TEAM HUDDLE: Establishing a High Quality Instrument Processing Program:

Sterilization

One of the most important duties of the Infection Control Coordinator (ICC) is to maintain procedures that ensure the instruments used to provide patient treatment have been properly prepared. The main goal of these procedures is to prevent the spread of potentially pathogenic microbes from contaminated instruments to patients. The “Chain of Instrument Processing” (Figure 1) is similar to the “Chain of Infection”. When one link is broken the overall desired result is challenged. The sterilization link is a key step in the process but must be performed correctly to ensure success.

LEARNING OBJECTIVES

After reading this publication, the reader should be able to:

• describe the three methods of sterilization used in dentistry.
• describe the advantages and precautions for each sterilization method.
• describe recommendations from the Centers for Disease Control and Prevention (CDC) on sterilization of patient care items.
SCENARIO: The Incident

Dr. Cass’ general dentistry practice got very busy after he accepted some new patients from the practice of a colleague who just retired. Dr. C hired a part-time person to help his wife Del (the head assistant) process instruments. He told Del that they would have to extend their office hours and become more efficient with instrument processing so he wouldn’t have to purchase more instruments or sterilizers.

He told Del to make sure the autoclave was always fully loaded. Del said they also would purchase a small table fan to dry the processed packages so they could eliminate the post-sterilization dry cycle. This would let them quickly reload the autoclave and increase the number of loads they could process per day. If they were running low on sterile instruments Dr. C said to be more efficient they should use that “Flash” cycle to shorten the cycle time but still dry the packages under the fan. The new part-time assistant asked if the instruments would still be sterile after making the processing changes. Dr. C said, “Make sure that each package is marked with autoclave tape to show that they are being properly sterilized”.

Potential Consequences

After instituting the new procedures Dr. C’s practice was able to process more instruments per day but unfortunately compromised patient safety in doing so. Instructions to make sure the autoclave is fully loaded can encourage overloading. Overloading prevents the steam from contacting the surface of each instrument, which jeopardizes sterilization. Eliminating the autoclave dry cycle does reduce the total cycle time, but handling wet packs increases the chances of tearing the packaging material (which breaches sterility) and facilitates wicking (the drawing through of microbes from the gloved hands and from the air). Using a fan to dry wet packages should be prohibited for it simply collects the contaminated air and continually blows it onto the wet packages. The packages do dry under the fan, but room air contains microbes on dust and in aerosol particles. The short sterilization time used in “Flash” sterilization decreases the safety factor built in to regular autoclave cycles.

Prevention

(Also, see “Strategies” on page 3-4 for more details)

Proper Loading

Proper loading of any sterilizer is to make sure each package has good access to the sterilizing agent be it steam, dry heat, or chemical vapor. There needs to be space between each package. Placing packages on their edges (rather than stacking them one upon the other) provides this space. They may also be placed in a single layer (but no stacking). Follow the manufacturer’s instructions for use (IFU) when loading the sterilizer.

Paper Packages

Paper packages processed in steam sterilizers will be wet immediately after the sterilization portion of the cycle. Wet packages can more easily tear, and will cause particles (i.e., microbes) on the surface of the packages to be drawn through to the items inside. Thus the packages need to be dried INSIDE the sterilizer. Many autoclaves have automatic dry cycles. With other models the door can be left slightly ajar for 10-30 minutes at the end of the sterilization cycle. Follow the manufacturer’s IFU for the cycle including the drying portion of the cycle.

Flash Sterilization

The CDC indicates that “Flash” sterilization (i.e., higher autoclave temperature and shorter time such as 3 minutes at 134°C with unwrapped items), also known as Immediate Use Steam Sterilization (I USS), should not be
used for reasons of convenience, as an alternative to purchasing additional instrument sets, or to save time. When absolutely necessary “Flash” sterilization may be used, for example, to process a dropped instrument for which a previously sterilized replacement is not available and storage will therefore not be necessary, as the instrument will be immediately transported aseptically to the point of use.

Autoclave Tape

Autoclave tape is a type of chemical indicator, and its change in color indicates if an item has been exposed for some period of time to a sterilizing temperature; however, this change does not indicate that the contents of the package are sterile.

Some Related CDC Recommendations

1-3

• Assign responsibilities for reprocessing of dental equipment to dental healthcare personnel with appropriate training on instrument processing.

• Wear puncture- and chemical-resistant/heavy duty utility gloves for instrument processing procedures.

• Wear appropriate personal protective equipment (PPE - e.g., mask, protective eyewear and gown) when splashing or spraying is anticipated during instrument processing.

• Have manufacturer instructions for reprocessing reusable dental instruments/equipment readily available, ideally in or near the reprocessing area.

• Use only Food and Drug Administration (FDA)-cleared sterilization equipment and use according to the manufacturer’s directions. #

• Ensure routine maintenance for sterilization equipment is performed according to the manufacturer’s instructions and maintenance records are kept.

• All items that contact oral tissues are to be cleaned, packaged, and heat-sterilized after each use or discarded.

• Allow packages to dry in the sterilizer before they are handled to avoid contamination.

• Reprocess heat-sensitive instruments by using FDA-cleared sterilant/high-level disinfectants* or an FDA-cleared low-temperature sterilization method (e.g., ethylene oxide). Follow the manufacturer’s instructions for use of chemical sterilants/high-level disinfectants. Single-use disposable instruments are acceptable alternatives if they are used only once and disposed of correctly.

• Sterilization of unwrapped items (“Flash” sterilization) – see reference 2 (page 6) for detailed recommendations from the CDC.

Precautions

• Reusable items used intraorally need to be cleaned, inspected, packaged, and sterilized before reuse. The use of heat (rather than chemicals at room temperature) to sterilize items has long been recognized as the most reliable and efficient method of sterilization. The use of chemicals at room temperature is less reliable because the items cannot be packaged prior to processing and are, therefore, subject to recontamination immediately upon removal from the chemical. Also, this process cannot be spore tested.

• FDA-cleared heat sterilizers in dentistry include the steam autoclave, dry heat sterilizer, and the unsaturated chemical vapor sterilizer. It’s absolutely necessary to follow the manufacturer’s IFU and equipment maintenance to ensure successful and reliable sterilization.

• Plan for an unexpected breakdown of the office sterilizer by either having a second sterilizer in the office or by making sure a local dental dealer can rapidly provide a back-up unit when needed. Make sure back-up units have been properly monitored (mechanical, chemical, biological) before processing patient treatment items.

(Continued on page 4)
STEAM STERILIZERS

Autoclaves are time efficient, reliable, and achieve good penetration of appropriate packaging material. During the operation of an autoclave it’s important that the chamber becomes saturated with steam (no air) so that sterilizing temperatures (121 - 134°C) can be reached. Air pockets will be at lower non-sterilizing temperatures. Thus autoclaves are designed to remove the air from the chamber during operation so that the appropriate temperatures can be reached. Three types of autoclaves are available depending upon how the air in the chamber is removed.

Gravity displacement type:
As steam is generated the heavier air settles to the bottom of the chamber where it is forced out through the drain or escape valve. When the drain or valve is closed pressure builds up in the chamber and allows the steam to reach sterilizing temperatures.

Vacuum pump sterilizer:
A vacuum pump removes the air before the steam is generated. In some models the pump also operates at the end of the sterilization cycle to provide a dry cycle.

Positive steam flush/pressure pulse sterilizer:
Uses repeated sequences of steam flushes and pressure pulses to remove the air.

PRECAUTIONS:
- Do not use closed containers such as capped glass vials or metal trays or boxes with lids in any type of steam sterilizer. Such containers prevent the steam from having direct contact with the surface of the item being processed, which is required for sterilization. Wrapping with aluminum foil also prevents steam penetration. Use only FDA-cleared packaging materials and follow the manufacturer’s IFU.
- Non-stainless steel metal items will corrode.
- Some plastic and rubber items may be damaged in an autoclave, so follow the manufacturer’s directions for cleaning and sterilizing these items.
- Items will be wet at the end of the regular cycle, so drying inside the autoclave is necessary.
- If unwrapped items are processed (e.g., for “Flash” sterilization), they will be quickly contaminated upon removal from the sterilizer.
- Make sure the chamber drain is not blocked and perform routine maintenance.

DRY HEAT STERILIZER

Instruments such as carbon steel burs,* endodontic files, and cutting instruments do not corrode in dry heat sterilizers. Closed containers can be used** in these sterilizers, and items are dry at the end of the cycle. With dry heat sterilization the heat energy in the hot air is transferred to the surface of the items to be processed. Since dry heat is not as efficient as steam under pressure in killing microbes, dry heat sterilizers must operate at higher temperatures (e.g., 160 - 190°C) for longer times. There are two types of dry heat sterilizers.

Static-air models:
Heating coils inside the chamber heat the air, and the hot air circulates through natural convection generating sterilization times of 60 – 120 minutes.

Forced-air model:
The hot air is circulated in the chamber at a high velocity, which allows for a more rapid transfer of heat energy from the air to the instruments. This permits a shorter exposure time for sterilization (6 – 12 minutes).

PRECAUTIONS:
- Some plastic and rubber items may be damaged, so follow the manufacturer’s directions for cleaning and sterilizing these items.
- Dry items before processing, for addition of moisture to the chamber may interfere with the anti-corrosion effect.
- Do not use closed containers such as capped glass vials or metal trays or boxes with lids. Such containers prevent the chemical vapor from having direct contact with the surface of the item to be sterilized, which is required for sterilization. Wrapping with aluminum foil also prevents vapor penetration.
- Provide adequate ventilation.
- May not be appropriate for handpieces, so follow the manufacturer’s directions for cleaning and sterilizing these and other items.

* Per FDA definitions, unless there are validated complete instructions from the manufacturer for dental bur (diamond and non-diamond) and endodontic file reprocessing/reuse, these items should be treated as single-use devices and not reprocessed. If there are no validated instructions for reuse, and reuse occurred, then it would be considered off-label use for which the dentist is responsible.

** Successful sterilization in closed containers needs to be confirmed by use of biological monitoring.

UNSATURATED CHEMICAL VAPOR STERILIZER

This sterilizer involves heating a special chemical solution in a closed chamber producing hot chemical vapors that kill microbes. The chemical solution contains a small amount of formaldehyde (the main active ingredient) and alcohol, acetone, ketone and a small amount of water. The major advantages of this type of sterilization are that there is no corrosion of the instruments and the packages are dry at the end of the cycle. The sterilizing temperature reached is about 132°C and the exposure time is similar to that of steam autoclaves.

PRECAUTIONS:
- Some plastic and rubber items may be damaged, so follow the manufacturer’s directions for cleaning and sterilizing these items.
- Dry items before processing, for addition of moisture to the chamber may interfere with the anti-corrosion effect.
- Do not use closed containers such as capped glass vials or metal trays or boxes with lids. Such containers prevent the chemical vapor from having direct contact with the surface of the item to be sterilized, which is required for sterilization. Wrapping with aluminum foil also prevents vapor penetration.
- Provide adequate ventilation.
- May not be appropriate for handpieces, so follow the manufacturer’s directions for cleaning and sterilizing these and other items.
What’s Wrong With This Picture?
Can you identify the breach(es) in infection prevention and safety procedures in this photo taken during a dental treatment procedure? Check your answer below.

Educational Spotlight

How Do You Let Patients Know You Are Serious About Their Safety?
To support the annual Dental Infection Control Awareness Month (DICAM), OSAP has designed a comprehensive campaign to help promote the dental community’s commitment to infection control/prevention.

Featured are many free, customizable resources to address the needs of four distinct communities within the dental arena:

• Dental practice settings
• Educators
• Consultants and Speakers
• Dental Trade

Be sure to visit the DICAM web page to check out the resources that best suit your work situation.
http://www.osap.org/?page=DICAM

September is Dental Infection Control Awareness Month!

Thanks to our sponsors
OSAP thanks the following companies that help to underwrite each issue of this special series of Infection Control in Practice Team Huddle™ in 2017.

Super Sponsors

Air Techniques
www.airtechniques.com

Coltene
www.coltene.com

Crosstex
www.crosstex.com

Dentsply Sirona
www.dentsplysirona.com

Henry Schein
www.henryscheindental.com

Hu-Friedy
www.hu-friedy.com

Kerr TotalCare
www.kerrdental.com

Midmark
www.midmark.com

Patterson Dental
www.pattersondental.com

SciCan
www.scican.com

OSAP appreciates the commitment of our sponsors in supporting the safestdentalvisit™.
Glossary

**FDA-cleared** Indication that the FDA had reviewed information and any testing data showing an item is safe and effective as defined on its labeling.

**Sterilization** The killing of all forms of microbial life and is the highest level of microbial kill that can be achieved.

Links to Resources


KEY TAKEAWAYS

1. Sterilization procedures must be performed correctly to ensure that instruments are safe to use on patients.
2. Manufacturers’ IFU for sterilizing equipment and for items to be sterilized must be followed to ensure successful processing of reusable patient care items.
3. Understanding the general working aspects of your sterilizer helps ensure proper use of the equipment.

QUESTIONS FOR ONLINE QUIZ

1. Why is it important to dry instrument packages inside the sterilizer before handling?
   a. To prevent wicking
   b. To eliminate water spots on the instruments
   c. To give extra heating time to ensure sterilization
   d. To ensure the sterilization indicators (e.g., autoclave tape) have changed

2. Why is it important to dry instruments before dry heat and unsaturated chemical vapor sterilization?
   a. To shorten the sterilization exposure time
   b. To allow the sterilization indicators to work
   c. To prevent water spotting of the instruments
   d. To maintain the anti-corrosion properties of the sterilizers

3. What is an acceptable reason for using “Flash” sterilization?
   a. Convenience
   b. To save time
   c. To quickly replace a dropped instrument
   d. As an alternative to purchasing additional instruments

4. What provides the highest level of patient protection when processing a reusable heat-sensitive instrument?
   a. Using “Flash” sterilization
   b. Using a hospital disinfectant in the ultrasonic cleaner
   c. Disinfecting by submerging in a sterilant/high-level disinfectant
   d. Sterilizing by submerging in a sterilant/high-level disinfectant

5. Is having air pockets in the autoclave chamber during the sterilization cycle good or bad?
   a. Bad. The instruments in those pockets may not become sterile
   b. Bad. The instruments in those pockets will corrode twice as fast
   c. Good. The instruments in those pockets will not corrode
   d. Good. The instruments in those pockets will become sterile sooner

6. Closed containers can be used in which type of sterilizer with proper sterilization monitoring?
   a. Dry heat
   b. Gravity displacement steam sterilizer
   c. Unsaturated chemical vapor sterilizer
   d. Positive steam flush/pressure pulse sterilizer

7. What is the advantage of using dry heat sterilization rather than a steam sterilizer?
   a. Dry heat yields less corrosion of carbon steel instruments
   b. Dry heat uses a lower temperature
   c. Dry heat uses a shorter exposure time
   d. Dry heat requires no packaging of the instruments

8. What is the main active ingredient in unsaturated chemical vapor sterilization?
   a. Steam
   b. Ketone
   c. Methane
   d. Formaldehyde

9. According to the CDC what kind of sterilizer records need to be kept?
   a. Age of the sterilizer used
   b. Maintenance work performed
   c. Average number of loads per day
   d. Manufacturer of the sterilizer and purchase price

10. According to the CDC what type of healthcare personnel should be assigned the responsibility for reprocessing dental instruments?
    a. The infection control coordinator
    b. One with appropriate training on instrument processing
    c. The dental assistant with the most years of work experience
    d. A dental hygienist or dental assistant who volunteers for the position

GET YOUR CE CREDIT ONLINE

OSAP is recognized by the American Dental Association as a CERP provider.*

Follow the instructions below to purchase and complete the quiz to receive 1 hour of CE credit.


Step 2: OSAP will send you a purchase confirmation email and a separate email with the link to the online CE exam. Click on that link to access the exam.

Step 3: Complete the online exam. You have 2 attempts to pass with 7 out of 10 correct answers. When finished, you can print out or download your CE record of completion for your records. Your record of completion will also be emailed to you.

*ADA CERP® is a service of the American Dental Association to assist dental professionals in identifying quality providers of continuing dental education. ADA CERP® does not approve or endorse individual courses or instructors, nor does it imply acceptance of credit hours by boards of dentistry. Concerns or complaints about a CE provider may be directed to the CE provider or to ADA CERP® at ADA.org/goto/cerp. Please email the OSAP central office at office@osap.org or call 410-571-0003 if you wish to be in contact with the course author/creator(s) with any questions or for clarification of course concepts. All participants assume individual responsibility for providing evidence of contact hours of continuing education to the appropriate authorities and for the maintenance of their individual records. Publication date: August, 2017. Expiry date: August, 2020.
TEAM HUDDLE HIGHLIGHTS

1. When did you last evaluate your instrument processing procedures?
2. Do you have a back-up sterilizer available?
3. Are you aware of all the CDC recommendations for dental instrument sterilization?
4. Do you know the types of sterilizers available in dentistry?

Read on!