Infection Control: Why Audiologists Need to Care

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- [Instructor] It's my pleasure at this time to introduce Dr. Bankaitis. she is Vice President and General Manager of Oaktree Products, Incorporated of St. Louis, Missouri. A multiline distributor of audiology and hearing health care products. Dr. Bankaitis earned her doctorate from the University of Cincinnati, where her funded research investigated the effects of varying degrees of HIV on the auditory system. This research naturally led to the area of infection control. Dr. Bankaitis is one of the leading experts in this area, as it pertains to the hearing industry, authoring numerous infection control publications, including the popular textbook, "Infection Control" in the audiology clinic. She has been a great friend to audiology online over the years, presenting many great courses that you can find in our course library, as well as on our sister sites, physicaltherapy.com, speechpathology.com, and it is always great having her back with us. Dr. Bankaitis, over to you.

- [Bankaitis] Thank you so much. Good morning, everybody. Today's presentation is part one on infection control and why audiologists need to care. From my experience, it is necessary to establish a foundation of why infection control is relevant to audiology because without this appreciation, it's much harder to implement infection control principles, if you don't know, or if you don't care, why they're important. I will be available to answer questions at the end of the presentation and my contact information will be posted. So please feel free to contact me at any time with any questions or comments that may develop in the future. So the goal of today's presentation is to review necessary information that will enable you to answer the following three questions. What is infection control? Why should we as audiologists care? And finally, how do you initially prepare to create and implement an infection control plan into your clinical practice? There is an infection control part two that accompanies this presentation that will focus on what to do and how to do it. So prior to watching part two, it's important to understand foundational information that will be reviewed today. So what do we mean by infection control? As defined by Bankaitis and Kemp, infection control refers to the conscious management of the clinical

environment for the specific purposes of minimizing or eliminating the potential spread of disease, regardless of how remote that possibility may seem. This is a very straightforward definition, and as a result, clinicians tend to quickly jump to the conclusion that integrating an infection control plan will be equally as straight forward. While creating and implementing an infection control plan is not rocket science. It's not that difficult, particularly with all the resources that are currently available. It is a process that involves conscious management of the clinical environment.

Infection control is a very intentional process that requires thinking through clinical procedures and assessing how those procedures may need to be modified to minimize the potential spread of disease. When you start thinking about that, it's usually at this point where you as the audiologist can become very quickly frustrated because you were suddenly forced to think through clinical procedures that have otherwise become so automatic. In addition, there is a tendency to overthink the process to the point where you conclude that the only way to achieve infection control goals is to actually wear a hazmat suit to work. And once you get to this point, the path of least resistance naturally leads us to abandon infection control efforts and to erroneously perceive them as unnecessary. The good news is, this infection control roller coaster is really a natural progression of the learning process and hopefully by the end with the information that is covered in part one, as well as part two, you will have the necessary information and tools to create and integrate, an effective infection control plan in your practice with minimum frustration.

So now that we know what we mean by infection control, the next logical question is to ask, why should you care? To answer this question, we first need to acquire a basic understanding of a few things, including the immune system and how it works, HIV and how it affects the immune system. We also need to take a step back to recognize the lessons that we learned from HIV. And finally, I want to share how all this information actually applies to the audiology setting. So starting with the immune system, human

beings are continually challenged by microorganisms readily found throughout the environment as different bacteria viruses, parasites, what have you, vigorously pursue a resource for growth and reproduction and as such, it is the job of the immune system to defend and protect us from these microorganisms. The immune system is actually comprised of two major subsystems, the natural immune system and the adaptive immune system. The natural immune system provides the first line of defense against any type of microorganism, and it's represented by a variety of physical barriers, cells, soluble factors that react to all infectious agents in the same way each and every time, without any regard to the structural or chemical property of the agent. So for example, your skin serves as a preliminary barrier to any kind of microorganism, regardless if we're dealing with a bacterium, a virus, a parasite or fungus.

Because the natural immune system responds in such a nondiscriminatory fashion, it provides us with what are referred to as non-specific immune responses. Although relatively effective, the non-specific immune response is generated by the natural immune system are not foolproof. And as a result, we significantly rely on the adaptive immune system to defend and protect us from infection. The adaptive immune system is a little bit more complex as it involves the meticulous recognition of antigen. Antigen refers to any substance or molecule that the adaptive immune system interprets as foreign. When the adaptive immune system detects the presence of antigen, it calls upon different groups of immune cells to do very specific things as such the adaptive immune system generates what are referred to as specific immune responses. And we are gonna dissect some of these specific immune responses shortly, but first we need to go over some general anatomy.

The organs of the adaptive immune system are positioned throughout the body and they include a number of organs, including the bone marrow, the thymus, the lymph nodes and the like. The bone marrow refers to the soft material that's found within the hollow shaft of bone, while the thymus is a very small, a butterfly shaped organ that's

located slightly above the heart. Both the bone marrow and the thymus are locations where the specialized immune cells of the adaptive immune system develop and mature. Once these immune cells develop and fully mature, they assemble in the lymph nodes, which are located in the neck, armpit, abdomen and groin regions. While the immune cells of the adaptive immune system mainly congregate in the lymph nodes, they do continually mobilize throughout the body via two interconnected systems. And these two systems include the lymphatic system and the bloodstream.

The lymphatic system is a network of vessels, that's responsible for channeling the clear tissue bathing lymph fluid to the lymph nodes. As the lymph fluid is channeled to the lymph nodes, the lymph nodes work like filters to determine if there's any antigen present. From the lymph nodes, the lymph fluid is directed to flow towards the chest where it empties into the bloodstream by way of the thoracic and lymphatic ducts. And once liberated in the bloodstream, the lymph fluid is eventually reabsorbed by the bodily organs and tissues and the lymph fluid is once again redirected to flow through the lymphatic system. So in other words, immune cells of the adaptive immune system are designed to continuously flow throughout the body. As a result of these connections, an immune response that's generated at one specific area of the body, will ultimately be communicated throughout its entirety. It's a very beautiful system.

However, this can, these connections do serve as a double edge sword. Because of these very same connections, if appropriate infection control protocols are not implemented and followed, what we do as audiologists at the level of the patient's ear can not only affect the health of the ear locally, but given the right conditions can affect the health of our patients systemically. And this is a very critical concept to appreciate and recognize because it drives home the point that what you do or do not do from an infection control perspective in your clinical practice can certainly impact the health of your patients. Immune cells that the adaptive immune system also continually mobilized via the bloodstream. Blood is comprised of two distinct cell populations.

Erythrocytes are more commonly referred to as red blood cells and then we have the second group, which are called leukocytes, which are more commonly referred to as white blood cells. The category of white blood cells pertinent to today's discussion is the lymphocytes.

Lymphocytes are a special group of white blood cells that are responsible for executing and managing all the activities of the adaptive immune system. The two types of lymphocytes that we're gonna focus on today include the B-cell and the T-cell lymphocyte. So let's start with the B-cell lymphocyte. The B-cell lymphocyte develops and fully matures in the bone marrow and an easy way to remember this, is bone marrow starts with the letter B, which is probably why they're referred to as B-cells to begin with. Now, the job of the B-cell is to recognize the presence of antigen. Once the B-cell recognizes the presence of antigen, the B-cell is triggered to mass produce antigen-specific antibody, and then to send that antibody throughout the body's fluids so that the antibody can neutralize and kill the antigen. So this following slide is intended to provide you with a visual cartoon of what basically happens. The red oval represents the antigen, the big, bad B-cell comes in and actually detects the presence of antigen. Even though it detects the presence of antigen, the B-cell is going to sit there. The B-cell actually needs to be triggered. It needs to receive some sort of activation signal before it can do anything. Once the B-cell receives the activation signal, it starts mass producing antibody and then sends the antibody throughout the body's fluids so that the antibody can attach itself to the antigen and then neutralize and kill the antigen.

Another term for bodily fluid is humor. So this entire process that you just saw played out on the slide is what's referred to as humoral immunity. Now comes the T-cell. All T-cells initiate their development within the bone marrow. However, in order for a T-cell to actually become a T-cell, it must pass through the thymus where it's fully mature. So an easy way to remember this is that thymus starts with the letter T, and this is

probably why they're called T-cells. There are several different categories of T-cells, but basically the one that we're gonna focus on is what's referred to as the CD-4 T-cell. The CD-4 simply stands for Cluster Designation four, and it's a very scientific key way to refer to the unique suction cup-like receptors that are found on the outer envelope on this or the surface of this actual cell. So like the B-cell, the job of the T-cell is to detect the presence of antigen. However, unlike the B-cell, the T-cell actually is responsible for destroying the antigen.

So let's go back to our visual representation, in the presence of antigen, the T-cell not only recognizes its presence, but because of those unique outer preceptors can actually attach itself to the antigen where it then neutralizes and kills the antigen. This process whereby the actual T-cell attaches itself to the antigen is what's referred to as cell-mediated immunity. So let's put these two visual concepts together to get a better appreciation of what actually happens. So we had the big, bad B-cell come in. And we also have the T-cell come in, both which recognize the presence of antigen. At this point, the CD-4 T-cell is able to attach itself to the antigen. In the meantime, the B-cell is just going to sit there dormant. It has to receive, what's referred to as an activation signal. The actual activation signal that the B-cell receives comes from the CD-4 T-cell. The CD-4 T-cell sends the signal to the B-cell that says yo, yo, yo, you need to start producing massive amounts of antigen-specific antibody. The B-cell does that, sends the antibody throughout the bodily fluids, and that's how the B-cell and the CD-4 T-cell work together in order to neutralize and kill the antigen.

So we're gonna watch this again, basically, this is how our immune cell provides us with cell-mediated and humoral immunity. It's a wonderful, wonderful system. Now that we understand how the healthy, intact adaptive immune system works, let's basically take a look at what happens in the presence of HIV or the Human Immunodeficiency Virus. HIV is the virus that causes Acquired Immunodeficiency Syndrome or AIDS. And unfortunately, the main cells that HIV targets are the CD-4 T-cells. So by saying that,

you can already probably visualize in your head what happens in this specific patient population in terms of having it affect their overall immunity. So to make sure that we're on the same page in this visual representation, the red square is HIV. The big, bad B-cell comes in, it recognizes the presence of HIV. It's just gonna sit there. Unfortunately, since the virus attacks CD-4 T-cells, whether it's because there aren't enough CD-4 T-cells, whether it's because the CD-4 T-cell is too weak to actually generate an activation signal, what happens is individuals infected with HIV, lose their cell-mediated and humoral immunities. And unfortunately this patient population becomes extremely susceptible to infections, including those that are caused by ubiquitous or ever present microorganisms that we tend to take for granted. HIV served as the disease that taught us many, many, many lessons with regard to infection control.

And in my mind, probably the three most important lessons for us as audiologists are as follows. Lesson number one was actually learned early on in the 1980s. HIV was actually the catalyst of change when it comes to infection control. With the discovery of HIV during the 1980s, the concern for cross-contamination resulted in the Occupational Safety and Health Administration or OSHA and other regulatory bodies to enact regulations that provided healthcare workers with guidelines on how to reduce or eliminate the risk of exposure to infectious agents. Although the risk of transmitting HIV in the audiology clinic is extremely rare, HIV transformed how healthcare and medical professionals approached infection control. Lesson two became evident in the early 90s when it became more and more obvious that audiologists were indeed providing services to the HIV positive and AIDS patient populations, both knowingly and most of the time unknowingly. And here's why. The HIV/AIDS population is prone to developing various types and degrees of hearing loss. And quantable quantifiable audiological changes can occur either as a direct or indirect consequence of HIV. In terms of direct effects, HIV maintains the preferential affinity to the central nervous system with nearly 100% of manifestations involving the areas of the head and neck. So considering the

extensive representation of the auditory system through these regions, auditory manifestations are to be expected, and they have been consistently documented throughout the literature. In terms of indirect effects, basically ototoxicity and opportunistic infections are two examples of how HIV may indirectly cause hearing loss and balance issues.

With regard to ototoxicity, in the absence of a vaccine, the medical management of HIV relies on numerous pharmacological interventions that incorporate both FDA approved and experimental antiretroviral medications. Furthermore, HIV infected individuals are additionally prescribed medications as a prophylaxis or treatment of opportunistic infections. And many of these drugs are known to cause hearing loss, tinnitus, dizziness, decreased in hearing and the like. This patient population is extremely susceptible to opportunistic infections as well, that are known to be associated with hearing loss. Opportunistic infections originate from very commonplace organisms that do not typically cause disease and those with intact immune systems, rather these microorganisms take the opportunity to infect a body that is exhibiting some degree of immunocompromise.

The table appearing in this slide, lists the most common opportunistic infections contracted by HIV infected individuals. These infections are independently known to cause varying forms and varying degrees of hearing loss. Now, while this table is from a 1996 publication, that information remains relevant even to this day. Again, what we learned as audiologists in the 1990s was that the HIV infected patient population remained extremely susceptible to developing hearing loss and vestibular disorders, and that audiologists were, and will find themselves in a position where they will be providing services to the HIV infected patient populations. Well, we're no longer living in the 1990s and basically the third and probably most important lesson we learned from HIV is the one that must resonate with all of you from this point forward as follows, audiologists are exposed to various microorganisms other than HIV and

various immunocompromised individuals, other than those infected with HIV, which brings home the following critical point. Infection control is not, is not about keeping you and your patients safe from HIV. There are many other microbes readily found throughout the audiology clinic and on hearing instrument surfaces that you need to be more concerned about. For example, audiologists are routinely exposed to various microorganisms that puts us at risk for potential exposure to, for example, hepatitis B, which is a very resilient virus that can survive for at least a week in dry blood at room temperature on floors, tables and other hard surfaces. Other microorganisms such as various forms of Candida, the 30 or so different strains of Staphylococcus that are so ubiquitous as well as Pseudomonas are all of concern, just to name a few.

The recent outbreak of Methicillin-resistant Staphylococcus aureus, MRSA serves as a additional reminder to us of the importance and relevance of infection control in the clinical environment. MRSA is a type of bacterium that's resistant to certain antibiotics, including methicillin, penicillin and amoxicillin. In the past, this genetic mutation of Staphylococcus was typically manifested as a nosocomial or hospital acquired infection. And unfortunately it has found its way into the general population. So just like in the 1980s, when HIV seemed to pop out of nowhere, many now ask, well, what do we need to do differently, now that MRSA is here? And the answer to that question may surprise you, but it's basically nothing different than what you should be doing in terms of infection control.

Just like there are other microbes to be concerned with, in the audiology clinic, there are many other patient populations who remain susceptible to opportunistic microorganisms. And as audiologists, we provide services to a wide range of patients, many of whom exhibit varying degrees of immunocompromise that may or may not be overly evident. Geriatric patients, as well as pediatric patients under the age of two are automatically considered immunocompromised based on the factor of age alone. Diabetic patients exhibiting varying degrees of immunocompromise, patients

undergoing, or who have undergone chemotherapy, radiation, as well as those taking certain medications are all considered immunocompromised and the list just simply goes on and on. So the bottom line is we provide services to patient populations that are vulnerable to common microorganisms residing in abundance throughout the clinical environment, making it that much more critical to implement effective infection control procedures.

So, well, let's go back full circle and answer the question in terms of why we should care about infection control. First and foremost, infection control is a federal mandate. In other words, it's the law. The Occupational Safety and Health Administration or OSHA is the federal regulatory body that's responsible for overseeing the implementation of safety procedures in the workplace and basically infection control falls under that umbrella of safety in the workplace. OSHA has issued specific guidelines on how to reduce exposure to potentially infectious agents, and audiologists are legally and ethically obligated to uphold these established federally mandated infection control standards. And these requirements also apply to students because students are not exempt from infection control protocols and requirements. Second, audiologists come in contact with bodily fluids and substances on a daily basis during routine procedures. So for example, cerumen is a bodily substance that is considered infectious when it's contaminated with blood, blood byproducts, ear drainage, pus, and the like, and given the color and viscosity of cerumen, the audiologist is not in a position to determine with any predictable accuracy, whether or not cerumen is contaminated with any of these things. So as a result, we need to treat cerumen as a potentially infectious bodily substance.

Third, the audiologist comes in contact with numerous patients and numerous reusable objects throughout the day. And this is an issue of concern since multiple contact inherently increases the potential for disease transmission to occur. In order for microbial transmission to occur, two main things need to happen at the level of the

outside environment. A microorganism requires a mode and a route of transmission. Mode of transmission refers to how a microorganism travels from point A, which is somewhere in the clinical environment to point B, which is somewhere within the vicinity of the human body. So again, mode refers to how does a microorganism move from the clinical environment to the vicinity of a human body. Now, there are four general modes of disease transmission, and they include contact, which we will discuss shortly, vehicle, whereby organisms catch a ride on contaminated food or water.

There's also airborne transmission, that basically involves when an organism travels via dust particles throughout the air. And we also have vector borne transmission, where microbes are actually carried by an infected animal or insects such as a tick or a mosquito. Now of the four modes of transmission that you see here, contact transmission basically represents the most common mode of disease transmission in the clinical environment. And there are several different categories of contact transmission, including direct and indirect. Direct contact transmission occurs when the clinician comes in contact with a microbe found in the environment. So for example, if you happen to touch a draining ear with your bare hand, that's an example of direct contact transmission. Indirect contact transmission occurs when handling or reusing a contaminated object. So for example, using the same listening stethoscope to conduct a hearing aid listening check on two different hearing instruments without first cleaning, and then disinfecting the bell between listening checks is an example of indirect transmission.

Now these just serve as some examples and the critical point to gain from this is not so much, you know what differentiates direct from indirect transmission, but rather what activities you, as an audiologist, perform throughout the day that can potentially offer microorganisms an opportunity to travel from one location to the next. Once a microbe has actually established a mode of transmission, it then requires a route of

transmission. Route refers to a portal of entry into the body and common portal of entry, entry into the body include, dry chapped hands or any other skin surfaces that may be dry or exposed with cuts or scratches. In addition, natural body orifices serve as portals of entry into the human body, including the nose, the eyes, the mouth, as well as your ears. Now, once the microbe enters the human body, a million different things need to happen in order for disease to occur, whether or not disease manifests is a moot point, from an infection control standpoint, our responsibility as audiologists is to control the external environment by performing diagnostic and rehabilitative procedures in a matter that eliminates potential modes and routes of microbial transmission.

Finally, why should we care, the concept of opportunistic infections represents a very critical element regarding the relevance of infection control to the field of audiology. And as previously mentioned, an opportunistic infection is a disease state that's caused by commonplace ubiquitous microorganisms that are readily found throughout the environment. Opportunistic microorganisms do not cause diseases in those with healthy, intact immune systems, rather as the name implies, these microorganisms take the opportunity to infect a body with some degree of immunocompromise. So the hallmark of immunocompromise is susceptibility to the very same microorganisms that are considered essentially harmless to healthy individuals.

So to put all of this in a more meaningful context, it is appropriate to review the findings of a study that was published by Bankaitis in 2002, that appeared in the hearing journal that's entitled, "What is growing on your patient's hearing aids?" The purpose of this study was to identify the presence or absence of microbial growth in hearing instrument surfaces. And if microbial growth was detected, the secondary purpose was to simply identify the type of bacterium and or fungus that were recovered from these surfaces. 10 custom hearing instruments were randomly selected from one ear of 10 different patients, all of whom were binaural wearers of

amplifications amplification, the hearing instruments surfaces were swabbed, utilizing the system that you see in this slide and essentially what this is, is a very, very expensive sterile Q-tip. So as shown in this picture, two systems were used to simultaneously swab the hearing instruments. Two swabs were necessary for purposes of microbial differentiation. So one swab was used by the microbiology lab to identify a bacterial growth. Whereas the other swab was used to identify the presence of any fungal growth. Once the specimen was collected, the individual cultures were reinserted into their individual capsules and activated by crushing the ampule, which saturated the swab in preparation for analysis, the cultures were then labeled, placed in a biohazard specimen pouch, and then dropped off at the St. Louis University Medical Center's microbiology lab for analysis within 15 minutes of specimen collection.

Now, in terms of the results that you're gonna be seeing, several tables are gonna follow this slide. That's gonna list any of the microbes that were recovered from hearing aid services, any listed microbe appearing in red font indicates that heavy amounts of the microbial growth were found. Anything appearing in yellow indicates moderate amounts and anything appearing in green indicates light amounts of microbial growth. So here we have the results of the first five hearing instruments listed on this table. The extreme left hand column lists each hearing instrument, along with a more specific indicator as to the type of custom device, whether it was an ITE or a CIC. The middle column lists recovered bacteria corresponding to each of the hearing instruments and then the far right hand column reflects any kind of fungal growth that may have been recovered from each of the hearing instrument surfaces. So let's just pick on hearing aid number two for a second.

What the results indicate is that we found moderate amounts of Staphylococcus. It appears in yellow on this hearing instrument, as well as light amounts of Acinetobacter, two different types of bacterium. In addition, we found moderate amounts of

Aspergillus on the same hearing instrument. In contrast, if we go down to hearing aid number five, there was no microbial, no fungal growth, but if you take a look light amounts of Staphylococcus and the bacterium lactobacillus was recovered from this specific instrument. If we basically take a look at hearing aids six through 10, I'm gonna pick on hearing aid number seven. If you take a look, there were light amounts of three different bacterium recovered, including Enterbacter, Pseudomonas and Enterococci as well as moderate amounts of Candida. If you scroll down to number 10, no fungal growth, but we did find moderate amounts of Staphylococcus aureus, as well as your everyday run of the mill Staphylococcus. So in looking at these tables, if I were to provide you with a visual illustration of the results, the 10 circles that you see in this slide represent each of the 10 hearing instruments that were swapped in this study. At this point, all the that's circles are the same color because we haven't applied any results of the study yet, if we start assigning a specific color to each and every specific microorganism recovered from the hearing aid surfaces, take a look and see what happens.

So first and foremost, nine of the 10 hearing instruments were contaminated with some type of Staphylococcus. There's 29 different forms of Staphylococcus and we simply did not have the funds nor pay the money to differentiate from the different types of Staphylococcus. Beyond Staphylococcus, what's important to note is that were a bunch of other bacterium that recovered as well. So not only were there seven different additional bacterium recovered from the hearing aid surfaces, but each hearing aid surface contained very different combinations of those different bacterium. Furthermore, four of the 10 hearing instruments were also contaminated with some type of fungal contamination. Again, with each color representing either a different microbe and or different bacterial fungal combination, all 10 hearing instruments, which initially started out blue in color, have a completely different color from one another, reflecting the presence of very unique combinations of microbial contamination on each of the hearing instruments. So in other words, none of the 10 hearing instruments

were contaminated with the same stuff. So a very logical question at this point would be, are these findings surprising? And you can take a moment to figure out whether or not you're gonna say yes or no. And let me tell you a couple of things. Taking into consideration, a couple of things I will tell you, the results of this study is not surprising. And when you start taking into consideration the normal flora of the external auditory canal, basically at the end of the day, if I were to take a system and put it in somebody's ear and send it down for analysis, we would find some of the same stuff growing in everybody's ears, including various forms of Staphylococcus, diphtheroids, as well as occasional fungal spores. On the other hand, if you answered yes in your mind, you are correct as well. Given the fact that each of the 10 hearing instruments reflected a very unique microbial combination, these findings are surprising. From an infection control standpoint, keep in mind that the external auditory canal is more prone to infection than virtually any other skin surface. And while cerumen may have some antimicrobial properties, the efficacy of cerumen's antimicrobial properties will most likely be challenged in the hearing aid wearing population.

In the absence of a hearing instrument, the ear canal is already a very warm, dark, moist place. When you plug it up with an earmold or a casting hearing instrument, or even, you know, iPod earphones or cell phone accessories, the ear canal becomes an even warmer, darker moister place, which causes it to retain moisture. And when the ear retains moisture, acid ions are depleted from the canal skin, raising the surface pH to a more neutral or alkaline level, which results in the creation of an environment that is actually more conducive to microbial growth. So with that in mind, if infection control procedures are not followed, opportunistic infections become a very realistic concern. So for example, recall that nine of the 10 hearing instruments were contaminated with staphylococcus. This is a ubiquitous bacterium readily found throughout the environment. However, this same bacterium accounts for the highest rates of hospital acquired infection, how can something found so readily throughout the environment cause so much disease in hospitals? Well, think about it. Who goes to hospitals?

Typically sick people who posses some degree of immunocompromise who will be extremely susceptible to bacteria or fungi that healthy individuals will not be so susceptible to. Pseudomonas was recovered from one of the hearing instruments, specifically hearing aid number seven, while Pseudomonas may be part of some patient's normal ear canal flora. It isn't necessarily considered part of every patient's normal ear canal flora. This is a bacterium that is highly virulent and it can cause otitis externa, which can quickly progress to malignant otitis externa also known as osteomyelitis in diabetic and HIV infected individuals, given the right set of circumstances. Now, while Staphylococcus and Pseudomonas may be considered expected components of ear canal flora, I gotta tell ya, some of the microorganisms that were recovered from these hearing instruments are not considered normal microbes that are found in human ears. So for example, lactobacillus, which was found in hearing aid number five in light amounts is a bacterium that's specifically isolated from urine.

So there was PP found on hearing aid number five, right? Enterobacter was found in hearing aid number seven. And this specific strain of Enterobacter is basically found in human feces. So we found poop on a hearing instrument. So what's my real point? Each hearing instrument reflected a unique microbial composition. And it's important to realize that no two hearing aids are actually the same. From an infection control standpoint, if you were to handle hearing instrument number seven, which belongs to one patient and in the absence of any infection control procedures, you started handling, hearing a number six, which belongs to a totally different patient. Anything residing on hearing aid seven will now cross-contaminate hearing aid number six. When you reinsert that now cross-contaminated hearing aid number six into the ear canal of your 80 year old diabetic patient, you just provided microorganisms a very easy route for disease transmission. A similar study was conducted by Sturgulewski and colleagues at Rush University whereby not only the findings of my original study were essentially duplicated, but a sub sample of hearing instrument pairs, swabbed

from the same patient revealed different microbial compositions between the same patient's ears, which basically opens a completely new can of worms. So the information the references listed on this slide, for those of you who are interested in reading up on this more. So, all of this brings us to the basically third and final objective of today's presentation, which is basically how do I prepare? What is it that I need to do tomorrow? Well, in order to initially prepare for an infection control plan, the first thing you really need to do is assess the scope of service. Basically, what services do you and your staff specifically provide? So for example, if you dispense hearing instruments, okay? You need to take out a piece of paper and a pencil and start listing every type of service that's associated with dispensing hearing instruments that your clinic provides.

So for example, if you were anybody in your clinical setting creates earmold impressions, you write that on your list. If you do the actual hearing instrument fittings or somebody else, you put that on your list, hearing instrument modifications, listening checks electroacoustic or real ear measurement, drop off services, loaner hearing instruments, stock earmolds. These are just examples of different services that fall under hearing aid dispensing. And everybody in a specific clinic needs to actually review the surf surf services that is provided in order to come up with this comprehensive list. Another example, if you perform audiological assessments, okay, usually that involves otoscopy. It also should involve air conduction audiometry, speech audiometry, bone conduction audiometry, emittance audiometry, perhaps OAEs and the like. The reason it's important to create, here's another example for cerumen removal.

So for example, if you do mechanical removal or suction or irrigation, or if you use cerumen softening agents, or, you know, in the event of a bleeder, you need to start writing all these things, all these services that you provide in your specific clinic. The reason this is so important and so critical is that this list of your scope of services is

actually going to dictate the number of work practice controls that you will need to create for your written infection control plan. A work practice control is a profession specific procedure that is designed to reduce the likelihood of cross contamination. So in other words, your homework assignment prior to you even taking a look at part two is to create your own list of services that's unique to the clinical environment in which you are working in. And the reason this is important is that every clinic will differ in terms of the scope of services that they provide. Once you create this list, that list is gonna dictate the number of work practice controls that you are gonna have to create and insert in your written infection control plan, okay? And basically that written procedure is going to outline how you and your staff will perform that procedure in a manner that's consistent with minimizing the spread of disease.

Now, in order to ensure that the written procedure actually integrates the necessary infection control principles, the work practice controls are gonna be based on the universal precautions that have been issued by the CDC. Universal precautions were originally set in 1987 by the Centers of Disease Control and Center for Diseases Control and Prevention or the CDC. And in response to HIV, the CDC created a list of recommendations that were intended to reduce the cross contamination of blood-borne pathogens, okay? So specifically the universal precautions focused on the nasty blood-borne pathogens, such as HIV, as well as hepatitis. What's important to appreciate is that since then, the universal precautions were expanded to include any and all potentially infectious microorganisms, including the ones that we recovered from hearing aid surfaces. So instead of the term universal precautions, you now hear the term standard precautions used.

Now basically the mindset of the standard precautions is as follows. You need to have the mindset that every patient is considered a potential carrier of an infectious disease and each procedure that you perform must be consistently performed with each and every patient each and every time. So as issued by the CDC, the standard precautions

actually include five of the following guidelines. Number one, appropriate personal barriers, such as gloves, masks, eye protection gowns must be worn when performing procedures that may expose one to infectious agents. Number two, hands must be washed before and after every patient contact and after glove removal. Three, touch and splash surfaces must be pre-cleaned and disinfected. Four, critical instruments must be sterilized. And then finally five, infectious waste must be disposed of appropriately.

These are the five standard precautions from which we are going to use as the foundation for writing the work practice controls, which are an extremely important element of the written infection control plan. This, these steps are basically gonna be covered in part two infection control part two, which will follow this presentation. So, in terms of the take home messages at this point, first and foremost, infection control require requires consciously managing your clinical environment. You're gonna have to think through a lot of things that otherwise come very automatic to you. And there is going to be a level of frustration where you're going to want to give up, please do not do that. This is when you rely on available resources or you get in touch with me in the event that you simply get stuck or frustrated. Infection control is a very important element of best practices for audiology, whether or not this presentation convinces you, that this is an important element, what you have to realize is that infection control, as previously mentioned, is the law.

You are legally as well as ethically obligated to implement infection control requirements into your clinical practice. Finally, the most important message in order for you to get the most out of part two, is that infection control requires preparation. And the biggest thing that you need to do is identify the scope of services that you or anybody else in your clinic provides and have that exhaustive list available, because that is going to be the one piece that will be critical in helping you develop a specific portion of the written plan. When it comes to a written infection control plan, 95% of it

can be copied. And I can give you the information. I mean, you gotta read it and understand it, but 95% of a written infection control plan can be written word for word. The 5% that you need to focus on are these work practice controls. And this 5%, these work practice controls. This is the part of the infection control plan that will differ from clinic to clinic because it's basically driven or dictated by the scope of services that are provided. This ends part one.

For those of you, we're gonna spend the last several minutes to answer any questions, I will tell you if there are additional questions that come to your mind, the easiest way to get in touch with me is via my email, which is au@oaktreeproducts.com. You can feel free to call, but I will tell you, 97% of the time, I'm not at my desk and you're gonna essentially get my voicemail mail. So the easiest way is via email. If you're looking for additional infection control resources, there is my blog that actually has a specific section that's dedicated to infection control. So if you go to aubankaitis.com, that's spelled A-U-B-A-N as in Nancy, K-A-I-T-I-S.com, that's my audiology blog where I post once a week on various topics, one of which is infection control.

So, one of the questions that I see, and this is the best time to start posting them, is how does one get a hold of the infection control textbook? There are two infections control textbooks. It's what I call the purple book and the yellow book, the purple book is basically "Infection Control in the Hearing Aid Clinic", which addresses everything that you need to know about infection control, including work practice controls associated with hearing aid dispensing and hearing aid dispensing only. The second book, which is the yellow book is "Infection Control in the Audiology Clinic". And that book basically includes everything that the purple book includes. So hearing aid dispensing as well as any and all aspects of practice, including interoperative monitoring, cochlear implants, vestibular testing, electrophysiology and the like.

The easiest way to order the book is to go to oaktreeproducts.com, and when you, if you don't have an account, it's really easy to set one up, or if you wanna email me and ask me how to set up an account, I can do that, but you can buy it online. It's found in our infection control section, or if you prefer to talk to a person, you can call customer service at 347-1960. One of the other questions is, does infection control change? Do I need to review my processes on a regular basis? We are gonna cover some of that stuff in part two, I will tell you the basic principles of infection control rarely change. It's never a bad idea to go over them annually and that's actually a requirement per OSHA. You also do need to review your procedures more often when you have new hires or if your clinic actually introduces a new procedure or a new technique.

So for example, at St. Louis University Medical Center, when I was director of audiology, we had a written infection control plan, but then when we decided to start doing otoacoustic emissions, guess what we had to review infection control specifically as it relates to how are we gonna perform otoacoustic emissions? So it's just gonna depend. Another question is we use bins to place hearing aids when they are drop-off, aside from cleaning with lysol, how else can we prevent contamination from one hearing aid to another? I see a lot of, for drop-off hearing instruments, I see a lot of clinics implementing either an envelope or a Dixie cup, so that the person transferring it to the next place doesn't have to handle it. The best way to, to clean and disinfect a hearing instrument is to either initially use a paper towel or a Kleenex to clean the surface followed by the use of a disinfecting towelette preferably preferably one that's not alcohol based because alcohol tends to denature acrylic, plastic, rubber and acrylic, plastic, rubber and silicone, which is basically everything we find in the audiology clinic. Again, those specific procedures are gonna be in part two.

When is part two? Today is Friday, May 2nd. The live webinar for part two will be Friday, May 9th, which is next Friday after which this as well as part two will be available as free to view in the form of recorded audio courses. I see, basically Emelda

indicated we clean the bins with lysol, not the hearing instrument. So you're basically reusing a bin that's gonna accommodate different hearing instruments. At the end of the day, you know, basically what you wanna do in between each or possibly at the end of the day is clean and disinfect those bins. It's more critical for you to make sure that the hearing aid that's removed from the bin is immediately cleaned and disinfected prior to you handling it. That's more critical than worrying about what kinda grubby stuff is growing inside the bin. You could technically wait until the end of the day to clean the inside of the bin. Assuming that every hearing instrument that you remove from that bin is immediately cleaned and disinfected. So again, great questions everybody. I know we went through a lot of information, the easiest way to get in touch with me if you have questions is via my email au@oaktreeproducts.com. I love this stuff. So you're never gonna be bothering me if you have any questions or concerns. In addition, if you are interested in receiving a template of an infection control plan in preparation for part two, send me an email and early next week, I will send you a word document, that basically is 95% of your infection control plan. Unfortunately, the other 5% is gonna have to come from you. So if there aren't any questions, I would like to thank everybody for their attention and for their questions, for their questions. This has been great.

- [Instructor] Thank you, thank you so much, Dr. Bankaitis. Another great class on infection control and we really appreciate it. Thanks to everybody who attended, as Dr. Bankaitis mentioned, this course is being recorded. So if you have friends or colleagues that need, or would like a course on infection control and updated course, please tell them to check out our course library and we hope you can join us next Friday at the same time.