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Infection Control in the Dental Practice through Proper Sterilization

In today's world, the need for infection control has never been greater. Dentists, their staff and patients are more concerned about the transmission of infection than ever before. Controlling bacterial contamination through sterilization has long been considered the most essential component in the infection control process and vital to patient safety. The result of proper instrument sterilization is the protection of the patient, physician and staff from various infectious diseases.

The sterilization process, however, can be time-consuming, the equipment can be expensive and mistakes can result in the unwanted spread of infection. Proper design of the instrument sterilization process and the processing area can help make sterilization more efficient, minimize environmental contamination, reduce errors, maintain the sterility of instruments and ensure staff and patient safety.

This article outlines some basic guidelines to follow for setting up an instrument processing area in a dental practice and an instrument sterilization workflow process. These processes are modeled after the Center for Disease Control and Prevention (CDC) guidelines, and are designed to be used in accordance with general state board guidelines. If discrepancies exist, local state board requirements should take precedence.

THE INSTRUMENT PROCESSING AREA

The dental instrument processing area in a practice should be centrally located within the office, separated from the operatories, but still easily accessed by staff. To reduce potential introduction of contamination into sterile environments, the area should have a traffic pattern that restricts it to authorized personnel only.

The work environments for processing equipment should be separated into four key areas: decontamination, packaging, sterilization and storage. The areas should be designed to separate the sections where contaminated items are received, processed and packaged from the areas where clean items are sterilized and stored. This separation can be achieved through partitions or spatially if the area is well designed and marked.

When laying out an instrument processing workspace, it is important to allow for a sink for hand washing, storage cabinets or drawers, adequate lighting and electrical service, floors that are easily cleanable and countertops that are water- and heat-resistant. It is also important to allow for proper ventilation when designing the space not only to maintain a comfortable room temperature, but also to remove any odors or vapors from chemicals or waste. Portable fans should not be used as they can recirculate dust and microbes from the floor and work surfaces, increasing the chance of recontamination.

The workspace layout should facilitate a natural workflow that encompasses all of the important steps in the sterilization process. Establishing a smooth workflow from dirty to clean in an instrument processing area can help contain contamination and also enhance the efficiency of the entire sterilization process.

The following steps will identify the proper procedure for cleaning and sterilizing instruments and handpieces:

Instrument Sterilization Workflow Chart

Midmark Steri-Center

Midmark M11 UltraClave® Automatic Sterilizer

Midmark M9 UltraClave® Automatic Sterilizer

Examination or procedure.

Transport instruments and handpieces to Steri-Center.

Sort instruments and handpieces. Dispose of waste properly*.

Handpieces

Wipe external surfaces and remove burs.

Follow handpiece manufacturer's recommended maintenance protocol

Instruments

Soak and ultrasonically clean instruments.

Rinse with clean** water and dry instruments.

Flow of Instruments

Pouch or wrap instruments.

Sterilize*** and dry instruments.

Store in a dry, protected area.

This workflow chart is designed to be used in accordance with general state board guidelines. If discrepancies are found, you must, in all cases, follow your local state dental board requirements.

* Biohazardous waste must be disposed according to your state's EPA requirements.

** Certain situations may require rinsing with distilled water.

*** Chemical and biological sterilization monitoring must follow your state dental board and/or CDC requirements.

Midmark Soniclean® Ultrasonic Cleaners

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Instrument Sterilization Workflow

Step 1 – Transport Instruments and Handpieces to Steri-Center

Contaminated instruments and handpieces should be transported to the processing area in a way that minimizes the risk of exposure to staff, patients and the environment. Once the contaminated instruments are finished being used in the operatory, they should be transported from the room in a closed, rigid, leak-proof container, and the staff who is transporting the instruments should be wearing appropriate personal protective equipment.

Step 2 – Sort Instruments and Handpieces - Dispose of Waste Properly

Separate the reusable instruments from the disposables and remove the handpieces for sterilization. Disposable instruments should be properly disposed of and not sterilized for reuse. Sort the reusable instruments based on the type of sterilization that is going to be required and the materials the instruments are constructed of (e.g. carbon steel instruments should be sterilized separately from stainless steel to avoid corrosion). Some instruments may require a cold soak prior to sterilization. If instruments cannot be cleaned immediately, pre-soaking or maintaining them in a moist environment may improve the cleaning process. Handpieces have a separate cleaning procedure prior to sterilization. Dispose of any excess waste in a biohazard waste receptacle according to state EPA requirements.

Step 3 – Instruments: Soak and Ultrasonically Clean Instruments

To minimize the risk of personnel injury, instruments should be cleaned with a hands-free mechanical process such as an ultrasonic cleaner or instrument washer prior to sterilization. Ultrasonic cleaning is the preferred process since it is safer and more effective than manual cleaning and more efficient in penetrating inaccessible areas such as crevices and joints. It is important to ensure that instruments are rinsed thoroughly and the majority of bioburden is washed off prior to placing them in an ultrasonic cleaner. Removal of debris may be easier if the instrument has had time to soften while in the holding solution. Visually inspect the instruments for residual debris, and damage and reclean or replace any instruments as appropriate. Hand scrubbing of instruments is not recommended because of the risk of “sticks” from sharp instruments.

Personal protective equipment should also be used in the ultrasonic process. Instruments are placed in an ultrasonic cleaning basket or cassette rack that assures positioning of the instruments at the proper distance from the bottom of the tank while keeping them completely immersed in ultrasonic solution. Follow the manufacturer’s recommended instructions to ensure optimum results.

While some microorganisms may be destroyed in the ultrasonic cleaner, this process should not be considered an appropriate substitute for disinfection or sterilization. Additionally, only those chemicals that are specifically labeled as ultrasonic solutions should be used. Detergents, disinfectants and various liquids not chemically prepared for such use should not be substituted. Solutions should be changed frequently to assure the continued effectiveness of the cleaner.

Handpieces: Wipe External Surfaces and Remove Burs

The burs should be removed from each handpiece. They should be properly cleaned and sterilized per the bur manufacturer’s requirements. The external surface of the handpiece should be wiped to remove any debris.

Selecting an Ultrasonic Cleaner – Different Options for Different Needs

Every practice has different cleaning needs, depending on the number of patients and the types of procedures being performed. There are multiple size options available in ultrasonic cleaners, and dentists can choose the cleaner that best meets their office’s individual needs. It is also important to evaluate the ease of use and the quality of the cleaner as well as the noise level. This is important to note because while ultrasonic cleaning is probably the fastest, most consistent and safest method of cleaning instruments and components, most cleaners can be noisy, emitting a high-pitched sound during the cleaning cycle. When selecting an ultrasonic cleaner, review the power of the transducers and the uniformity of the coverage of cavitation. More powerful transducers and more uniform cavitation coverage will result in a more thorough cleaning of the instruments.

Step 4 – Instruments: Rinse with Clean Water and Dry Instruments

After being ultrasonically cleaned, the instruments should be rinsed in clean water, and in certain situations, in distilled water. Then, dry the instruments before packaging by either allowing them to air dry, by patting them down or through the use of an instrument dryer. If required, follow manufacturers' recommendations to lubricate or use rust inhibitors that are appropriate for sterilization.

Handpieces: Follow Handpiece Manufacturer's Recommended Maintenance Protocol

Each handpiece manufacture has specific protocols for cleaning their handpieces. Follow their recommended guideline for cleaning and lubricating the handpiece prior to sterilization.

Step 5 – Pouch or Wrap Instruments

In order to prevent instrument recontamination, it is important to package items since placement of unwrapped sterilized instruments in a contaminated drawer, tray or other receptacle undermines the purpose of infection control.

All instruments to be sterilized should be packaged in pouches or wraps unless they will be used immediately after sterilization. There are a variety of packaging options available depending on a practice's needs. Packaging must be sealed to maintain sterility and compatible with the type of sterilization used.

Step 6 – Sterilize and Dry Instruments

There are a variety of different sterilization methods including steam sterilization (known as "autoclaving" or "moist heat under pressure"), dry-heat sterilization (electric oven) and chemical vapor sterilization. Critical patient care instruments (instruments that have direct contact with the bloodstream or tissues under the skin) must be sterilized prior to reuse to avoid possible transmission of infections. If the use of critical patient care instruments is a routine occurrence in the practice, it is important to have more than one method of sterilization or multiple sterilizers available to use as a backup in the event equipment breaks down, supplies run low, electricity is unavailable or to avoid disruption in the practice.

Steam sterilization is the most commonly used and recommended method of sterilization. To achieve optimal sterilization conditions inside the chamber of steam sterilizers, it is necessary to remove the air trapped inside the chamber once the sterilizer door is closed. Traditionally, steam sterilizers have been classified by the method used to remove this air. Gravity displacement sterilizers rely on gravity to force the air out of the bottom of the chamber through a mechanical valve at the beginning of the heating phase. Once specific conditions (temperature, pressure, etc.) inside the chamber are reached, this valve closes and remains closed throughout the remainder of the cycle. Thus there is the potential for small amounts of air to remain trapped in the chamber after the valve closes. This trapped air can result in incomplete sterilization under certain conditions.

Another traditional steam sterilizer type is the pre- and post-vacuum sterilizer. These sterilizers use a vacuum pump to remove air from the sterilizer chamber prior to and during the heating phase. Because this method uses a pump to draw the air out of the chamber and its contents instead of relying on gravity to cause the air to be moved to the bottom of the chamber and escape through an open valve, it can remove more air from the sterilizer chamber than gravity displace sterilizers. In this type of steam sterilizer, the vacuum pump is also usually used at the end of the sterilization cycle to remove moisture from the sterilizer contents to shorten the drying time. Pre- and post-vacuum sterilizers tend to be significantly more expensive and also more costly to maintain because of the added components and complexity.

The third and newest type of steam sterilizer is the Steam-Flush Pressure-Pulse model. This sterilizer uses an electronically operated valve in place of the mechanical valve used on gravity displacement sterilizers to remove the air from the sterilizer chamber and its contents. Since the valve is electronically controlled it can be opened numerous times as required to vent the air from the chamber, thus maximizing air removal. This type of steam sterilizer offers the low maintenance and cost of the gravity displacement sterilizers with the more effective air removal of the prevacuum sterilizers. This allows some sterilizers of this type to pass air removal tests that are only required by prevacuum sterilizers (an example would be the Midmark M11 UltraClave® Automatic Sterilizer), which removes more air from the chamber vs. gravity displacement sterilizers.

Whatever type of sterilizer is being used, follow the sterilizer manufacturer's instructions for specific instrument packaging, sterilizer operation and maintenance to ensure reliability of the equipment and correct operating procedures.

Chemical Indicators should be used in every cycle to validate that the sterilizer reached the appropriate cycle conditions necessary to achieve sterilization. Biological Indicators should be used in the sterilizer at least once a week to validate that the sterilizer is killing all microorganisms.

When loading the sterilizer, care must be taken not to pierce the instrument packaging with instruments, marking devices or other sharp objects. Correct loading of the sterilizer is required to achieve consistent, effective sterilization. Consult the sterilizer operator's manual for directions on maximum load limits and proper placement of items to be sterilized.

A normal sterilization cycle includes four phases: a heating phase (the period of time when the sterilizer is heating up to achieve appropriate sterilization temperature); an exposure phase (the actual time required for sterilization of the load); a venting phase (the period of time when the chamber vents the steam and depressurizes); and a drying phase (the period of time when the sterilizer is drying the instruments). The instruments should not be removed from the sterilizer until the full operating cycle is complete and the instruments and/or packaging is dry to prevent compromising packaging and re-contaminating the instruments.

What to Look For In a Sterilizer:
Reliability. Efficiency. Ease of Use.

No matter what the needs of a practice are, it is important to use sterilization that is reliable and efficient. So what should dentists look for when selecting the best sterilizer for them? It's important to do research and find a sterilizer that offers fast and efficient instrument processing for reliable and effective quality infection control. Operation should be intuitive with easy-to-use controls that help the user easily select the cycle needed. Controls should be programmable to allow for the creation of different cycle parameters based on the practice's sterilization needs. Fully automatic sterilizers are recommended for efficiency in the practice. Once the sterilizer is set, the operator can return to other duties in the office without having to monitor the sterilizer. Sterilizers should also offer easy draining and filling without moving the equipment to access a reservoir fill port or drain tube. A sterilizer should properly dry the instruments and/or packaging at the end of the cycle. Dentists should work with their local dealer to determine which sterilizer is right for their practice.

Step 7 – Store in a Dry, Protected Area

Sterilized instruments should be stored in a clean, dry and protected place that has minimal airflow. Instruments should not be stored unpackaged as this will cause them to become contaminated from hands and airborne microorganisms when doors or drawers are opened. Packaging should be placed on clean shelves or in clean drawers. Instrument packages should be rotated on a "first in, first out" basis. To minimize the possibility of contamination, instruments should remain packaged until they are required for a procedure and the packaging should be inspected prior to use of the instruments to assure the packaging is in tact. If the sterile barrier (packaging) has been punctured or gotten wet, the instruments should be re-sterilized before using them on a patient.