

Vital Signs Town Hall Teleconference
Stop the Spread of Antibiotic Resistance and C. difficile Using a Coordinated
Approach for Action
August 11, 2015
1:00 pm CT

Coordinator: Welcome everyone and thank you for standing by. At this time all participants have been placed in a listen-only mode until the question and answer portion of today's conference. At that time, if you would like to ask a question please press star one on your touchtone phone.

Today's conference is being recorded. If you have any objections, you may disconnect at this time. I would now like to turn today's conference over to Dan Baden. Thank you and You may begin.

Dr. Dan Baden: Thank you David. Good afternoon everyone. I'm Dr. Dan Baden. I'm the senior medical advisor in CDC's Office for State, Tribal, Local, and Territorial Support. I'm glad you could join us today.

We'll be discussing the latest *Vital Signs* report on making healthcare safer by stopping the spread of antibiotic resistance. Before we get started, let's go over some housekeeping details.

You can go online and download today's PowerPoint presentation so you can follow along with the presenters. The Web address is www.cdc.gov/stltpublichealth. That's S-T-L-T Public Health. Look on the far right side of the page for the *Vital Signs* Teleconference link or you can

Google “CDC *Vital Signs* Town Hall” and click on the top link. That should get you there.

On the same Web page, you can access bios for today’s presenters and the audio recording and transcript which should be available next week.

There will be time for questions after today’s presentation, but you can get in queue at any time. Just press star one and say your name when prompted. Now, back to our topic.

Stop the Spread of Antibiotic Resistance and *C. difficile* Using a Coordinated Approach for Action. We’re going to hear from four colleagues. First we’ll hear from Dr. Scott Fridkin, a senior advisor for antibiotic resistance and healthcare in the Division of Healthcare Quality Promotion at CDC’s National Center for Emerging and Zoonotic Infectious Diseases. He will talk about the findings in this month’s *Vital Signs* report.

Then, Dr. Marion Kainer will present. She’s the director of the Healthcare-Associated Infections and Antimicrobial Resistance Program at the Tennessee Department of Health. She will discuss the geographic variation of Carbapenem-resistant Enterobacteriaceae incidence in Tennessee and the implications for prevention efforts.

And then hand the call over to Erica Runningdeer, the healthcare-associated infection prevention coordinator at the Illinois Department of Health. She will talk about coordinated action to stop the spread of antibiotic resistance, and then hand the call over to Gwen Borlaug, the healthcare-associated infection prevention coordinator at the Wisconsin Department of Health Services. She will present on Wisconsin’s public health response to CRE.

And now, I'll turn the call over to Dr. Fridkin.

Dr. Scott Fridkin: Thank you very much. I am going to start on Slide 4 or page four and this is going to be just a high level overview of the content to the MMWR, which was our attempt to estimate the effects of a coordinated approach for action to reduce antibiotic resistant infections in healthcare facilities.

On page five, as background, CDC has estimated that roughly two million antibiotic resistant infections occur each year in the US and approximately 23,000 deaths are associated with these infections. Many of these infections are predominantly acquired in healthcare settings.

The next slide - we use these sorts of data to project forward in time and estimate how many infections and deaths would be expected to occur over each year for the next five years. Through modeling, we projected that with a nationwide initiative that included a combination of antibiotic stewardship and infection control activities that roughly 619,000 antibiotic resistant healthcare-associated infections or Clostridium difficile infections and 37,000 deaths would be averted with such a nationwide initiative.

Next slide.

We next worked with two different groups of partners to estimate the impact of different types of infection control actions and two different communities of healthcare facilities. We used Carbapenem-resistant Enterobacteriaceae or CRE as an example or a test case to illustrate the impact of these different types of infection control actions.

So using mathematical models, we estimated how many patients would get CRE if hospitals and nursing homes worked independently of each other, even if they did good infection control but they only acted based on information they had from their own facility versus modeling when hospitals and nursing homes worked in a coordinated fashion using information provided by a health department or by other facilities alerting them or alerting hospitals and nursing homes to the antibiotic resistance status of a patient.

We found that more patients get infections when facilities do not work together, when they're using this independent approach. And up to 70% fewer patients get CRE over five years if facilities coordinate to protect patients.

Page 8 or Slide 8 -- this slide is a screenshot of a video that is available at the link at the bottom of the slide. This video illustrates one of the agent-based models that was utilized for this MMWR. This model has ten facilities, one LTAC or long-term acute care facility in the middle, four acute care hospitals, and six nursing homes around the periphery of this slide.

If you watch this video, you will see how the model simulates patient movement between all these different types of healthcare facilities. And it's indicated after the first patient with CRE is introduced into this network of healthcare facilities how the prevalence of CRE varies over time. And we run this model for five years.

And what you can see at the end of the video is the relative difference between a coordinated action for prevention compared to the independent

action. The coordinated action led to 70% fewer transmission events occurring.

Next slide, page 9.

Based on these data, CDC recommends a coordinated approach to the prevention of antibiotic resistance and preventing the spread of antibiotic resistance. Public health authorities and healthcare facilities should work together to share experiences and connect patient safety efforts. Lack of such coordination between facilities will put patients at increased risk for acquiring these antibiotic resistant organisms.

Next Slide, 10.

So state and local health departments can do several things right now to begin to initiate and implement coordinated - types of coordinated action. First, they can identify the healthcare facilities in their area and how they are connected. They can know the infection prevention antibiotic stewardship activities that are going on at each of these facilities.

Second, they can dedicate staff to improve connections and coordination with healthcare facilities in their area. Third, they can work with CDC to gain access to existing data about healthcare associated infections and antibiotic resistance, and use these data to better prevent infections and improve antibiotic use in these healthcare settings.

And fourth, they can know the antibiotic resistance threats in their area or state.

CDC is working closely with a variety of partners to develop state tools and resources to prevent HAI's and improve antibiotic stewardship, including the National Association of County and City Health Officials, ASTHO, CSTE, and the Public Health Foundation.

Next slide, 11.

This concept of coordinated action is a very forward-looking approach and investment is needed. Now we have a clear sense not only of how bad the problem is and how bad it can be, but what needs to be done and what the benefits are of doing it. Now it's up to Congress to support the resources needed to protect Americans from drug-resistant bacteria and the risk of a post-antibiotic age that undermines many lifesaving procedures in modern medicine.

Health departments and hospitals cannot stand this up alone without help. However, some have taken significant steps towards such coordinated action now on some specific antibiotic resistance threats.

Next we're going to hear from three states that are making such progress. I'm going to turn it over to Marion Kainer, at the Tennessee Department of Health. Marion?

Marion Kainer: Thank you. It is my privilege to describe some of the work from the Tennessee Department of Health -- work which would not be possible without the financial support from CDC by our cooperative agreement.

Let's start off with Slide 14. In 2012, CDC published the CRE Toolkit, the approach taken by healthcare facilities should vary depending on whether the region has had no CRE, few CRE, or where the CRE are common.

Slide 15.

Position statement 15ID05 was passed at the recent annual meeting of the Council of State and Territorial Epidemiologists, or CSTE. It includes a standardized case definition for CRE and the recommendation for sub-classification and stratified reporting by public health.

Slide 16.

On the right you see the new 2015 definition from that position statement. *Klebsiella*, *E. coli*, or *Enterobacter* that are resistant to any carbapenem including ertapenem. It is much simpler than the previous definition shown on the left. It is the same definition that CDC implemented this year for lab ID event for CRE in the National Healthcare Safety Network, or NHSN.

Slide 17.

CRE are reportable in Tennessee. We capture CRE data in our electronic disease surveillance system, the NEDSS Base System, or NBS. The map shows the twenty-two jurisdictions that use the NBS. Our surveillance systems and informatics team extract the data for analysis. There are complex parent-child relationships for organism and susceptibility data.

The analyzed data for Tennessee residents were specimens collected in calendar year 2014 for *Klebsiella*, *E. coli*, and *Enterobacters*. We applied the

new 2015 definition that is resistant to any carbapenem including ertapenem with a numeric MIC value using the 2012 CLSI break points. We counted one organism for the calendar year.

The next slide, slide18, shows the map of CRE cases by genera and county of residence. Note this is county of residence, not location of any associated healthcare facility. *Klebsiella* are shown in purple, *E. coli* in yellow, and *Enterobacters* in green.

The darker lines indicate our eight emergency management system, or EMS, regions. In Tennessee, the EMS regions reflect referral patterns and correspond to the healthcare coalitions established for emergency preparedness. In the future we would like to confirm that these regions truly reflect interconnectivity of healthcare facilities across the healthcare spectrum to each other.

Slide 19 shows the annual incidence rate to 100,000 by county of residence for all three genera combined. You can see the striking geographic variation in the incidence of CRE across Tennessee. Of note, the counties in which the largest cities in Tennessee -- Memphis, Nashville, and Knoxville -- are located have a much lower incidence of CRE compared to rural West Tennessee, the tri-cities area in Northeast Tennessee, and Chattanooga.

Slide20.

The geographic variations seen for three genera combined is even greater when we stratify by organism. This is a map for *Klebsiella*. Note the striking clustering in Northeast Tennessee and the Chattanooga area.

Slide 21.

In contrast, *E. coli* have a high incidence in the Chattanooga area and in the rural West Tennessee.

Slide 22.

And the incidence of *Enterobacters* is high in West Tennessee.

Slide 23.

This map shows the number of CRE cases by the healthcare facility laboratory performing the tests. Some of these laboratories perform testing for outpatients, surrounding physician practices, and nursing homes -- not just inpatients. Isolates identified by promotional laboratories such as LabCorp or Quest are not shown on this map.

Jackson and West Tennessee, Chattanooga, and the Tri-cities area in Northeast Tennessee have the largest burden.

Slide 24.

We plan to share these data on an ongoing basis with our partners for situational awareness and targeted interventions. Now that we can extract the lab data, we plan to capture additional variable son the case report form to gain a better understanding of epidemiology of CRE across Tennessee, including capturing the names of associated healthcare facilities.

The duplication of names of healthcare facilities and laboratories in NBS would allow for easier analysis. Our state public health laboratory is working hard to expand resistance mechanism testing. We also plan to classify cases as likely or not likely carbapenemase-producing, or CP-CRE using the sub-classification table outlined in the CSTE position statement and create maps of likely CP-CRE and mechanism of resistance such as KPC and NDM.

Slide 25.

We also wish to get a better understanding of the degree of connectivity of individual healthcare facilities to each other across the spectrum of healthcare within Tennessee and our neighboring states, especially in our areas of high incidence. Understanding connectivity better will likely help us target our interventions even more specifically within those regions. If it turns out that much of a problem is in a subset of facilities that are highly interconnected with regard to sharing of patients, all of the facilities that seem to be amplifying or disseminating CRE to other facilities in the region.

CRE and residents don't respect state borders. In Tennessee, 10% of our hospital admissions are from other states. This proportion is much greater in population centers near our borders such as the tri-cities area in Northeast, Chattanooga, and Memphis.

To understand epidemiology of CRE, especially in healthcare facilities near our borders, we will need to expand the reporting requirements to not only include Tennessee residents but also any patients treated in a Tennessee healthcare facility. These are important considerations also as we explore leveraging the data collected in NBS to create a registry.

We have been inspired by the great work of Illinois with their XDR registry which you will hear more about from Erica Runningdeer in the next presentation.

Thank you. Erica?

Erica Runningdeer: Thank you so much Marion. We're on Slide 27 now. I want to thank everyone for inviting me to speak today.

And just to echo some things that Marion said about this year's *Vital Signs*, using a coordinated approach to stop the spread of antibiotic resistance is really what I see as a culmination of the last several years of work that CDC has been doing to support state health departments and working with local partners to build sustainable infrastructure to support effective infection prevention activities across the entire healthcare spectrum.

The ability to control infectious diseases and treat them with antibiotics is one of public health's greatest achievements and it's not an understatement to say that what we're discussing today is how to use everything that we've learned to prevent something really catastrophic from happening, such as the day when antibiotics just stop working.

I'm going to share with you a few of the highlights of what we've been doing in Illinois and much of that reads like we used the last few *Vital Signs* and major CDC publications as a playbook for our program because that's basically just what we did. And it's working very well.

Slide 28.

When CDC released the 2012 CRE Toolkit, we were fortunate that our academic partners at the Chicago CDC Prevention Epicenter had been funded by CDC to perform point prevalence surveys for CRE at long-term acute care hospitals and intensive care units around the Chicago area since 2010.

So we had a better situational awareness than many other states. And what they had found was alarming. There was up to a 3% prevalence in ICU's and a 30% prevalence in the long-term acute care hospitals. With the support of our healthcare-associated infection prevention advisory council, we made CRE a reportable condition under the Illinois Communicable Disease Code.

On Slide 29 - however, rather than add CRE reporting to an existing surveillance system, we realized that here we had a real opportunity to create a new system that would align the goals of care providers and public health. The extensively drug-resistant organism registry, which we call the XDRO registry, was designed primarily as an interfacility communication tool that gives care providers a way to look up information about a patient that might have been missed during a transition in care settings.

To realize how important this is, you first need to understand that patients are shared between healthcare facilities, and it's all too common for information to get lost along the way or buried within a large electronic medical record. For example, a patient might go to a hospital for surgery or serious illness and then transfer to a nursing home or rehabilitation facility for long-term care and recovery. That patient might even go home and end up back in a different hospital.

I found out that several of the large medical centers already had a kind of internal registry where they would put up automatic alerts when a patient

that they knew had CRE was readmitted to their facility to ensure that contact precautions were initiated. But that didn't solve the problem of knowing a patient's CRE history if they have been diagnosed at a different facility.

The XDRO registry was created as a solution to these challenges as a way to allow for communication across the healthcare spectrum regardless of facility or vendor-specific databases and so on. At first, all of this was manual. We recommended querying patients with risk factors since it isn't really feasible for large facilities to query every patient admitted.

The XDRO team has successfully piloted automated alerts at a couple of hospitals and are working on scaling that up. The automated alerts work by sending a secure encrypted feed of admission data to the registry that gets compared to encrypted data within the registry.

And when there's a potential match found, an automated email is sent to the infection preventionist or whoever is designated at that facility telling them they need to log into the secure system. And when they do that they'll see a facility alert button with a list of potential matches between the registry and new admission.

The very first day the automated alerts went live, a new admission was identified as having a history of CRE.

Slide 30.

The XDRO registry also serves as a useful surveillance tool for facilities and for public health. Pictured here is a facility dashboard that compares a

facility's reports with the state aggregate. The dashboard includes the number of unique patients identified by that facility compared to the state aggregate, as well as a breakdown of resistance mechanism and specimen source.

The state data show is true but there's some lag time between when cultures are collected and when they are reported. So just note that if you see an updated graph of this in the future, the numbers might be different.

With this registry we are able to identify trends, examine regional differences, and look for clusters of infections that might span multiple healthcare settings. Right now we're piloting the use of a software called Fast Scan which uses an algorithm to detect clusters within a geographic area over a specified period of time. We want to see if we can use Fast Scan to look for clusters based on sharing networks between facilities instead of just physical location.

And patient sharing networks aren't just based on a direct transfer between facilities, but whether the same patient had been shared between these facilities within a defined time period. The most readily available data that we have to start this analysis is with hospital discharge or administrative data. We're interested in exploring data from other sources like Medicaid or Medicare since that would include other settings such as nursing homes.

Additionally, local health departments are able to access data within their own jurisdiction through an interface with the INET reporting system. This is especially helpful in jurisdictions where there's a higher burden of CRE such as the Chicago metro area. We've been working more closely with our

colleagues in Chicago, Cook County, and DuPage Departments of Health to look into unusual isolates or potential clusters.

The goal of all of this is that we would be able to pick up on early signs that transmission might be happening within or even between healthcare facilities and take action that would stop an outbreak before it ever even happened.

To date there have been over 2,949 reports submitted to the registry and there can be more than one report per patient because the requirement that we have is to submit the first lab result that meets the definition per patient stay. Once we de-duplicate by first initial, last name, and date of birth, we see that there have been 1,943 unique patients with reports entered into the XDRO registry between November of 2013 and early August of 2015, which comes out to an average of two to three new patients added to the registry per day.

Slide 31.

Mandating reporting and rolling out the registry was a big undertaking, but it was only a piece of our prevention strategy. We convened a statewide task force of more than thirty representatives from various disciplines, care settings, laboratories, health departments, and stakeholders.

Their input was invaluable for creating guidelines and flow charts for lab testing procedures, guidelines on outbreak response, tailoring prevention recommendations for long-term care facilities, and designing the Illinois CRE Detect and Protect campaign.

213 families and twenty-three stakeholder sponsors signed up for the campaign. We offered nine webinars which were attended by more than 1,000 people from 227 facilities. Many of the resources are archived on the XDRO.org Web site.

In this graph you can see the jump in Web traffic that we saw with the implementation of the campaign. We just recently held three regional workshops with more than 400 attendees form across the state.

In addition to providing education specific to CRE, the workshops included skill sessions for participants walkthrough case studies together. We specifically presented them with scenarios that involved transitions across the spectrum of healthcare.

We've also woven antimicrobial stewardship content and action planning into all of our HAI prevention endeavors. The "detect and protect" strategy helps to contain CRE and prevents spread. The primary prevention of CRE, *Clostridium difficile*, MRSA, and other drug resistant bugs will only happen when we implement systems and programs to ensure antibiotics are used appropriately.

Slide 32.

Another example of Illinois' coordinate approach is our *C. difficile* infection prevention across transitions of care collaborative. We have ten facilities representing various levels of care that have committed to a more intensive prevention effort.

While the target outcome is prevention of *Clostridium difficile*, we include foundational strategies for infection control that are not really bug-specific. We are onboarding skilled nursing facilities into the National Healthcare Safety Network to report *Clostridium difficile* infections, but it's really building a whole new skill set of using NHSN reporting metrics.

The collaborative includes content on antimicrobial stewardship and communicating effectively during transitions of care. For the way we have selected facilities, they are organized into groups that exchange patients with each other. So we're also fostering peer learning groups and networks. We hope that this strategy will produce a more sustainable and coordinated effort.

Slide 33.

In conclusion, as you're admiring the beautiful skyline of Chicago, I want to acknowledge that Illinois has been able to make these strides in our program due to the resources that we receive from CDC. This would not be feasible without a very talented and creative healthcare-associated infection prevention team which includes dedicated staff from the Illinois Department of Public Health as well as our colleagues at Hektoen Institute, the CDC Prevention Epi Center, local health departments, and a very long list of stakeholders and subject matter experts who generously share their time and passion for prevention antimicrobial resistance and healthcare-associated infections.

Also, while you may have thought that I chose that photo because I love Chicago, and I do, I also wanted to show how much further the state can spread its message when we convene multiple stakeholders around a

common goal. So, just having our colleagues at Blue Cross Blue Shield light up their building with hashtag saveabx for Get Smart Week.

And now I'd like to turn the call over to Gwen Borlaug of the Wisconsin Department of Health Services to learn more about the public health response in Wisconsin. Thank you.

Gwen Borlaug: Thank you (Erica). Thank you. It's been very interesting to listen to what's going on in other states such as Tennessee and Illinois and I am grateful for the opportunity to talk about our CRE surveillance and response here in Wisconsin.

On slide 35 you will see that I'm going to discuss today how we conduct CRE surveillance in Wisconsin, what information we have obtained from that data that we've collected to help direct our CRE control strategies, what the role of our local health departments play, and what are the next steps in our fight against multi-drug resistant organisms.

Slide 36.

DPH mandated CRE surveillance during December of 2011 when we required all of our 137 hospitals to report CRE using the National Healthcare Safety Network. Our goals were to identify regions with high CRE prevalence to detect incidence of healthcare transmission, and to identify any high risk facilities -- that is those facilities with high numbers of CRE cases such that patients or residents being transferred to other facilities should be preemptively placed in appropriate precautions.

Now this hospital-based surveillance enabled us to accomplish our goal because it was complemented by our state labs - clinical laboratory based surveillance which began during 2010. State labs staff conduct PCR testing on all carbapenem non-susceptible enterobacteriaceae isolates to identify the mechanisms of carbapenemase production. And they also conduct pulsed-field gel electrophoresis on carbapenemase positive isolates to help identify possible incidence of healthcare-associated CRE transmission.

Next slide, slide 37.

So this table on this slide summarizes our DPH CRE surveillance data during 2013 and '14, and includes laboratory identified CRE events -- that is clinical isolates of *Klebsiella* species or *E. coli* that tested non-susceptible to doripenem, imipenem, or meropenem; or were carbapenemase positive by PCR. And that's per the NHSN protocol during those years with the prevalence expressed as the number of CRE events per 100,000 hospital admissions.

Statewide CRE prevalence among hospital inpatients was between six and seven events per 100,000 admissions during the two year period, but the substantially higher prevalence in the Southeast -- approximately twelve events per 100,000 admissions compared to two to three in the remainder of the state.

So these data certainly revealed Southeastern Wisconsin as a CRE hotspot and approximately 80% of our CRE cases occur in that area.

Our work with the state lab has helped identify three clusters of CRE to date. One cluster was associated with a long term care facility and resulted in

hospital transmission. A second cluster was associated with transmission of MDM-1 *E. coli* following exposure to a common duodenal scope. And we were recently made aware of a cluster of four hospital patients with closely-related CRE isolates. And that has prompted us to conduct weekly CRE screenings among patients located in the affected units of those facilities.

Next slide, slide 38.

So this slide illustrates the interfacility transmission of CRE associated with those first cases that were reported to DPH just two week safer mandatory CRE reporting went into effect on December 1, 2011. Three previously unrecognized CRE positive residents of a long-term care facility were admitted to the same hospital from December 19th through the 28th.

CRE positive cultures were obtained from all three residents within the first three days of admission. One resident, patient A, was located in a room adjacent to patient B from whom a CRE isolate was obtained on a subsequent admission. CRE isolates obtained from all four of these patients were closely related by PFGE analysis.

This cluster, I think, really demonstrates the importance of public health agencies facilitating coordinated CRE patient management and communications among healthcare institutions. This is the point that CDC is making very eloquently in their recent study with the modeling.

Because once we set up that interconnected communications with these two facilities and we came up with a plan together, we had face to face meetings -- there was no subsequent transmission. We had no evidence of transmission either intrafacility or interfacility once we had set that up.

So next slide, slide 39.

So these two means of CRE surveillance have really enabled us to achieve those goals we set at the onset of our program. Because we identified Southeastern Wisconsin as a high CRE prevalent area, our first regional collaborative group was created in this region.

In partnerships with the City of Milwaukee Health Department, we convened a group of experts that included hospital and nursing home infection preventionists, hospital epidemiologists and infection control medical directors, and of course local and state health department staff.

This group created our hospital and nursing home CRE toolkits, which were based on the CDC toolkit. Subsequently, a regional coalition was created in South Central Wisconsin among Dean County Infection Preventionists. And we've also used our local chapters of APIC as regional collaborative groups because these collaborative groups have really served as conduits for interfacility communications which, again, as the vital sign report shows is a key strategy in the fight against multidrug-resistant organisms.

In this toolkit we have emphasized the importance of immediately placing CRE patients in appropriate precautions, notifying receiving facilities upon transfer of CRE patients and residents, submitting isolates to the state lab, screening exposed patients and educating healthcare staff, patients, and families.

Slide 40.

The City of Milwaukee Health Department has been a role model for our other local health departments regarding a public health response to CRE. In addition to the convening that regional expert panel, this agency has provided educational opportunities for infection preventionists. For example, they hosted two CRE workshops at which we discussed the various components of the toolkit with hospital and nursing home staff together. So it was really great that we could all be in the room together at one time.

We have provided CRE education and discussed the CRE toolkit with other local health departments as well. Most local HD in Wisconsin meet regularly with their local infection preventionist and we've encouraged them to discuss the CRE toolkit at those meetings.

In the future, we'll want to involve our local HD as we develop a statewide antibiotic stewardship program.

Slide 41 indicates what our next steps are. Our future plans include engaging skilled nursing facilities and conducting voluntary CRE surveillance and reporting. We've trained more than 300 nursing home staff at nine surveillance workshops during 2014 to build surveillance capacity and we continue to work with those individuals toward CRE surveillance so we can get some information about what's going on in our skilled nursing facilities.

We're also currently conducting a data validation exercise among our hospital reporters to ensure that we have the most accurate and reliable CRE data possible. And we're also designing a case-control study to help elucidate some of the risk factors that might be unique to our patients in Southeastern Wisconsin.

Perhaps most importantly, we will capitalize on our current resources among our healthcare and quality improvement partners to ensure we have a coordinated statewide antibiotic stewardship response.

So that's a very general overview of our CRE surveillance and response and our plans for the future. On slide 42 I have included links to our CRE Web site and our annual CRE surveillance report.

So thanks again for the opportunity to present our program to you. And now I'm going to turn it over to Dan for the Q and A session.