Antibiotic Awareness Week Webinar

Presenter: Dr. Lynora Saxinger

Antibiotic Awareness Week 2013

Pamela Gareau: Welcome to this Antibiotic Awareness Week webinar on Tracking, Assessing and Reacting: Surveillance as a Tool in Controlling Antimicrobial Resistance, in Canada and globally.

Welcome Dr. Saxinger.

Dr. Lynora Saxinger: Thank you very much. And, please let me know if there are any problems with the audio. But, I have enough material to discuss for about 45 minutes at least, and I really would like to encourage people who are listening to think of points they'd like to raise, questions they'd like to ask, to have a really useful and fruitful discussion at the end.

Initially, my plan was to describe the results of the Antimicrobial Resistance and Utilization Surveillance Report. I was one of the group working on that report, which was also commissioned by the NCCID. But we're a little behind because, fairly late in the stage of finalization, we decided to use a different approach in analysing and presenting the results. And so, out of respect for my colleagues, to not produce something that's kind of half-baked, what I've chosen to do instead is to just bring up a number of issues and ideas that are very pertinent to antimicrobial resistance and antimicrobial utilization surveillance in 2013 and in Canada. So, there is a bit of a wide-ranging format.

And we can kind of start by saying this is Antibiotic Awareness Week in Canada. It's also Antibiotic Awareness Week in the U.S., through the CDC's Antibiotic Week. It was also Antibiotic Awareness Day in Europe, yesterday. And I think there are quite a number of other countries also that are observing similar things around this time. All this has been evolving over the past few years.

"Remember to use your antibiotics wisely, when needed, and as prescribed."

And although we've know about antimicrobial resistance for a long time, it does seem as if there's been quite an upwelling in interest in resistance, and appreciation for the potential of the dangers of resistance. As evidenced by things like the video that was put out by the WHO which actually discusses AMR as a global health security emergency. This was in the summer in 2013. "The dangers of hubris on human health - the rapid emergence of antimicrobial drug resistance".

Then, there was the very well-publicized comment from the U.K.'s Chief Medical Officer, Dame Sally Davies, who told people that she was afraid that she was going to need a hip replacement and would die of a superbug for which there were no antibiotics. And she terms this a catastrophe that ranks with terrorism and climate change. And then most recently, in September, the U.S. CDC put out an "Antibiotic Resistance Threats" in the U.S. that ranked threats. It was a report that tried to look at the burden of antimicrobial resistance and the threats posed, ranking organisms by their effect on human health. So, there has been a lot of activity lately.

And the reasons for that are manifold. Here is a graph of antimicrobial resistance for selected pathogens over time. This is just a classic graph that tells us what happened over time. We saw the introduction of penicillin led to penicillin-resistant *Staphylococcus aureus.* The introduction of cloxacillin, which was then a wonder drug, led to the introduction of methicillin-resistant

Staphylococcus aureus, which took a little bit longer to become predominant, but really did increase steadily over
the Eighties and Nineties to a pretty high rate in many places.

The second line on the graph there reflects enteroccocci resistant to vancomycin.

The number three line reflects *Pseudomonas aeruginosa* resistant to imipenem.

And the number four line reflects that *Acinetobacter spp* are resistant to imipenem. So imipenem-resistant Gram-negative bacteria are a hot topic right now as well.

This also extends beyond antibacterials to the realm of fungi, where we see increasing numbers of pathogenic Candida species are resistant to fluconazole.

The resistance starts with the use of an antimicrobial, be it for prevention of infection or growth promotion in animals, or for a human with a bacterial infection. Or someone who unfortunately has a viral infection. And if you develop resistant bacteria in your gastrointestinal tract, then you can spread that resistance either at home or in a healthcare setting. And within the healthcare setting we have additional complication of the healthcare facility itself, which can be a vehicle for infections spread from surfaces or from healthcare workers. And that's why hand washing is important.

In the environment, of course, fertilizer or water that contains animal feces with drug-resistant bacteria can actually get into the food chain. This then results in people carrying resistant bacteria as well.

This is just trying to establish that yes, antibiotics use promotes resistance and that this occurs in different places

And the other thing that has been eminently clear in the past few years is that things like the NDM-1 bacteria show us that resistance spreads. And it travels where people travel, and there is really no way around that. So the responsibility for antimicrobial resistance goes well beyond national borders, because it is really a very permeable border when you get right down to it.

And so, if you think about your human being as a host at risk, they get exposed to a pathogen and the pathogen might carry its own genetic armamentarium of resistance. Then you can put that in the context of community or agricultural antibiotic use. Then the host-and-pathogen relationship gets affected by antibiotics. Likewise, hospital antibiotic use, which is a very intensive place of antibiotic use, also affects the pathogen and the host. And that's where resistance happens. But infection control helps in the realms of hospital antimicrobial use and hospital and community-based stewardship can also try to reduce the development of resistance in those settings.

"A public health crisis." This is the CDC report. In just a few steps from that, they estimated that there are two million resistant infections, at least 23,000 deaths yearly from resistant infections. They estimated a quarter of a million people have *C. difficile* infections in hospitals. And they further said that 70% of the bacteria that cause hospital-acquired infections are resistant to at least one of the drugs most commonly used to treat them. Now this doesn't mean that we don't have options but it tells us something about where things are heading.

The other issue is that with some bug-drug combinations, the second or third choice drugs may be less effective, more toxic, and/or more expensive.

So, can you define this as a crisis? Well, what we have going up are the number of pathogens displaying resistance and increasing multidrug resistant strains. We have increasing numbers of compromised hosts as the successes of modern medicine result in people with malignancies and people with transplants and people with immune conditions receiving chemotherapy and immune modulators that can increase susceptibility to infections.

Mortality attributable to antimicrobial resistance has done nothing but increase and the speed with which resistant microbes can spread globally also has gone up. As have the costs of health care deriving from resistant microbes.

What we have dropping is the power of the antibiotic armamentarium to deal with so many resistant pathogens, as well as the amount of research and development dedicated to antimicrobials and in a lot of cases funding for public health infrastructure.

So, we need to use antibiotics properly. We want to limit their spread of resistance. It's quite unclear whether we can defeat resistance.

This is a quote that I like pulling out because it is very prescient: "The future of humanity and microbes will likely evolve as … episodes of our wits versus their genes." And that was in 1959, which was really quite early in the antibiotic era. And it turns out to be eminently true.

So is this fear-mongering? Occasionally we have cases of untreatable infections which have sometimes been called the end of the antibiotic era. I don't think that an untreatable infection, or even a handful of untreatable infections, is the end of the antibiotic era but it is certainly a disturbing sign. History shows us that resistance increases and that the genetic arsenal of microorganisms is very impressive and evolves quite quickly. And we do know that the antibiotic pipeline is at a low ebb, and that is something that might require some different approaches.

So, talking about resistance worldwide, you can get pieces of data that tell you what's going on. Comparing MRSAs. Greater than 50% of the Staphylococcus aureus is MRSA in some countries and 26 to 50% in other countries. This type of data is very useful to know what's going on worldwide.

When you look at other places, just looking at some data that I was accessing last night, this is the proportion of third-generation cephalosporin-resistant *Klebsiella pneumoniae* isolates in countries participating in the ECDC surveillance. Basically was current as of 2013-11-18, and we have up over 70% resistance of a common bug to one of the most common Gram-negative drugs used to treat it. And that's a bit of a sobering statistic.

Looking further at another example of a fairly common bug and drug, you can see the example of *Pseudomonas aeruginosa* in the European Union. There are areas with an incredibly high resistance. And it does make you wonder, you know, what is different in that place? How has this arisen? You do want to know more about the numbers and the data and some of those details are available when you drill into this Website.
But you can see that some places it's under 5% resistance. Other places, over 50%, over 25%. And knowing that is incredibly important for people who practice medicine in those areas to plan microbial therapy appropriately.

For Canadian data, I did find some data on, just as a parallel, on *Pseudomonas aeruginosa* susceptibilities. And the CANWARD Alliance has an interactive website that had data on 330 *Pseudomonas* isolates from across Canada. And it showed that our ceftazidime resistance rate was 85.2%. So we are less than some places and more than others.

When we look for other data on this type of resistance, I do want to clarify that there is a bit of difference when we talk about hospital antimicrobial-resistant organisms like MRSA and VRE. These are isolates that spread, that are basically already born that way and not made that way. So it's a strain that is spreading within hospital, and there is infection control feeds into that and antibiotic use can select for that strain to be more predominant. But antibiotic use has not created that MRSA at this time. That's just what is spreading.

When we look at other types of resistance surveillance, we can see the evolution of resistance that's related to the utilization of antibiotics in an intensive way, in a place, over time. And so that's where we actually sometimes have less data in Canada just from the way things have evolved. This is a website that actually offers a very strange but somehow fascinating way of looking at things. They have an indicator of a combined resistance score where they look at the overall ranking of resistance in bugs and drugs, pairings over time for countries that have that data available to them. And we don't really have data for Canada. So we're the Big White North unknown. And then you can see that there are some places that have higher resistance scores than others. And again with that information, you'd be tempted to go back and try to find out, why is that so, and can you affect how this is happening?

Which brings me to an issue that's important, which is antibiotic use as a driver of resistance. And stewardship is a topic of great interest nationally with the new Canadian accreditation requirements for stewardship in hospital settings, and also because it's the right thing to do. And the word steward is actually derived from an Anglo-Saxon word meaning the "keeper of the hall". And I like that idea. You're keeping the hall. The hall is a place of community. The hall is the centre of the community and you're trying to keep it good. Good antimicrobial stewardship is a practice that ensures the optimal selection, dose and duration of a treatment for the best clinical outcome for prevention or treatment of an infection, while producing the fewest toxic effects and the lowest risk for subsequent resistance. So this is a concept that's very important. And it's not really the driving force behind this discussion because really, I'm more moving around issues of surveillance here. But it is really an action step that follows from surveillance.

Now surveillance is derived basically from French roots, for "watching over". If you look at the classic Merriam-Webster definition, you find "close and continuous observation of one or more persons for the purpose of direction, supervision, or control". So you're watching for a reason.

The standard current definition in public health is "public health surveillance is the ongoing systematic collection, analysis, interpretation and dissemination of health data for the planning, implementation and evaluation of public health action." So, at a quick glance that seems somewhat boring, with a lot of words, but it turns out that every single word in that definition turns out to be important. We are going to wander through some issues around that now.

Now, public health systems, if you look in textbooks (I'm not a public health person but I'm keenly interested in it), are said to have five essential functions. Population health assessment, health promotion, health protection, disease and injury prevention, and surveillance. And when you look at all of those tools and actions, public health surveillance is considered the best weapon to avert epidemics. And public health successes, of course, are largely silent when nothing is happening. It's only when there is a breakthrough, some failure of public health infrastructure or unanticipated epidemic that was not surveilled – then suddenly people are concerned about it. So it's all been plagued by quiet success. In going back into the history of surveillance, I found this very interesting. In 1741, on a colony in Rhode Island, there was a decree that tavern keepers were required to report contagious diseases among their patrons. I thought that was an interesting happenstance. Two years later in the same place, they actually made the first move for required reporting for smallpox, yellow fever, and cholera, and the concept of notifiable diseases, I think is an important one. That just means that if we have confirmation of a specific disease in the community, it has to be brought to the attention of the appropriate people.

Now after we establish that surveillance is an important and even legislated activity, it's more than just the collection of data. I think there was evolving appreciation in the mid-1900s that the next step is that the information must go somewhere.

So the data and the interpretation must be disseminated to all who have contributed and to all other who need to know. We will talk about the need to know again, but it's interesting to think about. Who does need to know this? To whom should this information be available? And for what purposes? And the next step in the evolution in surveillance thinking was probably in the 21st World Health Assembly, where they actually linked this to doing something. Linking within surveillance to the "planning, implementation and assessment of disease control."

So I will briefly talk about a project that the NCCID put out a request for proposals for. It was basically a request to look at the antimicrobial resistance and antibiotic utilization surveillance systems in Canada and worldwide and try to use that information to help make recommendations on evolution of our systems in Canada. And as I mentioned earlier, I was originally planning on sharing results of this study, but at the moment we are doing a different approach to the analysis and I think that it would be inappropriate for me to share that material when it's still kind of half baked. The project has been a collaboration between the Association of Medical Microbiology and Infectious Diseases Canada with the Stewardship and Resistance Committee, specifically, the NCCID, our hosts today, and University of British Columbia and the University of Alberta. And we had a project team and we had an excellent steering committee with medical and veterinary representation and the funding was from the NCCID. And these are the project objectives that we were intending to address, which were to enumerate Canadian AMR and AMU surveillance programs, determine core elements, identify missing elements, and recommend some actions. And the data gathering approach had two aspects. One was a systematic literature review and there were also key informant interviews with qualitative analysis.

And the systematic search? These numbers might be slightly different now, but at the time that we last presented this, 22 databases were identified, and searching revealed 8837 records. There was a grey literature search and we went through it. The records were all basically screened and we were looking for features of surveillance programs to use in the enumeration of surveillance.

The survey was semi-structured interview that was snowballed, recruiting key informants, and we pilot-tested the tool and then collected data from our interviewees from January to March of this year (2013). And at the time that we last reported on this, there were sixteen human surveillance programs identified. Some of them were defunct or potentially just still in evolution and not yet reporting. Six of them were provincial or sub-provincial in scope and they all had, I guess, differing degrees of adherence to aspects that would make them an actual surveillance program. Four were national but with a narrower focus in terms of the scope of the organisms that were looked at. Three were national and broader in scope, of which one has not been active for the last few years, the CBSN. The CANWARD program (I actually showed you data from it) has up-to-date information on the website, and the CNISP program looks at hospital-acquired infections in Canada.

And we did take a little bit of time to take a look at the major Canadian programs to give a bit of an idea of what's happening with those programs. The CNISP program is well known to most people involved in public health, infectious diseases and medical microbiology in Canada. It provides active surveillance of nosocomial infections and antimicrobial-resistant organisms in sentinel sites which are quite representative of a lot of the Canadian population. The most recent reports issued have been on MRSA, vancomycin-resistant enterococci and *C. difficile.* There is some other information available on a project basis, including carbapenem-resistant organisms. And again this is focusing on the hospital domain, and this is a federal program under the Public Health Agency of Canada.

The CANWARD program has voluntary perspective sampling. About 10 to 15 hospitals submit 500 bacterial clinical isolates yearly from blood

respiratory specimens, urine specimens and wound specimens. It's a sample, over a period of time, including 500 isolates from 10 to 15 hospitals. This results in broad pathogen representation, with 500 isolates per site, that's a reasonable number to get an idea, to some extent, of what's going on. But this reflects approximately five to 10% of antibiogram isolates yearly. The domain is mostly hospitals: some can include outpatient clinics and emergency rooms. But it's unclear in some of the reports, how much can be said to be from non-hospital specimens. And this is pharmaceutical company supported, and in liaison with academia at the University of Manitoba. The Canadian Bacterial Surveillance Network I will not speak about as much because there have not been recent reports, although we believe there are still isolates being sent, and it also involves hospital specimens. There is also a pharma and academic consortium.

And the CIPARS program is one of the most well-known programs providing antibiotic resistance and antibiotic utilization data in Canada. This provides to some extent a farm-to-fork glimpse of antibiotic resistance by surveilling isolates from abbatoirs, retail meat, and from human salmonellosis across Canada. It is limited to food-borne salmonella isolates in humans. There have been attempts to get more in-depth reporting of antimicrobial use, both in the veterinary, and agri-food sectors, and also in human utilization in the community, through the CIPARS network, that have been increasingly successful. There is some very good data available now on antibiotic utilization from that group.

But let us look back to our host at risk, to our pathogen and to antibiotic use in the agri-food sector. We also have antibiotic use in hospitals and we have our resistance, we have CIPARS that looks at agri-food and limited human infections, we have CNISP which covers hospital-based infections very well. For this purpose, I actually put agri-food and community separately because they are somewhat different domains. We really don't have that much looking at community antimicrobial resistance evolution in Canada, presently. The CANWARD system does provide some of that information, but it is hospital-based and their representation of the data in perspective and the sampling might be less than desired. So, with that in mind and looking back to a few points that came out of our project, some key themes that came up when we were discussing with our expert group : Surveillance – people highlighted the need for it to be timely, and that came up a great deal. Accessible, representative and reliable, standardized, longitudinal and of course, funded. That merges very well with the official rubrics on how you evaluate surveillance systems.
Another thing I wanted to pull out from those data in advance of the report are some of the perceived barriers to creating cohesive surveillance systems for antimicrobial resistance and utilization in Canada. Our surveillance experts brought up issues around confidentiality. Issues in delay of data acquisition and transmission. A perceived barrier also was, "how do you determine what information can and should be shared?" There was some fear of the validity of comparisons that could be drawn between places. Technological difficulties with lab information systems that don't really talk to each other very well. And so the perceived barriers were I think largely, practical ones, and not really philosophic ones, which I think is a very good sign. And one other thing that had been a main goal for that project was, "what can we learn from other programs to help model what would be an ideal system here?" And for the purposes of this talk, I just wanted to bring up a couple of programs as exemplars.

One of them is the DANMAP program, and the other one is the ECDC EARS-Net program. DANMAP is kind of a tortured acronym: Danish Integrated Antimicrobial Resistance Monitoring and Research Program. It is a program that is quite well known and was mentioned by many people during our interview process. It was founded by the Danish Ministry of Food, Agriculture and Fisheries, and the Danish Ministry of Health in 1995, which would be kind of the equivalent of our CFIA and the Public Health Agency of Canada. And the objectives of the program are to monitor the consumption of antimicrobial agents, to monitor the occurrence of resistance in bacteria isolated from food animals, food of animal origins (that would be analogous to what our CIPARS does), and humans. To study associations between antimicrobial consumption and antimicrobial resistance, which I think is a very laudable goal, and we need to do more of that. And to identify routes of transmission and areas for future research studies.

They have three categories of what they decide to surveil in the DANMAP program. They look at human and animal pathogens. This reflects primarily resistance caused by use of antimicrobial agents in the respective reservoirs. So this is a type of evolving resistance that I alluded to earlier. They look at zoonotic bacteria because of the importance of antibiotic use in the animal reservoir. And they looked at indicator bacteria, basically bacteria that are all over the place and can basically highlight the development of resistance through exposure to antimicrobials because they readily develop such resistance. The program involves quite a lot of data flow, and they basically have humans, samples from general practice, and from hospitals, that get sent in centrally and reported to DANMAP. Food control laboratories, slaughter plants, and food animals, veterinary practices send samples in as well, which is interesting because not every system has that aspect covered. And the human health impact – I really like the way they do things. This is just a nice high-level look at DANMAP, looking at what they've done to decrease antimicrobial resistance in Denmark over 11 years, and they had an antibiotic awareness campaign, they publish reports to prescribers, they did mandatory notifications of increasing numbers of MRSA. And the "intervention had effect" column interests me. Increasing macrolide resistance in streptococcal pneumonia. They basically changed the way people practise, and they decreased macrolide resistance in strep pneumo. Then they also quite frankly indicate where an antibiotic campaign did not help. No - antibiotic use still increasing. No - Ciprofloxin use and resistance still increasing. So I do appreciate their unflinching look at how these things were, because we can learn from that.

Now, a program that actually relies more on routinely collected data and synthesis of large amounts of data- EARS-Net, which is European Antimicrobial Resistance Surveillance Network. This is a European-wide network of national surveillance systems and gives reference data on resistance for public health purposes. It is coordinated and funded by the European Centre for Prevention and Control. Now just to tell you a little bit about the E.U. There are 27 member states, they have 24 official languages. There are more than 50 million inhabitants, it's quite a patchwork of cultures, and I imagine it's a bureaucratic nightmare, and the fact that they manage to create a really good surveillance system through microbiology labs, across 24 official languages and that bureaucracy, I think is very heartening. And the key point here is that they collect routinely generated antimicrobial susceptibility data, provide spatial trend analyses, and give very timely access to the data via an interactive website. They also provide quality assurance and protocols on testing methods so that the participating labs can try to harmonize their reporting, and make sure that the standard of reporting is fairly consistent. They have 900 laboratories in 33 European countries. It ranges from 20% to 100% of the population coverage. They don't try to look at everything, but they do look at important things. Their list is *Streptococcus pneumoniae, Staphylococcus aureus,* the enterrococci, *E. faecalis, E. faecium, E. coli, Klebsiella pneumoniae,* and *Pseudomonas aeruginosa.* They also collect denominator data on lab and hospital activity and patient characteristics to help inform their reports.

Showing you some snap shots from the report before last because they had some extra useful slides on it. This is a percentage of invasive isolates showing resistance, *Staphylococcus aureus,* MRSA, and *Klebsiella pneumoniae* which had multiple drug resistance. I like this slide for a couple of reasons. One is that it shows that MRSA has been actually well controlled in quite a number of places

including the U.K. There are a few places where it's still very much on the rise, and it's still very high. But the control of MRSA, I think, is a little bit different and that a lot of it can be affected by infection control practices whereas *Klebsiella pneumoniae,* with evolving a resistance on antibiotic exposure, is a bit of a different scenario, and pretty much across the board what we see is an increasing combined resistance in Klebsiella pneumoniae.

And more data that just shows the difference between time between 2008 and 2011. You can see that there were some places that were heavily MRSA predominant, that have successfully brought it down to 25 to 50 per cent, or from greater than 50 per cent to between 5 and ten per cent. I think that is also a very heartening thing to show that you can actually create useful actions as well.

Here's a slide of *E. coli* on the percentage of invasive isolates resistant to third-generation cephalosporins. We would consider this kind of a concerning *E. coli.* Somewhat alarmingly, these are on the rise across Europe, pretty much across the board, and the rates vary, the highest that we see here is 25 to 50 per cent which is really unacceptable but even in places that have done a good job of controlling resistance in general, we see 5 to 10 per cent type numbers. Carbapenem resistance, like we said earlier, is a very hot topic and carbapenem-resistant *Klebsiella pneumoniae* is a huge problem in some places. I was just shocked by this one, so I decided to put it in. I'm not intending to give you a full tour of antimicrobial resistance in Europe, but I think that you can see that this type of data collection system which relies on things that are already happening, but synthesizes it and presents it, can be a very powerful tool in helping provide action. The reason this works, is the ECDC requires submission of resistance from working labs and they have a system that works to do that, and their data base actually seems to function very well, and they have goals for acquisition of data. They're very pragmatic - some of the concerns that our people raised with respect to, can we really compare data from this lab to that lab? Is the testing done the same way? They are very pragmatic and they just say that the data has been collected at the national level and sample size and coverage may vary. You should look at the annual reports for additional information if you are just looking at the website, to help contextualize those results.

So, this is my very unofficial read of Canadian surveillance at the moment. I think we do have very good hospital data on resistant organisms, especially those that pertain to infection prevention and control from the CNISP program, and CNISP, I understand, is also getting more information on antibiotic use in hospitals, and there are other avenues of trying to acquire that data because it's important to look at both development of resistance and use and try to correlate those factors. We do have very limited accessible data on community-based evolving resistance across Canada, especially comparing to other places that have more established surveillance systems for that. We do have good data on community-based antibiotic utilization from CIPARS reports that analyze IMS-based data sets. So, if we look at what we have here, I think that we have a bit of a patchwork, but there are some good parts and bad parts to our surveillance.

And now let us discuss challenges and considerations. We would like to have integrated antimicrobial resistance surveillance; we'd like to be able to develop large-scale and widespread data collection systems which are population based. We'd like to develop surveillance systems that integrate with research questions in AMR, which is very important especially in agri-food and veterinary realms, where I think that we really have to have robust data to make those connections, to help guide best practices for industry use of antimicrobials. We have to create direct and effective mechanisms to feed information into decision-making processes in antibiotic utilization, so everyone involved on this call who's involved in antimicrobial prescribing should know where to access information on current resistance trends. And we do need to develop better methods of dissemination to all those who "need to know." Now that strange little target thing is focusing me in on the "need to know." The phrase "need to know" is commonly used in espionage and government circles and is based on only telling those people who absolutely need to know because we don't want to expose anyone else to the dangers of this information. And so it's kind of a movie phrase in my head. On a practical level, I think a bit of thought as to who "needs to know" about resistance is important because I don't think that it's information that is necessarily requiring judgement, it's just more information, facts, that can help inform what people decide to do on a daily basis. Now that's my bias.

Putting it all together, our group will soon finish our report which will include a formal review of Canadian and international programs in light of key aspects of surveillance, with the goal of defining and refining important and actionable recommendations. I will mention that we do have good work, done by good people in antimicrobial resistance surveillance, but creating a cohesive system and addressing important gaps, especially the gaps in community antimicrobial resistance, is urgently needed.

So why do I have a picture of a cute baby at the end of this presentation? Well, people like cute babies, but this is my reminder to just talk about why we do this sort of work. At the moment, we are very fortunate; we have health care that's highly effective. Things that used to kill people are now reasonably easily treatable. But there certainly have been signs of more difficult-to-treat infections. Things that once were straightforward have become a lot more complicated in some areas. A lot of that can be tied to inappropriate antimicrobial use. We are basically looking at writing the future for our grandkids as to whether or not they will have the same advantages in healthcare that we have had. While I don't think we are in a post-antibiotic era at this time, I think that not being prudent right now. A phrase keeps on coming back to me from some of the HIV reports earlier on where it was said that, "history will judge us harshly if we don't take action right now." I think, using a precautionary principle, we really should be looking at antimicrobial resistance as a potential major future issue, and we should take appropriate steps right now to do what we can. That will involve surveillance, because without surveillance, without knowing what's going on, we can't really direct what is going on.

We define whether there is a problem. We can help determine the cause of the problem and risks. And if we identify evolving issues in antimicrobial resistance, they do need to be communicated to people who determine policy on public education, and intervention by programs, people who educate healthcare workers, anyone who treats patients, and anyone involved in antibiotic stewardship.

I think this ends my slides and I'm hoping that people will have some thoughts or questions that they can share in the question and answer session.

Pamela Gareau: Thank you, Dr. Saxinger. We have a little problem with the Question and Answer pod, but I do seem to have a few questions up on the screen here that I can see. The first one is, "When do you expect the report to be published?"

Dr. Lynora Saxinger: Before Christmas. So, it was meant to come out earlier, but as I mentioned we had some really useful feedback that kind of changed the direction we are going in with the data presentation, and so we're doing a bit of a re-do. We don't have to re-collect data, but we are kind of re-digesting it. And so we are looking to get that done within the next month or so.

Pamela Gareau: Thank you. I don't seem to see any other questions appearing right now. I just want to give it a moment. I would also like to take this opportunity to thank the participants and encourage you to fill out our one-minute survey that is featured on the last slide that is being put up shortly. Your feedback is very valuable, and will greatly enhance Antibiotic Awareness Week activities in Canada for 2014. If you click the link

now, you can participate in the survey, while we wait for additional questions.

Dr. Saxinger: I just saw a question come up. Do we currently have any evidence of increased rates of resistance in regions or communities with higher rates of prescription and utilization?

I would say "yes" but it is difficult in the absence of localized regional reports or publications to say that because we have higher rates of utilization of this antibiotic use in particular place that we have higher rates antimicrobial resistance to that antibiotic there. Someone from British Columbia has a good system for looking at prescriptions and resistance together. I think they probably have some of the better data that can demonstrate those correlations. I think one goal of a surveillance system would always be able to look at the utilization and the resistance. This would mean that we don't have unexpected consequences when we try to redirect prescribers or rewrite guidelines for certain antimicrobials for certain conditions. It would mean that we make sure that we are not inadvertently creating an unexpected, different resistance profile that might be even more negative by doing so. That is certainly is something that has been seen in hospital settings because there are complicated mechanisms of resistance that can lead to unanticipated outcomes.

And now, another question. Do you think that an electronic health record …?

Yes. Electronic health records would be very useful as long as we can get everyone to talk with each other, to help both to build in prescriber support and guidelines into the prescribing system, so that computerized order entry becomes a very well-established antimicrobial stewardship and overall drug stewardship tool. With that information, you should be able to link antimicrobial utilization resistance data and have a direct impact on antimicrobial utilization patterns. I think that the goal of electronic health records is not just to do the basics of making sure all the people looking after the patient know the available information on that patient, but actually to make a big difference to improving processes of care.

I have another question on making antibiotic resistant organisms, extended-spectrum beta-lactamase producers, and arbapenem-resistant organisms reportable. That's interesting, actually. Someone else may be able to feed into that so feel free to type in comments if you know. ESBLs in hospitals tend to be reported to infection control in the community, depending on where you are, there is some monitoring, lab-based monitoring of ESBL rates. But certainly that's not something I've seen officially reported, and I think it would be of great interest to see different patterns across the country even locally here we found that our ESBL rates are much higher in certain communities that tend to have people that are of a certain ethnic background.

So there's a diaspora from southeast Asia, communities that are fairly large and with a fair amount of travel back and forth, that tend to have higher rates of certain organisms, and that, I think is a notable trend and one that could be watched as well, and it could help inform how we decide to treat patients as well.

With the CNISP data for antimicrobial utilization, and the DDDs (defined daily doses), we hope all this fear around surveillance and inflammatory comments in the media will die down enough for people to get a breath and have a look at that data. But it's been in process, and there have been a few different thoughts about how that data will be used. I'm hoping it will be moved on pretty quickly. I think they now have two or three years' worth of data from participating sites. It might prove very useful in determining not really benchmarks, but what is being used in hospitals, and where there are any outlying patterns. Especially if there are any beneficial ones or adverse ones that should be studied and shared as well.

Question: How can we determine if changes and trends are simple natural fluctuations?

Well, yes, excellent question, always a good question. You do need a period of time to track the input and look at the patterns to determine where fluctuations come from. I think the data that you have from the "Do bugs need drugs?" program in B.C. is an example of where the time series analysis seems to be quite compellingly convincing. You can change utilization to change resistance, but being able to address your question very conclusively might be a bit of a challenge. I'd appreciate your comment back on that actually.

We could also establish lab-based antimicrobial susceptibility tests based on surveillance. If lab antibiograms, lab resistance data that are generated daily across the country, were to be made available in a data warehousing system similar to the ECDC, you would be able to look at the changes in ESBL isolation over time by looking at the changes in carbapenem resistance in certain organisms. That would make invoking the public health reportable disease arm less necessary, but still give you useful information.

I believe that this presentation and the voice-over will be available on this website, as the previous ones have been, so I think this will remain available. I hope people enjoyed it. I'd be interested if people feel like typing in comments.

And now a question on causal interference. We're talking about how to tell, if you've collected your data, if you have disseminated your data, and if you've made some programmatic changes as a result of it, how can you tell if what you've done has made a difference? I think that you're right. It's more diffuse in community settings. I think that in hospital settings, you actually can get better ideas. Just because you can do interventions in different places, or over different times and have a little bit better oversight of the other variables in that kind of setting. I think that is something that we could look at as we evolve antimicrobial stewardship infrastructure and connections in Canada. I think hospitals are important place for antibiotic resistance generation, because we both create it and we also find its manifestation coming in from the community as well because of the high intensity of antibiotic use in hospitals. I think that they do have a very important place for stewardship and resistance in the overall setting. So, although I tend to harp on community-based resistance, I think that the hospital and the infection control aspect of resistance are important.

And now an interesting comment that I will just make quickly. We were recently looking at febrile neutropenia protocols because of the perception of a spate of bacteremias with resistant organisms in a very fragile patient population. Reviewing the bloodstream infection data was interesting, but our infection control database did not include data on susceptibility testing. So I had to go and put in all of these susceptibilities into the infection control list, in order to see what type of resistance these organisms had. Now, I guess this goes to the idea of siloization, because the infection control data, and the etiology of the bloodstream infections, and whether or not they are related, is all very important. But if we had included susceptibility data, even though it doesn't have a direct infection control need, we would have been able to more easily collaborate on refining our febrile neutropenic protocols. This speaks to the idea of an integrated system and how important that might be going forward on a lot of different levels.

So, I think we are almost out of time. I'm going to see if anyone else has any comments and I'm not really seeing any.

Pamela Gareau: Dr. Saxinger, I believe that is all the time we have for questions. I would like to give you a big thanks for your informative presentation and the question-and-answer period. I encourage participants to again take the time to fill out the one-minute survey. The feedback will help for next year's antibioticawareness.ca site and webinar. I would like to also thank the partner organizations who helped make Antibiotic Awareness Week a success. Remember to use your antibiotics wisely, when needed, and as prescribed. Goodbye and have a great day.

Dr. Saxinger: Thank you. Goodbye.