IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 15, Issue 2 Ver. VIII (Feb. 2016), PP 10-15
www.iosrjournals.org

Infection Control In Dental Office: A Review

Dr Julie George Alapatt[1], Dr Neenu Mary Varghese[2], Dr Joy P T[3],
Dr Mohamed Saheer K[4], Dr Bennett Atlin Correya[5],
[1](assistant professor , Department of prosthodontics , govt dental college , thrissur,
[2](senior resident , Department of prosthodontics , govt dental college , calicut
[3](assistant professor , Department of prosthodontics , govt dental college ,calicut
[4](assistant professor , Department of prosthodontics , govt dental college , calicut
[5] assistant professor , Department of prosthodontics , govt dental college , calicut

Abstract: *From an infectious point of view, dentistry has never been safer than it is today for both patients and dental team. This state of affairs has resulted from establishment and practice of strict infection control in the office using universal precautions. Implementation of universal infection control in dentistry, entails the prevention of infection transmission within the dental clinic environment and assumes that all patients are carriers of infectious diseases. Implementing safe and realistic infection control procedures requires the full compliance of the whole dental team.. Hence, this literature review upgrades our knowledge on the pros and cons of all the available measures and techniques in the field of infection control in dental office and laboratory*
Keywords: *infectious diseases , dental office , waste management*

I. Introduction

Implementation of universal infection control in dentistry, entails the prevention of infection transmission within the dental clinic environment and assumes that all patients are carriers of infectious diseases[1]. Such a policy protects both patients & staff, reduces staff concerns & prevents discrimination against patients. Implementing safe and realistic infection control procedures requires the full compliance of the whole dental team. These procedures should be regularly monitored during clinical sessions. Hence, this literature review upgrades our knowledge on the pros and cons of all the available measures and techniques in the field of infection control in dental office and laboratory.

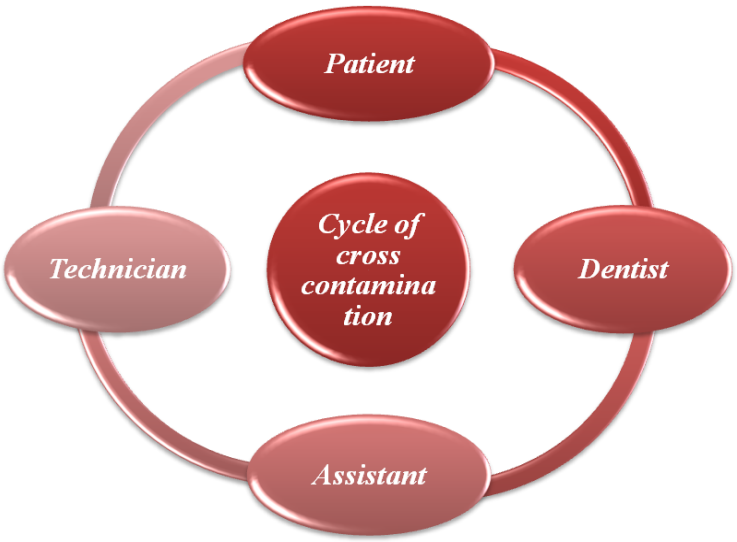

Fig 1: cycle of cross contamination

There are a number of elements in a comprehensive infection control protocol:

- ***Patient evaluation***
- ***Personal protection***
- ***Instrument cleaning, sterilization and storage***
- ***Use of disposables***
- ***Disinfection***
- ***Laboratory asepsis***
- ***Disposal of waste***

PATIENT EVALUATION: A thorough medical history should be taken from each patient and updated at each recall visit. In taking a history the practitioners should identify the infectious disease of concern, and relevant questions should be asked to disclose sensitive personal information and identify patients who are either particularly susceptible to infection or who are at risk of transmitting infection, known as carriers of disease or by being in a high-risk category[1]. The most common route of transmission of infection :

a) Direct contact (e.g. blood)
b) Indirect contact (e.g. instruments)
c) Contact of oral mucosa with droplets generated from an infected person (e.g. by coughing, sneezing, or talking);
d) Inhalation

Effective infection-control strategies prevent disease transmission by interrupting one or more links in the chain.[2]

PERSONAL PROTECTION

A. Personnel Health Elements of an Infection Control Program[3]
Education and training. .
Immunizations, exposure prevention and post exposure management, Medical condition management and work-related illnesses and restrictions
Health record maintenance
Blood borne Pathogens
Preventing Transmission of Blood borne Pathogens

The personal hygiene of all staff members who are either directly or indirectly in contact with patients should be scrupulous. Hand hygiene, the most cost effective and easy practice which can reduce potential pathogens is considered the single most critical measure for reducing the risk of transmitting infection to patients and health care professionals.[4-7] The dental personnel should refrain from touching anything not required for the particular procedure. They should cover cuts and bruises on fingers with dressings because they serve as easy portals for infections . Fingers are the most common vehicles of infection transmission.[8, 9] A clean sink should be provided for hand washing, and the taps should be elbow , foot control, or sensor operated . Keep finger nails short and clean. Jewellery should be removed as they tend to entrap organisms and damage gloves. Liquid soap should be used for routine hand washing and antimicrobial liquids for hand washing prior to surgical procedures. Gloves should be worn as the last step before treatment commences. A freshly laundered uniform or overgarment should be worn by all clinical personnel.

Use of dental instruments and air-water syringes creates droplets of water, saliva, blood, microorganisms, and other debris. Aerosols remain suspended in air for long time and can be inhaled [10] .Appropriate work practices, including use of dental dams [11]and high-velocity air evacuation, should minimize dissemination of droplets, spatter, and aerosols. [12] Barrier protection include use of gloves, eye shields, face masks and rubber dam isolation. OSHA regulations specify that all clinical personnel must wear treatment gloves during all treatment procedures. Gloves must meet new Food and Drug Administration (FDA) regulation, less than 4 per 100 can have a leak detectable by a water test. Hand cleansers containing a mild antiseptic like 3% PCMX (p-chloro, meta-nylenole) , povidone iodine or chlorhexidine are preferred. [13] Protective eyewear may consist of goggles, or glasses with solid side shields which protect the eyes from droplets or aerosols.[1, 13, 14] Face masks prevent splatter from patient's mouth or splashes of contaminated solutions of chemicals.

Hepatitis B Virus (HBV) is a well-recognized occupational risk for dental professionals.[15, 16] Dentist can best manage patients infected with HBV and protect themselves, and in turn other patients, by being vaccinated. Clare Connor's [1] has shown that the vaccine is safe and highly efficacious, affording protection with a success rate of more than 95%. In June 1982, the council on dental therapeutics adopted a resolution recommending that all dental personnel having patient contact including dentists, dental students and dental auxiliary personnel, and all dental laboratory personnel receive the Hepatitis B vaccine. [13 ,17] The vaccination programme must certainly be considered the most effective cross infection control measure to protect dental personnel and in turn their patients, from a potentially fatal disease[1,3,36 . 1, 18, 19] The schedule for immunization is three doses of 0, 1 and 6 month and a booster dose after every 5 years.

Needle Stick injuries: Infection may be due to a needle stick injury or cut with a sharp object or contact of mucous membrane or non intact skin with blood or other body fluids that are potentially infectious. The risk status post sharps injury, blood or body fluid exposure from a source will depend on 1) the status of the source 2) type of injury and 3) the status of the victim. Sharps containers of approved type should be used-should not be overfilled and must be properly closed. When recapping needles a single handed 'bayonet technique' or a resheathing device should be used. Remove burs from handpieces when finished, or if left in handpiece, point the bur away from hands and body.

Water testing from the dental chair should be an integral part for microbiological surveillance. Studies have demonstrated that dental unit waterlines (i.e. narrow-bore plastic tubing that carries water) can become colonized with microorganisms, including bacteria, fungi, and protozoa.[20- 26] Literature states that dental waterlines should be flushed at the beginning of the day to reduce the microbial load, but it is not sufficient for removal of biofilms. [12]To improve the water quality self- contained water systems with chemical treatment, in line micro-filters and combination of these treatments can be applied[18].

Instrument Sterilisation

7 STAGES OF SERILISATION
Pre-sterilization soaking (Holding)
Pre-cleaning
Corrosion control, drying, lubrication
Packaging
Sterilization or high level disinfection
Sterilization monitoring

STERILIZATION:

Patient-care items are categorized according to Spaulding classification system as critical, semi-critical, or noncritical, depending on the potential risk for infection associated with their intended use. [27,28] The biological indicators (spore strips of Bacillus stearotheromophillus) must be checked for every sterilization cycle and if not then at least once in a week with physical and chemicals methods of monitoring of sterilization cycles. Maintain the record of all these monitoring systems.

Methods For Sterilizing And Disinfecting Patient-Care Items And Environmental Surfaces 28

Process	Result	Method	Examples	Patient Care Items
Sterilization	Destroys all micro-organisms, including bacterial spores.	Heat-automated, high temperature	Steam, dry heat, unsaturated chemical vapor	Heat-tolerant critical and semicritical
		Heat-automated, low temperature	Ethylene oxide gas, plasma sterilization	Heat-sensitive critical and semicritical
		Liquid immersion	Glutaraldehyde, glutaraldehydes with phenols, hydrogen peroxide, hydrogen peroxide with peracetic acid, peracetic acid	
High-level disinfection	Destroys all micro-organisms, but not necessarily high numbers of bacterial spores.	Heat-automated	Washer disinfector	Heat-sensitive semicritical
		Liquid immersion	Glutaraldehyde, glutaraldehydes with phenols, hydrogen peroxide, hydrogen peroxide with peracetic acid, ortho-phthalaldehyde	
Intermediate-level disinfection	Destroys vegetative bacteria and most fungi and viruses. Inactivates Mycobacterium bovis‡. Not necessarily capable of killing bacterial spores.	Liquid contact	EPA-registered hospital disinfectant with label claim of tuberculocidal activity	Noncritical with visible blood
Low-level disinfection	Destroys most vegetative bacteria and certain fungi and viruses. Does not inactivate Mycobacterium bovis.	Liquid contact	EPA-registered hospital disinfectant with no label claim regarding tuberculocidal activity. OSHA also requires label claim of HIV and HBV potency for use of low-level disinfectant for use on clinical contact surfaces (e.g., quaternary ammonium compounds, some phenolics, some iodophors)	Noncritical without visible blood

DISINFECTION

The responsibility for ensuring impressions and appliances have been cleaned and disinfected, prior to despatch to the laboratory, lies solely with the dentist . The impression or appliance should be disinfected according to the manufacturer's recommendations. In 1992, H. S. Harold et al [29]determined the efficacy of eight disinfectant solutions : sodium hypochloride (undiluted), sodium hypochloride (diluted), Alcide L.D., OMC II, Biocide, Sporicidin, Lysol, Impresept and sterile water (control) when used as for immersion and a spray against three microorganisms (S. aureus, M. Phlei and Bacillus subtilis) and normal mixed oral flora on the surface of irreversible hydrocolloid impressions. This study concluded that, full strength sodium hypochlorite was the most

effective disinfectant over all and required the shortest contact time (1 minute). Disinfectants should not be sprayed onto the surface of the impression; it lessens the effectiveness and creates an inhalation risk. Immersion of the impression is recommended[30]. The impression or appliance should be rinsed again in water before sending to the laboratory accompanied by a confirmation that it has been disinfected.

Prostheses, inter treatment materials and non-sterilizable equipment must be cleaned with soap and water and disinfected with a hospital-level disinfectant if they become contaminated. If ultrasonic cleaners are used for cleaning or the disinfecting step, care must be taken not to overheat the material or disinfectant while in the ultrasonic cleaner. Spraying or soaking these items in the disinfectant in a separate container or bag is the method of choice. It is important to remember that most immersion disinfectants can only be used once. Brace & Plummer [31] in 1993 demonstrated that dental prostheses could be easily and effectively disinfected with a chlorine dioxide procedure. Casts are the most difficult to disinfect without causing damage. It is preferable to disinfect the impression so that the resulting cast will not have to be disinfected [32, 33 ,34]. Casts may be sprayed with an iodophor or chlorine product, rinsed, and handled in an aseptic manner for transfer to the production area[32]. Equipments that make no patient contact but require cleaning and disinfection should be evaluated based on their construction. They can be disinfected by spraying with a hospital level disinfectant, rinsing, drying, and for items with moving parts are lubricated . Prevention of contamination is better than having to use chemical agents on delicate equipment[35]. Any item that will withstand standard heat sterilization should be sterilized before reuse.

LABORATORY ASEPSIS:

No matter how well infection control is practiced, some equipments should receive special attention even in the "clean" laboratory. This will provide less chance of introducing laboratory contamination during the production . On the polishing lathe the pumice solution should be made by suspending the pumice in tincture of green soap or other surfactant and possibly adding an effective disinfectant solution to the mix[32]. This will prevent colonization from airborne and other organisms that may find themselves in the warm wet pumice environment. If the laboratory production area is properly isolated as outlined, no need exists for having separate pans for new and existing prostheses. The pumice should be changed daily and the machine should be cleaned and disinfected daily. Bench tops and work areas should be cleaned daily or. Surface disinfection protocols are the same in a Dental laboratory as that in a dental clinic[30].

BIOMEDICAL WASTE SEGREGATION:

Categories of biomedical waste includes:
CATEGORY 1*-Human anatomical waste(human tissues, organs, body parts)-Incineration/deep burial*
CATEGORY 2 *- Animal waste(animal tissues, organs, body parts carcasses, bleeding parts, fluids, blood) - Incineration/deep burial*
CATEGORY 3*-Microbiology & biotechnology waste(waste from lab cultures, research and infectious agents from research and industrial lab)- Incineration/deep burial*
CATEGORY 4 *- Sharps (needles, syringes, scalpel, blades, glass) - Incineration/disinfection treatment/mutilation*
CATEGORY 5*-Medicines and cytotoxic drugs Incineration/ destruction and Disposal in secured landfill*
CATEGORY 6*-Solid waste(blood and body fluids)autoclave/ chemical treatment/burial*
CATEGORY 7*-Solid waste(disposable items)autoclave/ chemical treatment/burial*
CATEGORY 8*-liquid waste(waste generated from lab., and washing, cleaning, housekeeping & disinfecting activities)-disinfection/chemicals/ discharge into drains*
CATEGORY 9*-Incineration ash -disposal in municipal landfill*
CATEGORY 10*-Chemical waste -chemical treatment/ secure landfill*

Following is the method of choice of disposal;[19,36]

COLOUR CODING	TYPE OF CONTAINER	WASTE CATEGORY	TREATMENT OPTIONS
YELLOW	Plastic bag	Human anatomical wastes, animal waste, microbiology and bio - technology wastes and solid wastes	Incineration/deep burial
RED	Plastic bag/disinfected container	Microbiology and bio - technology wastes and solid wastes	Autoclaving/microwave/chemical treatment
BLUE/WHITE TRANSLUCENT	Plastic bag/puncture proof container	Waste sharps and solid wastes	Autoclaving/microwave/chemical treatment/shredding
BLACK	Plastic bag	Discarded medicines, incineration ash and chemicals used in production of biologicals	Disposal in secured landfill

II. Conclusion:

From an infectious point of view, dentistry has never been safer than it is today for both patients and dental team. This state of affairs has resulted from establishment and practice of strict infection control in the office using universal precautions. Infection control consists of a series of procedures directed at reducing the no: of microbes shared among people. An approach to management of infection control involves identification of an office safety coordinator & total involvement of everyone in the office.

Reference:

[1]. Clare Connor. "Cross - contamination control in prosthodontic practice". mt. J. Prosthodont, 1991; 4:337-344
[2]. Greene VW. Microbiological contamination control in hospitals. 1.Perspectives. Hospitals 1969;43:78-88.
[3]. Kohn WG, Collins AS, Cleveland JL, Harte JA, Eklund KJ, Malvitz DM. Guidelines for infection control in dental health-care settings—2003.*MMWR.* 2003;52(RR17):1-61
[4]. Steere AC, Mallison GF. Handwashing practices for the prevention of nosocomial infections. Ann Intern Med 1975;83:683-90.121.
[5]. Garner JS. CDC guideline for prevention of surgical wound infections, 1985. Supersedes guideline for prevention of surgical wound infections published in 1982. (Originally published in November 1985). Revised. Infect Control 1986;7:193-200.
[6]. Larson EL. APIC guideline for hand washing and hand antisepsis in health-care settings. Am J Infect Control 1995;23:251-69.
[7]. CDC. Guideline for hand hygiene in health-care settings: recommendations of the Healthcare Infection Control Practices Advisory Committee and the HICPAC/SHEA/APIC/IDSA Hand Hygiene Task Force. MMWR 2002;51(No. RR-16).
[8]. Maki DG, Alvarado CJ, Hassemer CA, Zilz MA. Relation of the inanimate hospital environment to endemic nosocomial infection. N Engl J Med 1982;307:1562--6.
[9]. Danforth D, Nicolle LE, Hume K, Alfieri N, Sims H. Nosocomial infections on nursing units with floors cleaned with a disinfectant compared with detergent. J Hosp Infect 1987;10:229—35
[10]. Harrel SK, Molinari J. Aerosols and splatter in dentistry: a brief review of the literature and infection control implications. *J Am Dent Assoc*. 2004: (135)4;429-437
[11]. Cochran MA, Miller CH, Sheldrake MS. The efficacy of the rubber dam as a barrier to the spread of microorganisms during dental treatment. J Am Dent Assoc 1989;119:141--4. (172)
[12]. CDC. Recommended infection-control practices for dentistry, 1993. MMWR 1993;42(No. RR-8).
[13]. Council on dental materials, instruments, and equipment, council on dental practice, council on dental therapeutics. "Infection control recommendations for the dental office and the laboratory". J. Am. Dent. Assoc., 1998; 116:241 -248.
[14]. Sherry. A. Harfst. "Personal barrier protection". D. C. N. A., 1991;35(2): 357 – 366
[15]. Mast EE, Alter MJ. Prevention of hepatitis B virus infection among health-care workers. In: Ellis RW, ed. Hepatitis B vaccines in clinical practice. New York, NY: Marcel Dekker, 1993:295-307.
[16]. Beltrami EM, Williams IT, Shapiro CN, Chamberland ME. Risk and management of blood-borne infections in health care workers. Clin Microbiol Rev 2000;13:385-407.
[17]. Council on dental materials, instruments, and equipment, council on dental practice, council on dental therapeutics. "Infection control recommendations for the dental office and the laboratory". J. Am. Dent. Assoc., 1998; 116:241 -248
[18]. Mayo JA, Oertling KM, Andrieu SC. Bacterial biofilm: a source of contamination in dental air-water syringes. Clin Prev Dent 1990;12:13--20.
[19]. Mills SE. The dental unit waterline controversy: defusing the myths, defining the solutions. J Am Dent Assoc 2000;131:1427—41
[20]. Walker JT, Bradshaw DJ, Bennett AM, Fulford MR, Martin MV, Marsh PD. Microbial biofilm formation and contamination of dentalunit water systems in general dental practice. Appl Environ Microbiol 2000;66:3363--7.
[21]. Schulze-Robbecke R, Feldmann C, Fischeder R, Janning B, Exner M, Wahl G. Dental units: an environmental study of sources of potentially pathogenic mycobacteria. Tuber Lung Dis 1995;76:318--23.
[22]. Barbeau J, Tanguay R, Faucher E, et al. Multiparametric analysis of waterline contamination in dental units. Appl Environ Microbiol 1996;62:3954--9.
[23]. MMWR Recomendations and Reports - December 19, 2003 / Vol. 52 /No. RR—17

[24]. Atlas RM, Williams JF, Huntington MK. Legionella contamination of dental-unit waters. Appl Environ Microbiol 1995;61:1208--13.
[25]. Kelstrup J, Funder-Nielsen T, Theilade J. Microbial aggregate contamination of water lines in dental equipment and its control. Acta Pathol Microbiol Scand [B] 1977;85:177-83.
[26]. Challacombe SJ, Fernandes LL. Detecting Legionella pneumophila in water systems: a comparison of various dental units. J Am Dent Assoc 1995;126:603--8.
[27]. Spaulding EH. Chemical disinfection of medical and surgical materials [Chapter 32]. In: Lawrence CA, Block SS, eds. Disinfection, sterilization and preservation. Philadelphia, PA: Lea & Febiger, 1968:517--31.
[28]. Kohn WG, Collins AS, Cleveland JL, Harte JA, Eklund KJ, Malvitz DM. Guidelines for infection control in dental health-care settings—2003.*MMWR.* 2003;52(RR17):1-61
[29]. Harold.S.W, Donald V.B. and Richard S.S. "Efficacy of various spray disinfectants on irreversible hydrocolloid impressions". Tnt. J. Prosthodont., 1992; 5 : 47 - 54.
[30]. 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.
[31]. Michael. L. Brace and Kevin. D. Plummer. "Practical denture disinfection". 3. Prosthet. Dent., 1993; 70: 538 – 540
[32]. Rudra Kaul. , Aamir Rashid Purra, Riyaz Farooq, , Shafait ullah Khateeb, Fayaz Ahmad, Parvez Ahmed Parvez "Infection control in dental laboratories : a review " International Journal of Clinical Cases and Investigations 2012. Volume 4 (Issue 2),19:32, 1st July 2012
[33]. Dental laboratory relationship working Group OSAP Position paper. Laboratory Asepsis: November 1998.
[34]. Wood PR. Cross infection control in dentistry a practical illustrated guide
[35]. Bhat Vidya S, Shetty Mallika S, Shenoy Kamalakanth "Infection control in the prosthodontic laboratory" Journal of Indian prosthodontic society Year : 2007 | Volume : 7 | Issue : 2 | Page : 62—65
[36]. Rutala WA, Mayhall CG. Medical waste. Infect Control Hosp Edidemiol 1992;13:38--48.