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Review Article

Infection control in dentistry: A review

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ABSTRACT:
Infection management is straightforward, but it offers great mental joy when it successfully cures a patient of their issues. As a result of ongoing discussion and debate about how to prevent cross-infection and cross-contamination in dental practices, suggestions and guidelines are routinely reviewed in the context of the most recent data. To lessen the risk of infection transmission between patients and between patients and "Health Care Workers (HCWs)," a logical and practical practice for cross-contamination and cross-infection prevention should be followed. The “Centers for Disease Control and Prevention (CDC, USA)” and “the Hospital Infection Control Practice Advisory Committee (HICPAC)” recommend the rules for proper infection managements. The current review paper highlights a number of crucial features of infection control, preventive measures, and recommendations that must be followed in dental settings, including precautions. The “Occupational Safety and Health Administration's (OSHA)” rules in the United States, limits on dental healthcare workers' hours of work, control of blood and bodily fluid exposure, Assessment of the infection control program; design of the dental office with infection control in mind.
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INTRODUCTION

The "father of infection control," Hungarian physician Ignaz Semmelweis (1818–1865), first demonstrated that doctors were murdering patients by not washing their hands before exams. Unsafe care causes cross-infections, which are a major global killer.[1,2] The dental profession did not take infection prevention seriously until the 1970s and 1980s, when HBV and HIV were recognized as risks. Boiling water was once the preferred method for decontaminating instruments. "Universal precautions" or "standard precautions" for blood-borne disease prevention were advocated by "the British Dental Association (BDA)" in 1986 and CDC in the US in 1987. After a UK dentist was suspected of transmitting HIV, autoclaves were introduced in 1990. The CDC and ADA released dental practice guidelines in 1993.[3-6] The CDC updated dental infection prevention recommendations several times, and in 2003, the ADA recommended that all dental clinics implement a complete guide for dental treatments. Due to transmissible illnesses and cross-contamination, sterilization is crucial.[6] In dentistry, sterilization and disinfection are the most overlooked steps due to lack of attention and finances.[7] The dentist has a moral and legal duty to protect patients and others from infection and a personal interest in not getting sick from patients.[8] In a dental setting, diseases are spread through a variety of channels, including patient to dental team, dental worker to patient, patient to patient, dentist office to community, community to patient, etc.[9] The potential modes of transmission in a dental setting are, in order of severity: Inhalation of aerosols or droplets harboring pathogens (moderate risk), Percutaneous (high risk), Touch (high risk), Indirect contact through fomites (low risk). Infection control in the dental healthcare system is warranted to "manage" iatrogenic, nosocomial infections among patients [11] and potential occupational exposure of dental personnel to disease-causing germs during dental therapy. HICPAC and the

CDC published standard precautions in 1996. Precautions for preventing infection come in two levels:

1. Common safety measures that are used with all patients.
2. Further precautions depending on transmission for specific patient groups considered to be "at risk."

STANDARD PROTECTIONS

Standard precautions expand and combine universal precautions to protect both people and workers from various infections from agents like saliva, blood, tissue etc. Dental infection management has relied on fundamental measures since the mid-1980s. Infection control and safety protocols prevent blood-borne illnesses. Standard precautions expanded hospital infection control measures for patient safety.[7-10]

MEDICAL EVALUATION

The dentist must get a complete and pertinent medical history of the patient during the initial session. During subsequent visits, it is vital to examine and, if necessary, update this history.[11,12] Every time, a thorough medical history should be gathered. There should be specific inquiries concerning infections, recent weight loss, and lymphadenopathy. It is important to follow up on all favourable responses. A person might not be aware that they have an infectious condition, therefore diagnostic skill may be needed.[13]

HAND SANITIZATION

The term "hand hygiene" refers generally to practices intended to lessen the amount of bacteria on hands. Everyone should practice good personal hygiene, but healthcare professionals in the dental and medical fields should practice good hand hygiene as a fundamental method of disease prevention. Regular handwashing makes it simpler to get rid of transient flora, which colonizes the skin's outer layers. Hand hygiene is regarded as the single most important step for lowering the risk of spreading diseases to patients and medical professionals since it significantly minimizes potential germs on the hands. The emergence of multiresistant organisms, health care-associated illnesses, and outbreaks are all linked to noncompliance with hand hygiene regulations. Before using a handwash, users should take into account its durability, cost per use, supply, potential allergies, and compatibility with lotions.[9] The best technique for washing your hands depends on the process, the level of pollution, and how long you want the antimicrobial effect to last on your skin.[9] Alcohol-based hand sanitizers with or without additional germicides as well as hand sanitizers integrated into wet wipes have recently made their way into the market. These products are primarily intended for usage when handwashing is impossible or impractical.

PERSONNEL PROTECTIVE EQUIPMENT FOR DENTAL WORKERS (FIG1)

The barriers used to limit exposure to germs that are fleeing from their sources are included in "*Personal Protective Equipment (PPE*)". Use of PPE is based on potential exposure to chemical and biological risks, as well as "*Blood Or Other Potentially Infectious Material* (BOPIM)". The use of "complete PPE" is required whenever there is a risk of splash or spatter. In contrast to preventing the transmission of every single bacterium, barriers are mostly used to manage gross contamination. PPE is frequently utilized in general dentistry treatment, like gloves, aprons and masks that shield wearers from chemical and bodily fluid dangers.[14]

Figure 1: PPE for the dental practices

GLOVES

Gloves protect dental staff from bacteria from the patients as well from the surfaces it hoards on when a treatment is done. Bacteria can enter the body through hand wounds and abrasions. Gloves prevent saliva and blood from sticking in hard-to-clean areas, preventing cross-contamination. If gloves aren't worn, the dentist's blood bacteria can enter the patient's skin and cause hepatitis.

MASKS

It is a sort of personal protective equipment (PPE) worn over the nose and mouth to guard against breathing infections that arise from various procedures.[15] Masks prevent possibly contaminated droplet spatter from infecting the face, but they do not provide full microbiological protection. For particles measuring 3 to 5 micrometres (m), the filtering effectiveness of a mask should be at least 95%.[10] The two most popular styles of masks are the a) dome-shaped and b) flat type.[16]

EYE PROTECTION

During patient care, two different types of protective eyewear are worn: (1) glasses with side shields for added protection, and (2) face shields that are clear. It is possible to use a plastic face shield that extends to your chin as an alternative to safety glasses, but it cannot take the place of a face mask because it cannot guard against breathing in polluted aerosols.[16]

PROTECTIVE CLOTHING

It contains a lab coat, uniform, or gown that is either reusable or disposable. It can have long sleeves 10, short sleeves, or neither.

HEADCAP

Hair can retain significant contaminants, thus it should be kept away of the treatment area. When there is a chance of coming into contact with heavy splatter, such as from an ultrasonic scale instrument, Employees should wear a surgical cap to protect their head.

FOOTWEAR

While in any clinical or laboratory setting, closed-in, non-slip flat shoes are required to be worn at all times.[17]

LOWERING OF SPATTER

Any blood- or saliva-related procedures should be carried out in a way that reduces droplet production. Use of the rubber dam, high volume evacuation, and preoperative mouthwash are also included.

Vaccination has also been known to play a great role in prevention of infections.

SURFACE BARRIERS

Dental health care workers' gloved hands or direct spray or splatter from dental procedures both have the potential to contaminate clinical touch surfaces with patient materials. Surface barriers make it simple and practical to contain cross-contamination. Depending on whether they are used for surgical or non-surgical regular dental care, barriers can be sterile or non-sterile. Clinical touch surfaces can be kept clean by using barrier protection for equipment and surfaces, which is especially useful for dirty surfaces. Clear plastic wrap, bags, sheets, tubes, paper with a plastic backing, and other materials impermeable to moisture are examples of barriers. Between patients, while dental workers are still gloved, such coverings should be removed because they can become infected. The surface should be checked to make sure it hasn't become accidentally contaminated after the barrier has been removed. Only if pollution is clearly present does the surface require cleaning and disinfection.[9,20,21]

DISINFECTION

All work surfaces, even those that appear uncontaminated (outside the designated area), should be properly cleaned and decontaminated between clinical sessions using detergent and an appropriate viricidal disinfectant. The risk of disease transfer through cleaning surfaces like floors and walls is minimal. As a result, these surfaces often only need to be cleaned occasionally using weak detergents. If blood, saliva, or other bodily fluids are suspected of having gotten on a surface, it should first be cleaned by physically wiping the area with detergent liquid before being disinfected with a low-level disinfectant, which will kill or deactivate all microbes. Items used in patient care. Depending on the possible danger for infection associated with their intended usage, devices are classified as critical, semicritical, or noncritical, with critical and semicritical being high risk and noncritical having low risk.[20-25]

For patient-care equipment that do not require sterility, three degrees of disinfection—high, intermediate, and low—as well as two levels—intermediate and low—are employed.[19] Disinfectants come in a variety of forms, including immersion, surface, alcohol- and water-based, as well as immersion and surface. Disinfectants can be used to clean surfaces (may be water based or alcohol base).**fig 2**

Figure 2: Various disinfectants.

INSTRUMENT REPROCESSING

Since it relates to the objects that have the highest potential for disease transmission during dental care, instrument reprocessing is the most crucial component of dental infection control. According to Spaulding's Classification, any dental tool that enters the oral cavity is categorized as having critical or semi-critical surfaces and needs to be sterilized or sterile single-use disposables should be utilized. Dental offices frequently use autoclaving, chemiclaving, and dry heat for in-office sterilization. Chemical immersion procedures utilizing an authorized chemical sterilant must be utilized for goods that are heat labile.

METHODS OF STERILIZATION

In dentistry, the following sterilizing techniques are frequently used: a) Autoclave or steam under pressure; b) Chemiclave or a mixture of synergistic chemicals; and c) Dry Heat.

All hand and orthodontic equipment, as well as contaminated laboratory burs and diamond abrasives, are among the items that are sterilized by heat. (b) Every endodontic tool surgical instruments, ultrasonic periodontal scalers, high-volume evacuator tips, air-water syringe tips, electrosurgery tips, metal impression trays, and surgical instruments (j) equipment for intraoral radiography that can tolerate heat sterilization. The most popular form of sterilization is the autoclave, which uses steam and pressure to sterilize items. For instruments with a high carbon steel composition, this is the most reliable procedure, but it may also be the most corrosive (especially if packages are not adequately dried). Apart than standard instruments, items like water (liquids) are sterilized.

CHEMICLAVING

For a sterilization cycle, chemiclaves use a combination of liquid chemicals that are put into the chamber, along with heat, pressure, and around 15% water. The sterilizing conditions are a temperature of 131°C (270°F), a pressure of 20 psi, and a sterilization period of 30 minutes. Unsaturated chemical-vapor sterilization involves heating an alcohol-based chemical solution with 0.23 percent formaldehyde in a pressurized, enclosed space.

Another typical form of sterilizing in dentistry is dry heat. Although dry heat is noncorrosive and has low running costs, the procedure is time-consuming, and some patient-care equipment cannot withstand the high temperatures needed. Static-air and forced-air sterilizers are two varieties of dry-heat sterilizers used in dentistry.[19]

STERILIZATION OF UNWRAPPED INSTRUMENTS[19]

An unwrapped cycle sterilizes patient-care goods for immediate use (also known as flash sterilization). Unwrapped sterilization cycles vary by sterilizer and object (i.e., porous or nonporous). Sterilization monitoring should encompass mechanical, chemical, and biological process aspects. These criteria evaluate the sterilizing environment and method. The sterilizer's gauges or displays can be used to determine cycle length, temperature, and pressure for each load. Internal and external chemical indicators use delicate chemicals to assess sterilization parameters like time and temperature. External indications, such as chemical indicator tape or unique markings, swiftly change color to indicate that a product has been sterilized. Each package should have internal chemical indicators/ biological indicators, either single or multiple parameters, to ensure the sterilizing agent has penetrated the packing material and reached the equipment. Bead sterilizers, ETO, and others sterilize. Storing sterile bagged equipment requires dust-free shelves or cabinets.

DENTAL TREATMENT WATER POLLUTION CONTROL

Dental treatment water/irrigant pollution can be controlled by microbes in two different ways. Initially,

a decontaminating agent should be used to initially clean and periodically disinfect the dental unit water system to remove biofilms and other inorganic impurities 11. The water/irrigation used for patient care must be free of microbes, therefore it must be filtered, sterilized, and distilled/boiled before use, or a low-grade antibiotic that has been registered with the EPA and approved by the FDA must be applied. [16,20]

RADIOGRAPHIC ASEPSIS

If aseptic technique is not used when obtaining radiographs, there is a substantial risk of equipment and surrounding surfaces becoming contaminated with blood or saliva. Protective plastic pouches for radiographic films.[22] For the best barrier, sterilization, and disinfection methods for digital radiography sensors, other cutting-edge intraoral gear, and associated gear, manufacturers should be consulted.

DENTAL LABORATORY ASEPSIS

Materials used often in a laboratory are possible cross-contamination means. Bacteria, viruses, and fungi can infect dental prosthetics or imprints. In order to protect dental team members, patients, and the office setting, these things should be handled carefully. Decontamination is required for all the surfaces that have touched the human tissues as well as the equipment that was used to mold it by the application of the disinfectants. Other materials that are heat resistant can be autoclaved. [11]

ASEPSIS OF ELECTRONIC AND OTHER EQUIPMENTS

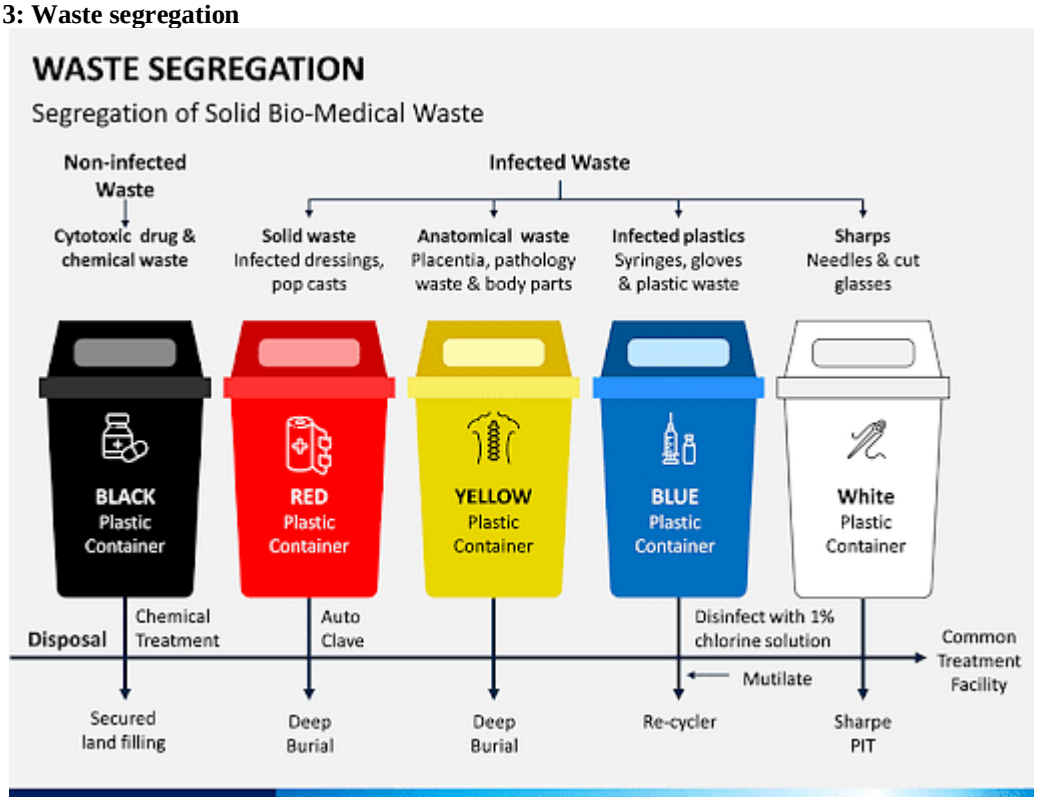
Curing light: To protect the fragile light-conducting rods from material contamination or unintentional damage, the tips of curing lights must be heat sterilized or have an appropriate barrier placed over them for each patient.

Implants: Both the surgical instruments and the implants used in implant insertion operations must be sterile at the time of usage. It is necessary to use sterile fields and fully aseptic techniques. The processing and reuse of removed devices is not permitted.[19]

MANAGEMENT OF DENTAL WASTE

As hazardous waste, biomedical waste cannot be disposed of with conventional trash. In general, all biomedical waste must be kept in color-coded containers that are tagged with the universal biohazard symbol and transferred to a biomedical waste carrier who has been authorized to transport the waste for disposal. Anatomical and Non-anatomical waste are additional categories for biomedical waste. Dental trash is divided into two categories: regulated waste and non-regulated garbage. **Fig 3**

Figure 3: Waste segregation



MANAGEMENT OF NEEDLES AND SHARPS

Blood-borne virus infections are most frequently transmitted in dentistry by injection injuries.[25] A percutaneous injury or contact of mucous membranes or non-intact skin with blood, saliva, or further potentially infectious body fluids can expose healthcare workers to HBV, HCV, or HIV infection. A safe needle system, the Bayonet Technique, single-

handed resheathing of needles, and other precautions can all help prevent needlestick accidents.

WORK BOUNDARIES FOR THOSE WORKING IN DENTAL HEALTHCARE

It should be dental workers' responsibility to keep track of their own health. The capacity to properly carry out their tasks should be examined with personal doctors if oral health care employees have acute or chronic medical disorders that make them vulnerable to opportunistic infection. Dental health care staff may occasionally be prohibited from working with patients or from having patient contact altogether in order to stop the spread of illness. The route of transmission and the duration of the disease's infectivity are taken into consideration while making decisions about workplace restrictions. [19]

After a blood exposure at work, post-exposure treatment is crucial to preventing infection. Blood is naturally present in saliva during dental operations. Blood can still be present in small amounts even when it is not visible, making it a potentially infectious substance. Dental personnel should be trained in assessing the method in situations if they are ever exposed. [19]

EVALUATION OF INFECTION CONTROL PROGRAM

The goal of a dental infection-control program is to provide a safe workplace by reducing the risk of healthcare-associated infections in patients and occupational exposures in oral health care employees. Effective program assessment is a methodical way to confirm that procedures are acceptable, practicable, moral, and accurate.[19] Program evaluation is an essential organizational practice, but it isn't done consistently across program areas or sufficiently incorporated into the majority of programs' everyday operations. [9]

INFECTION CONTROL CONSIDERATIONS IN DENTAL OFFICE DESIGN

During patient care, environmental surfaces in the dental operatory may get polluted. Although they have not been clearly linked to the spread of infection to either Caregivers or patients, several surfaces, particularly those that are regularly handled can act as reservoirs of microbial contamination. Although though good hand hygiene is essential for reducing the spread of harmful microorganisms, barrier protection—cleaning and disinfecting the surroundings—also guards against diseases linked to medical care. In comparison to nonporous hard surface flooring, carpeting is more difficult to clean and cannot be properly sterilized, especially after spills of blood and bodily fluids. Many microbial communities, mostly bacteria and fungi, have been found in carpeting, according to studies. Both locations that provide direct patient care and those where hazardous products are handled present similar contamination hazards when using cloth furnishings. For these reasons, it is best to avoid using carpeted floors and fabric-upholstered furniture in these spaces.

The following regulations have been summarized by the OSHA. Within ten days of starting work, employees should have vaccinations, particularly the Hepatitis B vaccine. To avoid coming into contact with blood and other potentially infectious materials, general measures must be taken. When it comes to dental care, saliva is viewed as a blood-contaminated body fluid. Technical controls are put in place to lessen the amount of polluted spatter, mists, and aerosols that are produced. Use control measures at work to reduce splashing, spattering, or bare hand contact with contaminated surfaces. Facilities and instructions should be made available for washing hands after taking off gloves and for cleaning skin as soon as is practical after coming into contact with blood or other potentially infectious materials. handling needles and other sharp objects safely. Use of single-use or disposable needles, wires, carpules, and sharps is encouraged as close to the point of usage as possible. They ought to be disposed of as quickly as practical in well sealed, hard-walled containers. A biohazard label must be present on the containers. Sharps containers must be used to dispose of teeth. Reusable sharp instruments that are contaminated cannot be handled by staff members during processing or storage. Restrict handling contact lenses, eating, drinking, storing, and other activities in polluted areas. Staff members are given personal protective equipment, including instructions on how to use it, such as gloves and gowns. The personnel should use the personal protective equipment properly and dispose of it or reuse it. Following treatment, it is important to take care of the housekeeping chores, such as cleaning any potentially contaminated sinks and floors. It is necessary to provide a written cleaning schedule. Laundering of protective clothing used by personnel as part of general measures.

CONCLUSION

Over the past century, and more recently, the science of dentistry has undergone positive improvement. As microorganisms are everywhere and they can contaminate, infect, and cause deterioration, it is vital to remove or eliminate them from objects or regions. This is what infection control aims to achieve. All healthcare professionals routinely come into contact with potentially fatal microorganisms. Clinicians must establish, assess, regularly update, and screen their infection anticipation and regulator policies and procedures due to worries about the potential spread of blood-borne illnesses as well as the impact of emerging, highly contagious respiratory and other disorders. The purpose of infection control in a dental practice is to stop the transfer of bacteria, viruses, and fungi that cause disease from one patient to another, from one dental care provider to another patient, and from one patient to another dental care provider or

other dental personnel. In addition to their professional duties, dentists also have an ethical responsibility to uphold a safe and healthy work environment for their patients and staff, as well as to follow all laws and ordinances pertaining to the operation of dental offices, such as those pertaining to environmental protection and workplace health and safety. Although there is extremely little likelihood that a dental procedure will result in an infection, this is a crucial patient safety problem. Dental health care workers can design plans to restrict the spread of pathogens from dental instruments, handpieces, devices, and equipment to patients and OHCWs by understanding how illnesses are conveyed and applying infection prevention and control principles.

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