

PROFESSIONAL ISSUES



Infection Risk Mitigation for Biofeedback Providers

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Biofeedback providers necessarily make contact with patients or clients using sterile and nonsterile instruments and sensors. Many biofeedback providers lack the aseptic technique training that is common to licensed medical providers. This review familiarizes biofeedback providers with the essential principles and procedures of infection risk mitigation by touching on routes of disease transmission, disinfection, sanitization, and Spaulding classification. Basic suggestions for infection risk mitigation standards of practice are offered.

Medical providers are generally well versed in aseptic techniques, sterile field, sterile item expiration dates, disinfection, and so forth, and it is well understood that these methods help mitigate the transmission of disease and infection. Perhaps because biofeedback modalities are considered noninvasive, there may be an industry naiveté surrounding the infection risks of biofeedback instrument use, whereby nonmedical biofeedback providers may be less sensitized to biofeedback infection risk management.

Three common routes of transmission that can facilitate infection or disease transfer are (a) direct contact (needle to skin, abraded skin, blood, sweat), (b) indirect contact to body fluid or via a host (flea, mosquito), and (c) airborne (droplet, dust). Becoming more aware of these mechanisms can help reduce risk. One basic risk reduction technique is

simple antibacterial hand washing and hand drying after any patient contact. A second infection control technique is to disinfect areas where patients will sit or recline. A third is the proper cleaning of all instruments that make contact with patients or users. Disinfection involves the use of regulated chemicals that do not remove all viable microorganisms, something that is only accomplished with sterilization; however, high-level disinfection does eliminate all viruses, pathogenic organisms, and some amount of spores. Sanitization is simply the reduction of any given microbial population on an object to what would be considered a reasonable safe level.

Providers of biofeedback (neurofeedback/brain computer interface, peripheral biofeedback), whether it be for peak performance, clinical applications, or even the increasingly available entertainment applications, all have one thing in common: applied sensor contact to human tissue. There is invariably also person-to-person contact. Whether you use permeable material stretch straps for monitoring respiration during a sweaty workout or at rest, cloth or neoprene electroencephalography (EEG) caps, headphone-style EEG headsets, earclips for reference, blood volume pulse detection, or any item that makes contact with Person A, you must properly sanitize, disinfect, or sterilize the material before it makes contact with Person B. Some equipment is easier than others to clean properly in between patients, but the difficulty of doing so is not an excuse for avoiding this requirement. Use of a manufacturer-approved sterilant and disinfectant (i.e., MetriCide) or enzymatic detergent (i.e., MetriZyme) is suggested by some equipment manufacturers and may be a requirement in some clinics or health care facilities.

EEG sensors often use mildly adhesive paste, and EEG caps or nets often require electrically conductive gel or a



saline-soaked sponge to make contact with the skin and the sensors. Other EEG sensory systems use dry bristle contact sensors, but the fact that these are dry does not remove the need for cleaning. There is a growing number of sensor types that do not use gel or saline solution, such as dry polymer foam and near-infrared spectroscopy, yet they too make contact with the skin and are subject to cleaning or replacement after use. Technicians placing EEG sensors on skin often abrade the skin with a wooden applicator, Q-tip, or other method, although this is not as critical with the newer EEG amplifiers on the market. The use of blunt needles for abrading the skin, even though sterile, is discouraged (Ferree, Luu, Russell, & Tucker, 2001) and if used should be discarded after use. Just because you cannot see blood does not mean there are not blood cells ample enough to transmit blood-borne pathogens. Even scrubbing the skin with an alcohol prep is a method of skin abrasion and can be a cause of infection or disease transmission. Once a sterile alcohol pad makes contact with the skin, it cannot touch any other item that could potentially be in contact with or in the transmission pathway to another person. Similarly, if you use an abrasive gel such as NuPrep by applying a drop to your nonsterile fingertip, then whatever your fingertip had touched prior to making contact with the opening of the NuPrep tube has now made its way to that opening for the next time it is used.

The Centers for Disease Control and Prevention and the Food and Drug Administration (CDC, 2008) follow the Spaulding classification for medical devices and levels of disinfection (Table), and under this system, skin prep for surface electrode placement is considered to be a semi-

critical risk. At this risk of infection level, the instrument or sensor should be subject to high-level (e.g., 2% glutaraldehyde) and at a minimum intermediate disinfection after each use. Even the retractable centimeter measuring tape for determining head circumference falls under the category of noncritical risk, and as such, there may be a need for low-level disinfecting after each use. EEG sensors applied over abraded skin should most definitely be disinfected after each use.

A common practice when using EEG caps is to apply conductive gel by syringe using a sterile blunt-tip needle. This needle is for single-use only and is to be placed in a properly marked biohazard sharps container after use. One common method of filling the plastic syringe with gel is to slowly (to avoid air bubbles) draw saline gel into a disposable syringe through the sterile blunt-tip needle. It is very important when using this method that the needle is never reinserted into the gel container after it makes contact with the skin of the recipient of care. Once the sterile needle touches the skin of the patient, or even the practitioner, then it is no longer considered sterile, and any reinsertion of this needle into the gel container thereby contaminates the whole container.

Standards of Practice

Decisions and development of standards toward the goal of optimal infection risk management involve several considerations, such as the feasibility of the disinfection method, the effect of the disinfectant on the instrument, the nature of the item to be cleaned (deep crevices), the effect of the disinfectant on the likely pathogen that may be transmitted

| Spaulding Classification | Comes in Contact with | Type Recommended | Biofeedback Instrument |
|---|--|---|--|
| Critical | Tissue; vascular space | Sterilization | <i>EMG pelvic floor perineometer; open wound sensor placement</i> |
| Semi-critical | Mucous membrane; nonintact skin from overabrasion causing blood exposure | High-level disinfection | <i>Reusable EEG cap with multiple sensor array; individually placed EEG sensor</i> |
| Noncritical | Intact skin; non-mucous membranes | Intermediate- or low-level disinfection | <i>Disposable pre-gelled ECG patches; finger-placed thermistor; noncontact EEG/ ECG sensor</i> |
| <i>Note.</i> Added biofeedback instrument correlations are in italics. EMG = electromyography; EEG = electroencephalography; ECG = electrocardiogram. | | | |

between patients, the safety to the user of the chemical, residual film, the corrosive nature to the material being cleaned, and the duration of time needed to kill the microorganisms.

Consider germicide-impregnated cloth wipes that may be used to wipe down surface areas or equipment. However, if the surface air dries too quickly, there may not have been ample time for the chemical to kill the organism. Steam sterilization would of course destroy all forms of microbial life, bacteria forms, spores, fungi, and viruses, but the biofeedback instrument could be damaged in the process. Now consider the commonly observed practice among biofeedback practitioners to use alcohol-impregnated 1 × 1 towelettes to clean the surface areas of sensors and other instruments that make contact with patients. The simplicity and convenience are evident, as is the ease of use and low cost. The airborne emissions of the chemical are low, and few users have an adverse skin reaction. The alcohol is also not corrosive to the sensor material. Unfortunately, the commonly used 20% isopropyl alcohol lacks sporicidal action and cannot penetrate protein-rich material, and as such, it has resulted in documented infection. Given that there appears to be an increased occurrence of difficult-to-kill *Clostridium difficile* and methicillin-resistant *Staphylococcus aureus* among many patients, the biofeedback practitioner is advised to use cleaner/disinfectant agents instead that are both sporicidal and bactericidal. Surface biocidal cleaners such as Freshnit or Virusolve may be considered rather than alcohol.

Clearly, not everything in the biofeedback provider's office can or even should be sterile. The intent here was simply to sensitize the reader to basic and reasonable disinfection standards and thereby cajole biofeedback providers a little closer toward infection risk mitigation practices.

References

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