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INFECTION CONTROL PROTOCOLS IN DENTAL PRACTICE: AN OVERVIEW

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ABSTRACT
Infection prevention and control is an important part of safe patient care in dental & medical practice. Concerns about the possible spread of blood-borne diseases, and the impact of emerging, highly contagious respiratory and other illnesses, require practitioners to establish, evaluate, continually update and monitor their infection prevention and control strategies and protocols. This article reflects current knowledge of the transmission of infection, and how to prevent and control it at various levels in dental practice.

INTRODUCTION

In dentistry, the most overlooked subject is hygiene, disinfection and sterilization. Patients have to be sure the environment has accepted international standards' hygienic conditions in addition of treatment quality. If the environment has not been sterilized adequately, the transmission risk of dangerous diseases gets higher**.** Sterilizing equipment is of the utmost importance in the medical & dental field. If unsterilized equipment is used, it can cause an infection which may not appear until much later. When it does, surgery may have to be performed again in order to remove it. This is expensive and can cause many life-threatening complications [1]. The disinfection of medical & dental devices is an important practice. Disinfection does not necessarily kill all microorganisms, especially resistant bacterial spores; it is less effective than sterilization, which is an extreme physical and/or chemical process that kills all types of life. Disinfectants are antimicrobial agents that are applied to non-living objects to destroy microorganisms that are living on the objects. Disinfectants are different from other antimicrobial agents such as antibiotics, which destroy microorganisms within the body, and antiseptics, which destroy microorganisms on living tissue. Disinfectants are also different from biocides — the latter are intended to destroy all forms of life, not just microorganisms. Disinfectants work by destroying the cell wall of microbes or interfering with the metabolism. Sanitizers are substances that simultaneously clean and disinfect. Disinfectants are frequently used in hospitals, dental surgeries, kitchens, and bathrooms to kill infectious organisms. Disinfectants are frequently used in hospitals, dental surgeries, kitchens, and bathrooms to kill infectious organisms [2].

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Routes of Transmission

• Direct contact with infectious lesion or infected saliva or blood
• Indirect transmission via transfer of organisms from a contaminated intermediate object
• Spatter of blood, saliva or secretions directly on to skin or mucosa
• Aerosolization of organisms [3].

Risk for transmission

The risk of transmission of micro-organisms will vary, depending on the type of dental procedure to be performed and the likelihood of exposure to blood, body

fluids and secretions, mucous membranes and non-intact skin. Additional factors to consider include:
• the health status of the patient;
• the characteristics of the patient, such as level of cooperativeness;
• the physical environment and resources available;
• the immune status of the OHCW [4].

Properties

A perfect disinfectant would also offer complete and full microbiological sterilisation, without harming humans and useful forms of life, be inexpensive, and non-corrosive. However, most disinfectants are also, by nature, potentially harmful (even toxic) to humans or animals. The choice of disinfectant to be used depends on the particular situation. Some disinfectants have a wide spectrum; while others kill a smaller range of disease-causing organisms but are preferred for other properties as they can be non-corrosive, non-toxic, or inexpensive).

There are arguments for creating or maintaining conditions that are not conducive to bacterial survival and multiplication, rather than attempting to kill them with chemicals. Bacteria can increase in number very quickly, which enables them to evolve rapidly. Some bacteria survive a chemical attack; they give rise to new generations composed completely of bacteria that have resistance to the particular chemical used. Under a sustained chemical attack, the surviving bacteria in successive generations are increasingly resistant to the chemical used, and ultimately the chemical is rendered ineffective. For this reason, some question the wisdom of impregnating cloths, cutting boards and worktops in the home with bactericidal chemicals [5].

Air disinfectant

They are typically chemical substances capable of disinfecting microorganisms suspended in the air. Disinfectants are generally assumed to be limited to use on surfaces, but that is not the case. In 1928, a study found that airborne microorganisms could be killed using mists of dilute bleach. An air disinfectant must be dispersed either as an aerosol or vapour at a sufficient concentration in the air to cause the number of viable infectious microorganisms to be significantly reduced. In the 1940s and early 1950s, further studies showed inactivation of diverse bacteria, influenza virus, and Penicillium chrysogenum mold fungus using various glycols, principally propylene glycol and triethylene glycol. In principle, these chemical substances are ideal air disinfectants because they have both high lethality to microorganisms and low mammalian toxicity. Although glycols are effective air disinfectants in controlled laboratory environments, it is more difficult to use them effectively in real-world environments because the disinfection of air is sensitive to continuous action. Continuous action in real-world environments with outside air exchanges at door, HVAC, and window interfaces, and in the presence of materials that adsorb and remove glycols from the air, poses engineering challenges that are not critical for surface disinfection.

The engineering challenge associated with creating a sufficient concentration of the glycol vapours in the air have not to date been sufficiently addressed [6].

Alcohols

Usually ethanol or isopropanol, are sometimes used as a disinfectant, but more often as an antiseptic. They are non-corrosive, but can be a fire hazard. They also have limited residual activity due to evaporation, which results in brief contact times unless the surface is submerged, and have a limited activity in the presence of organic material. Alcohols are most effective when combined with purified water to facilitate diffusion through the cell membrane; 100% alcohol typically denatures only external membrane proteins. A mixture of 70% ethanol or isopropanol diluted in water is effective against a wide spectrum of bacteria, though higher concentrations are often needed to disinfect wet surfaces. Additionally, high-concentration mixtures (such as 80% ethanol + 5% isopropanol) are required to effectively inactivate lipid-enveloped viruses (such as HIV, hepatitis B, and hepatitis C). The efficacy of alcohol is enhanced when in solution with the wetting agent dodecanoic acid (coconut soap). The synergistic effect of 29.4% ethanol with dodecanoic acid is effective against a broad spectrum of bacteria, fungi, and viruses. Further testing is being performed against Clostridium difficile (C.Diff) spores with higher concentrations of ethanol and dodecanoic acid, which proved effective with a contact time of ten minutes [7].

Aldehydes

Formaldehyde and glutaraldehyde, have a wide microbiocidal activity and are sporocidal and fungicidal. They are partly inactivated by organic matter and have slight residual activity. Some bacteria have developed resistance to glutaraldehyde, and it has been found that glutaraldehyde can cause asthma and other health hazards; hence ortho-phthalaldehyde is replacing glutaraldehyde [8].

Hydrogen peroxide

It is used in hospitals to disinfect surfaces and it is used in solution alone or in combination with other chemicals as a high level disinfectant. It is sometimes mixed with colloidal silver. It is often preferred because it causes far fewer allergic reactions than alternative disinfectants. Its vapor is used as a medical sterilant and as room disinfectant. It has the advantage that it decomposes to form oxygen and water thus leaving no long term residues, but hydrogen peroxide as with most other strong oxidants is hazardous, and solutions are a primary irritant. The vapor is hazardous to the respiratory system and eyes and consequently the Occupational Safety & Health

Administration (OSHA) permissible exposure limit is 1 ppm. Therefore, engineering controls, personal protective are used in the workplace. Vaporized hydrogen peroxide is one of the chemicals approved for decontamination of anthrax spores from contaminated buildings, such as occurred during the 2001 anthrax attacks in the U.S. It has also been shown to be effective in removing exotic animal viruses, such as avian influenza and Newcastle disease from equipment and surfaces. The antimicrobial action of hydrogen peroxide can be enhanced by surfactants and organic acids. The resulting chemistry is known as Accelerated Hydrogen Peroxide. A 2% solution, stabilized for extended use, achieves high-level disinfection in 5 minutes, and is suitable for disinfecting medical equipment made from hard plastic, such as in endoscopes. The evidence available suggests that products based on accelerated Hydrogen Peroxide, apart from being good germicides, are safer for humans and benign to the environment [9].

Iodine

It is usually dissolved in an organic solvent or as Lugol's iodine solution. In human and veterinary medicine, iodine products are widely used to prepare incision sites prior to surgery. Although it increases both scar tissue formation and healing time, tincture of iodine is used as an antiseptic for skin cuts and scrapes, and remains among the most effective antiseptics known. Also used as an iodophor [10].

Phenolics

They are active ingredients in some household disinfectants. They are also found in some mouthwashes and in disinfectant soap and hand washes. Phenol is probably the oldest known disinfectant as it was first used by Lister, when it was called carbolic acid. It is rather corrosive to the skin and sometimes toxic to sensitive people .Impure preparations of phenol were originally made from coal tar, and these contained low concentrations of other aromatic hydrocarbons including benzene. o-Phenylphenol is often used instead of phenol, since it is somewhat less corrosive. Chloroxylenol is the principal ingredient in Dettol, a household disinfectant and antiseptic [11].

Other

Ultraviolet germicidal irradiation is the use of high-intensity shortwave ultraviolet light for disinfecting smooth surfaces such as dental tools, but not porous materials that are opaque to the light such as wood or foam. Ultraviolet light fixtures are often present in microbiology labs, and are activated only when there are no occupants in a room (e.g., at night) [12].

Germicidal Levels may be classified in to four levels. Specific infection control activities require different levels of activity (Revised Center For Disease equipment, gas monitoring etc. should be employed where high concentrations of hydrogen peroxide
Control & infection (CDC) /Spaulding Classification and Operatory Surface Treatment Asepsis Recommendations).

• **Low Level Disinfection -** effective against some fungi, most medium sized viruses & vegetative bacteria
• **Intermediate Level Disinfection -** effective against TB, viruses, fungi and vegetative bacteria
• **High Level Disinfection -** effective against all pathogenic organisms except high numbers of bacterial spores
• **Sterilization -** effective against all pathogenic organisms including bacterial spores [13].

Principles of Infection Prevention and Control (IPAC)

The risk of infection as a result of a dental procedure is extremely low, but it represents an important patient safety consideration. By understanding how diseases are transmitted and applying infection prevention and control principles (IPAC), oral health care workers (OHCWs) can develop strategies to interrupt the transmission of micro-organisms among patients and OHCWs, and from dental instruments, handpieces, devices and equipment.
IPAC principles include:
• Patient assessment;
• Following routine practices;
• Using barrier techniques to protect both patients and OHCWs;
• Applying the principles of cleaning, disinfection, sterilization and storage of dental instruments;
• Environmental cleaning;
• Care of the overall office setting;
• Safe handling and disposal of wastes [14].

An overall IPAC program should focus on strategies to reduce the risk of transmission.
These strategies include:
a) Identifying, communicating and implementing standards and guidelines by setting specific policies and procedures;
b) Effective occupational health and safety programs for all OHCWs, such as written procedures for the workplace and guidance on immunization;
c) Educating OHCWs, as well as patients and their families, about everyone's role in infection prevention;
d) Ongoing review of policies and procedures, and evaluation of the IPAC program [15].

Handwashing

Since hands constitute a major source of cross contamination, stringent attention to hand washing is required to reduce the likelihood of spreading infectious diseases between and among patients and Dental Health Care Workers (DHCWs). All bracelets, jewelry and rings must be removed prior to washing hands and left off for

the duration of the procedure. The skin of DHCWs hands harbor resident and transient microorganisms. Most resident microorganisms found in the superficial layers of the skin are not highly virulent, but may be responsible for some skin infections. DHCWs contact with infected patients is a source of transient microorganisms on to their hands. Transient microorganisms pose the greatest risk of cross- infection. Adequate hand washing will remove or inhibit both transient and resident organisms. For routine procedures, washing with plain soap is adequate. Use antimicrobial soap for more invasive procedures, such as surgery. For all hand washing, convenient placement of sinks, towels, and soaps will encourage use by workers. Vigorously rubbing lathered hands together under a stream of water for a minimum of ten seconds is adequate for routine hand washing. Thorough rinsing under a stream of water should follow this. When using antimicrobial soap for surgical procedures, wash hands and at least 2 inches above wrists thoroughly for the length of time recommended by the manufacturer, which is usually 2 to 5 minutes. Clean under nails [16].

A disposable manicure stick may be used, but nailbrushes are not recommended, as they can become contaminated and damage the skin around the nails. Nails should be short enough to allow thorough cleaning underneath and not cause glove tears. Dry hands well before donning gloves. DHCWs with open sores or weeping dermatitis must refrain from direct patient contact and handling of patient care equipment until the condition is resolved [17].

PERSONAL PROTECTIVE EQUIPMENT

Routine use of barrier devices including eyewear, gloves, gowns and masks, is required to eliminate or reduce exposure to blood and saliva between patients and DHCWs.

Eyewear - protective eyewear (glasses with side shields, goggles, or face shield) must be worn by all DHCWs having contact with any aerosol spray, spatter or particulate matter (including nonpatient activities). Protective eyewear should be cleaned and disinfected between patients. Protective eyewear should be used by patients when risk of debris entering a patients eye is evident.

Gloves - DHCWs having patient contact must wear disposable gloves whenever there is direct or indirect contact with blood, saliva, or mucous membranes. Gloves must not be washed or reused. Gloves must be removed, disposed, and hands washed thoroughly before leaving the clinical area. Gloved hands are not to be used for non-patient activities (e.g. answering telephone, opening drawers, retrieving supplies, handling records & x rays, and pens & pencils, etc.).

Gloved hands must not be used to adjust glasses or face mask. Double-gloving may be utilized for some specific procedures, which may involve the handling of multiple sharp instruments or during longer appointments. Utility gloves should be worn while decontaminating, cleaning and preparing instruments for reprocessing. If a patient is allergic to latex, alternative barrier materials must be used [18].

Gown - exposure gowns must be worn by all DHCWs in clinical areas during occupational exposure. Exposure gowns, gloves and masks must not be worn outside designated clinical areas (e.g. in transit, lecture halls, administrative offices, cashier's line and areas where food is consumed). A clean gown must be worn each day. The gown must be changed when visibly soiled. Soiled gowns must be removed and disposed [19].

Masks - disposable masks must be worn by all DHCWs who have contact with any aerosol, spray or spatter that may be generated from a patient or contaminated materials. Masks become contaminated very quickly. Masks, like gloves, should be used for only one patient contact. When properly applied, a mask covers both the mouth and nose. A contaminated face mask worn around the neck or on the forehead between patients does nothing more than spread contamination to anything that touches the mask. Masks like gloves are single use. Mask use should be restricted to designated clinical and laboratory areas.

Protective clothing - Whenever spatter or spray is anticipated during dental procedures, the forearms of OHCWs should be protected by wearing long-sleeved protective clothing. This includes gowns and lab coats, which are meant to be worn over regular clinic clothing, such as uniforms, scrubs or street clothing. It is the dentist's responsibility to develop a policy that uniforms and scrubs worn during patient care procedures should not be worn outside the dental office.

Mouth wash - Preprocedure rinse. Rinsing with an ADA accepted antimicrobial mouthwash might reduce both aerobic and anaerobic contamination in an aerosol up to 93%. Reducing the aerosol bioburden will decrease surface contamination in and around the treatment area [20].

Minimizing Droplet Splatter By their very nature, the provision of dental services can involve the creation of droplets, spatter and spray contaminated with blood, saliva, other body fluids and debris. Rubber dam should be used whenever feasible and high-volume suction should be used whenever the creation of droplets, spatter and spray is possible [21].

Precleaning To prevent percutaneous injuries, contaminated instruments should be placed in a puncture-resistant container at the point of use and then transported

to the instrument processing area. Reusable instruments should be received, sorted, cleaned and rinsed in one section of the processing area. Cleaning involves the removal of debris (e.g. organic and inorganic matter). This is achieved either by scrubbing with a surfactant, detergent and water, or by an automated process (e.g. ultrasonic cleaner or washer with a cleaning solution). After cleaning, instruments should be rinsed with water to remove detergent residue and visually inspected to ensure all debris have been removed. The use of automated cleaning equipment can increase productivity, improve cleaning effectiveness and decrease worker exposure to blood and body fluids. Thus, using automated equipment can be safer and more efficient than manually cleaning contaminated instruments. If cleaning cannot be performed immediately, instruments should be placed in a puncture- resistant holding container and soaked with a detergent or an enzymatic cleaner to prevent drying of organic material, and make subsequent cleaning easier and less time-consuming.

Liquid chemical sterilants or high-level disinfectants (e.g. glutaraldehyde, ortho-phthalaldehyde) should not be used as holding solutions, due to the fixative nature of these chemicals making surfaces more difficult to clean, as well as their general toxicity.

PREPARATION AND PACKAGING

Suitable packaging materials include wrapped perforated instrument cassettes, peel pouches of plastic or paper, and woven or nonwoven sterilization wraps. Packaging materials should be designed for the type of sterilization process being used. Hinged instruments should be processed open and unlocked [22].

INSTRUMENT STERILIZATION

Critical and semi critical reusable equipment must be decontaminated, cleaned, packaged and sterilized in conformance routine standards of practice. The sterilization section of the processing area should include the sterilizer and related supplies, with adequate space for loading, unloading and cool down. The area may also include biological indicators and incubators for conducting spore tests, as well as enclosed storage for sterile and single-use disposable items. Heat-tolerant instruments are usually sterilized by steam under pressure (i.e. autoclaving), which is dependable and economical.

Other means include dry heat or unsaturated chemical vapour. Sterilization times, temperatures and other operating parameters recommended by the manufacturer of the equipment used, as well as instructions for correct use of containers, wraps, and chemical or biological indicators, should always be followed. Semi-critical items that are heat-sensitive should be cleaned and then receive high-level disinfection, which may be achieved by immersion in a liquid chemical germicide (e.g. 2% glutaraldehyde, 7% accelerated hydrogen peroxide, 6% hydrogen peroxide, 0.2% peracetic acid and 0.55% ortho-phthalaldehyde). Accordingly, the manufacturer's instructions regarding dilution, instrument preparation, immersion time, temperature and the changing of solutions should be followed carefully.

Non-critical items should be cleaned after use or, if contaminated, cleaned and then disinfected with an appropriate low-level disinfectant (e.g. chlorinebased products, 0.5% accelerated hydrogen peroxide, 3% hydrogen peroxide, 60 to 95% alcohols, iodophors, phenolics and quaternary ammonium compounds) [23].

Monitoring of sterilization must be conducted through a combination of mechanical, chemical and biological means, which evaluate both the sterilizing conditions and the procedure's effectiveness.

1. Mechanical indicators are the gauges or displays on the sterilizer for cycle time, temperature and pressure. Some tabletop sterilizers have recording devices that print out these parameters, which is preferred. All new sterilizers should have this feature. Mechanical indicators must be checked and recorded for each load.
2. Chemical indicators (i.e. internal and external) use sensitive chemicals to assess physical conditions during the sterilization process. For example, heat-sensitive tape, applied to the outside of a package, changes colour rapidly when a given temperature is reached. This signifies that the package has undergone a sterilization cycle, although it does not ensure that sterilization has been achieved.
3. Biological indicators (BIs or spore tests) are the most accepted means for monitoring of sterilization, because they directly assess the procedure's effectiveness in killing the most resistant micro-organisms. The spores used are more resistant and present in greater numbers than the common microbial contaminants found on patient care items. Therefore, an inactivated BI signifies that other potential pathogens in the load have been killed [24].

Set up for patient

Cover operating light handles with disposable impervious covering.

Cover headrest with disposable impervious covering.

Cover curing light tip when in use with a transparent impervious polythene sheath.

Check surgery has a sufficient supply of stock (materials, sundries and disposables) before session starts.

Check integrity and location of Emergency Equipment (Emergency Drugs box, Emergency Oxygen Cylinder and Resuscitation Equipment).

Check that ceiling lights are working normally

Check surgery floor is clean and dry and no trip risks are present.

Disinfection techniques for various Dental Armamentarium

Anaesthetic cartridges

- Single patient use only
- Discard into sharps container

Prosthetic/orthodontic appliances

- Treat as for impressions.
- If gross contamination an ultrasonic bath containing a general purpose neutral detergent and water solution should be used for cleaning prior to rinsing and disinfection.

Aspirators/tubing Clean regularly according to manufacturer's instructions and flush through daily with their recommended non-foaming disinfecting agent.

Steel burs and debonding burs: Disposable, clinician to discard into sharps container after single use. Tungsten Carbide, Diamond burs, Finishing burs and Stones: Preclean then sterilise in an autoclave after each patient use.

Bracket tables Wash daily and between each patient using the appropriate detergent wipe. In the event of contamination, clean with appropriate detergent wipe and then wipe over with 70% isopropyl alcohol impregnated wipe.

Chair: hand controls Clean daily and between each patient, before use, using an appropriate detergent wipe. Protect during procedures with disposable impervious cover - discard after each patient and wipe over with appropriate detergent wipe.

Cavitron Handpieces Wipe over between use with appropriate detergent wipe and 70% isopropyl alcohol impregnated wipe.

Cavitron heads A sterile Cavitron head must be used for each patient. Pre-clean and autoclave after each use, or discard into sharps container if disposable.

Curing light Cover tip when in use with a transparent impervious polythene cover. Wipe over after use with appropriate detergent wipe.

Handpieces A sterilised hand piece must be used for each patient:

 Remove bur during cleaning to prevent contamination of hand piece bearing.
 Clean outside of hand piece with appropriate detergent wipe - Do not immerse; do not use alcohol wipes
 Lubricate hand piece with pressurised oil, as recommended by the manufacturer, until clean oil appears out of the chuck
 Clean off excess oil
 Lubricate hand piece after sterilisation, if recommended by manufacturer
 Run hand piece briefly before use to clear excess lubricant

Each morning run for 2 minutes before use to clear the water line. If the unit has been out of operation for more than a few days, increase time to 5 minutes.

Headrests Use disposable cover and discard after each patient. Wipe over between patients with the appropriate detergent wipe.

Impressions It must be decontaminated before leaving the surgery. Immediately on removal from the mouth, rinse under running water until visibly clean to remove saliva, blood and debris – Avoid splashing. After cleaning as above (except for hydrocolloid or polyether impressions); disinfect by immersion in chlorine releasing agent 10,000 ppm available chlorine for 10 minutes. Rinse well again under running water.

Hydrocolloid or polyether impressions:

 Dip the rinsed impression in chlorine releasing agent 10,000 ppm available chlorine rinse under running water
 Dip again in the chlorine releasing agent
 Cover with gauze dampened in above disinfectant solution, for 10 minutes
 Rinse well under running water
 Store for transport as per manufacturers' instructions

M**atrix bands** Disposable - discard into sharps box after single patient use.

Mouthwash cups Disposable - discard after single patient use.

Needles Disposable – clinician to discard into sharps containers after single patient use

Operating light Clean daily before use and after each patient with the appropriate detergent wipe. Protect handles during procedures with disposable impervious cover, discarded after each patient and wiped down with appropriate detergent wipe.

Saliva ejectors Use disposable or autoclave between patients.

Spittoon Clean using appropriate detergent wipe as often as required.

Sinks Clean using appropriate detergent wipe, once a day or as often as required.

Syringe 3-in-one Use disposable tips for each patient. Use disposable cover and discard after each patient. Each morning run for 2 minutes before use to clear the water line. If the unit has been out of operation for more than a few days, increase time to 5 minutes.

Work Surfaces Wipe over with appropriate detergent wipe. Work Practice Controls eliminate or reduce the likelihood of exposure by changing the way a task is performed; in the absence of engineering controls, work practice controls must be emphasized.

Examples of work practice controls include: unit dose dispensing

• Removing masks by ties

• Isolation of chart and x-rays
• Announcing instrument passes
• One-handed scoop technique for needle recapping
• Alterative treatment arrangements for latex sensitive patients
• Replacing sharps containers before they are allowed to be overfilled
• Passing instruments with sharp ends pointing away from all persons
• Minimizing uncontrolled movement of sharp instruments under force
• Decontaminating and cleaning instruments prior to return to dispensary
• Disposing used impression material, dispensing tips and etches applicators
• Placing mask and eye protection before washing hands and donning gloves
• Obtaining retraction cord and wedges with uncontaminated scissors and cotton forceps
• Using instruments instead of fingers to retract tissues during suturing and anesthetic injections
• Use of barriers when touching surfaces that cannot be disinfected (e.g. computer keyboard if used in clinic or with digital x-ray equipment)

Dental laboratory practice (laboratory procedures are semi-critical) Equipment, instruments, supplies & patient related items transferred to the dental laboratory must be sterilized or disinfected. Items being transferred must be place in a transport bag. Equipment, supplies and patient related items used during the dental laboratory phases of patient care may be unavoidably exposed to pathogenic organisms through contact with saliva. Dried saliva presents a risk for cross contamination from patient-to-patient or to DHCW. Standard precautions must be employed during laboratory procedures. Laboratory procedures should be completed in the dental laboratory not a clinic operatory. Impressions must be thoroughly rinsed to remove saliva, blood and debris. Impressions must be disinfected prior to initiation of any procedure. Models must be disinfected after contact with a prosthesis or appliance that has been in a patient's mouth

RADIOLOGY PROCEDURES (RADIOLOGY PROCEDURES ARE SEMI-CRITICAL)
The following steps must be used during radiological procedures.
• Place barriers on x-ray machine control panel and door handle
• Wear gloves while positioning and exposing films
• Place exposed films in a transport cup
• Remove barriers and disinfect surfaces in the x-ray room
• Digital x-ray equipment - barriers for clinical contact surfaces
• Digital x-ray sensor - clean & disinfect with an intermediate level disinfectant after barrier removal
If using an x-ray processor with a daylight loader care is required to avoid contamination of the sleeves, external and internal components.
• Place the cup containing exposed film packets inside the daylight loader
• Wearing clean powder free glove [25].

BIOPSY SPECIMENS & EXTRACTED TEETH
Biopsy specimens and extracted teeth are potentially infectious because they contain blood. Standard Precautions must be employed whenever biopsy specimens or extracted teeth are handled. All persons who collect, transport, or manipulate extracted must use standard precautions. Extracted teeth should be immersed in a fresh solution of chemical germicide (dilute household bleach, or buffered formalin) suitable for fixation. Extracted teeth containing amalgam restorations must be managed utilizing mercury hygiene practices including collection and storage for amalgam recycling.

REGULATED WASTE For the purposes of infection control, waste from dental offices can be divided into two categories: biomedical waste and general office waste. Ontario legislation dictates that biomedical waste must be handled and disposed of in a manner that avoids transmission of potential infections. Biomedical waste is classified as hazardous waste and must not be disposed with regular garbage. It must be handled safely to protect human health and the environment. In general, all biomedical waste must be stored in colour-coded containers that are marked with the universal biohazard symbol & released to an approved biomedical waste carrier for disposal. Biomedical waste can be further divided into anatomical and non-anatomical waste.

i) Anatomical waste (i.e. human tissue)
The generation of anatomical waste is normally limited to oral surgeons and periodontists, such as in the course of harvesting human tissue for treatment. Anatomical waste must be separated and collected in a RED liner bag that is labelled with the universal biohazard symbol.

ii) Non-anatomical waste (i.e. sharps and blood-soaked materials)
Sharps (e.g. needles, syringes with needles, scalpel blades, clinical glass) must be separated and collected in a YELLOW puncture-resistant, leak-proof container that is specifically designed for their management and labelled with the universal biohazard symbol. Once the container has reached the designated capacity, it must only be released to an approved biomedical waste carrier for disposal. Non-anatomical waste also includes blood-soaked materials that release liquid or semi-liquid blood if compressed.

General office waste
General office waste is no more infective than residential waste. Therefore, the majority of soiled items generated in dental offices do not require any special disposal methods,

other than careful containment and removal. Some recommendations for all types of general office waste include:

• Ensure all garbage containers are waterproof and have tight-fitting lids, preferably operated by a foot pedal. Open wastebaskets might be dangerous if children are around them.

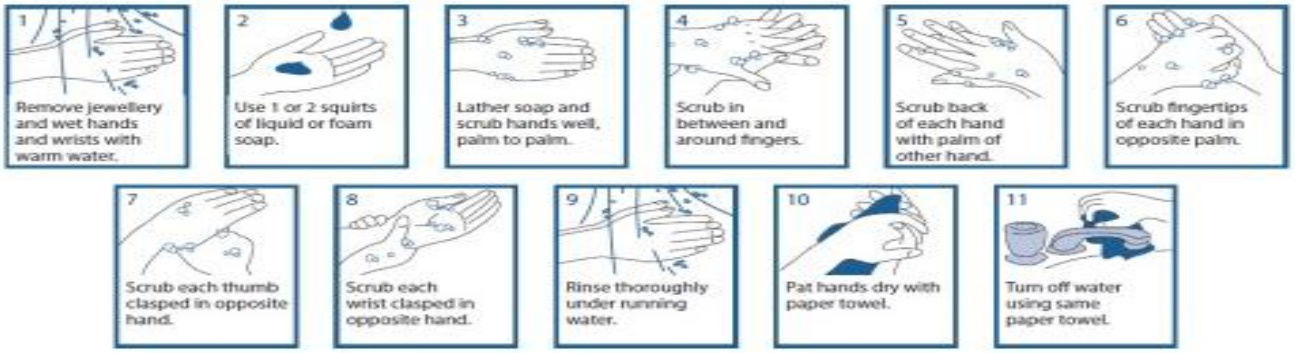
• Use plastic bags to line the garbage containers. The use of double-bagging is not necessary, unless the integrity of the bag is jeopardized or the outside is visibly soiled.

• Do not overfill garbage containers.

• Do not place sharp, hard or heavy objects into plastic bags that could cause them to burst [18].

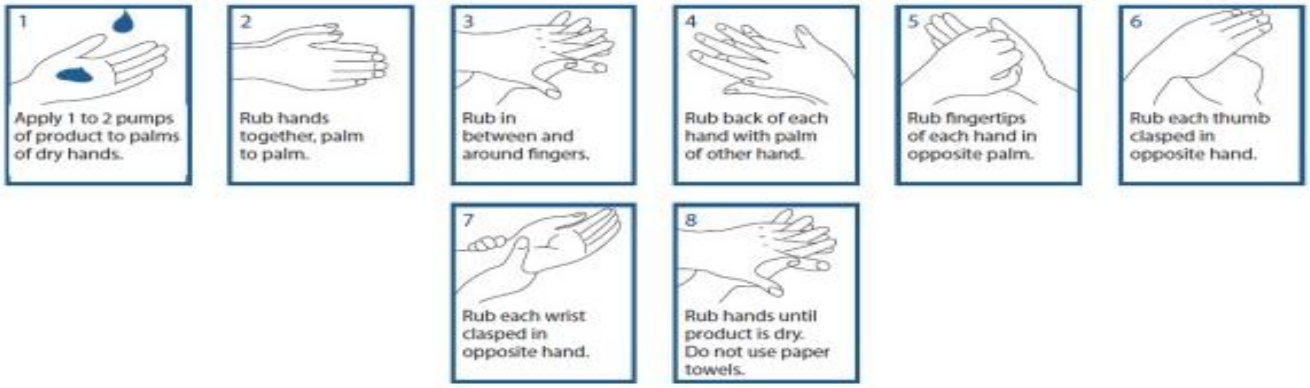
Category	Definition	Processing
Critical items	Penetrate soft tissue or contact bone (e.g. all surgical instruments, sterilization periodontal scalers, etc.)	Cleaning followed by sterilization
Semi-Critical items	Contact mucous membranes or non-intact skin (e.g. mouth mirrors amalgam condensers, reusable impression trays, handpieces, etc.)	Cleaning followed by sterilization
Non-Critical items	Contact intact skin, but not mucous membranes, or do not directly contact low-level disinfection the patient (e.g. radiograph head/cone, blood pressure cuff, facebow, pulse oximeter, etc.)	Cleaning followed by disinfection

Figure 1. Handwashing with soap and water



Courtesy: Ontario Ministry of Health and Long-Term Care

Figure 1. Cleaning with alcohol-based hand rub



Courtesy: Ontario Ministry of Health and Long-Term Care

CONCLUSION

OHCWs must maintain current knowledge of infection prevention and control procedures, and apply and maintain them appropriately and consistently.

To this end, it is the dentist's responsibility to ensure that staff are adequately trained in infection prevention and control procedures, and that the necessary supplies and equipment are available, fully operational, up-to-date and routinely monitored for efficacy. In addition to professional obligations, dentists also have an ethical duty to maintain a safe and healthy office environment for both patients and staff, and to adhere to all rules and regulations related to the operation of a dental practice, including workplace health and safety and environmental protection.

REFRENCES

1. Alfa MJ.et.al. (1994). In-hospital evaluation of ortho-phthalaldehyde as a high level disinfectant for flexible endoscopes. *Journal of Hospital Infection*, 26, 15-26.
2. Alvarado CJ et.al. (2000). APIC guidelines for infection prevention and control in flexible endoscopy. *American Journal of Infection Control*, 22, 19-38.
3. Buckthal JE et.al. (1988). Survey of sterilization and disinfection procedures. *J Clin Orthod*, 22, 22-8.
4. Ayliffe GA et.al. (1992). Sterilization of arthroscopes and laparoscopes. *Journal of Hospital Infection*, 22, 265-269.
5. Cash RG et.al. (1990). Trends in sterilization and disinfection procedures in orthodontic offices. *Am J Orthod Dentofacial Orthop*, 98,292-9.
6. Breslin et.al. (1996). Tuberculosis – the threat re-emerges. *Anaesthesia and Intensive Care*, 24,176-179.
7. Velez AE et.al. (1998). An evaluation of sterilization of endodontic instruments in artificial sponges. *J Endod*, 1, 51-3.
8. Fraud S et.al (2001). Comparison of the mycobactericidal activity of ortho-phthalaldehyde, glutaraldehyde and other dialdehydes by a quantitative suspension test. *Journal of Hospital Infection*, 48,214-221.
9. Matlack RE et.al. (1979). Instrument sterilization in orthodontic offices. Angle Orthod 49,205-21.
10. Blair FM et.al. (1996). A survey of the methods of disinfection of dental impressions used in dental hospitals in the United Kingdom. *Br Dent J*, 180,369-75.
11. McDonnell G et.al (1999). Antiseptics and disinfectants: activity, action and resistance. *Clinical Microbiology Reviews*, 12,147-179.
12. Venkatasubramanian R et.al (2010). Comparison of the effectiveness of sterilizing endodontic files by 4 different methods: an in vitro study. *J Indian Soc Pedod Prev Dent*, 28, 2-5.
13. Jeffries CLet.al. (1991). The effects of 2% alkaline glutaraldehyde solution on the elastic properties of elastomeric chain. *Angle Orthod*, 61, 25-30.
14. Rutala WA et.al (1999). Disinfection of endoscopes: review of new chemical sterilants used for high-level disinfection. Infection Control and Hospital Epidemiology, 20, 69-76.
15. Benson PE et.al. (2007). Decontamination of orthodontic bands following size determination and cleaning. *J Orthod*, 34, 18-24
16. Rutala WA et.al. (1999). Patient injury from flash-Sterilized instruments Infection Control and Hospital Epidemiology 1999; 20,458.
17. Schrader ES et.al (1992). Flash sterilization: is it safe for routine use? *AORN Journal*, 55, 1547-1551.
18. Mazzocchi AR et.al. (1994). Effects of 3 types of sterilization on orthodontic pliers. J Clin Orthod, 28,644-7.
19. Geiss HK et.al. (1995). Reprocessing of anaesthetic and ventilator equipment. *Journal of Hospital Infection*, 30, 414-420.
20. Walsh SE et.al. (1999). Ortho-phthalaldehyde: a possible alternative to glutaraldehyde for high level disinfection. *Journal of Applied Microbiology*, 86, 1039-1046.
21. George O et al (2005). Effect of surgical sterilization procedures on orthodontic pliers: a preliminary report. *Eur Cells Materials*, 10, 13.
22. Mayberry DRet.al. (1991). Effects of disinfection procedures on elastomeric ligatures. *J Clin Orthod*, 30, 49-51.
23. Hohlt WF et.al. (1990). Sterilization of orthodontic instruments and bands in cassettes. *Am J Orthod*, 98,411-6.
24. Hogarth I et.al. (1996). Anaesthetic machine and breathing system contamination and the efficacy of bacterial/viral filters. *Anaesthesia and Intensive Care*, 24, 154-163.
25. Manian AF et.al.(1993) . Is eliminating flash sterilization practical? Infection Control and Hospital Epidemiology, 14, 479-480.