms having to get where you need to go, but it is not a huge [geographic area].

HIC: How do you set up the program for those that are going to be vaccinated within the hospital? Did you go around with vaccination carts?

Drees: For the two physical hospitals, we set two locations at the bigger one, and one at the smaller one, where staff could come down to get vaccinated. We have multiple tables and there were very few times throughout the day that there were lines — just because we had staffed up appropriately. For the outpatient sites, we had to know how many people needed vaccination, so that we could drop off a package — vaccine, syringes, alcohol swabs — everything they needed to vaccinate their own staff. Or the traveling vaccine team would come through [and immunize people]. We were able to find out ahead of time how many staff needed vaccine.

HIC: Does this one-day campaign generate a lot of enthusiasm that helps with staff participation?

Drees: I think it really does — we really talk it up a lot. [Marketing] did a great job in terms of publicity. You have to make it fun. A radio station came in, we had therapy dogs, and tons of stuff that people could do while they were waiting.

The other thing is we had a lot of nurses and pharmacists volunteer to give vaccines. We also had a lot of hospital leaders come down to help and that was nice. It's fun — you get to see staff you don't see every day.

HIC: For the drive-thru immunization, did staff have to get out of their car?

Drees: No, actually you just roll up your sleeve. We thought it might be a nice opportunity to get some of our people that were off they day. They might have their kids with them and they don't want to park and come in. We put it in back of the employee parking lot, and we got a lot of positive feedback. The longest wait was like 25 minutes, but people were happy with that option. That was a big success for this year — that was something new.

HIC: Can you report this mass immunization effort as a drill for emergency preparedness to The Joint Commission?

Drees: Yes, exactly. It helps us with that regulatory accreditation, but we really did need to understand how we would do this on very short notice. We took six months to plan our first event, and the second time it got a little bit easier in some ways. There are a lot of lessons learned. For example, nobody had a true "master list" of where all our staff work. Different departments had different lists. From an emergency management perspective, you need to have a master list. That was a great lesson learned from the first go-around. We have primary care clinics with outpatient labs, outpatient radiology, and physical therapy. No one person at that physical location had a reporting system for all of those different types of clinical sites. So, you have to communicate four different times for four different clinics, even though they are all physically at the same place. That was a lesson learned last year. So, this year we made sure there was some kind of site contact that was responsible for communicating for all of the different services at a given physical site. That really streamlined things. It has been nice to partner with emergency management. It is a ton of work, so the fact that we have support from the very top is really essential. We never know when flu is going to hit — some years it hits earlier than others. But by the middle of October we have two-thirds or three-quarters of this done. It is nice to have a jumpstart on that.

HIC: Would this kind of drill be appropriate training for the next influenza pandemic or the kind of mass prophylaxis that would be necessary after a large exposure or bioterrorism incident?

Drees: I was here in 2009, when we had the last pandemic. I think the bigger issue then was we didn't have vaccine. So, the question was how you prioritize [vaccine] to the patients, the staff, and to which staff. Who are the people at a higher risk of complications? It gets very tricky. So, this is slightly different, but I think we still learned things by having this drill. It doesn't have to be a vaccine necessarily, it could be a mass prophylaxis with antibiotics. It would be the same process, so I think it is useful for other things.

HIC: Does your healthcare system mandate seasonal flu immunization for healthcare workers?

Drees: We do not. We allow people to decline. We have what I call a "mandatory declination" process. They are required to participate in the process. We typically have less than 5% decline. That is pretty good herd immunity for flu. I know facilities that mandate vaccine have about 99% [compliance] because they fire people. This is a little more lenient, but we still get the results that we need.

HIC: Do you conduct annual education to try overcoming antivaccine sentiment and myths?

Drees: We always do education. We put together web-based learning that we push out in September. For the last couple of years, we have done kind of a [basic] version for people who know they are going to be vaccinated and just wanted to know where and when. Or they can choose a longer version that goes into the type of vaccines out there

and any safety concerns. We probably have 200 "frequently asked questions" — all grouped by category — based on questions we have received in the past. We make sure that is updated each year. For those people that do decline, we have them give a reason for declining. We also look at what department they are in. So, if there is a department that has a little lower vaccination rate, we target them for some advertising materials and try to get some of their own staff members to be models for the fliers. So, it really emphasizes that someone they know is really supportive of flu vaccination.

HIC: For those who decline vaccination, do you enforce mask requirements during flu season?

Drees: They must participate in the [vaccination] process and we give them a date of November 30 to complete that. We then push out to managers [which employees] are not vaccinated and they know that they have to wear a mask. Once flu starts circulating in the community, we will put out a notice saying now is the time to start masking for anyone who is unvaccinated for any reason. We typically get another rush at that time down to employee health, of people who want to get vaccinated. They don't want to wear a mask, so they come down and get it, but we do have people who wear masks all winter long. ■

CDC: Fight Against AIDS at Key Inflection Point

Available prevention, treatment tools are not being used

Since 2013, progress in reducing the number of new HIV infections in the United States has stalled at about 38,000 new infections occurring each year, the Centers for Disease Control and Prevention (CDC) reports.

"Accelerated efforts to diagnose, treat, and prevent HIV infection are urgently needed," the CDC emphasized.[1]

The first cases of what would come to be known as HIV/AIDS were detected in the United States in 1981[2] and since then, the infection has killed about 35 million people across the globe. It is one of the great plagues in human history, but evidence is growing that the tools to finally stop transmission are at hand, even as research on an elusive vaccine continues.

"Ending the HIV epidemic would be one of the greatest public health triumphs in our nation's history," **Eugene McCray**, MD, director of the division of HIV/AIDs prevention at the CDC, said at a recent press conference.

CDC officials updated an ambitious plan to essentially end the AIDS epidemic in the United States in the next decade. While taking an overall national approach, the plan — part of a collaboration between the CDC and other federal agencies — would target specific geographic areas and at-risk populations. The goals are a 75% reduction in infections in the next five years and a 90% reduction in 10 years.[3] *(See* Hospital Infection Control & Prevention, *May 2019.)*

"Targets to reach this goal include that at least 95% of persons with HIV receive a diagnosis, 95% of persons with diagnosed HIV infection have a suppressed viral load, and 50% of those at increased risk for acquiring HIV are prescribed pre-exposure prophylaxis (PrEP). PrEP contains two HIV antiretroviral medications (tenofovir and emtricitabine). The CDC estimates that one prophylaxis pill a day taken by an uninfected, at-risk person is 97% effective at preventing HIV transmission from an untreated sex partner.

However, only 18% of the 1.2 million people indicated for PrEP were prescribed the drugs in 2018. For those already infected, today's treatments are so effective that viral loads can be suppressed so low (< 200 copies of HIV ribonucleic acid [RNA] per mL) that there is "effectively no risk of sexually transmitting the virus" the CDC report states.

Despite this, the United States is on track to have almost 400,000 new HIV infections this decade, even though an array of prevention and treatment improvements are now available.

"Nevertheless, 38% of new HIV infections are transmitted from persons with HIV infection who are unaware of their infection," the CDC states. "Further, 43% of new HIV infections are transmitted from persons who have received a diagnosis but are not receiving HIV medical care, and 20% of new HIV infections are transmitted from persons receiving medical care for HIV, but who are not virally suppressed."

"It emphasizes the continued urgent need to increase these interventions," says **Jay Butler**, CDC's deputy director for infectious diseases. "The science is there, we have the tools. There's a critical need to fully engage the community to include new voices and build capacity."

Part of that will be rooting out HIV in sectors with grim socioeconomic conditions, including those infected or

at risk among the homeless, addicted, and those with untreated mental health issues.

"More than 150,000 Americans still don't know that they have HIV, and need to be tested," Butler says. "Not enough Americans with HIV have the virus under control through effective treatments." ■

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CME/CE INSTRUCTIONS

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CME/CE QUESTIONS

1. Which of the following was *not* classified as an urgent threat — the highest level — by the Centers for Disease Control and Prevention (CDC)?

a. *Candida auris*
b. Carbapenem-resistant *Acinetobacter*
c. Carbapenem-resistant Enterobacteriaceae
d. Methicillin-resistant *Staphylococcus aureus*

2. The CDC estimated that what percentage of deaths caused by antibiotic-resistant pathogens were healthcare-associated infections?

a. 25%
b. 50%
c. 65%
d. 85%

3. Tom Chiller, MD, MPHTM, described which state as "ground zero" for the emergence of multidrug-resistant *Candida auris*?

a. Illinois
b. California
c. New York
d. Florida

4. Michael Pulia, MD, MS, said which patient group is frequently being given antibiotics inappropriately for asymptomatic bacteriuria?

a. pediatric
b. geriatric
c. neonates
d. diabetic