

## Instrument Cassettes: An Effective Infection Control Precaution

Increased patient and staff safety are two key advantages

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### ABSTRACT

Instrument processing and recirculation involves a complex, sequenced series of events that requires qualified dental healthcare workers, specialized equipment, and adequate space. The ultimate goal of the process is to provide sterile instruments for patient care. Because many of the individual procedures involve handling of instruments contaminated with blood, saliva, and other bioburden, a major focus for any comprehensive infection control program is minimizing the risk for percutaneous sharps injuries. This article will review the inclusion of instrument cassettes in the process, as well as provide an overview of engineering and work practice controls and instrument processing, to emphasize how appropriate use of cassettes can increase process effectiveness and improve office safety.

Clearly written policies, procedures, and guidelines have been advocated and developed by professional organizations and governmental agencies to help ensure consistency, efficiency, and effective coordination of infection control activities.<sup>1,2</sup> One occupational risk faced by dental healthcare workers (DHCWs) is the possibility of

percutaneous sharps exposure when handling contaminated dental instruments. Minimizing the potential for this mode of transmission is therefore a primary focus for a comprehensive infection control program.

One aspect to consider when implementing an infection control program is selecting technologies and products that can maximize a safe and efficient work environment for healthcare personnel and patients. Instrument

cassettes represent examples of both a technology and a product that can be integrated into a dental office. When used appropriately, cassettes can increase organization and improve safety and infection control both in the dental operatory and when processing instruments for reuse on patients.

### Instrument Cassette Selection

Instrument cassettes were first introduced in hospitals to organize



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### LEARNING OBJECTIVES

- Describe general instrument processing and recirculation procedures.
- Explain advantages of using instrument cassettes in a dental setting.
- Discuss items to consider when selecting a cassette system.
- Define and provide examples of engineering and work practice controls.

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instruments into procedure sets. They were later incorporated into dental school clinics, and in recent years have also become increasingly popular in dental offices. One important feature of instrument cassettes is that a single cassette can be used to hold and organize a complete set of instruments for a specific procedure (Figure 1). This convenience eliminates the need to gather multiple packages for a procedure. In addition, cassettes allow for less handling of contaminated instruments during cleanup and reprocessing. This latter attribute can provide additional safety by enhancing instrument flow while saving time. Table 1 summarizes the main advantages of using a cassette system in dental practice. Figure 2 shows an instrument cassette ready for chairside use.

As with the selection of any new product, it is important to consider what features cassettes can provide that will meet the needs of a specific dental practice. For example, cassettes are available in a variety of materials, sizes, and shapes (Figure 3). When determining what size(s) will best fit practice needs, one must consider how many instruments and accessories are used for each procedure. The most probable outcome of such a review is that several different sizes of cassettes will be needed due to specialized instrument requirements for certain procedures (eg, operative, hygiene, surgical procedures). When considering cassette size, it is also important

to evaluate the size of the practice's cleaning and sterilization equipment (eg, ultrasonic cleaner, instrument washer, heat sterilizer). Making sure there is adequate processing and storage space should be determined early on, because cassettes will occupy more storage space compared with other types of packaging materials.

This type of logistics review logically leads to a consideration of the impact of cassette implementation on practice costs. The answer is that cassettes will incur an initial financial investment. What also needs to be included in the office discussion, however, is what the cost would be to the practice owner when one of the clinical employees incurs an accidental percutaneous exposure when treating a patient. Initial consultations with a licensed medical facility, multiple post-accident serologic tests, and follow-up evaluations can cost hundreds of dollars for each accident that occurs. These do not begin to approach the emotional impact a sharps exposure can have on the employee. When taken as a whole, cassettes make sense.

Virtually all commercially available cassettes are perforated cassettes; these are preferable to containers that are completely solid. Solid cassettes may not allow steam or chemical vapor to reach the contents for sterilization to occur. Additionally, cassette perforations allow thorough ultrasonic or instrument washer cleaning. Other features to consider

would be instrument rails, strips, holders, or racks inside the cassette that are used to hold instruments in place. If these are made of soft material, they may decrease scratching on the instrument surfaces. Also, check to see if the holding devices provide adequate space between instruments to allow easy access during instrument cleaning prior to heat sterilization. A study performed at The Dental Advisor demonstrated that a single instrument washer or ultrasonic unit cleaning cycle was able to completely remove bioburden coated and dried onto instruments and cassette rails.<sup>3</sup>

Compartments within the cassette to place accessories such as rubber dam clamps, anesthetic syringes, burs, amalgam wells, and air water syringe tips would be advantageous. The inclusion of important safety features such as a built-in needle recapping device can further reduce the potential for accidental needlestick injuries during patient care.

## Engineering and Work Practice Controls

Avoiding occupational exposures to blood is the primary way to prevent transmission of blood-borne diseases (eg, hepatitis B virus, hepatitis C virus, human immunodeficiency virus) in healthcare settings. Exposures occur through percutaneous sharps injury (eg, a needlestick or cut with a sharp object) as well as through contact between potentially infectious blood, tissues, or other body fluids and mucous



FIG. 1



FIG. 2

**ORGANIZATION (1.)** An example of a cassette with all of the instruments for a restorative dentistry procedure. **(2.)** Instrument cassettes allow aseptic presentation of instruments chairside.

membranes of the eye, nose, and mouth or nonintact skin (eg, exposed skin that is chapped, abraded, or shows signs of dermatitis).

The majority of exposures in dentistry are preventable.<sup>1</sup> Strategies to reduce the risk of blood contacts and prevent the transmission of blood-borne diseases include the use of the hepatitis B vaccine, standard precautions, use of engineering controls, and modifications of work practices. Usually a combination of these practices is used. These approaches, along with training and education, have contributed to the decrease in percutaneous injuries among dentists in recent years.<sup>4-7</sup> To help DHCWs be as safe as possible with regard to sharp exposures, the Occupational Safety and Health Administration (OSHA) requires the use of engineering and work practice controls to eliminate or minimize employee exposure.<sup>8</sup>

Engineering controls are often technology based and isolate or remove the hazard from the workplace. Whenever possible, engineering controls should be used as the primary method to reduce exposures to blood and saliva from sharp instruments and needles. Examples of engineering controls include sharps disposal containers, safety needles, and scalpels that isolate or remove the blood-borne pathogen hazards from the workplace.

Work practice controls are those behavior-based practices that are incorporated into the everyday work routine that reduce the likelihood of exposure by altering the manner in which a task is performed (eg, using one-handed scoop technique or a needle recapping device to recap a needle; not bending or breaking needles before disposal; not passing a syringe with an unsheathed needle). In many cases, engineering and work practice controls are used together to eliminate or minimize workplace hazards. For example, by not recapping a needle with two hands, one is using a work practice control; if one recaps the needle using a needle recapping device, it is an engineering control.

An instrument cassette can be considered both an engineering and work practice control. When using instrument

cassettes, the instruments are organized in one unit from the chairside procedure through cleaning, rinsing, drying, sterilization, and storage. Sharps injuries can be reduced chairside, because when reaching for instruments during a procedure, it is likely that the instruments will be more organized when using a cassette. As mentioned above, using cassettes can also decrease sharps injuries during cleaning after the procedure because of decreased handling of contaminated instruments. A built-in needle recapping device inside the cassette can also assist with one-handed needle recapping and eliminate the need to purchase a separate device.

### Instrument Processing

The goal of instrument reprocessing is to deliver sterile instruments to patients. When cleaning and processing contaminated instruments between patient treatment procedures, the instrument recirculation system should be logical and organized in a manner that will most efficiently accomplish reprocessing and sterilization and minimize procedures that can place employees at risk for percutaneous, sharps exposures, or other hazards.<sup>9-11</sup> Using instrument cassettes streamlines instrument processing by keeping all the instruments for a specific procedure

together in one cassette from the chairside procedure through cleaning, rinsing, drying, packaging, sterilization, storage, and delivery to chairside for the next patient. As a result, DHCW can save time and increase processing efficiency, in addition to reducing the potential for sharps injuries. The following sections review steps involved in instrument reprocessing, with an emphasis on how cassettes can improve efficiency and DHCW safety.

### Instrument Preparation at Chairside

The practice should designate a central instrument processing area to more easily control quality and ensure safety, instead of performing these procedures in the operator.<sup>1,9,12</sup> Preparation for instrument processing does begin chairside in the dental operator, however. After completion of patient treatment, appropriate personal protective equipment should be worn when disposable sharp objects (ie, needles, burs) are discarded in sharps containers. All other disposable items, including gauze, cotton rolls, articulating paper, and cotton tip applicators, can be placed in appropriate waste containers when indicated. Closed and secured cassettes containing contaminated instruments can then be transported to the instrument

TABLE 1

### Instrument Cassette Advantages

**TIME SAVINGS.** During instrument processing, one cassette holds all instruments for a specific procedure together from the chairside procedure through cleaning, rinsing, drying, packaging, sterilization, and storage.

**IMPROVED SAFETY.** Cassettes lessen handling of contaminated instruments during processing for re-use, which decreases chance of sharps injuries.

**BETTER ORGANIZATION.** Sharps injuries are also reduced because instruments are more organized during treatment when staff members reach for them.

**DECREASED CONTAMINATION.** Cassettes help to maintain instrument sterility during storage and allow aseptic and organized presentation of instruments.

**STREAMLINED WORKFLOW.** Instrument cassettes can decrease need for repackaging and sterilizing because of instruments tearing paper/plastic sterilization wraps.

**INCREASED INSTRUMENT LONGEVITY.** Need to replace instruments that become damaged or misplaced during instrument processing is decreased.



processing area. Instruments should be arranged in an orderly manner when preparing them for the next patient, because they will not be removed from the cassette during instrument processing. OSHA regulations state that reusable sharp instruments should be placed in an appropriate container at the point of use to prevent percutaneous injuries during transport to the instrument processing area.<sup>1,12</sup> Although an additional container may be used for this, a cassette readily accomplishes the same goal by having contaminated instruments already secured inside.

### ***Cleaning and Decontamination***

The basic premise of aseptic technique—clean it first—applies to instrument processing. Cleaning involves the removal of debris as well as organic and inorganic contamination. Because of the potential for injury from sharp instruments, hand scrubbing should be avoided as much as possible.<sup>1,9</sup> Most dental offices use automated equipment such as ultrasonic cleaners for cleaning dental instruments. Instrument washers are becoming more popular in dental practices and can streamline the instrument cleaning process. When using perforated instrument cassettes, the cassette can be placed

directly into the ultrasonic cleaner or instrument washer (Figure 4). After cleaning is complete, the cassette is removed and allowed to dry before wrapping. Because there isn't any direct handling of the instruments during cleaning or sorting instruments later, the potential for injury can be substantially reduced.

### ***Packaging***

The purpose of packaging is to protect instruments from environmental contamination after removal from the sterilizer and storage. Packaging materials must be compatible and designed for the type of sterilization process being used (eg, steam autoclave, dry heat, unsaturated chemical vapor) and cleared by the Food and Drug Administration (FDA). Packaging materials include bags, wraps, pouches, and wrapped perforated instrument cassettes. Instruments should never be stored unpackaged because an unwrapped item does not have a shelf life.<sup>1</sup> Instrument cassettes are very useful and a popular method to package dental instruments, as virtually every US and Canadian dental school uses them to train students.

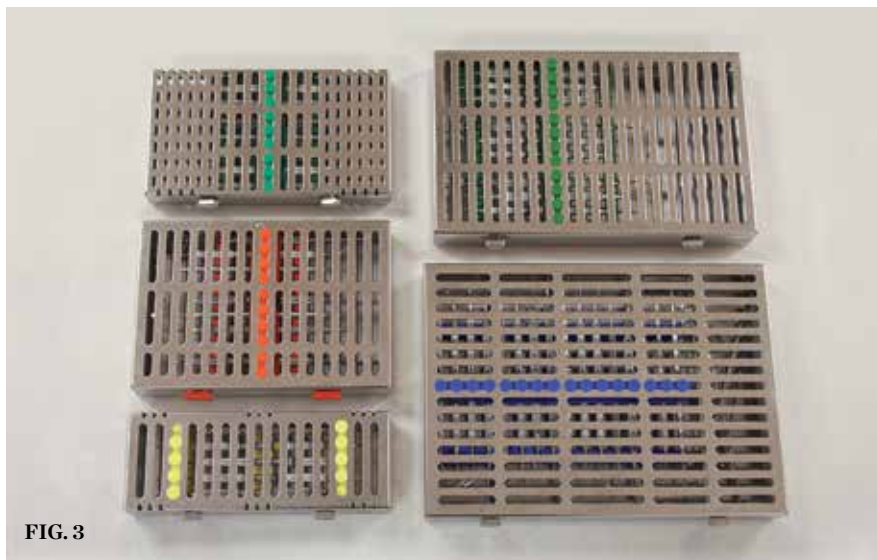
It is important to note that when using cassettes, all instruments for that specific procedure can be pre-arranged

inside the cassette, thereby eliminating the need for bringing miscellaneous packages into the operatory. Decreased handling may even allow for a quicker set-up for the next patient. After the instrument cassette is cleaned and dried, the cassette can be opened and any disposable gauze items can be placed inside before sterilization.

Manufacturer's instructions provide recommendations for cleaning, wrapping, and sterilizing cassettes. Unfortunately, the need to wrap a cassette is sometimes misunderstood, and a number of dental practices are thus not maximizing the benefit of cassette use. If a wrapping material (ie, sterilization wrapper, paper/plastic pouch) is not used to wrap the cassette, the contents will not remain sterile during storage because of the perforations in the cassette. Also, before wrapping the cassette, place an internal chemical indicator inside with the instruments. If an opaque packaging material is used and the internal indicator will not be visible on the outside of the package, place an external indicator on the package.

### ***Sterilization***

In dentistry, the three most common methods used to sterilize patient care



**FIG. 3**



**FIG. 4**

**MAINTAINING STERILITY (3.)** Cassettes are available in a variety of materials, sizes, and shapes. **(4.)** A full instrument cassette can be placed in the ultrasonic cleaner as a unit, decreasing the handling of contaminated sharps.

items are steam under pressure (autoclaving), dry heat, or unsaturated chemical vapor. Steam sterilization is a dependable and cost-effective process and is the most widely used method for items that are not sensitive to heat or moisture.<sup>1</sup> All sterilization equipment must be cleared by the FDA and used according to manufacturer instructions. Correct loading of the sterilizer chamber is essential. Items to be sterilized should be arranged to allow adequate circulation of the sterilizing agent.

Because the size and shape of instrument cassettes vary, it is important to consider the size of the sterilizer chamber when selecting and purchasing both sterilizers and cassettes. They will most likely take up more space than other types of packaging materials. Accessories, such as racks or trays, are usually provided with the sterilizer to help with proper loading procedures. Usually packages should be placed in the chamber on their edges so that the sterilizing agent contacts every surface of every article to be sterilized. Additionally, it is important to ensure that the cassette materials are compatible with the sterilization method being used in the office. Instrument packs should be allowed to dry inside the sterilizer chamber before removing and handling, as wet packs can easily tear. Finally, sterile packs should not be touched until they are cool and dry because hot packs act as wicks, absorbing moisture, and thus can introduce bacteria from hands and the environment.

### Storage

Storage of sterilized items should occur in a manner that prevents contamination; package integrity must remain intact until the time of use. Sterile dental items

and clean patient care supplies should be stored in a clean and dry enclosed storage area. Closed cabinets limit dust accumulation and inadvertent contact with the sterile items. Because cassettes take up more storage space than instruments in pouches, it is important to also consider the size of storage space. Also, a wrapped cassette can reduce the necessity of re-packaging and sterilizing items as a result of sharp or heavy instruments tearing paper or plastic package materials.

### Summary

An important part of the office infection control program is selecting and using technologies and products to develop a safe working environment for patients and staff. Instrument cassettes are an example of a product that can be integrated into a dental office and, when used appropriately, can increase organization and improve safety and infection control both in the dental operator and when processing instruments for reuse on patients.

### Disclosure

Dr. Molinari provides consultation services to Hu-Friedy Manufacturing, Inc.

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