

Instrument recirculation: Maximizing the process

John A. Molinari, PhD

THE FUNDAMENTAL GOAL of reprocessing contaminated instruments for health care continues to be the delivery of sterile items for patient care.

Basic recommendations have been developed to provide guidance to those team members responsible for this task, including:

1. Reprocessing should not occur in the treatment operator.
2. The recirculation system should be logical and organized to accomplish reprocessing and sterilization most efficiently.
3. It should minimize procedures that can place employees at risk for percutaneous or sharps exposures or other hazards.

Many useful equipment and product choices are available to accomplish the overall goal within the framework of these recommendations. However, in some instances, responsible personnel may use equipment and products in a manner that is out of line with manufacturer's instructions for use (IFUs) . . . When this happens, it can lead to confusion, product misuse, and the possibility of compromising instrument cleaning and sterilization. Since manufacturers are required to provide specific instructions and information on equipment and product use, this article will discuss a few representative examples of failure to comply with IFUs, and the possible impact on product efficacy and patient safety.

DRYING ITEMS BEFORE PACKAGING AND STERILIZATION

Dental staff who are responsible for instrument processing frequently ask whether cleaned instruments, cassettes, and other items need to be dried before sterilization. The most common thought for not drying instruments before placing them in pouches or wraps is that the instruments are going to get wet anyway from exposure to steam, which is 100% water vapor, during the cycle. There are problems with this line of thinking. The venting and drying components of autoclaves are designed and manufactured to remove only the same amount of water vapor that is placed into the chamber during the cycle. Instruments that are still very wet when placed into their containers and packaging materials present more of a water burden for the sterilizer to remove. This results in wet packs being removed from the sterilizer. If the packages come out wet, the paper on the pouch can funnel moisture or bacteria from a staff member's hands through the paper, compromising the integrity of the packaging. This is referred to as "wicking." Wet packaging is also much more susceptible to tearing and leakage than dry packaging. Lastly, wetness can cause the instruments to corrode.

LOADING STERILIZERS

Manufacturers provide specific instructions for loading sterilizers, and correct loading of the chamber is essential for the success of the sterilization cycle. Heat sterilizers require free circulation of the sterilizing agent (e.g., steam, dry heat,

unsaturated chemical vapor) throughout the cycle. Unfortunately, during instrument reprocessing, the staff member may be tempted to fill a sterilizer chamber with as many sealed pouches and wrapped packs as possible to get as much done in a single run. Why do manufacturers caution against this? In addition to increasing the warm-up time needed to achieve sterilization conditions, overloading the chamber can delay or even prevent thorough contact of the sterilizing agent with all items in the unit. If the improperly loaded sterilizer is being biologically monitored using a spore test, the chances for a failed test increase.

Studies were performed years ago investigating possible reasons for sterilization cycle failures. Findings revealed that 85%–87% of the failures were due to human error and not equipment malfunction. An important finding was that the overwhelming majority of failures occurred as a result of sterilizer overloading.¹ This problem can be greatly reduced by using racks to ensure that proper loading procedures are routinely performed. Generally, packages should be placed in the chamber on their edges so that there is enough space to allow the sterilizing agent to contact every surface of every item. Post sterilization, instrument packs should be allowed to dry inside the sterilizer chamber before removing and handling.

STERILIZATION MONITORING

The importance of instrument sterilization and sterilization monitoring as fundamental components of any infection-control program cannot be overstated. The 2003 CDC dental infection-control guidelines specifically address this: “Use mechanical, chemical, and biological monitors according to manufacturer’s instructions to ensure the effectiveness of the sterilization process.”² With particular reference to chemical monitoring, technological advances have led to availability of improved chemical indicators and integrators for evaluating sterilization cycles (table 1). We have progressed far beyond the relative insensitivity of autoclave tape, to the point where it is possible to utilize a multiparameter Class V integrator to obtain immediate notification of the success of each autoclave cycle.

Table 1: Chemical Indicators: Class, Use, and Product Application

Class	Use/Product Application
Class 1: Process indicators	Intended for use with individual packs to indicate that the pack has been exposed to the sterilization process and distinguish between processed and unprocessed packs. Autoclave monitor tape, some indicator strips, indicator labels
Class 2: Indicators for use in specific tests	Bowie-Dick tests (used with Class B/pre-vac sterilizers)
Class 3: Single-variable indicators	Responds to a single variable in the process; e.g., temperature. They are intended to indicate exposure to a sterilization process at the stated value of the chosen variable.
Class 4: Multivariable indicators	Responds to two or more variables in the process. Printed indicator strips
Class 5: Integrating indicators	Mirrors the response of a BI if used in the same process. Integrating indicators are the most accurate of the internal chemical indicators. Moving front integrators; color-change integrators.
Class 6: Emulating indicators	Indicators for a specific sterilization cycle. A different emulating indicator needs to be used for each sterilization cycle time and temperature (e.g., 3 minutes and 15 minutes) run. Process challenge device

CDC recommendations call for at least weekly monitoring of sterilizers with spore tests using biologic indicators (BI). How does one check the autoclave cycles in between the weekly BI? The latest chemical monitoring innovation, the Class V integrator, contains a chemical that reacts with the three sterilization parameters (i.e., temperature, pressure, time). Movement of the chemical ink into the SAFE or ACCEPT zone of a test strip only occurs when sterilization conditions for all three have been met. Thus, a processed integrator strip showing that positive result can serve as an immediate indication of the success of the sterilization cycle. Placing a Class V integrator into each autoclave cycle can, therefore, assist practices in instrument sterilization and also identify compliance and equipment problems as early as possible.

In summary, a lack of compliance with basic principles associated with IFUs can have an adverse ripple effect by lessening the margin of safety overlap, especially when shortcuts are taken. It may not appear so, but each infection-control procedure and protocol reinforces the others. While potential issues are not eliminated even when the best precautionary practices are employed, the door may unknowingly be opened for increased microbial cross-contamination and infection when compliance wanes. You can prevent many problems by conscientiously adhering to appropriate instructions and recommendations. **DE**

REFERENCES

- Hastreiter RJ, Molinari JA, Falken MC, Roesch MH, Gleason MJ, Merchant VA. Effectiveness of dental office instrument sterilization procedures. *J Am Dent Assoc.* 1991;122(10):51-56.
- Kohn WG, Collins AS, Cleveland JL, Harte JA, Eklund KJ, Malvitz DM. Guidelines for infection control in dental health-care settings—2003. Centers for Disease Control and Prevention. *Morbidity and Mortality Weekly Report.* 2003; 52(RR-17):43.



JOHN A. MOLINARI, PhD, is director of infection control for The Dental Advisor. Previously, he was professor and chairman of the Department of Biomedical Sciences at the University of Detroit Mercy School of Dentistry. Contact him at johnmolinariphd@gmail.com.