Quality Resource Guide

Infection Control and OSHA Update - Part Two

Author Acknowledgements

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Educational Objectives

Following this unit of instruction, the practitioner should be able to:

1. Understand the rationale and application for standard- and transmission-based infection control precautions in the treatment of dental patients.
2. Utilize aseptic technique in the application of all infection control practices.
3. Understand that hand hygiene is the most important component of an effective infection control program.
4. Discuss general instrument sterilization and reprocessing procedures.
5. Discuss the importance and appropriate use of personal protective equipment in dental practice.

This Guide describes office procedures for infection control. Readers should review "Infection Control and OSHA Update – Part One" prior to starting this paper.

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Patient Screening and Evaluations

The basic premise of Standard Precautions relates to the fact that a medical history does not identify all infectious patients, and thus, should not be used to identify the "infectious disease risk" of the patient. The patient may not know their infectious status or be willing to disclose pertinent infection information in their medical history. Many infectious patients do not manifest classical symptoms. Therefore, Standard Precautions, as defined by the Centers for Disease Control and Prevention (CDC), must be used in providing dental care for all patients.

Aseptic Procedures

Asepsis is a fundamental principle that runs through all aspects of infection control practices. Aseptic technique refers to the use of procedures that break the cycle of infection and, ideally, eliminate cross-contamination. At the heart of this principle is the requirement for cleaning. A fundamental infection control principle for all health care professionals is to "clean it first." Appropriate cleaning reduces the number of contaminating microorganisms, and assists in keeping work areas clean. The health care worker (HCW) is constantly reminded to: 1) wash their hands routinely before and after patient care; 2) clean instruments before employing sterilization procedures; 3) clean surfaces before applying disinfectants; 4) clean dentures before spraying them with, or immersing them in, chemical agents; and 5) clean dental waterlines before initiating routine maintenance protocols.

Hand Hygiene

Hand hygiene (formerly termed hand washing) (**Table 1**) is the single most important infection control procedure clinicians perform to minimize the potential for development of nosocomial (health-care associated) infections. Its primary purpose is the mechanical removal of transient microorganisms from the skin, thus preventing cross-contamination and cross-infection. The most frequently used classes of currently available antimicrobial antiseptics for hand hygiene are chlorhexidine gluconate, para-chlorometaxylenol, iodophors, and triclosan. Each is capable of providing substantivity (residual antimicrobial effect) following each hand wash procedure.[1-2] Some health professionals with dry or sensitive skin may develop dermatitis over time when using antimicrobial handwash products. The use of a

Table 1 - Hand Hygiene Overview

Method	Definition/Agent(s)	Purpose	Area	Duration (minimum)
Routine Handwash	Water and non-antimicrobial detergent (*e.g.*, plain soap)*	Remove soil and transient micro-organisms	Fingertips to the wrist	15 seconds†
Routine Hand Antisepsis Antiseptic Handwash	Water and antimicrobial agent/detergent (*e.g.*, chlorhexidine, iodine and iodophors, chloroxylenol [PCMX], triclosan)	Remove or destroy transient micro-organisms and reduce resident flora	Fingertips to the wrist at a minimum	15 seconds†
Antiseptic Hand Rub	Alcohol-based hand rub§			Rub hands until the agent is dry
Surgical Hand Antisepsis	Water and antimicrobial agent/detergent (*e.g.*, chlorhexidine, iodine and iodophors, chloroxylenol [PCMX], triclosan)	Remove or destroy transient microorganisms and reduce resident flora (persistent effect)	Hands and forearms¶	2-6 minutes
	Water and non-antimicrobial detergent (*e.g.*, plain soap*) followed by an alcohol-based surgical hand-scrub product with persistent activity			Follow manufacturer instructions for alcohol-based surgical hand-scrub product with persistent activity**

Source: CDC Guidelines for infection control in dental health-care settings, 2003. MMWR 2003; 52 (No. RR-17):1-66.

Pathogenic organisms have been found on or around bar soap during and after use. Use of liquid soap with hands-free dispensing controls is preferable.

† For most procedures, a vigorous, brief (at least 15 seconds) rubbing together of all surfaces of premoistened lathered hands and fingers followed by rinsing under a stream of cool or tepid water is recommended. Hands should always be dried thoroughly before donning gloves.

§ Preparations containing 60-95% alcohol. Alcohol-based hand rubs should not be used in the presence of visible soil or organic material. If using an alcohol-based hand rub, apply adequate amount to palm of one hand and rub hands together, covering all surfaces of the hands and fingers, until hands are dry. Follow manufacturer's recommendations regarding the volume of product to use. If hands feel dry after rubbing hands together for 10-15 seconds, an insufficient volume of product likely was applied.

¶ Removal of all jewelry, vigorous rubbing together of all surfaces of premoistened lathered hands and forearms.

** Before applying the alcohol solution, pre-wash hands and forearms with water and a non-antimicrobial soap and dry arms and forearms completely. After application of the alcohol-based product as recommended, allow hands and forearms to dry thoroughly and immediately don sterile gloves.

non-antimicrobial liquid soap for non-surgical procedures can be of use in these instances, as the primary goal of cleaning hands can still be accomplished.[3]

The CDC expanded its recommendations in 2002 to include alcohol-based hand rubs (preparations containing 60-90% alcohol) as an option for routine hand hygiene, and not just when soap and water aren't available. Accumulated evidence has demonstrated that alcohol-based hand rubs significantly reduce the number of microorganisms on skin, are fast acting, cause less skin irritation due to the inclusion of emollients (*i.e.* glycerin, aloe vera, vitamin E) in the preparations, and may increase compliance with this basic infection control procedure. It is important to emphasize here that both antimicrobial antiseptics and alcohol-based hand rubs provide appropriate alternatives for the HCW. However, positive and negative features of each should be considered before use (**Table 2**).[4]

While routine hand washing is a fundamental application of aseptic technique, it can also lead to immunologic or non-specific irritant-induced dermatitis or exudative problems. It is the most common form of harmful skin reaction. The keys to preventing hand dermatitis are to understand how it develops and what factors contribute to its progression.

Healthy, intact skin is the primary barrier against infection. The physical act of washing hands can remove surface lipids, fatty acids, and other skin components that lubricate epithelium. Frequent use of hand hygiene agents, especially soaps and detergents, has been associated with irritant dermatitis among HCW, although other factors can contribute to its onset and progression (**Figure 1**).

Healthcare professionals perform many hand hygiene procedures each day either by washing with soaps or antimicrobial antiseptic preparations, or using waterless, alcohol–based hand rubs and sprays. If proper care is not taken, hands can become dry over time, even when using mild liquid soap.

A number of factors can play a role as hands become worse. For example, damage to the epithelium can cause changes in the presence of the normal skin microflora. This can result in colonization by "transient" organisms, which typically have a greater potential for causing harmful infections. Methicillin–resistant *Staphylococcus aureus* (MRSA) and Pseudomonas aeruginosa represent two medically important examples of this type of acquired pathogen.

Frequent use of many types of soaps and antiseptics is also associated with irritation dermatitis among those HCP who have a history of skin problems. Keratinized epithelium can become red and sore from acute inflammation. This leads to more drying, even cracking and bleeding. Symptoms usually develop gradually

Table 2 - Pros and Cons of Handwashing* vs. Alcohol-Based (Antiseptic) Hand Rubs†

Technique	Pros (+)	Cons (-)
Handwashing	+ Can use plain or antimicrobial soaps + Effective antimicrobial activity with antimicrobial soaps + Effectiveness only minimally affected by organic matter + Sinks readily available and accessible in most dental settings + Familiar technique + Allergic reactions to antimicrobial active ingredients are rare + Irritation dermatitis related to handwashing may be solved by relatively simple techniques / changes	- Frequent handwashing may cause skin dryness, chapping and irritation - Compliance with recommended handwashing protocol is traditionally low - Takes more time than antiseptic hand rubs - Requires sink and water and paper towels or air dryers - Personal habits and preferred products such as hand lotions may undermine professional training - Strong fragrances and other ingredients may be poorly tolerated by sensitive people - Water alone may be a skin irritant - Time and technique are critical
Alcohol-Based (Antiseptic) Hand Rub	+ Provides more effective antiseptic action on visibly clean hands than handwashing with plain or antimicrobial soaps + Faster protocol than handwashing + Reduced skin irritation and dryness compared to handwashing + May be used in absence of sinks and water, and during boil-water notices + Allergic reactions to alcohol or additives are rare + Reduces use of paper towels, waste	- Not indicated for use when hands are visibly dirty or contaminated - Dispensing proper amount is critical - Hands must be dry before agent is applied - Frequent use may cause skin dryness or irritation if product lacks effective emollients / skin conditioners - Agent may temporarily sting compromised skin - Strong fragrances and other ingredients may be poorly tolerated by sensitive people - Alcohol products are flammable – should be stored away from flames - Residual powder may interfere with effectiveness or comfort of antiseptic rub - Handwashing stations must still be accessible for times where waterless sanitizers are inappropriate

* Handwashing performed according to recommended protocol, as outlined in this chapter

† Antiseptic Hand Rubs meet recommended product selection criteria as defined in this chapter

(Adapted with permission from Organization for Safety and Asepsis Procedures. From policy to practice: OSAP's guide to the guidelines. 2004: 23.)[4]

over a period of days to weeks and are localized to the areas of exposure. Most of these adverse manifestations stop at the boundary of the glove cuff with skin.

In addition to frequent washing and use of harsh chemicals, dermal reaction can result from: 1) not completely rinsing antiseptics off skin after washing; 2) irritation from cornstarch powder in gloves; 3) excessive perspiration while wearing gloves; 4) improper washing techniques; 5) using hot water for handwashing; and 6) failure to dry hands completely. (**Figure 1**)

Figure 1

The degree of skin irritation varies considerably, and can be reduced substantially by choosing hand hygiene products with emollients and using appropriate hand lotions that reduce dryness. Antimicrobials in products, such as chlorhexidine gluconate, parachorometaxylenol (PCMX), or iodophors, can also promote treat nonspecific irritation dermatitis. Even alcohols, which are among the safest antiseptics, can cause drying and skin irritation. Preventing hand dermatitis requires compliance with recommended hand hygiene procedures and routine care of hands. Washing with a handwash agent or waterless product that is the least irritating can help prevent initial drying of skin. Soap should be rinsed off completely after washing and hands should be dried thoroughly.

A HCW with exudative lesions or weeping dermatitis should refrain from direct patient contact until the condition is resolved. Individuals should also take steps to allow re-establishment of epithelial integrity in areas of damaged skin by ceasing to use antiseptics that remove skin oils, and replacing them with a non-antiseptic, mechanical cleansing agent, such as liquid soap and water. Lotions are also often recommended to ease the dryness resulting from frequent hand washing and more recently to prevent dermatitis resulting from glove use. Unfortunately, petroleum-based lotion formulations used by many people outside of health care settings can weaken latex and other glove types, which can cause increased permeability. For that reason, lotions that contain petroleum or other oil emollients should not be used. Instead, multiple water-based lotions are available to resolve hand dermatitis problems and prevent dermatitis recurrences.

Instrument Reprocessing

A basic principle for effective infection control is: ***Do not disinfect when you can sterilize.*** Sterilization of contaminated instruments is a fundamental quality control component of any asepsis program. An initial distinction must made here between the required antimicrobial outcomes of sterilization and disinfection. Sterilization is defined as the destruction of all forms of life, with particular reference to microbial forms. The limiting requirement and basic criterion for accomplishment of sterilization is the destruction of high numbers of bacterial and mycotic spores, the most heat resistant microbial forms. In contrast, disinfection refers to the inhibition or destruction of pathogens. Spores are not killed during disinfection procedures.

The use of heat has long been recognized as the most efficient, reliable method of sterilization. The historical practice of using liquid chemical disinfectants in dentistry ("cold sterilization"), including agents such as glutaraldehyde or chlorine dioxide, is no longer necessary or appropriate, since most reusable instruments devices used in dentistry can withstand heat sterilization. If certain devices cannot be sterilized, single-use disposable replacements should be considered.

Several methods of heat sterilization are available and effective in dental health-care settings. These include steam under pressure (autoclave), dry heat, or unsaturated chemical vapor (**Table 3**). Steam sterilization remains the most efficient, widely used modality for wrapped and unwrapped items that are not sensitive to heat and moisture. The evolution of steam sterilization has continued with development of a number of technological advances. The most recent major innovations are classified as pre- and post-vacuum sterilizers, also called "Class B" sterilizers. In this type of unit, a pump housed within the sterilizer creates a vacuum at the beginning of the cycle to prevent the mixing of air and steam. This ensures more rapid and efficient penetration of steam to instrument surfaces. The post-vacuum component at the end of the sterilization interval facilitates more thorough and effective drying, thereby reducing metal corrosion.

The CDC has continued to update earlier dental infection control recommendations first published in 1986,[5-13] calling for proper functioning of sterilization cycles to be verified by the periodic use (at least weekly) of biologic indicators (spore tests). Biologic indicators containing heat-resistant spores provide the best challenge for sterilization cycles. Two species are used, *Geobacillus stearothermophilus* and *Bacillus atrophaeus* (formerly *Bacillus stearothermophilus* and *Bacillus subtilis*). A fundamental feature to note is that a spore vehicle designed for one sterilization method is not necessarily the proper

Table 3 - Advantages and Disadvantages of Major Methods of Heat Sterilization

Method	Advantages	Disadvantages
Steam Autoclave	Rapid turnaround time, low cost per cycle, good penetration, no toxic/hazardous chemicals; cycle easy to control and monitor	Cannot be used with most plastics, wet packages with overloading
Dry Heat Oven	Does not corrode instruments, no toxic/hazardous chemicals, low cost per cycle.	Long cycle time, cannot be used with plastics, paper products may char, poor penetration compared to steam, not appropriate for handpieces.
Rapid Heat Transfer	Short cycle, items are dry after cycle.	Cannot sterilize liquids, may damage plastic and rubber items, door cannot be opened before end of cycle, small capacity per cost, unwrapped items quickly contaminated after cycle, not appropriate for handpieces
Unsaturated Chemical Vapor	Good turn around time, less corrosive to instruments.	Uses toxic/hazardous chemicals, requires fume ventilation, cannot be used with many plastics, instruments must be dry before sterilization

Time and temperature parameters may vary by manufacturer. Follow manufacturer's instructions for the particular unit. To avoid contamination, packages should be allowed to dry in the sterilizer before they are handled.

modality to use for other units. Calibrated *G. stearothermophilus* spore-impregnated paper strips or glass vials are the appropriate biological monitors for autoclaves and unsaturated chemical vapor sterilizers, while *B. atrophaeus* preparations provide effective challenge for conditions in dry heat sterilizers and ethylene oxide units. Manufacturer's directions should determine the placement and location of biological indicator in the sterilizer, as well as appropriate incubation times and temperatures. Proof of destruction of these resistant microbial forms is used to infer that all microorganisms exposed to the same conditions have been destroyed, thereby representing the most sensitive check of sterilizer efficiency. Instrument packs that are sterilized should be labeled to permit identification in the event of a sterilizer failure.

Table 4 - Common Reasons for Sterilization Cycle Failure Using a Heat Sterilizer

1. Inadequate precleaning of instruments
2. Improper equipment maintenance
3. Cycle time too short or temperature too low
4. Overloading or improper loading of sterilizer chamber
5. Incompatible packaging material
6. Interruption of sterilization cycle to add or remove an item

Unfortunately, there are numerous equipment malfunctions and human factors that can adversely affect a sterilizer's performance (**Table 4**).

Earlier studies tested over 400 sterilizers in dental practices investigating possible reasons for sterilization cycle failures,[14] and the findings indicated that 85-87% of the failures were due to human error and not equipment malfunction. It is therefore imperative that sterilizer effectiveness be routinely monitored and verified using mechanical, chemical, and biological indicators. Mechanical monitoring of each sterilization cycle involves observing gauges, displays, or computer printouts for correct temperature, pressure, and exposure time. Heat- sensitive chemical indicator and integrators such as those that change color after exposure to heat are useful in detecting major unit malfunctions or human errors during sterilization procedures, yet they do not ensure adequacy of the sterilization cycle. In recent years, more effective chemical monitors (*i.e.*, Class 5 integrators) have become available which are able to react with the three sterilization parameters (*i.e.* temperature, pressure, and time). It is important to remember that testing with these chemical sterilization monitors is not a substitute for spore testing, which remains the "gold standard" for heat sterilization. However, a positive result with this type of monitor can serve as an immediate indication that the sterilization cycle was successful. These chemical process monitors can be used with each load of processed instruments to detect problems in between BI test intervals.

A practice's instrument recirculation system should be logical and organized in such a manner as to:

1. most efficiently accomplish reprocessing and sterilization;
2. minimize procedures which can place the HCW at risk for percutaneous, sharps exposures or other hazards, such as hand scrubbing of dirty instruments;
3. conduct instrument reprocessing in an area outside of the treatment operatory; and
4. assure separation of the area for contaminated items from the clean/ sterile area.

In addition, no food or drink is to be present in the operatory, sterilization, or dental material storage areas, such as refrigerators. The 2003 CDC dental infection control guidelines further recommend avoiding the use of carpeting and cloth-upholstered furnishings in dental operatories, laboratories, and instrument processing areas.[7] Many choices for implementation are available for practitioners, each of which can be effective when used appropriately.

Personal Protective Equipment

The routine use of personal and environmental barriers is important to prevent tissue contact with potentially infectious pathogens and materials, ultimately reducing cross-contamination and cross-infection between the HCW and their patient. Prior to the COVID-19 pandemic, infection control regulations and recommendations stated that HCWs must wear protective attire such as disposable gloves, eyewear and protective clothing when performing treatment procedures capable of causing splash, spatter, contact with body fluids or mucous membranes, or touching items or surfaces that may be contaminated with body fluids (**Table 5**). However, COVID-19 forced healthcare workers and provision of health care to face a new normal. Delivery of dental care, in particular, has been significantly impacted as a result of the emergence and spread of SARS-CoV-2 virus, A number of infection control guidelines and updates have been issued by OSHA, CDA and ADA as new knowledge and information about the virus, its transmission, and prevention in healthcare facilities continue to be updated.[15-18]

Gloves

Properly fitting gloves protect the HCW from direct exposure through visually undetected cuts and abrasions on the hands. Gloves used during the provision of patient care are single-use items and must not be used when providing care for another patient or be washed for reuse. The American Dental Association (ADA) initially approached the issue of practitioners wearing disposable gloves in an important 1976 publication[9] aimed at protecting dental clinicians from occupational HBV infection. This recommendation was re-enforced and expanded in later ADA and CDC publications,[5-13] and in today's health care environment the routine use of disposable gloves constitutes the single most important aspect of personal protective protection.

Traditionally, the most common type of glove worn during patient treatment has been comprised of latex. This material can be manufactured in a number of sizes and specifications (ambidextrous, right or left hand, low powder, powder-free, low protein), affords a comfortable fit and tactility for most users, and provides an effective barrier during the time interval needed to provide most dental procedures. As a consequence of the development and manifestations of latex allergies in HCW and the population at large, a large percentage of HCW are now wearing nitrile gloves. Other types of disposable gloves include medical vinyl, chloroprene, and neoprene. The use of sterile latex or similar treatment glove materials is indicated when surgical procedures are performed. These are found as right- and left-handed fitted items, and offer clinicians excellent tactility, comfort and dexterity.

Puncture and chemical resistant reusable utility gloves are a type of non-treatment glove routinely worn when the DHW handles and cleans contaminated instruments, cleans the operatory area, or completes surface cleaning and disinfection procedures. These gloves are puncture- resistant, resistant to chemical toxicity, and are able to withstand multiple cleaning and disinfection exposures. They are usually comprised of nitrile or neoprene. Some types can withstand repeated heat sterilization in an autoclave. A summary of considerations for glove selection is provided in **Table 6**.

Respiratory Protection

Dental HCW are routinely exposed to high concentrations of aerosols, sprays, spatter and/or splashes during various treatment procedures. These involve the use of a dental handpiece, ultrasonic scaler, air/water spray, while grinding items contaminated with oral secretions, or even while cleaning contaminated instruments. In addition to SARS-CoV-2 viruses, airborne microorganisms that can be infectious via this route of exposure include staphylococci, streptococci, tubercle bacilli, rubeola (measles) viruses, herpesviruses, and influenza viruses.[19]

With documented transmission by SARS-CoV-2 viruses via droplets and aerosols, dental professionals have had to adapt to additional respiratory equipment and practices which are

Table 5 - Personal Protective Equipment before COVID-19

Face Mask	Protective Clothing	Protective Eyewear
1. It must fit the face well to minimize open spaces on the side of the face. 2. It should be able to prevent penetration of aerosolized particles generated during the procedure for which the mask is worn. 3. It should not rest against the mouth, as the wearer's breath can condense and wet the fabric.	1. The outer occupational garment should be fluid resistant, not fluid proof. 2. Appropriate garment material should not permit blood or other potentially infectious fluids to pass through or reach the health-care worker's clothes or epithelial/mucosal tissues. 3. For routine dental procedures, cotton or cotton/polyester laboratory coats or clinic jackets with cuffs are satisfactory. 4. Protective garments must be changed at least when visibly soiled. 5. Protective garments must be removed before leaving the workplace.	1. It should have solid sideshields to afford peripheral protection. 2. It must meet the American National Standards Institute Occupational and Educational Eye and Face Protection Standard for impact resistance. 3. It should be able to withstand cleaning and disinfection between patient procedures. 4. It should not distort the operator's vision. 5. A faceshield worn with a mask can be worn when greater protection is desired.

able to protect against this pathogen.[18] These include development of a respiratory protection plan, use of N95 respirators for aerosol-generating procedures, additional personal protective equipment (PPE) and suggested approaches for improving air quality in treatment areas. Earlier guidelines consistently recommended the use of high-volume evacuation (HVE) and a rubber dam during many dental procedures. Application of these devices can substantially decrease the potential for any contamination arising from saliva or blood.[19]

N95 Respirators

An N95 respirator is a respiratory protective device designed to achieve a very close facial fit and very efficient filtration of airborne particles. The edges of this respirator are designed to form a seal around the nose and mouth. Wearers must be initially fit-tested with an N95 respirator before use in patient care settings where aerosol-generating procedures are being performed. N95 respirators include standard and surgical N95 respirators. All N95 respirators used in healthcare and other occupational settings must be approved by the National Institute of Occupational Safety and Health (NIOSH). In contrast to surgical masks, these devices and other NIOSH-approved respirators can filter airborne contaminants with a minimum size of .3 microns. In contrast, surgical facemasks protect against sprays, splashes and large droplets. A comparison of major features of N95 respirators and face masks is presented in **Table 7**.

Face Masks

An FDA-approved mask will protect against microbe-laden sprays, splashes, and droplets. Surgical facemasks do not provide the wearer with sufficient protection against pathogens transmitted by aerosols. During routine use a facemask should be carefully adjusted to mold to the face, and changed between patients and more frequently when exposed to heavy spatter and/or droplets during treatment, or if it becomes moist or wet. This is an important consideration as wet fabric may serve as a vehicle for microbial passage through the mask.

Table 6 - Considerations for Selection of Gloves

Considerations	Examples
Material	• latex, vinyl, nitrile, chloroprene
Skin Sensitivity	• allergies to latex or nitrile • hand perspiration
Size	• proper size, lightweight and pliable • snug fit without hand constriction • appropriate finger length • fits palm without compression
Tactile Sensation	• grip • glove thickness • slipperiness of glove material when wet
Function	• non-sterile gloves • sterile gloves surgical procedures • utility gloves for instrument reprocessing and clean-up procedures

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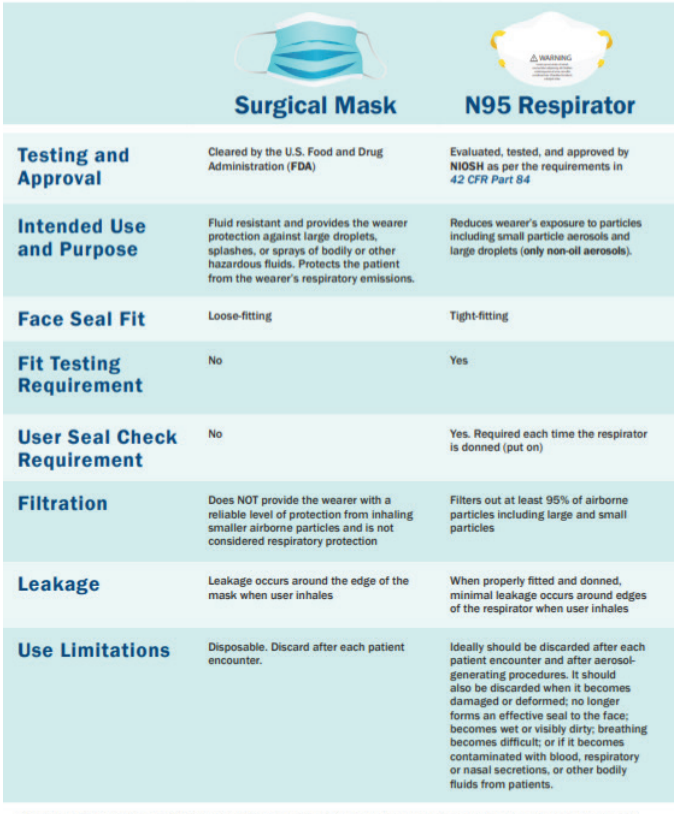
Table 7 - Understanding the Differences Between Surgical Masks and N95 Respirators



	Surgical Mask	N95 Respirator
Testing and Approval	Cleared by the U.S. Food and Drug Administration (**FDA**)	Evaluated, tested, and approved by **NIOSH** as per the requirements in *42 CFR Part 84*
Intended Use and Purpose	Fluid resistant and provides the wearer protection against large droplets, splashes, or sprays of bodily or other hazardous fluids. Protects the patient from the wearer's respiratory emissions.	Reduces wearer's exposure to particles including small particle aerosols and large droplets (**only non-oil aerosols**).
Face Seal Fit	Loose-fitting	Tight-fitting
Fit Testing Requirement	No	Yes
User Seal Check Requirement	No	Yes. Required each time the respirator is donned (put on)
Filtration	Does NOT provide the wearer with a reliable level of protection from inhaling smaller airborne particles and is not considered respiratory protection	Filters out at least 95% of airborne particles including large and small particles
Leakage	Leakage occurs around the edge of the mask when user inhales	When properly fitted and donned, minimal leakage occurs around edges of the respirator when user inhales
Use Limitations	Disposable. Discard after each patient encounter.	Ideally should be discarded after each patient encounter and after aerosol-generating procedures. It should also be discarded when it becomes damaged or deformed; no longer forms an effective seal to the face; becomes wet or visibly dirty; breathing becomes difficult; or if it becomes contaminated with blood, respiratory or nasal secretions, or other bodily fluids from patients.

This information provides clarification regarding respirator and mask use in workplaces in which employees are exposed to respiratory hazards, it is not specific for the COVID-19 pandemic.

Protective Eyewear

The eyes and other surrounding tissues of the HCW can be exposed to:

1. a variety of macroscopic and microscopic particles (tooth fragments, amalgam, surgical tissue debris) which can cause mechanical trauma;
2. chemical injury from splashing;
3. or infection (conjunctivitis caused by *staphylococci, gonococci*, or herpes simplex viruses).

Protective eyewear such as goggles, glasses with side-shields, or chin-length face shields should be used during procedures in which aerosol generation or splash/spatter is anticipated. One should choose an appropriate device based on the level of protection indicated. A mask should be used in conjunction with an eye protection device, even if the device is a face shield, to reduce contamination through the nasal and oral portals of bacterial entry. The use of eyewear that is too small to protect the eyes from airborne debris is potentially dangerous, and can increase the risk of ocular injury from macroscopic or microscopic particles (**Figure 2**).

Dental health care personnel should wear protective eyewear with solid side shields or a face shield during procedures likely to generate splashes or sprays of blood or body fluids or the spatter of debris. Reusable protective eyewear should be cleaned with soap and water, and disinfected between patients.[7]

Protective Clothing

The 1991 OSHA Bloodborne Pathogens Standard mandated employers to address employee protective clothing:

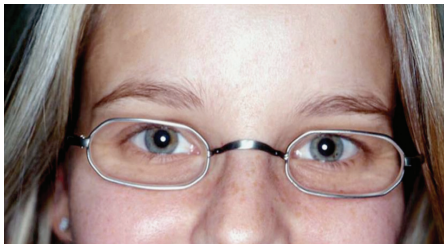
"Gowns, Aprons, and Other Protective Body Clothing: Appropriate protective clothing such as, but not limited to, gowns, aprons, lab coats, clinic jackets, or similar garments shall be worn in occupational exposure situations. The type and characteristics will depend upon the task and degree of exposure anticipated."[20]

For routine dental procedures, cotton or cotton/polyester high neck, long-sleeved laboratory coats or clinic jackets with elastic or stocking net cuffs are satisfactory. The end of the sleeves should be fashioned in such a way so that gloves can be cuffed up over them to protect the forearm. Prior to COVID-19 infection control recommendations included guidelines for protective clothing being changed at least daily, or when visibly soiled.

Hierarchy of Infection Prevention Controls

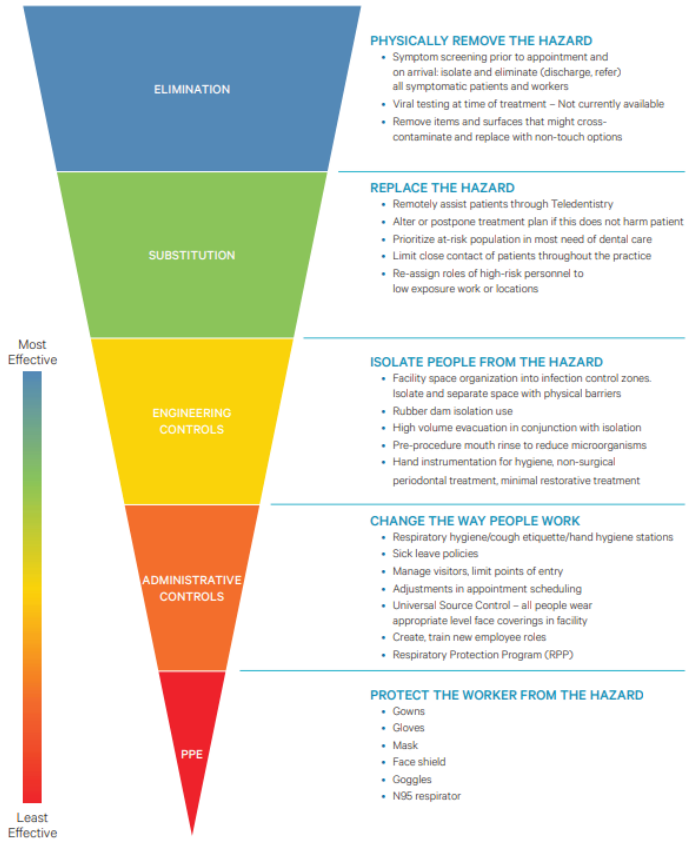
The CDC and OSHA, in conjunction with NIOSH, developed a "hierarchy of controls" in 2015 to protect workers and employees from occupational injury and illness.[21] This was modified in 2020 to emphasize effective workplace strategies for prevention of CIVID-19 and other diseases.[22] **Figure 3** presents a graphic of the NIOSH Hierarchy of Controls adapted for dentistry with representative (not a complete) list of procedural examples.[23]

Figure 2



The use of eyewear which is not sized or designed for use during provision of dental treatment does not provide sufficient protection from airborne macroscopic or microscopic trauma to the eyes.

Figure 3 - Hierarchy of Controls with Dental Examples



Summary

This article continued the consideration of representative components of an infection control program. In addition to providing a brief update to augment the reader's knowledge base, review of Parts 1 and 2 also will hopefully allow better comprehension of basic infection control principles. While most have been covered in the previous sections, a few other important additions are included (**Table 8**).[24] At a minimum a dental facility should periodically review its infection control policies and procedures. In addition to the requirement for a written infection control program, it is important for the plan to address the following considerations:

1. embody the principles of infection control and occupational health;
2. reflect current science; and
3. adhere to relevant federal, state, and local regulations and statutes.

The human factor also should not be overlooked when considering the success of any clinical infection control program. Changes in the way dental professionals practice using effective technologies and products, have primarily come about because care providers were convinced that documented infectious disease risks were real and appropriate preventive solutions were available. The dental profession has and will continue to respond to protect both those who provide and receive patient care.[25]

Table 8 - Basic Infection Control Principles

1. Exposure is not synonymous with infection.
2. Clean it first.
3. Hand hygiene is the basic asepsis practice.
4. Prevention of sharps accidents is fundamental to reducing occupational exposure risks.
5. Use of PPE during patient care protects skin and mucous membranes from exposure to infectious materials via direct contact or from spray/spatter/aerosols.
6. Most hand dermatitis is NOT a latex allergy.
7. Do not disinfect when you can sterilize.
8. Effective infection control allows acceptable choices.

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POST-TEST

Internet Users: This page is intended to assist you in fast and accurate testing when completing the "Online Exam." We suggest reviewing the questions and then circling your answers on this page prior to completing the online exam.

(2.0 CE Credit Contact Hour) Please circle the correct answer. 70% equals passing grade.

1. **The infection control principle which is the basic concept of preventive practices and protocols is:**
   a. use of disposable gloves during provision of dental treatment.
   b. sterilization of contaminated items.
   c. aseptic procedures.
   d. cleaning of contaminated instruments prior to sterilization

2. **Which of the following chemical monitors can be used to check the effectiveness of autoclave sterilization cycle?**
   a. Autoclave tape
   b. External and internal pouch indicators
   c. Type V integrators
   d. All of the above

3. **Considerations for the use of Personal Protective Barriers by treatment providers include:**
   a. the use of ambidextrous non-sterile gloves when surgical procedures are performed.
   b. use of puncture-resistant utility gloves when handling and cleaning contaminated instruments.
   c. use of masks only when treating a known infectious patient with tuberculosis.
   d. use of protective eyewear that is large enough and has side shields to protect the eyes from airborne debris.
   e. Both b and d only

4. **It is recommended that N95 respirators and face masks be changed:**
   a. only when they become wet.
   b. between patients.
   c. daily
   d. twice per day.

5. **Hand hygiene refers to:**
   a. Handwashing using plain liquid soap and water.
   b. Use of an antiseptic hand rub (*i.e.*, alcohol-based).
   c. Handwashing using an antimicrobial antiseptic and water.
   d. All of the above

6. **With regard to instrument re-processing and sterilization procedures:**
   a. proof of sterilization is achieved when the indicators on heat-processed pouches change color.
   b. CDC guidelines for re-processing procedures primarily recommend cleaning of instruments by hand scrubbing.
   c. Destruction of heat-resistant bacterial spores is considered the main validation of a sterilization process.
   d. Manual hand scrubbing of contaminated instruments is just as efficient as ultrasonic cleaning.

7. **The most appropriate microorganism to use for monitoring autoclaves and unsaturated chemical vapor sterilizers is:**
   a. *Bacillus subtilis.*
   b. *Geobacillus stearothermophilus.*
   c. *Mycobacterium tuberculosis.*
   d. Hepatitis B virus.

8. **The property of substantivity is defined as:**
   a. the ability of a chemical sterilant to penetrate and clean surface bioburden.
   b. the ability to develop a residual antimicrobial effect with repeated usage.
   c. the antimicrobial spectrum of an antiseptic.
   d. the ability of a chemical to inactivate microbial spores

9. **According to OSHA, a fitted Level 3 surgical mask can be used during aerosol-generating procedures.**
   a. True
   b. False

10. **Initial fit-testing is required before clinical use of:**
    a. N95 respirators
    b. surgical face masks
    c. reusable face shields
    d. None of the above

Registration/Certification Information (Necessary for proper certification)

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PLEASE PRINT CLEARLY

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Evaluation - Infection Control and OSHA Update Part Two 5th Edition

Providing dentists with the opportunity for continuing dental education is an essential part of MetLife's commitment to helping dentists improve the oral health of their patients through education. You can help in this effort by providing feedback regarding the continuing education offering you have just completed.

Please respond to the statements below by checking the appropriate box, using the scale on the right.

	1 = POOR				5 = Excellent	
	1	2	3	4	5	
1. How well did this course meet its stated educational objectives?	☐	☐	☐	☐	☐	
2. How would you rate the quality of the content?	☐	☐	☐	☐	☐	
3. Please rate the effectiveness of the author.	☐	☐	☐	☐	☐	
4. Please rate the written materials and visual aids used.	☐	☐	☐	☐	☐	
5. The use of evidence-based dentistry on the topic when applicable.	☐	☐	☐	☐	☐	☐ N/A
6. How relevant was the course material to your practice?	☐	☐	☐	☐	☐	
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11. Please identify future topics that you would like to see:

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