Hearing Aid Related Infection Control

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Introduction

With the discovery of human immunodeficiency virus type 1 (HIV-1), the concern over potential cross-infection of health care workers and patients became the impetus for change in healthcare. This concern resulted in the Occupational Safety and Health Administration (OSHA) and other regulatory bodies (Table 14–1) to enact regulations for providing health care employers and workers with guidelines on how to reduce the risk of exposure to infectious agents. With regard to audiology, the scope of practice dictates OSHA’s jurisdiction of the profession. Whether employed in a hospital setting, university, or private practice, audiologists are obligated to uphold the same regulatory standards as defined by OSHA. The only technical exception applies to clinicians employed within the public schools. The public school system falls within the jurisdiction of county and state health departments. Infection control standards defined by these local regulatory bodies, however, are directly based on those outlined by OSHA.

Regardless of the employment environment, as health care workers, audiologists have been expected to practice a certain degree of infection control through routine hand washing and keeping patient care areas tidy and clean. However, infection control is a concept and a process that extends beyond routine hand washing and good housekeeping. Infection control refers to the organized effort to manage the clinical environment to minimize exposure of patients and clinicians to potentially infectious microorganisms (Kemp and Bankaitis, 2000a,b). Transmission of infection may occur in a variety of ways in the hearing aid clinic, and audiologists must be diligent in their efforts to control the spread of infectious disease within the context of their practice. This chapter provides an orientation to the importance of infection control with practical suggestions for hearing aid-specific infection control procedures that may be implemented in clinical practice.

Need for Infection Control

From a general perspective, infection control is an important issue from two standpoints. First, hearing aid services are sought by a wide range of patients who vary across several factors such as age, nutritional status, exposure to past and current pharmacologic interventions, and socioeconomic status. The hearing-impaired population often includes geriatric patients with underlying disease such as diabetes, pediatric patients with immature immune systems, or possibly HIV-infected individuals, to name a few (Bankaitis, 2000; Kemp and Bankaitis, 2000a,b). As such, audiologists provide hearing aid services,
both knowingly and usually unknowingly, to individuals with compromised immunity (Bankaitis, 1996, 1998). Because varying degrees of immunocompromise influence the efficacy of the immune system and overall health of an individual (Schountz and Bankaitis, 1998), these patient populations maintain a heightened susceptibility to otherwise ubiquitous microorganisms, and therefore may be at considerable risk of developing opportunistic infections. Opportunistic infections originate from commonplace microbes that take the opportunity to infect a body with a weakened immune system (Bankaitis, 1996). When reduced resistance occurs, otherwise nonpathogenic organisms living in substantial numbers in many healthy persons can gain access to an immunocompromised system, resulting in the development of infection that may lead to serious, life-threatening complications.

Second, the nature of the audiology profession involves a remarkable degree of direct and indirect contact with multiple patients and multiple objects that come in contact with other patients. Direct patient contact occurs when audiologists touch the patient with their bare hands as during a handshake or when touching the patient’s ear during a hearing aid fitting. Indirect patient contact occurs when the audiologist comes in contact with objects or items that have previously established contact with the patient or other employees. For example, handling an immittance probe tip or removing hearing aids from the patient’s ears is a form of indirect patient contact.

### Need for Hearing Aid-Specific Infection Control

Beyond general reasons for implementing infection control procedures in the audiology clinic, the practice of dispensing hearing aids creates the need for the application of procedures specifically designed to minimize potential risks of contamination. The process of dispensing, fitting, and repairing hearing aids involves potential contact with bodily fluid including cerumen, ear drainage, and blood. Cerumen is not considered an infectious agent until it becomes contaminated with blood or mucus (Kemp et al, 1996). Due to the color and viscosity of cerumen, the clinician is not in the position to determine, with a high degree of confidence or predictable accuracy, the presence or absence of intermixed bodily fluids (Kemp et al, 1996). Because hearing aids are often contaminated with light to moderate amounts of cerumen, and dispensing audiologists often handle numerous such devices each day, the potential for cross-infection or the transmission of infection from one patient to another, whether direct or indirect, is a potential situation that warrants further consideration.

### Table 14–1. State and Federal Regulatory Agencies Responsible for Developing Guidelines for the Workplace

| Occupational Safety and Health Administration (OSHA) | Regulates workplace to ensure safe conditions, including establishing infection control regulations |
| Joint Commission for the Accreditation of Healthcare Organizations (JCAHO) | Establishes standards and conducts voluntary accreditation programs for health care organizations; sets infection control standards based on OSHA standards |
| Commission on Accreditation of Rehabilitative Facilities (CARF) | Establishes standards for organizations providing services to persons with disabilities based on OSHA standards |
| Environmental Protection Agency (EPA) | Protects public and environment from risks posed by pesticides, promotes safer means of pest control, and registers chemical disinfectants and sterilants |
| Food and Drug Administration (FDA) | Ensures safety of foods, cosmetics, medicines, medical devices; collaborates with EPA to research and document biologic effects of chemicals, including disinfectants and sterilants |
Although hearing aids have not been previously identified as a source of spreading bacterial and/or fungal infection, anecdotal reports throughout the medical literature indicate their potential role in disease transmission. Breathnach et al (1992) swabbed the surfaces of 29 stethoscopes and sent the specimens to a microbiology laboratory for routine culture analysis. Of the 29 stethoscopes, 26 were contaminated with the bacterium coagulant-negative *Staphylococcus*, with five of the 26 specimens also containing *Staphylococcus aureus*. In a similar study, Brook (1985) applied the same technique to 20 sterile airline headsets to determine what types of bacteria, if any, were present after they were worn by subjects for a period of 1 hour. Several different species of bacteria were recovered from all headsets with *S. aureus* (12/20 headsets) and coagulant-negative *Staphylococcus* (10/20) identified as the predominant organisms.

*Staphylococcus* is a bacterium universally found on the skin and nasopharyngeal areas of the respiratory tract. For classification purposes, it is traditionally categorized into one of two groups according to whether or not the specific species of *Staphylococcus* produces the blood-clotting enzyme coagulase (Cohen, 1986). The only species that produces the enzyme coagulase is *S. aureus*; therefore, all other species not identified as *S. aureus* may be generically referred to as coagulant-negative *Staphylococcus* (Murray et al, 1994). For example, the category coagulant-negative *Staphylococcus* may refer to any non-*S. aureus* species of the bacteria such as *S. epidermidis*, *S. capitis*, *S. bacillus*, and the like.

Both Breathnach et al’s (1992) and Brook’s (1985) findings indicate the possible role of hearing aids in potentially spreading bacterial infection to objects or persons with which they come in contact. The recovered fungal and bacterial colonies can be easily spread from direct or indirect contact from clinician to patient or patient to patient. Furthermore, objects placed in the ear canal, including hearing aids or earmolds, would more likely be contaminated with similar pathogens (Kemp et al, 1996). Unlike airline headset devices and stethoscopes used in their respective studies, hearing aids and earmolds are custom-made to fit snugly in the ear and are prescribed to be worn continuously throughout the day. In the absence of previous studies, Bankaitis (2000) swabbed surfaces of two in-the-ear (ITE) hearing aids removed from the ears of two patients to determine whether or not bacterial and/or fungal growth could be detected. As shown in Table 14–2, routine culture for bacterial growth confirmed the presence of *Staphylococcus* on both hearing aids.

The general finding of microbial growth on both hearing aids’ surfaces should not be considered an extraordinary finding. First, from a microbiologic standpoint, the recovered bacteria from the swabbed hearing aid surfaces are widely distributed throughout the environment. In normal individuals, coagulant-negative *Staphylococcus* thrives on skin surfaces and may be cultured in the external auditory canal (Caruso and Meyerhoff, 1980; Jahn and Hawke, 1992).

Second, the external auditory canal contains cerumen, a substance often observed on hearing aid surfaces. From a physiologic perspective, cerumen is effective in inhibiting the growth of certain bacteria and/or fungi by maintaining a unique potential for hydrogen or pH level that is not conducive to microbial growth (Caruso and Meyerhoff, 1980; Hawke, 1987). In chemistry, pH is expressed in a numeric value ranging from pH 0 to pH 14 that indicates the level or degree of acidity or alkalinity of a substance. A pH of 7 is considered neutral, where a substance is neither acid nor alkaline. Values less than pH 7 are considered acid, whereas values greater than pH 7 are alkaline. Microbes require a low acidity environment to grow; however, the pH value of cerumen is acidic or lower than pH 7. Because one function of cerumen is inhibiting microbial growth, the presence of such microorganisms within cerumen is to be expected.

Assessing microbial growth on only two hearing aids does not provide overwhelming evidence to generalize these anecdotal findings; however, this information does
generate several interesting points regarding practice standards from the aspect of infection control. Despite the unique defense mechanisms provided by the external ear, the ear canal remains more prone to bacterial infection than other skin surfaces (Jahn and Hawke, 1992). For those patients fit with custom hearing aids or earmolds, the efficacy of cerumen in inhibiting microbial growth may be uniquely challenged. A hearing aid or earmold, even with a large vent, creates a warmer and moister environment. When the ear canal retains moisture, the normally acidic pH level of the ear canal may become more alkaline, creating an environment that is conducive to encouraging the growth of pathogenic bacteria and/or fungi (Jahn and Hawke, 1992).

Although the recovered microbes from hearing aid surfaces are ubiquitous in nature, the hallmark of immunosuppression is characterized by susceptibility of disease-prone individuals to these very same organisms. For instance, certain strains of *Staphylococcus* are universal, found throughout the surfaces of human skin and nasopharyngeal areas. Because of its ubiquitous nature, shedding of this bacterium is very common; however, because of its universal nature, it also accounts for a high percentage of hospital-acquired infections by susceptible patients exhibiting varying degrees of immunosuppression (Murray et al, 1994). From the standpoint of minimizing the potential risk of infection to patient populations, a more active approach to infection control should be considered.

### Process of Infection

The process of infection is extremely complex. Equally sophisticated is the immune system’s ability to keep the human body relatively safe from a variety of infectious agents. The manner in which infection may be transmitted in the clinical setting has been well documented, and the reader is referred to these reviews found throughout the audiology literature (Kemp et al, 1996; Schountz and Bankaitis, 1998; Kemp and Bankaitis, 2000a,b).

In general, disease transmission involves a two-tiered process: (1) a transmission mode, and (2) a transmission route. Microorganisms may be transmitted via four primary modes: contact, vehicle, vector borne, and airborne. Of the four modes, contact transmission, whether direct or indirect, represents the most frequent means of disease transmission in the hearing aid clinic (Kemp and Bankaitis, 2000a). Contact transmission may occur directly or indirectly. Direct transmission mostly involves those clinical situations in which the audiologist touches the patient or certain items with bare hands. For example, removing a patient’s hearing aid from the ear and handling the hearing aid without the use of gloves is a common situation where direct contact transmission is perpetuated. Placing the same hearing aid on a counter without cleaning the counter surface puts the next patient or clinician at risk for indirect contact exposure in the event that the patient or clinician touches the contaminated surface area.

Vehicle transmission occurs when other items known as “vehicles” such as food, water, or blood, contain microorganisms that are in the position to infect individuals. For example, ingesting food contaminated with *Salmonella* bacteria may result in mild to severe and often fatal cases of food poisoning. In contrast, airborne transmission involves the spreading of disease by way of the air. When people cough, evaporated droplets from their respiratory system are expelled and circulate throughout the air. The residue of such evaporated droplets may remain sus-

| Table 14–2. Microorganisms Detected on the Surfaces of Two Hearing Aids |
|-----------------------------|-----------------|-----------------|
| **Hearing Aid** | **Model** | **Routine Culture** |
| 1 | ITE | Coagulant Negative *Staphylococcus* *Aspergillus Flavus* (fungus) |
| 2 | ITE | Coagulant Negative *Staphylococcus* |

ITE, in the ear.
pend in the air for extended periods of time, can be widely dispersed by air current, and may eventually be inhaled by or de- posited on a susceptible host. Lastly, infec- tion may also be transmitted to humans from infected animals or from infected insects. Or- ganisms that carry pathogens from one host to another are referred to as “vectors;” therefore, this potential form of disease transmis- sion is referred to as vector-borne transmis- sion. Lyme disease, transmitted by ticks, and malaria, transmitted by mosquitoes, repre- sent two examples of vector-borne diseases.

Regardless of the established mode of dis- ease transmission, once a mode is established and completed, microbes seek an entry or a route into the body, usually by natural ori- fices such as the nose, eyes, and ears, or via the epithelial layer of the skin (Kemp et al, 1996). Although the skin serves as a pre- liminary barrier to potentially infectious mi- croorganisms, dry, chapped, or cracked skin surfaces represent common routes of mi- crobe penetration and access to the human body. This applies to the epithelial layer of the skin at the level of the external auditory canal. Given the nature of the practice of hearing aid dispensing and servicing along with the potential opportunity for encoun- tering direct or indirect contact transmission, the concern about introducing a bacteria into the ear canal with a contaminated object (cross-infection) cannot be overlooked.

**Current Infection Control Practices**

The paucity of publications in the area of infection control practices by audiologists complicates the justification for hearing aid related infection control. To our knowledge, there are no publications regarding current infection control practice trends specific to hearing aids. A limited number of studies assessing general infection control practices are found throughout the audiology litera- ture, all of which have relied on the collec- tion of data through the use of question- naires. Although the number of publications remains very small, the available survey data suggest apathetic infection control practices in audiology, and the general lack of awareness of the fact that diseases can be transmitted through virulent pathogens on standard clinical equipment, including headphones, otoscope specula, and instruments used in cerumen management (Hudson and Ballachanda, 1996).

Of the few published studies addressing general infection control practices in the audi- ology clinic, the most recent was conducted and published by Amlani (1999). Infection control practice questionnaires were ran- domly distributed to 600 practicing audiolo- gists. Of the 311 respondents, 213 (68%) be- lieved that the audiology clinic was not a setting potentially associated with high expo- sure to communicable disease. Furthermore, only 26% of respondents reported washing hands at the conclusion of an appointment with a patient, although 188 (60%) reported washing their hands following removal of earmold impressions from patients’ ears. Fur- thermore, 36% of the audiologists handled earmold impressions with bare hands in ad- dition to not washing hands between pa- tients. According to the Centers for Disease Control and Prevention (CDC), hand wash- ing is the single most important method of re- ducing the spread of disease, particularly in the health care setting (Freyer, 1998). Al- though this particular study did not specifi- cally assess hearing aid practices, the re- ported trends by Amlani (1999) may be reflective of hearing aid related infection con- trol practices.

**Infection Control Protocols in the Hearing Aid Clinic**

Protection against inadvertent transmission of disease from patient to patient, clinician to patient, and patient to clinician must be approached from a preventive standpoint. As such, infection control refers to the calculated method for managing the environment for purposes of minimizing the risk of exposure to potentially pathogenic microorganisms. Infection control is most effective when these...
preventative procedures are well thought out, organized, and then written as standard clinical protocols. These written protocols should be reviewed annually by clinicians providing services. Front-office personnel should also be included in infection control in-service training as they often are the first to encounter hearing aid patients. To effectively develop strategies for infection control, an appreciation of “universal precautions” and an understanding of relevant infection-control related terms are necessary.

**Universal Precautions**

Health care settings implement specific infection control procedures that, when followed, minimize or reduce the potential of disease transmission. These infection control procedures should be based on guidelines set by the CDC (1987) for universal blood and body fluid precautions, more commonly referred to as “universal precautions” (Table 14–3). In terms of hearing aid related procedures, these same general guidelines should serve as a foundation for developing hearing aid-specific infection control protocols in the clinic that are designed to reduce or eliminate the transmission of potential disease to patient and/or clinician. Although the universal precautions apply to blood, semen, vaginal secretions, and other body fluids containing visible blood (CDC, 1989), the audiologist who is handling hearing aids is not in the position to determine, with predictable accuracy, the presence or absence of blood in cerumen. Compliance with universal precautions by treating all substances, including cerumen, as potentially infectious, regardless of the visible presence or absence of blood, is a strategic mindset for those involved in dispensing hearing aids (Kemp and Bankaitis, 2000b). In addition, all patients should be universally considered potential carriers of or susceptible hosts to infectious disease. As such, infection control is regarded as standard patient care for every patient, and such procedures should be followed universally.

**Infection Control Terms**

**Cleaning, Disinfection, and Sterilization**

Prior to strategizing an appropriate infection control plan in the hearing aid clinic, related issues must be understood. Effective infection control involves the processes of

Table 14–3. Universal Precautions

<table>
<thead>
<tr>
<th>Centers for Disease Control and Prevention (CDC) Universal Precautions</th>
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<tbody>
<tr>
<td>All health care workers should routinely use appropriate barrier precautions to prevent skin and mucous-membrane exposure when contact with blood or other body fluids of any patient is anticipated. Gloves should be worn for touching blood and body fluids, mucous membranes, or nonintact skin of all patients, for handling items or surfaces soiled with blood or body fluids, and for performing venipuncture and other vascular access procedures. Gloves should be changed after contact with each patient. Masks and protective eyewear or face shields should be worn during procedures that are likely to generate droplets of blood or other body fluids to prevent exposure of mucous membranes of the mouth, nose, and eyes. Gowns or aprons should be worn during procedures that are likely to generate splashes of blood or other body fluids.</td>
</tr>
<tr>
<td>Hands and other skin surfaces should be washed immediately and thoroughly if contaminated with blood or other body fluids. Hands should be washed immediately after gloves are removed.</td>
</tr>
<tr>
<td>All health care workers should take precautions to prevent injuries caused by needles, scalpels, and other sharp instruments or devices during procedures; when cleaning used instruments; during disposal of used needles; and when handling sharp instruments after procedures.</td>
</tr>
<tr>
<td>Healthcare workers who have exudative lesions or weeping dermatitis should refrain from all direct patient care and from handling patient-care equipment until the condition resolves.</td>
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</tbody>
</table>

From CDC, 1987.
cleaning, disinfecting, and sterilizing items, objects, or surfaces. Each term has been specifically defined by the Environmental Protection Agency (EPA) and, as such, will influence the appropriateness and effectiveness of an infection control procedure designed for a specific clinic. In addition, these processes involve the use of various products, readily available from several different manufacturers (Table 14–4).

The term cleaning refers to procedures in which gross contamination is removed from surfaces or objects without killing germs. By definition, cleaning does not imply any level of germ killing. It is, however, an important prerequisite for other processes in which killing germs is an objective. Without cleaning, the process of disinfecting or sterilizing will not be effective (Kemp and Bankaitis, 2000b).

The term disinfecting refers to a process in which germs are killed. The term encompasses a wide range of germ killing. Levels of disinfection vary according to how many and which specific germs are killed. Household disinfectants kill a limited number of germs that are more commonly found in the household. In contrast, hospital-level disinfectants, by virtue of their need to kill a greater number and a wider variety of germs encountered in the medical setting, are much stronger and more effective than household disinfectants. Regardless of the strength of disinfection, items to be disinfected must be cleaned first in order for the disinfection process to be effective.

The term sterilizing may be defined as killing 100% of vegetative microorganisms, including associated endospores. In addition, sterilization also kills germ endospores. When microbes are challenged, they revert to the more resistant life form called a spore (Kemp and Bankaitis, 2000b). Sterilants, by definition, must neutralize and destroy spores because if the spore is not killed, it may become vegetative again and cause disease. Whereas disinfection may kill some germs, even many germs, sterilization (by definition) kills all germs and associated endospores each and every time.

Table 14–4. Contact Information for Manufacturers Distributing Infection Control Products

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Address</th>
<th>Phone</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oaktree Products Inc.</td>
<td>716-J Crown Industrial Court</td>
<td>(800) 347–1960</td>
<td><a href="http://www.oaktreeproducts.com">www.oaktreeproducts.com</a></td>
</tr>
<tr>
<td>Hal Hen Company, Inc.</td>
<td>180 Atlantic Avenue</td>
<td>(800) 242–5436</td>
<td></td>
</tr>
<tr>
<td>Westone Laboratories, Inc.</td>
<td>2264 Executive Circle</td>
<td>(800) 525–5017</td>
<td><a href="http://www.earmold.com">www.earmold.com</a></td>
</tr>
</tbody>
</table>

How and What to Clean, Disinfect, and Sterilize

Objects must be cleaned prior to the implementation of disinfection or sterilization. Whether readily visible or not, the surface of contaminated objects should be wiped off to remove any gross contamination. Objects or surfaces may be wiped off using a regular paper towel, a cleaning brush, or an environmental wipe specific for cleaning (for example, Audiologist’s Choice Audio-Wipes) (Fig. 14–1). Hearing aids and earmolds may be wiped off using spray solutions specifically designed to clean these surfaces (for example, Audiologist’s Choice Earmold and ITE Hearing Aid Spray) (Fig. 14–2). Disinfectant towelettes may also be used to clean objects or surfaces (SaniCloth) (Fig. 14–3). Because the purpose of cleaning is to wipe off or remove contamination from object surfaces, in the event a disinfectant towelette is used to preliminarily clean objects, a fresh disinfectant towelette must be subsequently used to proceed with disinfection if the disinfectant towelette is the method of choice for disinfection. Any reusable objects making direct or indirect contact with a patient, including but not limited to immittance probe tips, real-ear probe tubes, and cerumen management instruments, should be used exclusively in one ear and used on the
same patient only. Once these objects have been used, they should be considered contaminated. Contaminated objects must be cleaned and then either disinfected or sterilized prior to reuse. By design, disposable objects such as insert earphone tips and disposable otoscope specula are not reusable and should be disposed of after use.

As previously indicated, the term disinfecting encompasses varying degrees of germ killing. Hospital-grade disinfectants, however, should be incorporated in infection control protocols implemented in health care settings, including clinics or private practice facilities where hearing aids are dispensed (Rutala, 1990). It is appropriate for those objects or items that do not make contact with blood or other potentially infectious substances, such as headphones or specula, for surfaces in work areas, such as repair counters where earmold and hearing aids are cleaned, and for surfaces that patients touch, such as reception counters (Table 14–5). Custom hearing aids make contact with cerumen; however, the instrument cannot be submerged in cold chemical solutions. In this case, hearing aids should not be handled with bare hands unless first cleaned and then disinfected (Table 14–5).

Various forms of disinfectants are available and shown in Figure 14–3. Spray bottles of tuberculocidal hospital grade disinfectants (Cavicide) may be used to disinfect countertops and other potentially contaminated surface areas. Premoistened tuberculocidal hospital-grade disinfectant towelettes (Sani Cloth) may be used to disinfect hearing aids, hearing aid related instruments, and earmolds. Disinfectant towelettes may also be used on hearing aid stethoscopes in between listening checks. Noncritical objects and instruments such as specula, probe tips, and earmolds may be immersed in commercial disinfectants (Audiologist's Choice Ultrasonic Disinfectant/Cleaner).

There are two sterilization techniques: (1) the autoclave, and (2) cold sterilization. Because the autoclave involves pressurized
heat and most of the hearing aid instruments would melt, this process is not recommended. In contrast, cold sterilization involves soaking instruments in approved and appropriate liquid chemicals for a specified number of hours. Glutaraldehyde solutions in concentrations of 2% or higher or 7.5% or higher levels of hydrogen peroxide (H₂O₂), including Sporox (Fig. 14–4), are the only chemicals approved by the EPA for cold sterilization (Kemp and Bankaitis, 2000b).

Items that may contact blood, mucus, or cerumen that can be sterilized require sterilization. As indicated earlier, cerumen is not an infectious substance per se, but it may be potentially contaminated with varying degrees of dried blood or mucus. If there is visible blood in or on cerumen, then that cerumen specimen is a potentially infectious substance and the instruments contacting it must be precleaned and then sterilized (Kemp and Bankaitis, 2000b). Instruments like curettes used in cerumen removal, impedance probe tips, and otoscopic specula should be sterilized after use when visibly contaminated with cerumen, ear drainage, or blood. The process requires cleaning items first and then sterilizing the instruments in an autoclave or 2% glutaraldehyde (Table 14–6).

**Hand Washing**

Hand washing is the single most important procedure that effectively limits the spread of infectious disease, representing one of the most critical components of a basic infection control program. Antimicrobial liquid soaps should be used in audiology clinics (Vionex) (Fig. 14–5). Bar soap should be avoided as it serves as a breeding ground for germs. Hands should be washed before and after

**Table 14–5. Disinfection Guidelines**

<table>
<thead>
<tr>
<th>Surface disinfection</th>
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<tbody>
<tr>
<td>1. Select a hospital-grade, Environmental Protection Agency (EPA) registered disinfectant in spray or towelette form</td>
</tr>
<tr>
<td>2. Clean the contaminated surface by spraying the surface or wiping the surface with a disinfectant towelette</td>
</tr>
<tr>
<td>3. After removing the gross contamination, re-spray or wipe the surface again with a fresh towelette</td>
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<tr>
<td>4. Leave the surface wet for the time specified on the label, then wipe dry</td>
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</table>

**Hearing Aid Surface Disinfection**

1. Handle undisinfected hearing aids with gloved hand or accept the hearing aid from the patient in a disinfectant towelette
2. Pre-clean the hearing aid either with a paper towel or with a disinfectant towelette
3. After cleaning the hearing aid, use a fresh disinfectant towelette to wipe the entire surface of the hearing aid
eating or smoking, after use of the toilet, and after removing latex gloves.

Unfortunately, hand washing may be underutilized because it is deemed inconvenient due to limited access to a sink with running water. Alternative methods of hand washing are available with the use of antimicrobial “no-rinse” hand degermers. When water is not available, antibacterial hand disinfectants (CalStat, Purell Hand Sanitizer) (Fig. 14–6) or the previously mentioned disinfectant hand wipes (SaniDex) may be incorporated in infection control protocols. Both methods are outlined and either one may be incorporated in the hearing aid clinic’s infection control plan (Table 14–7).

Table 14–6. Guidelines for Sterilization of Critical Instruments

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<tbody>
<tr>
<td>1.</td>
<td>Clean the surface of critical instruments with a paper towel, disinfectant towelette, or the like</td>
</tr>
<tr>
<td>2.</td>
<td>When using cold chemical sterilization, wear gloves when planning on handling the solution</td>
</tr>
<tr>
<td>3.</td>
<td>Prepare the solution in a covered, plastic tray</td>
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<tr>
<td>4.</td>
<td>After cleaning instruments, submerge the instruments in the solution; leave instruments submerged according to manufacturer’s directions</td>
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<tr>
<td>5.</td>
<td>Remove instruments from the solution using special removal trays; gloves should be worn during this procedure</td>
</tr>
<tr>
<td>6.</td>
<td>Rinse instruments in a sink designated as a cleaning sink</td>
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<tr>
<td>7.</td>
<td>Allow instruments to air dry</td>
</tr>
<tr>
<td>8.</td>
<td>Change glutaraldehyde solution every 28 days and Sporox every 21 days; change the solution sooner if the solution becomes visibly soiled</td>
</tr>
</tbody>
</table>
Gloves

Latex or nonlatex gloves should be incorporated in an infection control program for those clinics providing hearing aid services. Gloves come in a variety of sizes and it is imperative that the clinician use the appropriate-sized glove. The fit of the glove should be tight, adhering very closely to the skin (Fig. 14–7). When the correct-sized glove is worn, the clinician is able to easily manipulate instruments and devices used throughout the hearing aid appointment. Gloves that are too large are ineffective, as the looseness of the material will interfere with hearing aid related procedures (Fig. 14–8).

Gloves should be worn prophylactically when the risk of encountering infectious substances is high. With regard to hearing aid services, gloves should be considered while handling earmold impressions and when directly handling custom hearing aids or earmolds (Tables 14–8 and 14–9). In addition, gloves should also be worn when immersing instruments and/or handling instruments removed from cold sterilant. In the event that a patient questions the use of gloves, educating the patients about universal precautions and the role gloves play in modern care would be appropriate. Considering that most other health care professionals wear gloves as a precautionary measure, incorporating their use in the hearing aid clinic would be considered a reflection of modern care.

Gloves are disposable. They should not be reused nor should the same pair be used during two separate patient appointments.

Table 14–7. Guidelines for Hand Washing

<table>
<thead>
<tr>
<th>With access to sink with running water</th>
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</thead>
<tbody>
<tr>
<td>1. Remove jewelry</td>
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<tr>
<td>2. Start water and apply appropriate amount of medical-grade antibacterial liquid soap</td>
</tr>
<tr>
<td>3. Lather the soap, scrub palms, back of hands, and wrists for at least ten seconds</td>
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<tr>
<td>4. Thoroughly rinse off with clean running water</td>
</tr>
<tr>
<td>5. While keeping the water running, dry hands with paper towel</td>
</tr>
<tr>
<td>6. Using the same paper towel, turn faucet off without making direct contact with your now-clean hand</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Without access to sink with running water</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Remove jewelry</td>
</tr>
<tr>
<td>2. Squeeze appropriate amount of “no-rinse” antibacterial hand degremer on one palm</td>
</tr>
<tr>
<td>3. Rub solution on both hands, rubbing palms together</td>
</tr>
<tr>
<td>4. Rub solution in between fingers on both hands</td>
</tr>
<tr>
<td>5. Do not dry hands with a towel as the “no-rinse” solution is self-drying</td>
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</tbody>
</table>
After glove use, they should be properly removed (Table 14–10) and disposed of. Unless grossly contaminated with blood or other bodily fluids, gloves may be disposed of in the regular trash. In the event gloves are grossly contaminated with blood, the gloves should be placed in a sealable plastic bag and then placed in the regular trash.

**Other Protective Apparel**

Safety glasses and disposable masks are necessary when there is risk of splash or splatter of potentially infectious material, or when the clinician or patient is at risk of airborne contamination. With regard to hearing aids, safety glasses and a mask should be worn when working with a grinding or buffing wheel, to reduce the chance of microorganisms and particles of plastic from being inhaled or landing in the eyes.

**Hearing Aid Specific Procedures**

**Earmold Impressions**

Earmold impressions are routinely obtained in the hearing aid clinic for purposes of ordering custom hearing aids or earmolds. Taking ear impressions involves the insertion of an otoblock deeply inside the external auditory canal, just beyond the second bend of the ear canal, and filling the ear canal completely with impression material. Once the...
impression material is set, the impression is carefully removed from the ear, inspected, and packaged in an impression material box. Because ear impression material makes direct contact with the lining of the external auditory canal, upon removal the outer surface of the impression will be contaminated with substances originally lining the outer surface of the external auditory canal. Appropriate precautions must be taken to minimize the risk of cross-infection (Table 14–8).

Other Hearing Aid Related Services
Due to contamination of surfaces with cerumen, hearing aids should be handled in a...
Table 14–10. Proper Removal of Gloves

Using a gloved hand, pinch the latex material of the opposite glove at the level of the wrist

Remove the glove moving from the wrist to the fingertip

While holding the removed glove with the remaining gloved hand, tuck the finger of the bare hand inside the remaining glove so that the finger is between the skin and the inside portion of the latex glove

Remove the glove in a similar fashion, moving from wrist to fingertip until the newly removed glove is completely removed. If removed in this fashion, the glove that was removed first will be completely wrapped in the glove that was removed last

Dispose the gloves in the waste

Wash hands according to the guidelines in Table 14–7

Table 14–11. Cleaning Custom Hearing Aids

Accept the hearing aid in a manner described in Table 14–9

Gloves should always be worn when cleaning aids on the repair bench due to the possibility of encountering dried blood, mucus, and/or cerumen on the surface of the hearing aid

Protective eye apparel should be worn, particularly if picks are used to clean out vents or sound ports

Picks and probes should be cleaned then sterilized after each use

Counter space should be disinfected after the hearing aid is cleaned

Gloves should be removed, disposed of properly, and hands should be washed

Table 14–12. Hearing Aid Listening Check

Patients removing hearing aids and/or earmolds will be instructed to either place items in

- a gloved hand
- a disinfectant towelette; once in the towelette, the hearing aid or earmold will be wiped all over, disinfecting it
- a fresh ear mold impression packaging box; walk-in patients leaving hearing aids with the front office will be instructed to place the hearing aids in an earmold impression packaging box; front-office personnel will close the box for appropriate handling

Gloves will always be worn when cleaning or handling hearing aids, and during real ear measurements

Always disinfect the stethoscope using a disinfectant towelette prior to attaching it to another aid or storing it

Always disinfect the ear tips of the stethoscope with a fresh disinfectant towelette prior to use and storage

Always disinfect the probe tube prior to use and storage

Disinfect picks, probes, and other hearing aid check instruments after use and in the absence of blood, drainage, or cerumen that contains either; sterilize such instruments in the event that blood, drainage, or cerumen that contains either is encountered

Surface disinfection of table and/or counter in main hearing aid room and counter in hearing aid room is to be performed after hearing aid check or dispense, prior to vacating the room for next patient
manner that would minimize the risk of potential infection. Standard protocols should be outlined for accepting hearing aids from patients, troubleshooting, conducting listening checks, and cleaning hearing aids. Recommended procedures are outlined in Tables 14–11 and 14–12.

Conclusion

Infection control is an important component of standard health care. It should be approached with the mindset that all bodily fluids, including cerumen, should be treated as potentially infectious and all patients as potential carriers of an infectious disease (Kemp and Bankaitis, 2000b). This mindset, along with a written infection control plan specific to hearing aid related services, will assist in minimizing the potential risks of cross-infection that exist in the hearing aid clinic.

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