Review Article

Dental Office Design and Waste Care Management in Infection Control

Sindhuja Krishnan, Saravana Pandian[1]

Department of Orthodontics and Dentofacial Orthopaedics, Madha Dental College, Dr. MGR University, [1]Department of Orthodontics and Dentofacial Orthopaedics, Saveetha Dental College, Saveetha University, Chennai, Tamil Nadu, India

Abstract

Infection control is the most vital and fundamental aspect of health-care practice pertaining to the faculties of medicine, surgery, or dentistry. The nature of dental procedures involves occupational exposure to blood and saliva that might carry these microorganisms. Dental health-care professionals and dental patients are, therefore, at a high risk for developing infectious diseases. This article emphasizes the importance of infection control in a dental office. It describes the protocol to be followed in a dental clinic setup. Steps in health care waste management have also been discussed. It is extremely important for a dentist to follow a protocol to facilitate cross-infection control in the office and to prevent cross-contamination between the patients, dentists, assistants, and ancillary staff. Personal protection, decontamination/sterilization of instruments and materials, and formulation of an infection control policy have been discussed.

Key words: Cross-infection, dental clinic, dentistry, disinfection, sterilization

Introduction

Infection control may be defined as the feature of health-care practice which entails processes that render used instruments safe for re-use in clinical practice, control the spread of cross-contamination in health-care settings by nullifying or limiting the exposure to pathogenic microorganisms, increasing the resistance to infectious diseases, effective health care waste management, and management of infected health-care service providers.[1]

With the resurgence of blood-borne pathogens and infections such as pneumonia, tuberculosis, and encephalopathies and highly resistant bacteria such as the methicillin-resistant *Staphylococcus aureus*, the threat of cross-infection in clinical orthodontic practice has magnified.[1,2] The oral environment is conducive to the growth and multiplication of many bacteria, virus, fungi, etc., As per the "chain of infection," as given by the Centers for Disease Control, it is vital for a dentist to be aware of it to help effectively break it.[3]

In 1985, the Council of Dental Therapeutics stated that infection control programs should have four goals: (1) reduce the number of available pathogenic microbes to a level where the normal resistance mechanisms of the body can prevent infection, (2) break the cycle of infection and eliminate cross-contamination, (3) treat every patient as though capable of transmitting infection, (4) protect patients and all dental personnel from infection and its consequences and protect all dental personnel from the threat of malpractice suit.[4] There are multitude pathways for cross-contamination in the dental office, the main being:[5,6]

- Patient to dental team
- Dental team to patient
- Patient to patient
- Dental office to community, including the dental team's families.

Dental Office Design

Most of the dental offices have been designed around concepts that support production with little or no regard to infection control.[7]

Address for correspondence: Dr. Sindhuja Krishnan, Department of Orthodontics and Dentofacial Orthopaedics, Madha Dental College, Dr. MGR University, Chennai, Tamil Nadu, India.
E-Mail: reachsindhuja@yahoo.com

How to cite this article: Krishnan S, Pandian S. Dental office design and waste care management in infection control. Int J Pedod Rehabil 2016;1:37-41.

This article describes in detail the elements of a dental office design for effective infection control. The success of an effective infection control program depends, in part, on proper office design. The following areas should be addressed.[5,8]

- Floor plan and traffic flow
- Materials
- Fixtures
- Operatory design
- Instrument recirculation center (IRC).

Treatment areas are defined as any area where direct intraoral mucosal contact occurs. Examples of areas where direct mucosal contact occurs are operatories, radiographic processing areas, and oral hygiene instruction areas.

Treatment support areas are where indirect patient contact occurs through directly handling contaminated procedure support items such as impressions, instruments, and exposed film. Examples of these areas are the laboratory, IRC, and radiograph processing room.

Nontreatment areas usually require no direct patient contact. The business office, reception room, patient lavatory, staff lavatory, staff lounge, and private offices are considered nontreatment areas.

Floor plan and traffic flow

Most design errors begin when workspace requirements have been either overlooked or mismanaged.[7] Workspace is the amount of area necessary to carry out operational tasks or functions required for production. Insufficient workspace forces workers to function inefficiently. Furthermore, exposed items and surrounding surfaces become contaminated from splash and spatter.[7]

Patient treatment areas generate the highest level of microbial-laden spatter. These areas must be separated from the treatment support area as well as the nontreatment areas. Careful office planning in design and remodeling can maximize this reduction [Figure 1].

Patient and visitor traffic flow must avoid passage through the laboratory, IRC, or other treatment and support areas.

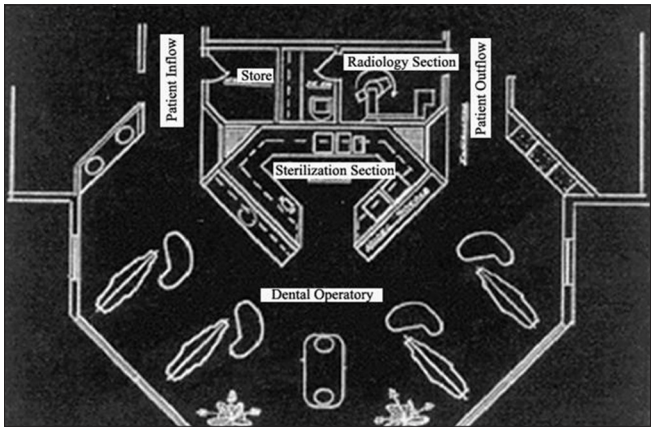

Figure 1: Dental office design.

Direct access should be available from the reception area to the scheduled operatory. Consultation areas should be located closest to the administrative and reception areas, followed by the hygiene/patient education room(s) and full treatment operatories. Longer appointments should be scheduled in the most distant operatory with short visits scheduled in the first treatment rooms. This directs the heaviest flow of patient/visitor traffic away from extensive treatment and treatment support areas.

The laboratory should be accessible to the treatment areas that require laboratory support. A utility room containing the central vacuum and air compressor is best located adjacent to the laboratory to provide access for cleaning of filters and traps. A private entrance for staff is desirable and should be located with the staff lounge and lavatory in a remote yet accessible area. The private office should be located away from treatment and support areas unless it is used for patient consultation.[7]

Materials

All floors, walls, surfaces, cabinets, drawers, and equipment must be capable of being quickly and easily cleaned and disinfected. The use of wood surfaces, textured wall coverings, stuffed animals, and fabrics for decoration should be minimized. Smooth and seamless nonporous materials will inhibit the collection and protection of microbes.

Carpet should not be used in treatment or treatment support areas. Continuous roll hard vinyl floor covering has been recommended for several years. Tile squares create cracks and crevices that harbor debris. Some carpeting is now available with an antimicrobial agent, but as of now, it is relatively untested.

Dimethyl methylacrylate (Corian-DuPont) is a nonporous, nonstaining material that will not chip, discolor, or crack according to the manufacturer. It may be used for backsplash, counters, cabinet fronts, dental cart top surfaces, or sinks. It is also available as a "coating" for the existing structures. Extremely white surfaces should be avoided, as some surface disinfectants may discolor certain materials over a period of time.[8]

Aluminum should also be avoided on drawer handles, pulls, or switches, as it can also be affected by some chemical agents.

Fixtures

Sink faucets, liquid dispensers, and waste receptacles

Carefully choosing fixtures that require minimal hand contact will maximize the effectiveness of the infection control program. Sink faucets and soap or lotion dispensers should be foot or arm operated. Electric "eye" sink faucets and dispensers are available and may be an attractive alternative. Paper towel dispensers also pose a contamination dilemma. "No touch" wall-mounted towel dispensers are preferred. Hand-controlled sink faucets, if present, should be turned off using a paper towel after handwashing and drying. Cloth towels should never be used, as they retain a high number of microbes and serve as a source of cross-contamination.[9]

Waste receptacles in the treatment and support areas should be recessed into countertops or cabinet fronts. Openings should be large enough to dispose of debris with ease. Treatment room receptacles should be used for handwashing waste only. "Medical waste" items taken from the mouth and soaked with blood or saliva (e.g., cotton rolls, gauze, pellets, and tissue "packs" from treatment procedures) should be disposed into biohazard containers in accordance with the governmental regulations. Puncture-resistant leak-proof biohazard containers must be used for "sharps" (for example: needles and BP blade).

Operatory design

Historically, dental manufacturers designed equipment and support cabinetry for the doctor in a two-handed dentistry situation. An overabundant supply of cabinetry and equipment, positioned for doctor-only access, encouraged the doctor to "reach out and touch something" with contaminated hands.[10]

The operatory should be designed with adequate work surface to accommodate preset procedure trays and support armamentarium. Drawers should be deep enough to accommodate sterile packages of extra instruments, burs, and disposables. Drawers should be made of impervious materials and should be easily removable for cleaning and disinfection.

All instruments should be retrieved from the IRC and returned at the conclusion of the treatment. Cabinetry must also support small auxiliary equipment such as curing lights, and other support items that are impractical to remove from the operatory after each appointment. Be sure to protect these items from aerosol and spatter. Work areas must have a positive ventilation to control noxious vapors from various chemicals used in laboratory and sterilization areas. In addition, considering that microbes are inevitably transported from one area to another via ventilation systems, these systems must be designed to prevent recirculation of contaminated air.

Heating, ventilation, and air conditioning system should have filters to prevent the transfer of microbes. Filters also must be maintained properly.[10]

Instrument recirculation center

The IRC has been the most overlooked and underestimated space in dental office design**.** The IRC serves as the nucleus of the office infection control program and therefore must be conveniently located to all treatment areas.[11] The IRC must also be designed in an area that avoids direct patient traffic pathways. The schematic representation of sterilization room has been depicted [Figure 2].

The IRC serves the following needs:

- Precleaning of all contaminated instruments
- Drying, sorting, and packaging items
- Sterilization (heat and chemical)
- Storage.

Preventive Care

Prevention of disease can be achieved through the following methods:

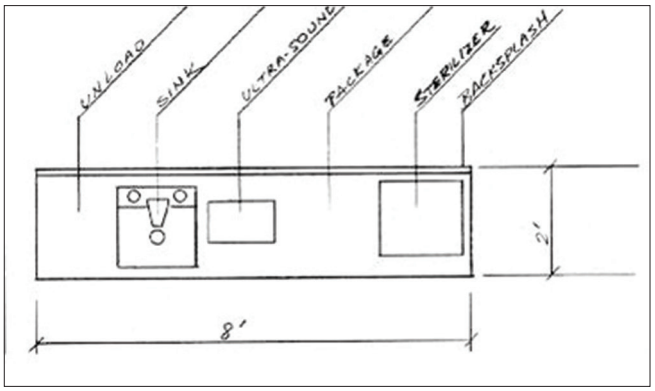

Figure 2: Schematic representation of sterilization room.

1. Screening
2. Instituting an infection control programme.

Screening

This is the first step to be initiated in a dental office practice and more specifically in the orthodontic office. Before beginning treatment for any individual, the orthodontist must obtain the relevant medical and dental history from the patient for possible systemic diseases.[12] This would help in ruling out the presence of any infections in the patient's body and also help in diagnosing latent or subclinical infections. A consultation with the physician must also be carried out if doubt arises.[13,14]

Instituting an infection control program

The primary goal of an infection control program is to provide a safe working environment that will reduce the risk of health care-associated infections among patients and occupational exposures among dental health-care personnel.[14]

Objectives of the infection control program

- Monitoring of hospital-associated infections
- Training of staff in prevention and control of hospital-associated infections
- Investigation of outbreaks
- Controlling the outbreak by rectification of technical lapses, if any
- Monitoring of staff health to prevent staff to patient and patient to staff spread of infection
- Advice on isolation procedures and infection control measures
- Infection control audit including inspection of waste disposal.

Infection control team

The functions of the team are many. However, certain core activities are included within the purview of all infection control teams (ICTs).[11] These can be broadly classified as:

- Policy formulation and implementation
- Education: To facilitate the implementation of infection control policies, all grades of staff need educational input. This may be in the format of presentations or teaching sessions to particular staff groups, but most often takes the form of giving timely advice regarding a particular situation or problem

- Surveillance: Various surveillance methods can be used to identify patients at a particular risk from infection and to identify the need for changes in practice as well as monitoring local infection trends
- Monitoring/audit: ICTs have an important role in the audit of infection control practices to monitor adherence to policies. A set of standards and audit criteria for various equipment are essential for this process
- Advice/liaison: To achieve this, it needs to encourage all grades of staff to use their ICT as a resource for advice and information. This may cover many different aspects of health care ranging from the care of an individual patient, or the correct decontamination of a piece of equipment.

Waste management in dental office

Dental office is subjected to a variety of federal, state, and local regulations concerning infection control, hazardous material handling, employee safety, and waste management issue both in India and abroad.

All employees must be knowledgeable of occupational safety and health administration (OSHA) regulations concerning blood-borne pathogens, hazardous materials, and safe use of chemicals in the laboratory.[15,16] The environmental protection agency has standards, many of which are applicable to dentistry, for both workplace exposure levels to chemicals, heat, and radiation, and for discharge and final treatment of waste material. A summary of the types of medical waste is shown in Table 1.[17]

Medical waste items in dentistry

- Sharps used and unused needles, scalpel blades, sutures, instruments, burs, and broken glass
- Human tissue removed during surgery of teeth and incidental tissue
- Blood-soaked materials: Soaked cotton, gauze, pellets, and tissue coverings
- Infectious waste management.

Blood in a liquid form

In the overwhelming number of areas, blood (even mixed with other fluids, such as saliva) can be poured or evacuated into the office/clinic waste water system through the evacuation lines. Sink traps and evacuation lines should be thoroughly rinsed at least daily. It would be helpful if a disinfectant solution (e.g., an iodophor that is going to be disposed of at the end of the day) were drawn through the lines. Final rinsing with water is required, especially if a bleach solution is used.[16]

Pathologic waste (teeth and other tissues)

Steam autoclaving is the method of choice. Pathologic waste should be wrapped before disposing. Any autoclavable plastic/plastic paper bag or pouch can be used. One common problem involved is the treatment of teeth containing amalgam restorations. The heat of sterilization could create dangerous mercury vapors, hence amalgam-restored teeth can be disinfected before disposal. Ideally, a sterilizing chemical (e.g., full strength-activated glutaraldehyde) should be used. A tooth could be added to a small volume of fresh glutaraldehyde held within a selected container. Exposure should be for at least 30 min.

Sharps

One form of medical waste known to be capable of transmitting disease is a contaminated sharp. Sharps are items that can penetrate the skin and include injection needles, scalpel blades, sutures, instruments, and broken glass. In the orthodontic office, sharps include discarded archwires, cut ligature ties, band material, and bands. The OSHA regulations indicate that immediately after use, disposable sharps should be placed in closeable, leak-proof, puncture-resistant containers called "sharp boxes" [Figure 3]. These containers must be labeled with a biohazard symbol and color-coded for easy identification. For ease of handling, a small bag is attached to the cabinet or unit for each patient.[18]

Proper handling of sharps is essential because common personal protective barriers, such as gloves, will not prevent needle-stick accidents. To minimize the potential for accidents, needles should not be recapped, bent, broken, or manipulated by unprotected hands. The use of some types of protective cap holding device or replacement of the capping sheath by "the scoop technique" with the syringe held in one hand is required.[19] The color coding of waste collection boxes is shown in Table 2.

Thus, to summarize the steps in health care waste management are:[20]

- Segregation
- Decontamination
- Deformation containment
- Transportation
- Final disposal.

Table 1: Type of waste

Term	Definition
Infectious waste	"Waste capable of causing an infectious disease"
Contaminated waste	"Items that have had contact with blood or other body secretions"
Hazardous waste	"Waste posing a risk or peril to humans or the environment"
Toxic waste	"Waste capable of having a poisonous effect"
Medical waste	"Any solid waste which is generated in the diagnosis, treatment, or immunization of human beings or animals in research pertaining thereto, or in the production or testing of biological material. The term does not include any hazardous waste or household waste"

Table 2: Color coding of waste collection boxes

Waste class	Color code
Contaminated sharps and blades	Yellow
Blood and body fluids, soaked gauze pieces	Red
Discarded medicine	Blue
Noninfectious waste such as stationery	Black

Figure 3: Sharp boxes.

Conclusion

It is the responsibility of the dentists to implement effective and efficient infection control policies in the dental office that would help prevent the outbreak of infections and cross-contamination, thereby safeguarding not only their own health and of the dental assistants but also of the ancillary staff, and even the community.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. British Dental Association. Infection Control in Dentistry. BDA Advice Sheet A12. London: British Dental Association; 2003.
2. Infection control recommendations for the dental office and the dental laboratory. ADA Council on Scientific Affairs and ADA Council on Dental Practice. J Am Dent Assoc 1996;127:672-80.
3. Recommended infection-control practices for dentistry, 1993. Centers for Disease Control and Prevention. MMWR Recomm Rep 1993;42:1-12.
4. Guidelines for infection control in the dental office and the commercial dental laboratory. Council on dental therapeutics. Council on prosthetic services and dental laboratory relations. J Am Dent Assoc 1985;110:969-72.
5. Cottone JA, Terezhalmy GT, Molinari JA. Practical Infection Control in Dentistry. 2nd ed. Baltimore: Williams and Wilkins; 1996.
6. Anil S, Samaranayake LP, Krygier G. Practical Infection Control in Dentistry. 1st ed. Delhi: AITBS Publishers and Distributors; 1999.
7. Hamula W. Orthodontic office design. Planning a sterilization area. J Clin Orthod 1991;25:375-81.
8. Rosa AC, Brusca MI, Manto MC, Mosca CO, Nastri N. Effects of handling and storage on sterile dental instruments. Acta Odontol Latinoam 2001;14:35-9.
9. Drake DL. Optimizing orthodontic sterilization techniques. J Clin Orthod 1997;31:491-8.
10. Bentley EM, Sarll DW. Improvements in cross-infection control in general dental practice. Br Dent J 1995;179:19-21.
11. Payne GS. Sterilization and disinfection in the orthodontic office: A practical approach. Am J Orthod Dentofacial Orthop 1986;90:250-2.
12. Unthank M. Dental office planning. J Am Dent Assoc 1999;130:1579-82.
13. Kumar Vinay KR, Mogra S, Shetty Surendra V. Hepatitis B: Facts and concerns to orthodontist in India. J Indian Orthod Soc 2007;41:30-4.
14. Shulman ER, Brehm WT. Dental clinical attire and infection-control procedures. J Am Dent Assoc 2001;132:508-16.
15. Occupational Safety and Health Administration. Regulations. 29 CFR Part 1910, Department of Labor, OSHA, 1991.
16. Miller C, Paelnik CJ. Infection Control & Management of Hazardous Materials for the Dental Team. 3rd ed. St.Louis, Missouri: CV Mosby Co.; 2005.
17. Park K. Preventive and Social Medicine. 19th ed. Jabalpur, India: Banarsidas Bhanot Publishers; 2007. p. 644-50.
18. Bellavia DC. Efficient and effective infection control. J Clin Orthod 1992;26:46-54.
19. Matlack RE. Instrument sterilization in orthodontic offices. Angle Orthod 1979;49:205-11.
20. Pushpanjali K, Shaik Hyder Ali KH, Srivastava BK. Safe management of dental health care waste. J Indian Dent Assoc 2003;74:29-33.