Module 7: Outbreak Investigation & Disease Control – Outbreak Investigation

TRANSCRIPT

Slide 1: Introduction

Hello, and welcome to Module 7: Outbreak Investigation. My name is Krissy Simeonsson. I’m an assistant professor with the Department of Public Health and Pediatrics at the Brody School of Medicine.

Slide 2: Acknowledgements

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- Kristina Simeonsson, MD, MSPH
  Department of Public Health
  Brody School of Medicine at East Carolina University
- Julie Daugherty, MPH
  Department of Public Health
  Brody School of Medicine at East Carolina University

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Slide 3: What do the following have in common?

What do the following have in common? Cantaloupes, peanut butter, frozen strawberries, ground beef, milk, and oysters?
Slide 4: Foodborne Outbreaks in the News

All of these foods have been implicated in foodborne outbreaks in the past 5 years in the United States. While this presentation is going to focus on the steps of an outbreak investigation, and most investigations do center around infectious diseases, realize that not all outbreaks may have an infectious source.

Slide 5: Presentation Objectives

During the course of the presentation today we are going to start with defining some of the terms that we hear a lot with outbreaks. Principally we are going to look at the term outbreak versus epidemic, and also define the term pandemic. We are going to discuss reasons that outbreaks occur, then we’re going to spend some time figuring out the rationale for investigating outbreaks. Why do we bother, why is it important? Finally, we’re going to spend the majority of the presentation describing the steps of an outbreak investigation. And what you’re role as future health professionals might be.

Slide 6: Epidemic V. Outbreak

We often hear the terms, outbreak, and epidemic, used in the media, and it seems like they’re interchangeable, but actually there is a difference between these terms. An epidemic refers to an occurrence of more cases of a disease than expected in a given area or among a specific group of people over a particular period of time. In comparison an outbreak is an epidemic, but it’s limited to a localized increase in the incidence of disease. Another term that you might hear is, a cluster, and this is not an epidemic nor is it an outbreak. A cluster is just merely a group of cases in a given area over a particular period without regard to whether the number of cases is more than expected.
### Slide 7: What is a Pandemic?

So we’ve defined the terms for epidemic and outbreak, but not what a pandemic is. A pandemic is an epidemic occurring over a widespread area and usually affecting a substantial proportion of the population. Often with high levels of morbidity and also sometimes higher levels of mortality. I’ve listed here some examples of infectious diseases that have caused pandemics, most notably Influenza is very well known for causing pandemics. Also Severe Acute Respiratory Syndrome (SARS), tuberculosis, and also HIV/AIDS.

### Slide 8: Mortality Rate

This graph shows the mortality rate due to infectious diseases in the United States over the 20th century. On the y-axis is the number of deaths per 100,000 population, and on the x-axis is the 20th century in 20 year intervals. And you can see overall in the 20th century there was a steady decline of mortality, the mortality rate, due to infectious disease. But there is one large, ominous, spike centered around 1918, and this is where the mortality rate almost doubled. This was due to the Spanish flu pandemic of 1918. This is a graphic example of what a pandemic can do to mortality rates.

### Slide 9: Epidemiologic Triad

We are now going to turn to the reasons that epidemics occur. This diagram depicts the epidemiologic triad, which is made up of the agent, the host, and the environment. An agent can be transmitted to a host to cause infection by a variety of ways. There can be airborne transmission. There can be direct contact as a route of transmission. There can be spread through foods, insects can spread diseases, so there are a lot of different modes of transmission.

So, how do epidemics or outbreaks occur? You can start with a change in the agent
itself. There can be an increase in the amount of agent, or the virulence of the agent. You can also have introduction of the agent into a setting where it has not been before. So, those are two factors related to the agent as part of this triad. Looking down at the host, certainly, the host can have a change in susceptibility, so they can become less immune, or may have risk factors that make them more susceptible to an infectious disease. You can also have host factors that increase their possibility of being exposed. Maybe some occupational hazard they have, some other type of recreational activity, certainly, can increase their exposure.

Finally, the environment can be conducive to the interaction between the host and the agent so you can have an environment that brings those two other components of the triad closer together. Finally, there can be an enhanced mode of transmission, so the agent can be transmitted to the host in a way that’s more efficient at causing infection.

Slide 10: Why Investigate Outbreaks

Now we are briefly going to talk about why we investigate outbreaks, and what is the rationale for doing that. This list was adapted from a self-study case available at the Centers for Disease Control and Prevention website, and it’s part of a case, Principles of Epidemiology and Public Health Practice, 3rd edition. The most important reason that we investigate outbreaks is to prevent and control the further spread of disease. So, obviously that is first on everyone’s mind when we talk about investigating an outbreak. There may also be a role for research in doing an outbreak investigation. We may want to conduct research into a new laboratory method to diagnose diseases, there may be need to do research to look at why certain people are more susceptible, what risk factors do they have. Sometimes outbreaks even though they may not be scary to health professionals, may really concern the public. So, often there is pressure from that side. Oftentimes there can be political pressure in investigating outbreaks. Certainly, program considerations are a reason. If there’s a program already in place to control a certain disease and an outbreak occurs, it’s important to investigate an outbreak to see if something isn’t working the way it should be.

Finally, outbreaks provide a great opportunity to train other epidemiologists, as well as healthcare professionals who are interested in public health.
So I’ve listed here the 10 steps of an outbreak investigation, and depending on what reference or resource you use the list may look a little bit different from one source to the next. But really, if you look closely at any list that describes the steps of an outbreak investigation you’ll find pretty similar steps. Sometimes they’re combined or expanded further, but for the sake of simplicity we’ve listed ten of them here. It’s important to realize that these are listed in sort of a conceptual order, but in reality during an outbreak investigation several steps may be happening at the same time, or in a different order, most notably step number nine (control measures). Oftentimes at the beginning of an outbreak investigation, you may have some idea of what the cause is. If you have an idea about the source or the way the disease is being transmitted you may want to go ahead and put some control measures in place even before you’ve tested your hypothesis or performed additional studies. We are going to go through these in a step-wise approach, but in real life, in an outbreak investigation these may be happening in less of an order, so to speak. I did want to mention before I get into the steps what your role as future healthcare professionals would in this. Certainly, you may be the front line person for step number one who determines that there might be an outbreak. You might recognize several cases occurring in your practice, and report those to the health department. You may be involved in helping to verify the diagnosis. Oftentimes the health department will ask for certain lab studies, so you may help in obtaining that for them. Step number four in identifying additional cases, oftentimes health departments will ask healthcare providers to help them find more cases when an outbreak is on-going. Depending on your level of interest in working with public health, you may help with epidemiologic studies. Step number nine is everyone’s job, so certainly, implementing control measures, helping to recommend certain control measures is something you may be involved with. Finally, communicating what’s going on with an outbreak. Although you may not be the person who gets put in front of the camera for the nightly news, patients are going to come to you, and want to know what you’re opinion is and what you think. So, certainly being part of that communication process is something as healthcare professionals you will have a role in.
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Slide 12: Steps of an Outbreak Investigation

The first step is to “establish the existence of an outbreak.”

- Establish existence of an outbreak
- Verify the diagnosis
- Define a case
- Identify additional cases
- Perform descriptive epidemiology
- Develop and test hypothesis
- Reconsider hypothesis
- Perform additional studies if needed
- Implement control measures
- Communicate findings

Slide 13: Establish Existence of Outbreak

The first thing that is done is to determine if the observed number of cases exceeds the expected level. So, we talked in another lecture in module 7 about public health surveillance, and surveillance data is very important because it helps us establish that baseline, what is the number of cases we routinely see in non-epidemic settings. So, you want to know if a certain number of cases occurring in your community at a certain time really is a rise above the baseline, or just seems to be one of those clusters of cases that we mentioned earlier in this talk. Epidemiologists are always going to be aware of other causes for outbreaks, so to speak, sometimes there can be changes in reporting practices. Maybe healthcare providers all just had an in-service training on what diseases to report, so suddenly they’re reporting more. Oftentimes the media will start talking about a certain disease a lot so providers will be on the look-out for those, and might report them with more gusto than usual. Sometimes diseases that are considered notifiable, or reportable, which we talked about in the surveillance lecture, those all have case definitions and sometimes that case definition changes, so that can cause an increase in the number of cases being reported. Finally, if there is a new way to test for a disease, if a new diagnostic test is available, that may increase the number of cases people are seeing of certain diseases.
Slide 14: Steps of an Outbreak Investigation

Step number 2 is “to verify the diagnosis”

Slide 15: Verify the Diagnosis

This basically refers to the fact that the diagnosis needs to be confirmed by both the clinical information available, as well as laboratory results, if they’re available. And as a healthcare provider you may be asked to supply information on the clinical side of things, you may be asked about laboratory tests that you’ve ordered, or ones that are pending. When verifying the diagnosis you will be assisting the health department with this step of the process. Now not every case in an outbreak investigation needs to be laboratory confirmed. Certainly, some of the first few do need to be laboratory confirmed if there is a laboratory test available, and then other cases can be included, just with clinical information if they’re linked to the outbreak in other ways, like they had contact with someone who has been lab confirmed. If they had similar exposures, and also had the clinical signs and symptoms, that’s another way, but not every case has to be laboratory confirmed.
Slide 16: Steps of an Outbreak Investigation

The third step of an outbreak investigation is to define a case.

Slide 17: Case Definition

To define a case, you need to have a case definition. Ideally your case definition will include most, if not all, of the actual cases, but very few, or none, of what we consider false positive cases. A case definition, uses a set of standard criteria for deciding whether an individual should be classified as a case or not.

What are those standard criteria? Well there’s always clinical information. Have they had diarrhea, have they had vomiting, do they have a fever, do they have a rash? It changes depending on what the disease is. And then there are elements of person, place, and time, you know were they at a certain event, were they of a certain age, if we’re looking at an outbreak in children, were they exposed, or did they have onset of symptoms within a certain time-frame that we’re looking at? Case definitions can have varying degrees of certainty. You can have a suspect case, who has some of the clinical things, but you don’t have a lab test confirmed. You have a probable case, which often has something else linking them to the outbreak, in addition to clinical symptoms. And then finally, confirmed case almost always means they have the clinical information, and they’re linked to the outbreak, and they have lab confirmation. You may see outbreak investigations defining cases a: we have this many confirmed cases, but this many probable cases. Oftentimes there are more probable cases, than there are confirmed, and that makes sense because not everybody is going to have laboratory testing done.
Slide 18: Case Definition

This is an example of a case definition that the Centers for Disease Control and Prevention has on their website. And this is a case definition from 2010 for measles. You can see the varying degrees of certainty. They have suspected cases, they have probable cases, and they have confirmed cases. And suspect cases are any febrile illness that is accompanied by a rash that doesn’t meet the criteria for the probable and confirmed cases, which are outlined below. So again, this is someone who has a fever and a rash suspicious for measles. If it’s part of an outbreak investigation they might be a suspected case. Probable cases get a little more specific: generalized rash, meaning all over their body, lasting for 3 or more days, febrile illness defined as a temperature higher than 101 degrees Fahrenheit, and other symptoms like cough, coryza, and conjunctivitis. They don’t have any other confirmatory testing available and they don’t have a link to other cases. That is a probable case. Confirmed takes all those other pieces and then also has laboratory confirmation, or if they don’t have laboratory confirmation they are linked to a case that has been confirmed.

Slide 19: Case Definition

One more note on case definitions, they can vary depending on the purpose, or what are you using the case definition for. For example if you want to characterize the extent of the outbreak, you want to know how many cases there are in your community, and you don’t want to miss one, you want to make sure you capture all the cases that are in the community. You would have what’s known as a sensitive case definition. It’s not going to miss any cases, hopefully. What a sensitive case definition does is casts a wide net, with very few criteria to be considered a case. Certainly a sensitive case definition is used if you’re really trying to see what is the extent of the outbreak. The flip side of that is that you can have a case definition that you use because you really want to find the cause, or you want to find out what are the risk factors for getting the disease. In that case, you want a very narrow, or specific, case definition. What that means is you want a case definition that the only people that are going to get counted are those that truly have the disease. Realize that case definitions can sometimes vary, depending on what you are using it for. Are you trying to characterize the extent of the outbreak, or do you really want to look specifically at what the risk factors are?
Slide 20: Steps of an Outbreak Investigation

The next step is to “identify additional cases.”

Slide 21: Identify Additional Cases

So once you have your case definition, you then want to figure out if there are other cases out there. And this is often done by the health department, doing that active surveillance. Where they’re checking in clinics and hospitals, and other health provider offices to say “Have you seen cases of this? Here’s the case definition, let us know how many you’ve seen.” As they are identifying additional cases they will put all of their data into what is known as a line listing. It’s a spreadsheet or a table showing each case, each line represents a case, and it summarizes all the data quickly, whether they’ve had laboratory confirmation, what signs and symptoms they’ve had, etc. This line listing is showing an example of a hepatitis A outbreak. Under “signs” and “symptoms” for example, the “n” and the “v” is nausea and vomiting, the “f” is fever, the “j” is jaundice. They also usually include gender and age, and date of onset, etc. It gives them a way to look and keep all the cases organized, so they can start to perform the next step, which we are going to talk about now.
The next step is “performing descriptive epidemiology.”

So, what does that really mean? Well, performing descriptive epidemiology is orienting your data to time, place, and person.

When we talk about orienting the data by time we want to characterize the cases by plotting them on a graph, which is also called an epidemic curve. It displays the number of cases on the y-axis, and over the x-axis is the timing of the onset of illness or symptoms. Sometimes it’s the symptom onset, or it’s the date cases were laboratory confirmed, or it might be the date cases were hospitalized. You want to use an appropriate interval on the x-axis. If people are all getting sick within several hours of a picnic you don’t want to use a time interval of months that is not going to help, because everybody’s going to show up in one big block being sick in July. You want to have hours as your interval or maybe even 30 minute increments. Sometimes in the course of an investigation you may look at the epidemic curve and change that interval to see what gives you the pattern that provides the most clues.
Slide 25: Epidemic Curve

This epidemic curve is showing pneumonia cases, and the date on the bottom, or x-axis represents the date of admission to the hospital with pneumonia. It’s not symptom onset because in this particular outbreak that was hard to define. An epidemic curve tells us the size of the epidemic, or the magnitude. It can give us some information in terms of relationship to endemic cases, or the background rate of cases.

Another thing that is really important is the presence of outliers, and those are cases that might occur very early on, or come up a lot later, not as part of the main peak. Outliers are very important in an outbreak investigation because sometimes it’s their risk factors that can kind of crack the whole case open. What made them part of this outbreak, even though their onset of symptoms was so different from everybody else? An epidemic curve also gives you an idea about time course. Was it over days, was it over hours, or was it over weeks? The pattern of spread may also be determined. Was this all from one contaminated food product, or was this disease spread from person to person?

Finally, as you continue to plot cases, it can tell you where you are in the course of the epidemic. So, if you’ve already implemented some control measures, does the epidemic curve show a decline, in the number of cases?

Slide 26: Epidemic Curve of HUS Cases

Now I just wanted to show a few more examples, this is an epidemic curve of hemolytic uremic syndrome cases from an outbreak in Germany, from May-July in 2011. This epidemic curve gets kind of fancy because it also includes some color-coding, which you can see there. But again, main things to point out, that y-axis is your number of cases; your x-axis is over time on the x-axis, doing 24-hour intervals. And you can see that being involved with Company A was a risk factor, maybe everybody ate at the canteen at Company A and all got sick at the same time. Then you start to see other cases coming out that were associated with parties, or maybe they traveled into the area. But those last 3 cases, there are two in purple associated with travel history, and then there’s also that green case located around June 27th that’s an outbreak case, but they haven’t linked them. It’s going to be really important to interview those three cases, and find out what are their risk factors that linked them to this outbreak, because again often times it’s that information that can be most revealing.
Slide 27: Epidemic Curve of Avian Influenza

This is one other epidemic curve I wanted to share with you. This is from avian influenza, or bird flu, Influenza H5N1, the outbreak that has been ongoing for several years now. This is a very busy epidemic curve, but again the main take away points are: the number of cases on that y-axis, and then along the bottom this is showing over 6 to 7 years time. Color coded again by country, where the cases were, so this gives us some information that clearly this outbreak is not controlled. It’s spreading to other countries, certainly Vietnam that’s in that real bright pink, started with cases as early as 2003, and is now having fewer cases, so control measures may be working there. They had a lot of cases early on. But you can see where other countries continue to have cases occurring.

Slide 28: Orient by Place

We can also orient by place, and what that means is really looking at the cases and how they’re distributed geographically. Do they all live in a certain area? If it’s an outbreak that’s associated with a worksite, where do they work in the building? If it’s a statewide outbreak of mosquito-borne illnesses, is there something about certain parts of the state, maybe where there has been flooding? Geographic distribution can often give us clues into certain risk factors, or other sources of the outbreak. It can also help us identify the vehicle, so if food is contaminated, or there’s a certain other mode of transmission that’s involved, orienting by place can help with that as well.
Slide 29: H5N1

Staying with our flu theme, this is again the H5N1 outbreak that’s been going on for many years, and shows a map of the eastern hemisphere, where there have been lots of cases in different countries. What do these cases all have in common, what do these countries all have in common? One of the biggest risk factors is direct contact with poultry, live birds, and the different behavioral risk factors associated with that: living in close proximity with poultry, how they’re used for food, how they’re used for recreation, etc. Geographical distribution can show you risk factors or other clues why an outbreak is going on.

Slide 30: Orient by Place

And the final step in the descriptive epidemiology portion is to orient by person. Examine the characteristics of cases: what are the personal characteristics, how old are they, are there more males than females? That’s some of the characteristics, and then exposures: where do they work, what do they do in their free time? If it’s a food-borne epidemic where do they eat, where do they shop, do they eat out? Another personal characteristic that can come into play is their medical status; do they have underlying conditions that make them more susceptible to disease? Orienting by person gives you another piece to the puzzle.
Slide 31: Orienting to Person for H5N1 Influenza

Finally one more example, orienting to person for H5N1 Influenza. This is data through February of 2011 that shows the number of cases of H5N1. They’re also showing outcomes: those who are still alive in blue, those that died are in red. And they’re giving you a breakdown of ages so you can see that its younger people in the population that seem to be susceptible to disease.

Slide 32: Steps of an Outbreak Investigation

The next step is to “develop and test a hypothesis.”

Slide 33: Develop and Test Hypothesis

The source and route of exposure has to be determined in an outbreak to understand why it’s occurring: to prevent future outbreaks or to prevent additional cases if an outbreak is still occurring. We want to develop a hypothesis which is a testable proposition developed from what we know already, so what’s the data telling us, what facts do we know about the disease, do we know what the actual disease is? Sometimes we’ll already know what the infectious disease is, but we won’t know how it’s transmitted, or what the source is. And there are some outbreaks of emerging infectious diseases where epidemiologists are starting with a blank slate and don’t even know what the infectious disease is. We want to develop a hypothesis using that descriptive epi, that information on person, place, and time, and then using the clinical and laboratory findings that we have available to us on the cases. Then you test that hypothesis using
analytic epidemiology, which helps us identify the exposures that are significantly associated with disease. The two study designs most commonly used in outbreaks are the retrospective cohort study and also the case-control study. There’s more information on these types of study designs, in module 2, but I’m going to summarize a little bit here.

**Slide 34: (Retrospective) Cohort Study**

A retrospective cohort study is one in which the cases are enrolled after the disease has occurred. We’re being called to the scene because there is an outbreak, so cases are already occurring. What we do is we enroll everybody in our study in a given population, regardless of whether they’ve been sick or not. This is the study design of choice if you can do it in an acute outbreak, if you have a well-defined population. The classic example for teaching epidemiology students is always that church supper where there is some item brought to the potluck that causes everybody to get sick. Two hours after the event people are starting to throw-up and have diarrhea. You take everybody that attended that supper and interview them, whether they got sick or not, and then you look at their exposures. Other examples of well-defined populations include an outbreak on a cruise ship. You’ll have a list of everyone that was on the ship at the time of the outbreak. If you have a well-defined population, you have a cohort already; this is the study design of choice.

**Slide 35: (Retrospective) Cohort Study**

The reason that it’s the study design of choice is because you can directly measure risk of disease because the population at-risk is known. You have everybody there that was at the same event, so you know everybody who was potentially at risk. Your outcome measure is known as the “relative risk,” and this is really just the risk in your exposed group, divided by the risk in your unexposed group. You’re looking at what they ate or, what other activity they did. In an acute outbreak the relative risk is also known as the attack rate ratio. How many people that ate hamburgers got sick, versus who many that didn’t eat hamburgers got sick? So you look at the attack rate in those who ate hamburgers, and you look at the attack rate in those who did not eat hamburgers, and then you compare them. That’s your attack rate ratio, but it’s also called the relative risk. When you’re trying to evaluate which exposures
might be significant, exposures that have a higher attack rate, meaning a high attack rate in those who were exposed, compared to a low attack rate in those who were not exposed, kind of points you towards exposures that are more likely to be implicated in your outbreak.

The other study design which is often used is a case-control study. This begins with disease, with people who already have disease, and looks backward in time at what their prior exposures were. This is used when the population at risk is unknown. Nationwide food-borne outbreaks, for example, the salmonella in peanut butter outbreak, was a nationwide outbreak. Cases were occurring in many states, so it was hard to know the population at risk. You can’t enroll the entire population of the United States in a cohort. That would be too hard to do, so you opt instead to do a case-control study. A case-control study uses a group of people with disease, these are your cases. And a group of people without disease controls. You enroll both cases and controls, and then you look at their prior exposures. And it’s a difference in exposure between these two groups that can point you toward an association between certain exposures and a disease.

The important thing to realize is the true size of who’s been exposed and who’s not been exposed is really unknown in a case-control study. You don’t have that denominator of everybody who was exposed in a case-control study. This is an important point because you cannot calculate relative risk; you can’t calculate that attack rate. So, what outcome measure do we use? What we use in a case-control study is an odds ratio. It’s the odds of developing a disease based on exposure. And an odds ratio can be a pretty good measure of relative risk; it can approximate relative risk if your cases and your controls are both representative. If the disease you’re studying is really rare, then your odds ratio is going to closely approximate your relative risk. So, if you have a well-defined population more times than not people are going to steer towards that retrospective cohort study. But many times you don’t know who that population is exposed, so you opt instead for a case-control study.
Slide 38: Study Design Comparison

One last slide doing a side-by-side comparison of the two. A cohort study starts with an illness within a well-defined population, and it compares rates of illness among those with a risk factor or exposure and those without; that’s the attack rate. Your outcome measure is the relative risk, or attack rate ratio. The case-control study on the other hand is when you have illness occurring in a not so well-defined population; you have got cases happening all over the place. You’re comparing exposures among people who are ill, meaning your cases, and you’re comparing that to people without illness, and those are your controls.

Slide 39: Steps of an Outbreak Investigation

Step number 7 is “reconsidering the hypothesis,” seeing where we are at in the outbreak and reconsidering the hypothesis.

Slide 40: Reconsider Hypothesis

So you want to “square” your hypothesis to your clinical, laboratory, and epidemiologic facts: Is this all fitting with what we know so far? If your hypothesis was, related to a certain exposure, but your exposure histories for people who were ill versus people who were well are not really that different. Then it’s time to back up and develop a new hypothesis. Even though you develop a hypothesis and you test it, which may not be the answer to the source of your outbreak. Sometimes you have to develop a new hypothesis.
Step number 8 involves “performing additional studies if they’re needed.”

A lot of times we perform additional studies because we want to find more cases. We already have some cases, and we’re starting to develop and test hypotheses, but we want to continue to find more cases. This is an example where they might use a more specific case definition. Sometimes you might want to perform additional studies again to evaluate a new laboratory technique. Maybe there’s a new test on the horizon that you can use to compare; if it’s a rapid test you can use it to compare to a gold standard test, like a bacterial, or viral culture. You may also want to perform an additional study to evaluate your case-finding technique. Sometimes they’ll ask: is there a dose-response here, like were cases that were exposed for a longer period of time or ingested more food, were they more likely to get sick? So, those are other additional studies. An environmental investigation is often part of an outbreak investigation so looking at food handling practices, investigating buildings, if it’s a common place where people seem to be getting sick are parts of an environmental investigation. Often you’ll have the help of an industrial hygienist, and an environmental specialist who can come in and assist with that part of the investigation.

Now we’re to step number 9, which at this point in the investigation you would have already been implementing some controls measures. If you’ve got a good grasp now on what the source is you can start to put into place those control measures.
Why do we put control measures into place? This list should look pretty familiar because this is why we investigate outbreaks in the first place. The underlying purpose of investigating outbreaks is to control the spread of disease and prevent morbidity and mortality. So control measures really help us prevent further exposure, prevent infection in people who are exposed. If they do get infected can we minimize the severity of the disease? Can we prevent death? So for example, if we know a food item is implicated, making sure that we’ve removed that food item. If it’s out in stores, taking it off the shelf. Preventing infection, if there is a way to vaccinate individuals who have not been exposed yet, certainly that is a control measure. Offering prophylaxis to people who have been exposed, is another control measure. A lot times in an outbreak investigation, if it is a disease that is spread person to person, you will often hear about isolation of people who are sick, and quarantine of people who have been exposed, but haven’t developed symptoms yet. These are control measures that were used during the SARS pandemic. It was a huge undertaking by public health to isolate the individuals who were sick, checking in with them daily, and then quarantining or keeping people who had been exposed separate.

And keeping with our flu theme, again control measures for Influenza. Influenza is an epidemic that happens every year. We have seasonal epidemics in the United States, usually around January, or February, every year. Control measures for flu are numerous. Certainly there’s a vaccine available, but there are other ways to control the spread. Washing your hands is always a great idea with most communicable disease prevention strategies. On the far left they have “cover it,” so people who are sneezing and coughing, trying to keep their secretions to themselves. And then the bottom picture of the child with the thermometer, “keep ‘em home,” so this is another example of isolation. If you’re sick with flu-like symptoms you shouldn’t go to work, you shouldn’t go to school.
Slide 46: Steps of an Outbreak Investigation

So we’re going to turn now to the last step on the list, but this is often happening all along. “Communicating your findings.”

Slide 47: Communicate Findings

I’ve listed here just a short list, but there may be many others. There are groups of people who will need to be updated about the investigation. Both as it’s ongoing, as well as at the end, kind of the wrap-up. Anybody that’s involved in the investigation process is going to need frequent updates. Public health personnel will communicate with one another, between different jurisdictions. Local public health will often talk to the state. Public health personnel who can also be in touch with federal public health officials if the outbreak is big. Political pressure to intervene means that you will need to update government officials about what is going on, where you’re at in the outbreak, is it slowing down, are you preventing cases? Healthcare providers, need to be updated. Are they still looking for cases, what is the case definition, what do we need to be reporting, what do we need to be telling patients that get sick? Being able to communicate with the media is a very important skill to have. The media helps us communicate to the community-at-large because a lot of times they have concern about what’s going on and want to know ways to keep themselves from becoming sick.

Slide 48: Risk Communication

So I wanted to spend the last little bit talking briefly about communicating with media because it’s a skill that not many people receive training on, but it’s something you may be asked to do at some point, and even if it’s not talking to the media, some of these skills you can even use in talking with your patients about difficult issues. Risk communication is a science that teaches us ways to communicate with people in situations that are higher risk or that people are worried about. It was developed from the need to find more effective ways to communicate health risks to the public, and the goal was to give people information about the outcome from a behavior or exposure.
The purpose of risk communication is not to be like a kindergarten teacher and say everybody sit down and do what I ask you to do. It’s to empower people to make good decisions for themselves. It’s important to point out when we talk about risk communication, not all risks are considered equal, and so risks that are familiar to people, that they’ve heard of before, risks that are resulting from natural disasters, like hurricanes or tornadoes, risks to adults, are much more tolerated than risks that are not familiar to people. Risks that are exotic, ones that are man-made or created by man, certainly one’s that involve children, are much harder for people to accept. So it’s important to realize when we talk about risk communication we understand that perception of risk changes depending on what the situation is.

Risk Communication Pitfalls

- Mixed messages from multiple experts
- Messages that are over reassuring
- Leaking myths, rumors, and dangers that are unchallenged or uncorrected
- Public speaking people who lack affect

Slide 49: Risk Communication Pitfalls

Listed here are some of the pitfalls of risk communication. If the public is hearing mixed messages from multiple experts, so you’re talking heads on all your television news stations, your 24/7 outlets, who are all saying different things really create havoc for people. Messages that are over reassuring; experts who get on television and say “look don’t worry about this it’s not a big deal,” usually backfire. Risk communication pitfalls can also include myths or rumors that are left uncorrected or unchallenged. If someone else starts a rumor that you can get bird flu by eating chicken, and no expert says that’s not true, then that’s an issue. You’ve really got to be quick to correct things that are wrong. Finally you can imagine this, public spokesperson’s people who are getting up in front of the camera to update people who really lack affect, who don’t really engage and seem to be flat people, don’t respond as well to that.

Slide 50: Crisis Emergency Risk Communication

One of the resources that we have as part of this module is a link to this “Crisis Emergency Risk Communication” module that the Centers for Disease Control and Prevention (CDC) has at their website. This is a module that you can go through online, and there are some great handouts as well to be printed. It trains people on the important components of successful communication. It really boils down to credibility and trust, and the pieces that go into credibility are really how accurate is your information and also how fast you get it out there. If it takes you 3 months to really put together your press release other non-experts are going to have already been on TV talking about what they want to talk about, so your information needs to be right, but you also have to be ready to get it out there quickly. People also have to feel like they
can trust you as a spokesperson, and this is important as a healthcare provider as well. You have to have empathy; you have to be open for people to trust you. So credibility and trust are both important in successful communication, and I think these are important tenets even in our one-on-one interactions with our patients. They want to know that we’re credible, that we’ve got the right information, and that we’re up-to-date on that information and can answer their questions in a timely manner. And they want to be able to trust us; they want to know we have empathy and that we’re open to their concerns and their questions. So not just in a crisis, but certainly in our day-to-day interactions these are effective skills for communicating.

**Slide 51: Emergency Risk Communication Principles**

This shows some principles of risk communication, which again you can find at the CDC website. It gives tips on things that you can do if you are ever asked to speak to a group during an outbreak investigation, and it’s some of the things we’ve talked about already: not trying to tell people not to panic, not trying to over reassure people. People want you to be open and honest, so if you don’t know the answer, they want you to say we don’t have the answer at this time. Acknowledge people’s fears, telling them “this is a scary situation,” or “we all are worried about what’s going on.” Expressing wishes: “we wish we knew more, we wish we had the answer to that question.” Another important one is to give people things to do, and to use them in a positive way. It’s not good to say “don’t panic, don’t go outside,” but instead say things like “stay calm, stay inside,” things that are positive that people can do.

**Slide 52: Challenges in Outbreak Investigations**

What are the challenges in outbreak investigations? Certainly these are some listed in the textbook Field Epidemiology by Michael Gregg. In outbreak investigations, oftentimes we have to realize we’re working with data sources that may not be ideal, we have to take information where we can get it. This is not a well-defined study where you can create an outbreak and get the information that you want. You have to use what information is available. So the data sources are not always ideal because you’re not picking data sources based on your situation, you’re using the data that’s available once the epidemic starts. Oftentimes you’ll be dealing with small numbers, and you don’t have enough cases to figure out what the exposures are in a way.
that’s statistically significant. So, small numbers can certainly be an issue. Specimen collection can be hard because sometimes people are feeling better by the time you get to them, so they don’t want to give a blood sample, or they’re not having diarrhea anymore so they don’t want to give a stool sample. If it’s a food-borne outbreak and you’re worried about a certain food item that may have already been discarded, so doing testing on a food item may not be possible. There is often a lot of publicity involved in outbreak investigations, risk communication is very important. Finally, people are often reluctant to participate because you didn’t enroll them in your study over the course of time and really got people who wanted to participate. You’re trying to find people who were involved in this acute outbreak, and they may not want to answer your questions, they may not want to participate. Again as a healthcare provider one of our roles, certainly is to encourage patients to participate if they’re willing because their information can really be helpful to figuring out the source of an outbreak, and prevent further cases, or future outbreaks from happening.

Slide 53: Summary

In summary we’ve talked about these 10 steps of an outbreak investigation, but realize again they’re a guide, they’re not cookbook do step 1, check, now we’ll move on to step 2. They’re not to be used as a “one size fits all.” There may be investigations where the cause is evident right away, so you may not have to conduct additional studies, and you may only have to develop and test one hypothesis. Some steps may happen simultaneously. As a healthcare provider, you may have a role in terms of several of the steps going on, and may be called into action at different points. Finally clear and consistent communication is key, and this is huge in outbreak investigations.
Module 7: Outbreak Investigation & Disease Control – Outbreak Investigation

TRANSCRIPT

Advisory Committee

Mike Barry, CAE
Lorrie Basnight, MD
Nancy Bennett, MD, MS
Ruth Garre Bernhein, JD, MPH
Amber Berrian, MPH
James Cawley, MPH, PA-C
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Nawraz Shawir, MBBS

APTR

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  President
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  Executive Director
- O. Kent Nordvig, MEd
  Project Representative