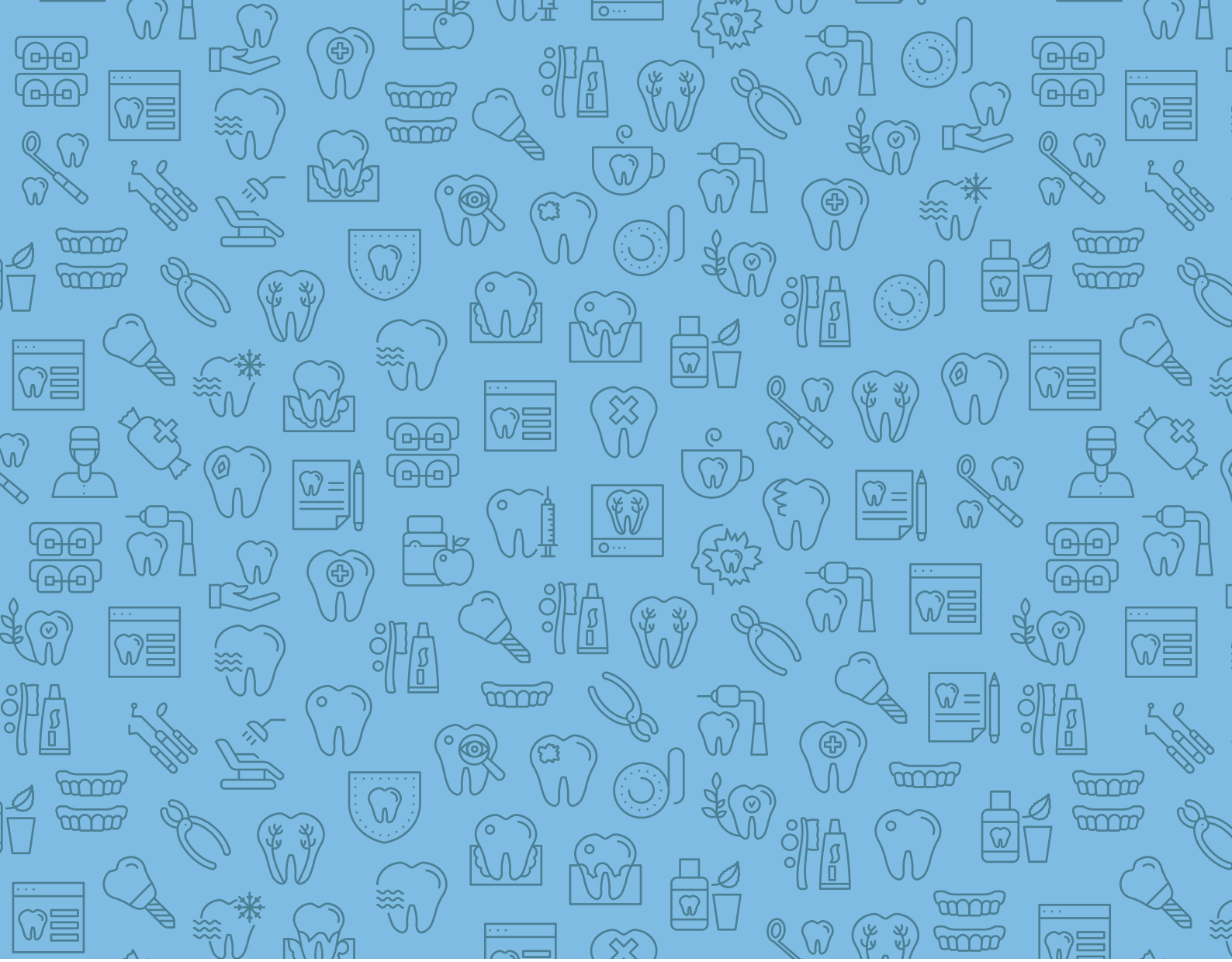

FIRST EDITION

Infection Control

Guidelines for Oral Health Care

SOUTH AFRICA

Jeanné Oosthuysen • Elsa Potgieter • Annabel Fossey

EDITING BY SR LAURA ZIADY

IMPORTANT DISCLAIMER:
Although the authors believe that the information contained in this document is accurate, inadvertent errors may occur. The South African guidelines are intended for use in South African public and private oral health care facilities and tertiary institutions, taking the unique conditions in South Africa into account. The users are encouraged to read the international guidelines from the Centers for Disease Control, the British Dental Association, the American Dental Association, the Australian/ New Zealand Standards and others for additional information publised by the South African Dental Association and the National Institute for Communicable Diseases.

This book is dedicated to every oral health care worker in South Africa who is passionate about dentistry.

> Never doubt that a small group of thoughtful, committed citizens can change the world. Indeed, it is the only thing that ever has."

MARGARET MEAD

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List of Abbreviations

ADA:	American Dental Association
AIDS:	Acquired Immune Deficiency Syndrome
CDA:	Canadian Dental Association
CDC:	Centers for Disease Control and Prevention
COVID-19	Coronavirus disease
CPD:	Continuous Professional Development
CSSD:	Central Services and Sterilisation Department
FDI:	Fédération Dentaire Internationale
HBV:	Hepatitis B Virus
HCV:	Hepatitis C Virus
HHV:	Human Herpes Virus
HIV:	Human Immunodeficiency Virus
HSV:	Herpes Simplex Virus
HSV1:	Herpes Simplex Virus Type 1
HSV2:	Herpes Simplex Virus Type 2
SDSs:	Safety Data Sheets
OHCW:	Oral health care worker
OMFS:	Oral Maxillofacial Surgeon
OSAP:	Organization for Safety and Asepsis Procedures
PEP:	Post Exposure Prophylaxis
PPE:	Personal Protective Equipment
SADA:	South African Dental Association
SARS-CoV-2:	Severe Acute Respiratory Syndrome Coronavirus 2
SOPs:	Standard Operating Procedures
TB:	Tuberculosis
WHO:	World Health Organization

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PART I:

Background to infection prevention and control in oral health care

1

PART I:
Background to Infection Control

1.1 Introduction

Throughout the lives of people of all ages tooth decay, periodontal disease, oral trauma and oral cancer have contributed to a tremendous disease burden. When working in, or visiting health care facilities, people from infancy through old age are exposed to the potential of a variety of infections and injury related risks [2].

In oral health care facilities, disease transmission may occur when microbial pathogenic agents are transmitted to patients, oral health care workers or the public [3]. The prevention or reduction of the risk of disease transmission is conventionally accomplished by breaking the chain of infection through the application of standard precautions [4, 5].

South Africa has a substantial and unique burden of disease [6-9]. Human immunodeficiency virus (HIV) and acquired immune deficiency syndrome (AIDS), Hepatitis B and C, tuberculosis infection, preventable conditions arising from poor sanitation, nutrition and other conditions of poverty, and a growing burden of non-communicable disease, for example obesity and diabetes, all affect the lives and lifestyles of South Africans. Although vaccines have become available for many diseases; to date there is no curative treatment or vaccine available for HIV infection [10].

It is every South African citizen's constitutional right to receive health care in an environment that is not harmful to his / her well-being [11]. In the National Core Standards of quality health care in South Africa, infection prevention and control has been identified as a fast track priority for improvement [12, 13]. Detailed infection prevention and control recommendations and guidelines pertaining to the oral health care profession are presently sadly lacking in South Africa. The National Infection Prevention and Control Policy and Strategy sets minimum national standards for the effective prevention and management of health care associated infections [14]. However, these standards do not specifically address the oral health care environment. The Norms, Standards and Practice Guidelines for Primary Oral Health Care provides a few pages listing succinct guidelines for infection control in primary oral health care facilities [15], without any detailed instructions regarding the limitless variety of oral health care problems / procedures found in rural and urban facilities on the one hand, and public and private oral health care facilities on the other hand, or the diversity of training levels of personnel and the

vast differences in available resources that exist between these two extremes. These unique conditions, including the burden of disease in South Africa, necessitates the development and application of consistent mechanisms or instruments to measure and monitor compliance to infection prevention and control in oral health care facilities, as well as set guidelines to regulate service delivery.

1.2 Historical perspective to infection control

> "The first requirement of a hospital is that it should do the sick no harm."
>
> **FLORENCE NIGHTINGALE (1820-1910)**

In 1675, Antony van Leeuwenhoek constructed the first, simple microscope and observed "animalcules" in saliva, scrapings from teeth and gutter water (bacteria, yeasts, and protozoa) [2, 16]. At that time, the relationship between microbes and disease had not been defined. It was only during the mid- to late 1800s, during the "Golden Age of Microbiology", that the relationship between these "little animals" and disease was established by researchers such as Louis Pasteur (France), Robert Koch (Germany) and Lord John Lister (England). The American researcher, Willougby D. Miller, became known as the "Father of Oral Microbiology" because of his contributions to the understanding of oral microbes and disease [2]. By the 1900s, bacteria had been described as being the cause of numerous diseases, including dental caries [17].

The prevention of disease, through the use of *Infection Control Procedures,* was brought about during the *Golden Age of Microbiology* [2]. As stated, it was during the mid- to late 1800s that Ignaz Semmelweis (Vienna) and Oliver Wendell Holmes (USA) provided first hand evidence that puerperal fever was a contagious disease [17]. Both researchers outlined measures to minimise the spread of illness, especially considering the relationship between disease and the practice of health care professionals [16]. They were also the first to specifically recognise the importance of hand washing in preventing the spread of disease [17]. During 1846, Semmelweis observed that women whose babies were delivered by students and physicians in the First Clinic at the General Hospital of Vienna consistently had a higher mortality rate than those whose babies were delivered by midwives in the Second Clinic [18]. From May 1847, Semmelweis insisted that students and physicians clean their hands with a chlorine solution, after which the maternal mortality rate in the First Clinic dropped dramatically and remained low [18].

Louis Pasteur and John Tindall discovered that heat destroys bacteria and resistant bacterial spores [17]. Their technique of using boiling water to destroy bacteria (called pasteurisation) is still in use today. The surgeon, Lord John Lister, further reduced post-operative infections by the use of phenols [17]. Because of Lister's contribution to the study of post-operative infections and hygiene practices, he became known as the "father of clean and decent surgery" [16]. At that

time his proposal to spray the air around patients before surgery was considered both bold and shocking. The practice of spraying the air around patients before surgery paved the way for the sterile and aseptic techniques practised worldwide today [17].

The scientific study of hospital cross-infection began during the 18th century. In 1858 Florence Nightingale promoted hospital reform, and her memorable motto: "The first requirement of a hospital is that it should do the sick no harm", is still applicable today [16, 19].

In oral health care, the electric dental engine was introduced in the 1920s, after which it was discovered that dental personnel and patients were more exposed to aerosol contamination than previously with foot-driven engines. A report from 1931 revealed that oral health care workers (OHCWs) were more prone to airborne infections than workers in any other profession [20]. In 1951 the introduction of the high-speed turbine machine and ultrasonic cleaner further increased bacteria-laden aerosol contamination in oral health care facilities. It was only during the 1970s, and early 1980s, that it was realised that the incidence of certain diseases among oral health care professionals was much higher than observed in the general public, and that this was a result of the continuous exposure to saliva and blood [16]. In 1981 the human immunodeficiency virus (HIV) that is responsible for acquired immune deficiency syndrome (AIDS), was identified. Although vaccines has become available for many diseases, to date there is no curative treatment available for HIV infection [10].

New and improved infection control procedures emerged from the late 1980s to 1992, owing to a better understanding of the variety of hazards health care workers are exposed to. It was during the late 1980s and early 1990s that authorities such as the American Dental Association (ADA), the Occupational Safety and Health Administration (OSHA) and the Centers for Disease Control (CDC), increasingly urged oral health care professionals to improve their infection control practices [21, 22].

In the past, infection control procedures in oral health care facilities mainly only involved frequent hand washing. Structured infection control practice was the exception rather than the rule. During the 21st century, the emergence and re-emergence of infection challenges have confronted health practitioners [2]. One of the most important of these includes the first epidemic of the century, namely the Severe Acute Respiratory Syndrome (SARS) outbreak of late 2002 and early 2003. In addition shortly afterwards, avian influenza outbreaks among domesticated birds in Asia became the focus of investigations into the potential for human-to-human transmission [23].

Today it is imperative for health care facilities and personnel to face the challenges of providing care for patients potentially infected with new viruses, among others the pandemic of the new influenza A (H1N1) virus that has gained prominence since 2009. It is, therefore, critical that OHCWs follow appropriate infection prevention and control precautions to protect themselves, other personnel, patients and the community in order to minimise or prevent the possibility of disease transmission [24].

1.3 Microorganisms and infectious agents in oral health care

It has only been since the 1980s that the concern about the HIV pandemic and the consequent risks of cross contamination and infection has resulted in the increased awareness of infection prevention and control in oral health care [25]. In addition, as a result of intense media coverage, many patients have become concerned about the possibility of disease transmission in health care facilities [25]. If however, proper infection prevention and control precaution measures are applied, patients can be treated safely and with confidence, whether the patient's infectious status is known or not [26].

There are five groups of microorganisms and infectious agents that may cause diseases that are of importance in oral health care. Understanding the characteristics of these microorganisms, how they are transferred and how they cause specific diseases forms the basis of how to prevent the microorganisms causing harm to OHCWs and patients (Table 1.1).

TABLE 1.1: Classification, characteristics and diseases of infectious agents in oral health care

Vector of disease	Characteristics	Examples of diseases
Prions	• Proteinaceous infectious particles that are unique elements to nature. • Very long incubation periods (up to 20 years) in humans. • Transmission of prion disease by neurosurgical instruments has been reported. • It is suggested to use disposable instruments or autoclaving for a minimum of 18 minutes at 134°C in a vacuum autoclave to achieve sterility. • There is no vaccine or treatment against prion induced diseases.	Creutzfeldt-Jakob disease (CJD), including variant CJD, fatal familial insomnia, Kuru fever, Gerstmann-Straussler-Scheinker syndrome [23].
Viruses	• Viruses cause many diseases in humans. • A virus is a very small microorganism, 1/100th of the size of one bacterium, requiring an electron microscope to observe it. • Viruses require a living cell to reproduce - thus must live inside a host cell to multiply. • Because viruses live within cells they are often protected against chemicals. • To survive, viruses change constantly. • Viruses outside the body can be deactivated by heat and chemicals. • Controlling the parasitic viral growth inside host cells using chemicals is very difficult. • Most viral diseases can only be prevented through immunisation and infection control. • Viral diseases cannot be treated with antibiotics.	Hepatitis, AIDS, herpetic gingivostomatitis, recurrent herpes (e.g. herpes labialis), hand-foot-and-mouth disease, herpangia, hairy leukoplakia, varicella, common cold, influenza, bronchitis, pneumonia, cytomegalovirus (CMV) disease, infectious mononucleosis, measles, mumps, rubella [16, 17].

Bacteria	• Bacteria include the vast majority of human pathogens. • They are only visible under a light microscope. • Different bacteria have different metabolic properties, e.g. nutrients used to grow, requirements for oxygen, excretion of waste materials such as acids and enzymes, which must be present in a particular habitat for growth. These metabolic properties determine where bacteria will grow and the damage that will be caused. • Under adverse environmental conditions, some bacteria form a dense, thick walled structure called a spore or endospore - extremely resistant to heat, drying and chemicals. • Bacteria multiply at a high rate, e.g. one *Escherichia coli* can multiply under optimal conditions to 3 trillion billion cells within 24 hours. • Controlling bacteria is accomplished through preventing their multiplication or by destroying them by means of procedures, such as sterilisation and disinfection. • In humans, bacterial diseases can be successfully treated with antibiotics.	Dental decay, periodontal disease, tuberculosis, gonococcal pharyngitis, streptococcal pharyngitis, scarlet fever, syphilis, diphtheria, pneumonia, meningitis, sinusitis, conjunctivitis, bronchitis [17].
Fungi	• Yeast cells can be killed outside the body by exposure to heat or antiseptics / disinfectants that can be used on living tissue, with minimal damage. • *Candida* is an opportunistic pathogen in people with depressed immune systems, trauma to tissues (e.g. poor-fitting dentures), or on long term antibiotic treatment. • *Candida albicans* is a member of the normal oral flora in about 30% of adults. • *C. albicans* infections are easily treated with topical antifungal agents.	Candidiasis, denture stomatitis [17], Candidiasis glossitis, Angular cheilitis and a number of fungal infections of the lower respiratory tract, especially in those who are immuno-compromised [23].
Protozoa	• Protozoa are microscopic single-celled 'animals'. • They live in fluids in the oral cavity and in polluted water. • Protozoa can also cause periodontal disease. • Examples of pathogenic protozoa include *Cryptosporidium* and *Giardia*, occurring in countries where the public water supply is contaminated with faecal matter.	Amoebiasis (amoebic dysentery), cryptosporidiosis and giardiasis. Protozoa can also cause periodontal disease [23].

Given the specific nature of oral health care procedures, some diseases are of particular interest to OHCWs due to the occupational risk they carry. Cross infection may occur when disease causing pathogens are transferred from one person to another in an oral health care facility, e.g. through contact or spatter. It is therefore important to consider the cumulative risk of infection, which is largely determined by:

1. The prevalence or frequency of the disease in the patient population;
2. the risk of transmission amongst OHCWs and / or patients after exposure (varies due to type of microorganism / agent and the immune status of OHCWs and / or patients);
3. the type and frequency of contact with potentially infectious materials;
4. lack of knowledge and understanding of diseases and their causative agents; and
5. inadequacy of organisation and equipment in oral health care facilities.

The diseases and risks that are of particular interest to OHCWs and patients are listed in Table 1.2.

TABLE 1.2: Infectious disease risks in oral health care [16]

Disease	Ethiologic agent	Incubation time
Viral		
Influenza	Influenza viruses	1 to 4 days
COVID-19	SARS-CoV-2	Estimated 2 to 12 days up to 24 days
Common cold	Rhinoviruses (most common)	Few days
Recurrent herpetic lesion	Herpes simplex, types 1 and 2	Up to 2 weeks
Rubella	Rubella virus	9 to 11 days
Hepatitis B	Hepatitis B virus	6 weeks to 6 months
Hepatitis C	Hepatitis C virus	Weeks to months
Delta hepatitis (hepatitis D)	Hepatitis D virus	Weeks to months
Infectious mononucleosis	Epstein-Barr virus	4 to 7 weeks
Hand-foot-and-mouth disease	Primarily coxsackievirus A16	2 days to 3 weeks
Herpangina	Coxsackieviruses group A	5 days
AIDS	HIV	Months to years
Bacterial		
Staphylococcal infections	*Staphylococcus aureus*	4 to 10 days
Tuberculosis	*Mycobacterium tuberculosis*	Up to 6 months
Streptococcal infections	*Streptococcus pyogenes*	One to 3 days
Fungal		
Dermatomycoses (superficial skin infections)	*Trichophyton, Microsporum, Epidermophyton* and *Candida genera*	Days to weeks
Candidiasis	*Candida albicans*	Days to weeks
Miscellaneous		
Infections of fingers, hands and eyes from dental plaque and calculus	Variety of microorganisms	1 to 8 days

Fundamental infection prevention and control is based upon the principle that disease transmission will be prevented when any of the steps or links in the chain of infection is broken or interrupted (Figure 1.1). The first attempt in preventing microorganisms and infectious agents from causing harm is to keep them from becoming a potential source of infection. Reservoirs or sources of the pathogens should be eliminated through procedures such as cleaning, disinfection / pasteurisation, sterilisation, growth inhibition, immunisation or antimicrobial therapy. Contamination of susceptible hosts by infectious agents may be prevented by limiting or avoiding exposure to the reservoirs or sources of the agents, by application of precautions such as barrier protection or use of pre-procedural mouth rinses [17].

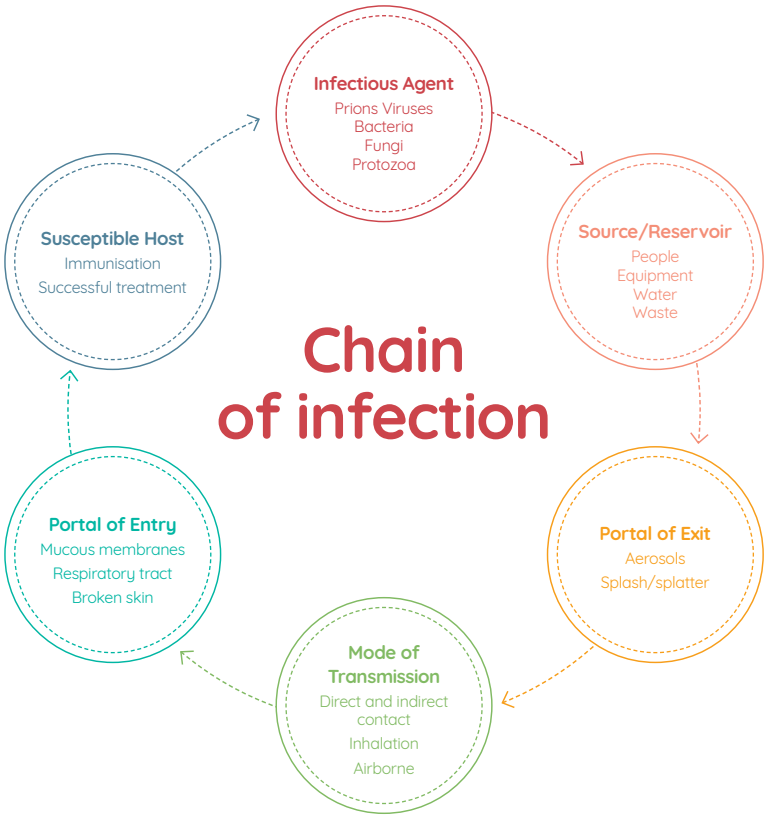


FIGURE 1.1: Chain of infection

The four pillars upon which all precautions or protection methods in oral health care rests include taking actions to ensure the health of OHCWs and that patients avoid contact with blood and body fluids, using instruments and supplies in a safe manner and limiting the spread of blood and body fluid contamination (Table 1.3).

TABLE 1.3: Four pillars of infection prevention [1, 22]

Pillars of infection prevention			
Actions to stay healthy	**Avoidance of contact with blood and body fluids**	**Safe use of objects**	**Limiting the spread of blood and body fluid contamination**
Actions			
Implement administrative controls that include standard operating procedures, written policies; periodic training of personnel; job orientation; various records (e.g. medical and vaccination records); actions to keep OHCWs healthy (e.g. routinely recommended vaccinations) and actions to encourage adherence to recommended precautions, e.g. using personal protective equipment such as masks. One of the most important precautions that should be emphasised continuously is that of hand hygiene.	Standard precautions to avoid contact with blood and other potentially infectious materials (including hand washing; using personal protective equipment such as gloves, eyewear and face protection, protective clothing; safe handling of sharps and using controls to prevent injury, e.g. needle capping using the one handed technique and other safety devices). Each patient should be treated as if infectious.	The safe use of objects includes safe working habits, such as working with care when handling sharp objects and other methods; technology that isolates or removes hazards; cleaning and sterilisation of patient care items and instruments; protection, cleaning and disinfection of surfaces; and general environmental hygiene and housekeeping.	Methods to limit the spread of blood and body fluid contamination include minimising the spatter and aerosols created during dental procedures; environmental control by covering or disinfecting surfaces that may become contaminated between patient contacts and proper health care risk waste disposal.

1.4 Risk identification and assessment in oral health care

Risk is defined as the probability that a substance or situation will produce harm under specified conditions and have an effect on public health and / or on the environment [27]. Risk is a combination of two factors, namely the probability that a harmful event will occur, e.g. specific disease or injury; and that the consequences of the event will be unsafe.

OHCWs have a duty and responsibility to themselves, colleagues and patients to take the necessary steps to prevent cross infection in an oral health care facility. The Occupational Health and Safety Act of 1993, which applies to all workplaces including oral health care facilities, has the requirement for oral health care providers or employees to perform risk assessments at intervals not exceeding two years embedded within its safety legislation [5]. The goal of risk management is to apply scientifically sound, cost-effective and integrated actions that reduce or prevent risk, while taking into account all appropriate social, cultural, ethical, political, and legal considerations [27].

Risk assessments are undertaken to identify hazards, determine who might be at risk of being harmed and to initiate appropriate and reasonable actions to minimise the risks [28]. A risk assessment is the systematic, scientific categorization of potential harmful effects of exposures to hazardous agents or activities. It is performed by considering the types of hazards, the extent of exposure to the hazards, and information about the relationship between exposures and responses, including variation in susceptibility. Harmful effects or responses can result from exposure to chemicals, microorganisms, radiation, or natural events [27].

Risk assessment involves five major stages [4]:

1. Identifying the risk factors or looking for the hazards;
2. deciding who might be harmed and how;
3. evaluating the risk arising from the hazard and deciding whether existing precautions are adequate or if more should be done;
4. recording the findings of the risk assessment; and
5. reviewing the risk assessment on a periodic basis and revising if necessary.

The steps of the different stages that facilitates a risk assessment are shown in Table 1.4 [4].

TABLE 1.4: Stages and their steps of a risk assessment

Stages of risk assessment	Steps within each stage
1 **Identify the risk factors or look for the hazards**	• Divide the work into manageable categories. • Concentrate on significant hazards that could cause serious harm or affect several people. • Give all employees opportunity to share their views and involve the whole team. • Divide activities into operational stages to ensure there are no hidden hazards. • Use the manufacturers' material safety data sheets (SDS) to assist in the process to identify the risk and to put the risk into true perspective. • Review previous accidents or incidents and work related illness records.

2 **Decide who might be harmed and how**	• Identify all members of personnel who may be at risk. • Include persons who infrequently come into contact with the hazard, for example maintenance service people, visitors, general public and people sharing the workspace. • Identify more vulnerable people and persons at particular risk, e.g. the very young or very old, people with disabilities, inexperienced or temporary workers.
3 **Evaluate the level of risk**	• Aim to reduce the risk to a low level. • For each significant risk, *after all precautions have been applied,* determine whether the remaining risk is high, medium or low. • Examine the actual process of the specific standard operating procedure. • Confirm compliance with guidelines, requirements or standards. • Confirm legal compliance to keep the workplace safe.
4 **Record the findings of the risk assessment**	• Keep records of assessment of significant findings, hazards and conclusions, including the following: o Activities or work examined; o Hazards identified; o Persons exposed to hazards; o Evaluation of the risk and determination of priorities in these; o Effectiveness of existing control measures, and o Identification of additional precautions; persons who take action and when.
5 **Review the assessment and revise if necessary**	• This is a continuous process that must be kept up to date. • Take into account all new activities and hazards, any changes in processes, methods of work and new personnel members. • The likelihood of occurrence of the hazard determines when the review assessment must be executed: Yearly, quarterly, monthly or daily.

Not all oral health care procedures carry an equal risk of disease transmission. It is therefore recommended that oral health care providers evaluate a task and the type of exposure expected for each treatment situation, prior to choosing the appropriate personal barrier precautions to implement. The highest risk of disease transmission comes from a significant exposure to blood, however, saliva has always been considered a risk in oral health care [29]. Therefore, procedures involving blood, blooded body fluids, and non-intact tissues require maximum protection. On the other hand, procedures involving no anticipated exposure may not need stringent barrier precautions. Listed in Table 1.5 are examples of task levels and exposure types.

It is recommended that each oral health care facility implements a risk assessment action plan in order to identify, control or eliminate hazards. Such an action plan should involve the following [4] :

1. Eliminate or remove the risk, e.g. by means of safer procedures, services or goods;
2. substitute the risk e.g. by using something less hazardous or risky;
3. contain or enclose the risk to remove the hazard from the worker or patient with improved environmental controls, e.g. by using closed, leak-proof puncture-resistant containers to carry contaminated instruments to a sterilisation area;
4. guard and / or segregate the hazard, e.g. exclude people from waste disposal- / storage areas and segregate health care risk waste at the point of generation in the clinical area;
5. modify procedures, protocols and work practices to reduce risk to an acceptable low level;

6. verbally communicate and provide written standard operating procedures for each facility to all persons affected and provide training in order to update / upgrade knowledge and understanding;
7. provide adequate supervision and monitor OHCW and patient compliance;
8. identify training needs and implementation of these;
9. provide information / instruction / training by means of handouts, guidelines and policies (following training, part of the SOP should require that people who are being trained must provide signed documentation that they have been trained and understand the procedures as provided in training); and
10. provide and supervise the use of personal protective equipment (PPE).

TABLE 1.5: Categories of oral health care tasks for risk assessment [30]

Task level	Exposure type	Personal barrier
Surgery, periodontal procedures, etc.	Involves the exposure to blood, blood-contaminated saliva, or non-intact tissue, especially when aerosol or spatter is likely to be produced.	Maximum necessary, including hand washing; using personal protective equipment such as gloves, eyewear and face protection, protective clothing; safe handling of sharps and using controls to prevent injury.
Examinations, radiographs, etc.	Involves contact with intact oral mucosa but no anticipated blood, aerosol or spatter.	Moderate (at minimum, gloves recommended)
Consultations, etc.	Involves no exposure to blood, other potentially infectious materials such as saliva, or tissues.	None required

1.5 Patient history in oral health care

A comprehensive record of each patient's medical and dental history and other relevant information should be solicited at the first visit to an oral health care facility. Questions posed to the patient should include aspect such as illnesses, surgeries and chronic diseases, of particular interest to oral health care (Table 1.6).

TABLE 1.6: Information included in the patient history [31]

Information	Details
Identification characteristics	This information includes basic biological data: the patient's name, address, telephone number, age, next of kin, emergency contact person, occupation and the date the history is being recorded. Except for identifying the patient, this information may also indicate risk categories for diseases, e.g. military and health care personnel may be exposed to a different variety of infectious diseases based on their geographical or occupational environment.

Reason for visit	Signs, symptoms, duration of problem, constant or irregular symptoms, location of pain and / or lesion, nature of discomfort (acute or dull), and effects on overall health or ability to function.
Previous oral health care experiences	Problems and discomfort from previous oral health care appointments may alert the professional to potential problems, e.g. post treatment ulcerations may indicate latex sensitivity or allergy to materials or medication.
History of illness and major surgeries (past and present)	Questions should cover current health status, past and present medical conditions and their severity, genetic and hereditary issues, surgical / hospital procedures (including over-the-counter medicines and supplements), injuries, accidents, reactions to anaesthesia and medication, blood transfusions and responses to treatment. Questions should also cover chronic or newly diagnosed conditions, such as hepatitis, HIV disease, diabetes, hypertension and other chronic conditions.
Family history	History of rheumatic fever or other cardiac conditions that would require use of prophylactic antibiotics according to current guidelines. Also, conditions such as diabetes, haemophilia and allergies, are hereditary in nature. HIV infection can be passed on from affected mother to child. Acquired diseases such as TB are also important, because horizontal transmission can occur through proximity, e.g. between spouses or patients, from patient to HCW and vice-versa.
Social experiences	Environmental, economic, emotional and cultural factors may influence the patient's health. Sexual promiscuity, use of drugs, frequent travelling and immigration are all high risk elements that should alert the oral health care professional to possible problems.
Medication	Ask specific questions regarding medication, including the over-the-counter products, that the patient is currently taking. This may provide additional clues to risk factors and medical conditions. Some patients may be unaware of existing conditions. Persons on long-term treatment with various medications may suffer from abnormalities that may affect the immune system. Important conditions that alter the immune function and thereby routine treatment of these patients include anaemia, HIV infection, leukaemia or other cancers and patients without a spleen.
Allergies	Dental materials may contain ingredients causing allergic or adverse reactions, e.g. latex, nickel, anaesthetics or acrylics.

Indications related to specific organs or systems that suggest abnormalities should be noted. Patients with, for example, joint prostheses, heart murmurs or heart surgery that requires antibiotic prophylaxis may be unaware of the connection between the condition and oral health care treatment. Table 1.7 provides examples of conditions of the body systems influencing health and safety during oral health care treatments, which needs to be reviewed prior to such treatments.

TABLE 1.7: Body systems for patient assessment [31]

Body system	Examples of conditions influencing health and safety
Skeletal system - limbs	Infectious, immunologic and neoplastic processes may be associated with joint disorders. Consider modification of routine oral health care treatment to reduce the risk of infections in persons with prosthetic implants and total joint replacement with antibiotic prophylaxis, with a possible consultation with the patient's physician.

Integumentary system - skin	Generalized itching could be commonly seen as a sign of cirrhosis prior to occurrence of jaundice. Maculae, papules, vesicles and scars could indicate various stages of chicken pox. Pigmentation conditions associated with varying levels of immune-suppression include Addison's disease, Von Rechlinghausen's disease, Puetz-Jeghers syndrome, Cushing's disease and some conditions caused by nutritional deficiencies. Lack or loss of body hair may be associated chronic illnesses, e.g. dermatomysitis, systemic lupus erythematosis, lymphoma, cachexia, herpes zoster and micronutrient deficiencies.
Eyes	Blurred vision may be associated with diabetes mellitus and Stevens-Johnson syndrome. Some signs of hemolytic / obstructive jaundice, chronic hepatitis, cirrhosis may be associated with icteric sclera, herpes keratitis, common cold, viral infections, gonococcal infections and chlamydial infection could be associated with signs of conjunctivitis.
Ear, nose or throat	Hearing loss may be associated with rubella or syphilis. Sinusitis with purulence may be associated with an acute episode of viral infection and a bacterial super-infection. Acute viral and bacterial infections of the upper respiratory tract may be associated with pharyngitis.
Respiratory system	Chronic bronchitis, pulmonary tuberculosis, pneumonias and viral infections in the upper respiratory tract could be associated with productive or non-productive cough. Haemoptysis may be associated commonly with pulmonary tuberculosis. A cough of three weeks or more could be a sign of pulmonary tuberculosis necessitating a referral for a TB test and a pulmonology consultation to rule out active TB.
Cardiovascular system	Handle all patients with cardiovascular disease with care. They are more likely to suffer from stress and anxiety they could be immuno-compromised. Infective endocarditis prophylaxis must be applied to rheumatic heart disease, which includes organic heart disease and non-rheumatic heart conditions such as mitral valve prolapse. Other conditions indicating such action is prosthetic heart valves and persons undergoing dialysis. If adequate antibiotic coverage is not provided, patients may end up with infective endocarditis.
Digestive system; gastro-intestinal tract	Signs of jaundice could be related to hepatitis, cirrhosis, hepatocellular carcinoma as consequences of viral infections of the liver. Other than hepatitis A, E, B, C, D and G, Epstein - Barr virus, cytomegalovirus, rubella, rubeola, coxsackie B virus, herpes viruses and adenoviruses may also be associated with inflammation of the liver. Infections of the liver will predispose the patient to other infections due to immuno-suppression.
Reproductive system; genitourinary tract	Hypertension can affect the kidneys - leading to secondary renal damage and influencing the patient's immune response. The prolonged use of medication in these cases is also a risk associated with immuno-suppression. Sexually transmitted diseases and effects in function of the reproductive system could also be an associated risk.
Endocrine system	Diabetes mellitus, thyroid abnormalities and adrenal insufficiencies also alter the patient's immune response.

1.6 Contact dermatitis and latex hypersensitivity in oral health care

Contact dermatitis and latex hypersensitivity have in recent years become increasingly important problems in oral health care. Patients regularly demonstrate these afflictions resulting in reactions of varying in degrees, from mild itches to anaphylactic shock. It is therefore imperative that OHCWs are familiar with the signs and symptoms of these afflictions and are able to take precautionary measures

to identify and control possible reactions. Precautionary steps to be taken to avoid dermatitis and hypersensitivity reactions in patients are listed in Table 1.8.

TABLE 1.8: Precautionary steps to avoid dermatitis and hypersensitivity reaction in patients [32, 33]

Precautions to avoid dermatitis and latex hypersensitivity reactions
1. Take a medical history and screen all patients for latex allergy.
2. Refer a hypersensitive person for medical consultation when latex allergy is suspected.
3. Be vigilant about latent allergens causing respiratory or anaphylactic symptoms among persons with latex hypersensitivity.
4. Minimise exposure to airborne latex particles for patients with a latex allergy by scheduling them for the first appointment of the day.
5. All working areas that are possibly contaminated with latex powder or dust, should be cleaned 32.
6. If latex-related complications occur during or after a procedure, emergency assistance should be sought immediately.

1.7 Oral health care protocol in response to the COVID-19 epidemic - a South African perspective

Given the novelty of the disease, no transmission of SARS-CoV-2 in an oral health care facility has been identified yet. However, given the high risks involved and the possibilities of transmission of the disease considering the nature of routine oral health care procedures usually generate aerosols; during the course of this pandemic, alterations to oral health care treatment should be considered to maintain a healthy and safe environment for the patients and all the members of the oral health care team. During the execution of oral health care procedures OHCWs and patients may not be aware of their disease transmission status. To prevent transmission of disease, a proper risk assessment must be done, and a series of infection control procedures and precautions should be followed each time when an oral health care procedure is performed, because the patient's disease transmission status may not be known and cannot be predicted. In addition to blood and salivary contamination, most routine oral health care procedures generate significant amounts of droplets and aerosols. This is usually related to the utilisation of devices and equipment such as ultrasonic scalers, air-water syringes and air turbine handpieces. Specific protocols have been issued by the South African Dental Association.

1.8 Conclusion

Infection prevention and control precautions have rapidly evolved in the past three decades, particular with the advent of emerging high risk diseases. In South Africa, with its unique burden of disease including the high incidence of HIV / AIDS, hepatitis B and C, as well as tuberculosis, infection prevention and control in oral health care facilities is of particular significance.

PART II:

Guidelines

2

PART II:

Infection Prevention and Control Guidelines for Oral Health Care Facilities in South Africa

The guidelines are intended for practical use by any member of the oral health care team. This is an important source of information about the practical application of infection control during day-to-day work situations in oral health care facilities and dental training institutions. These guidelines should be used by dental practitioners / employers / managers; personnel involved in and whom are responsible for executing the procedures of infection control in oral health care facilities; the dental chairside assistants, oral hygienists, dental therapists, dental technicians, persons in charge of central sterilisation; and other personnel not directly involved with patient care, such as administrative personnel, cleaners; students and trainees.

What is the purpose of the guidelines?

The purpose of the guidelines is to provide oral health care workers (OHCWs) with the background and knowledge to minimise the spread of potentially pathogenic microorganisms or agents in oral health care facilities. This is accomplished by preventing or reducing the risk of disease transmission; breaking the chain of infection; applying standard and transmission-based precautions; and preventing work related infection of OHCWs, patients and people from the surrounding community. Thus, additionally preventing subsequent liability of the OHCWs for negligence in this regard.

How were the guidelines developed?

The international guidelines of the Centers for Disease Control [29], the American Dental Association [34], the Australian/ New Zealand Standards [35], the British Dental Association [36] and the recent *Health Technical Memorandum HTM 01-05 and 07-01* from the Department of Health-Commissioning and Systems Management in Great Britain [37, 38] were used as a point of departure to compare and develop the South African guidelines.

How are the South African guidelines different from international guidelines?

The international guidelines are very comprehensive and in part highly technical. These guidelines outline what OHCWs need to do and not always how they need to do it. The guidelines of the Centers for Disease Control [29], in particular, are science-based. The words used, and the concepts are in many instances exceptionally difficult to understand, especially for OHCWs with limited or no scientific background. The South African guidelines have, therefore, taken into consideration the unique conditions that exist in the country and focused on using clinical language in simple, easily understood terminology.

The layout of the guidelines uses icons to designate the different components that explain the "why" and "what" the guidelines involve. This is followed by a summary of the "how", indicating the steps to follow when the guideline is applied. Explanation of the icons:

Why?

Explains the reason why a particular subset of the guidelines is important.

What?

Explains what a particular subset of the guidelines entail.

How?

Explains the details of the application of a particular subset of the guidelines.

Stakeholder involvement

To ensure that these guidelines are applicable to the unique conditions in South Africa, stakeholder inputs were requested. Stakeholders included the following authorities:

- South African Dental Association;
- Health Professions Council of South Africa;
- Directorate Oral Health, Department of Health;

- Dental training institutions;
- Dental assistants;
- Dental technicians;
- Dental therapists;
- Oral hygienists;
- Dental practitioners;
- Directorate Oral Health, Military Services;
- Representative of the Medicross Group;
- Representative of the Netcare Group;
- Representatives of the Board of Health Funders;
- Representatives of the Dental Traders Association; and
- International oral health care infection control specialists.

Review and update of the guidelines

It is intended that the South African Infection Prevention and Control Guidelines for Oral Health Care Professionals should be reviewed every two years to incorporate and reflect new research findings.

Financial implication of the guidelines

Significant additional costs are not anticipated in implementing the guidelines in oral health care facilities. However, associated increase in costs can be expected where current equipment or resources do not facilitate the needed requirements, or where levels of adherence to guidelines are poor. However, non-compliance with the guidelines could pose a health and safety risk for oral health care professionals, as well as for patients.

Sections of the guidelines

Section 1: Administrative Controls
Section 2: Personnel Protection Controls
Section 3: Environmental- and Work Controls
Section 4: Surface Contamination Management
Section 5: Equipment Maintenance, Service or Repair
Section 6: Air- and Waterline Management
Section 7: Personal Protective Equipment Usage
Section 8: Personal- and Hand Hygiene Practices
Section 9: Sterilisation Practices
Section 10: Safe Sharps Handling
Section 11: Waste Management

Administrative Controls

> "To err is human, to cover up is unforgivable, and to fail to learn is inexcusable."
>
> SIR LIAM DONALDSON

Why?

All employers have a legal responsibility to provide a safe environment in the workplace. In the clinical environment of health care, oral health care workers (OHCWs) and patients may be exposed to an increased infectious risk and many health hazards.

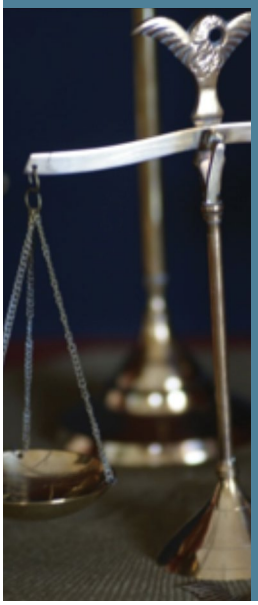


FIGURE 1.1: Maintaining an audit trail of evidence

What?

In a public confession of their commitment, many health care professionals take the Hippocratic Oath, stating[39]:

"I do solemnly swear, by whatever I hold most sacred, that I will be loyal to the Profession … and just and generous to its members …
… I will care for my patients and their families as I would have them care for me and my family."

Administrative controls involve documentation informing the OHCWs of their legal and ethical duties, but also provide a trial of evidence confirming compliance in the facility.

How?

1.1 Fulfilling the legal responsibility to provide a safe environment in the workplace
1.2 Recordkeeping of the legislative documentation applicable to infection control practices
1.3 Maintaining an audit trail of evidence
1.4 Applying standard precautions as a rule for any contact with a patient

1.1 Fulfilling the legal responsibility to provide a safe environment in the workplace

Fulfilling the legal responsibility to provide a safe environment in the workplace

The employer is ultimately accountable for safety in the workplace, and his / her responsibilities include the following [40]:

- Ensure the workplace is safe;
- provide adequate facilities and safe systems of work;
- provide personal protective equipment;
- provide information, instruction, training and supervision to perform work safely;
- provide a system to ensure an incident is recorded confidentially; and
- data from blood and body fluid exposures are monitored and information should be used as the basis of change where problems are identified.

Responsibility for an effective infection control programme depends on the involvement and dedication of every member of the oral health care team. However, the employer may wish to the assign responsibility to manage the infection control and safety programme to an appointed employee; for instance, the practice manager, dental assistant or infection control and safety coordinator. It is each and every employees responsibility to do the following [40]:

- Follow the safe systems of work;
- follow advice as given by the employer;
- use protective equipment supplied; and
- report all injuries, exposures / dangerous incidents.

1.2 Recordkeeping of the legislative documentation applicable to infection control practices

Legislative documentation suggested for recordkeeping* [41]

Act / Regulation / Ordinance Name	Act No.	Notes / Remarks
Constitution of the Republic of South Africa	108 of 1996	*The South African Constitution, Section 24, affords everyone the right to live in an environment that is not harmful to his / her health or well-being. The Constitution provides the foundation for environmental regulation and policy in South Africa.*
Occupational Health and Safety Act	85 of 1993	*Effective implementation of the Occupational Health and Safety Act, will in itself go a long way towards ensuring sound infection control. Section 8(1) obliges an employer to provide as far as is reasonably practicable, a safe working environment. Section 13 of the act imposes a duty on every employer, to as far as is reasonably practicable, inform every employee about the hazards imposing on his health and safety, attached to his work. Every employee should thus be made conversant with the precautionary measures to be taken with respect to the hazards associated with oral health care.* *Furthermore, Government Notice R1390 of 27 December 2001, Hazardous Biological Agents Regulations, promulgated under Section 43 of the*

		Occupational Health and Safety Act, No 85 of 1993, regulates the exposure of employees to hazardous biological agents. Every employee should thus be made conversant with the precautionary measures to be taken with respect to the specific biological hazards associated with oral health care.
Environmental Conservation Act	73 of 1989	*All wastes containing Hazardous Biological Agents that can cause exposure to disease can only be disposed of on sites specifically designed for this purpose.*
National Environmental Management: Waste Amendment Act	26 of 2014	*Reforms the law regulating waste management, and for the first time provides a coherent and integrated legislative framework addressing all the steps in the waste hierarchy.*
Compensation for Occupational Injuries and Health Diseases Act	130 of 1993	*If an employee contracts an infectious disease and the origin can traced to the work environment, the employer can be held responsible under the Act.*
Hazardous Substances Act	15 of 1973	*This Act provides for the control of substances which may cause injury or ill-health resulting from the toxic, corrosive, irritant, strongly sensitising, e.g. disinfectants or chemical sterilants, or flammable nature of products used in the oral health care facility. It furthermore includes the generation of pressure, for example when autoclaves or other vessels under pressure, are utilised. When using chemicals in oral health care facilities the following are important guidelines.* *Steps to follow:* • *Employees, who can be potentially exposed to chemicals at work, should be trained and protected.* • *Records of all chemicals that are used in the oral health care facility should be listed.* • *Adequate personal protective equipment (PPE) should be provided to employees and they should be trained to use these correctly.* • *Employees should be taught to use and read data safety sheets (SDS) of all the chemical and products used in oral health care facilities.* • *SDS of all chemicals and products used in the facility should be catalogued and kept in a logbook or file. These records should be accessible at all times and continuously updated.* • *Information on SDS should include the following:* o *Health hazards* o *Routes of exposure* o *Carcinogenic evaluations* o *Treatment for acute exposure* o *Chemicals or methods to inactivate* o *Solubility, volatility and stability of* o *PPE required for safe handling* o *Spill control and chemical disposal procedures* o *Emergency and first aid procedures* o *Name, address and contact details of the manufacturers.*
Human Tissue Act	65 of 1983	*This Act makes provision for the handling and disposal of extracted teeth, which includes practical training sessions and demonstrations.*
Health Professions Act	56 of 1974	*This Act controls the scope of all OHCWs and also the standard of training of OHCWs.*
Skills Development Levies Act	9 of 1999	*Sections in this Act are specifically directed to the workplace, which is considered to be a place of teaching and learning.*

The Code of Good Practice on key aspects of HIV and AIDS and Employment Regulation		*Employers should include the Code in their orientation and training programmes of employees. The code sets out guidelines for employers, public and private oral health care faculties, and trade unions to implement, and thereby prevent unfair discrimination against employees in the workplace.*
Consumer Protection Act	of 2008	*Sections in this Act are specifically directed to the necessary performance, quality and safety standards applicable to oral health care.*

**Please note that above list is not exhaustive*

1.3 Maintaining an audit trail of evidence

Record keeping

In order to maintain a trail of evidence, the keeping of records is an important part of administrative controls. These records involve evidence concerning the personnel employed in the oral health care facility, measures applied to prevent and manage injuries or incidents, safety measures and controls for hazardous materials or equipment employees and patients may be exposed to, as well as routines and schedules followed during the execution of routine oral health care procedures [22].

Records of the following should be maintained, and could be used as evidence in case of legal prosecution:

1. Health records for each personnel member	Establish and keep updated confidential health records for each personnel member, including occupational illnesses or exposures.
2. Personnel database	Maintain a personnel database, preferably computerized, that allows tracking of personnel immunisations, screening tests, and assessment of infections and diseases for personnel.
3. Exposure incidents and management	Keep records of occupational exposures of OHCWs, exposure management and follow-up, accident investigations, causes of incidents and corrective actions suggested.
4. Implementation of preventive strategies	Application of standard precautions, training on exposure risk, improved sharps disposal systems, application of personal protective equipment, and safety-engineered sharp devices to ensure a safer working environment.
5. Training sessions	Establish and keep updated records for periodic training sessions, attendees and presenters of such sessions. It is suggested that each personnel member keep individual records of continuous professional development.
6. Waste management and disposal	Keep written records of waste management and disposal.

7. Records of chemical inventory	Keep written records of chemical inventory, including SDS for each product, e.g. disinfectants.
8. Equipment maintenance and repair	Keep records and invoices of equipment maintenance and repair schedule.
9. Schedule of housekeeping	Establish and keep a housekeeping schedule.
10. Schedule of dates for specific activities	Keep schedules of dates for specific activities, e.g., sterilisation monitoring, cleaning and changing of chemicals with a log demonstrating that these activities have been performed.

1.4 Applying standard precautions as a rule for any contact with a patient

Applying standard precautions as a rule for any contact with a patient

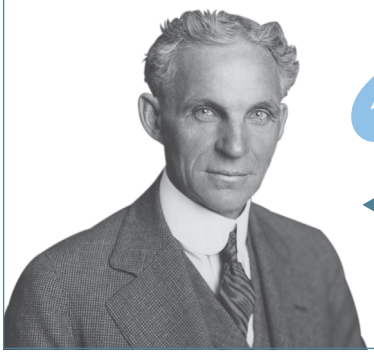
During the execution of oral health care procedures OHCWs and patients may not be aware of their disease transmission status. To prevent transmission of disease, a series of infection control procedures and precautions should be followed each time when an oral health care procedure is performed, because the patient's disease transmission status may not be known and cannot be predicted. Prior to 2003, universal precautions were applied; treating all patients as if infected and infectious [22]. Saliva has always been considered as other potentially infectious materials (OPIM) in oral health care, because it may be contaminated with blood [29]. Because of the constant presence of saliva during oral health care procedures, the universal precautions were replaced by standard precautions [29]. The principle of standard precautions, is firstly to recognise that all body fluids, excretions, secretions and tissues as potentially infectious, and secondly, is designed to reduce the risk of transmission of infectious organisms or agents in the workplace [5]. Infection control procedures are determined according to the procedure, not the patient [42].

Standard precautions should be applied for any contact with a patient, determined by the task being performed and the type of exposure to blood, body fluid or pathogens that is anticipated. Recognising all body fluids, excretions, and secretions are potentially infectious, protective measures and standard precautions should be employed:

Standard precautions to apply for contact with any patient; including any body fluid, excretion, or secretion:

1. Performing hand hygiene and caring of hands procedures;
2. using PPE, including gloves, masks, eye protection, and protective clothing or uniforms that is intended to prevent the exposure of skin and mucous membranes to blood and OPIM;
3. cleaning and decontamination of patient care equipment and instruments;
4. cleaning and disinfection of environmental surfaces;
5. application of environmental controls or safer work practices in order to prevent injuries;
6. application of zoning for work areas;
7. application of barrier protection;
8. disinfection of equipment and surfaces;
9. respiratory hygiene- / cough etiquette; and
10. application of safe injection practices.

Personnel Protection Controls



> Coming together is a beginning, staying together is progress, and working together is success."
>
> HENRY FORD (1863-1947)

Why?

Personnel protection controls are instituted to protect all oral health care workers (OHCWs) and patients from being exposed to hazardous risks, which include infectious hazards, chemical hazards, physical hazards and waste materials.

What?

Personnel protection control programmes protect OHCWs from routine exposure to risk factors within oral health care facilities.

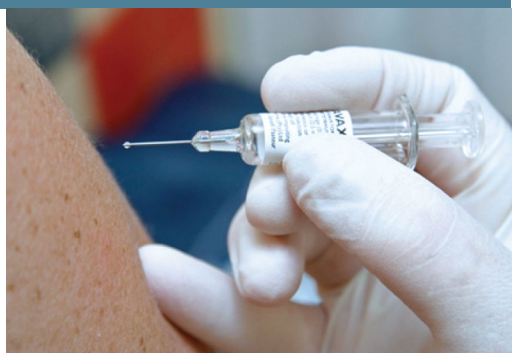


FIGURE 2.1:
Vaccines for oral health care workers

How?

2.1 Monitoring health of OHCWs
2.2 Training of OHCWs
2.3 Implementing infection control programme(s)
2.4 Keeping and maintaining health and safety records of employees

2.1 Monitoring health of oral health care workers (OHCWs)

2.1.1 WORK RELATED ILLNESSES AND INFECTIONS

Acute illnesses and infections

An employee should be excluded from patient treatment procedures if s / he has an active form of any of the following diseases [29]:

- Conjunctivitis (pinkeye);
- hepatitis A;
- herpetic whitlow (herpes on the hands / fingers);
- measles, mumps, rubella;
- chickenpox;
- pertussis (whooping cough);
- staphylococcal infections;
- tuberculosis;
- pneumonia;
- influenza; and
- fever of unknown origin.

Infections and chronic illnesses

To ensure patient safety, an OHCW with HIV / AIDS, active hepatitis B or C , TB or other transmissible diseases should consult a qualified medical professional before performing any exposure-prone procedure in the oral health care facility**.** Carrier status of any possible communicable disease should also be considered. Where there is a risk of an OHCW transmitting an infection to a patient or other OHCW, for example, if the OHCW is infected with a blood borne virus, other transmissible infection or skin condition, the OHCW should be counselled about work options and provided with information to continue his or her profession [29].

Consultation of qualified medical professionals

In oral health care facilities there may arise situations that require the assistance of medical professionals. It is recommended that an oral health care facility has a permanent arrangement with such professionals in order to expedite medical care.

- To ensure prompt and appropriate provision of preventive services, e.g. vaccinations;
- in case of any medical reaction or emergency, e.g. latex sensitivity;
- for occupationally related medical services, e.g. annual medical check-up for registration as radiographic worker; and
- for post-exposure or accident management with medical follow-up.

2.1.2 RISK CATEGORIES OF OHCW

Employee risk categories

To be able to determine an employee's risk of exposure to blood and OPIM, all employees should be provided with a list of job related duties. According to these duties, the risk of exposure to blood and OPIM can be identified, and employees categorised according to the nature of their employment. Training can then be provided accordingly [43].

The levels of anticipated contact between the OHCW and the patient's mucous membranes, blood or saliva visibly contaminated with blood, should determine the level of anticipated risk and thus the precautionary measures applied for the specific employee:

TABLE 2.1: CATEGORIES OF EMPLOYEES

Category I employees Anticipated contact with the patient's mucous membranes, blood or saliva visibly contaminated with blood.	All personnel performing clinical duties involving exposure to blood, OPIM or body tissue, including dental practitioners, dental therapists, oral hygienists, chairside assistants, and dental technicians.
Category II employees Anticipated contact with the patient's mucous membranes, but not with blood or saliva visibly contaminated with blood.	All non-clinical personnel, performing duties involving exposure to blood, OPIM or body tissue, including receptionists, practice managers or secretaries. They are not but may sometime be called in as replacement to do chairside clinical duties.
Category III employees No anticipated contact with the patient's mucous membranes, blood, or saliva visibly contaminated with blood.	All personnel, performing duties that never involve exposure to blood, OPIM or body tissue, including administrative personnel, accountants or financial advisors.

All dental practitioners, dental therapists, oral hygienists, chairside assistants, and dental technicians perform clinical duties, involving exposure and contact with oral mucosa, and thus blood or saliva with blood. Therefore, these personnel need to apply standard precautions. Receptionists, practice managers or secretaries do not perform clinical duties involving exposure to blood and other potentially infectious materials. An exception applies when they are called in as a replacement for Category I employees (Table 2.1). Class II employees have contact with oral mucosa, but never have contact with blood or saliva with blood. Category III employees are administrative personnel not involved in clinical duties at all.

2.1.3 HEPATITIS B AND OTHER DISEASE PREVENTABLE VACCINATIONS

Disease preventable vaccinations

Immunisation of OHCWs should be performed prior to risk exposure. This remains the most efficient and effective way of preventing diseases in oral health care facilities [32]. Oral health care workers should be immunised with following vaccines:

- Hepatitis B vaccine (three dose series, with a booster every five years);
- MMR vaccine (measles / mumps / rubella);
- Chickenpox vaccine;
- Polio vaccine;
- Tetanus vaccine (with a booster every 10 years); and
- Annual influenza (flu) vaccine.

Steps to follow for vaccinations:

1. Provide training to employees concerning the risks of transmission of infectious diseases and the availability of vaccines.
2. Offer available vaccinations to all OHCWs with potential occupational exposure to blood or OPIM.
3. Make specific arrangements with qualified medical professionals for vaccinations and follow-up appointments.
4. Follow recommendations for specific vaccination, serologic testing, follow-up, and boosters.
5. Counsel non-responders to the vaccinations about their susceptibility to infection and required precautions.
6. OHCWs, who decline immunisation, should sign a declination form that should be kept on file.
7. Records of all immunisations should also be kept on file, or, if this is a condition of employment, inform the potential employee during the job interview.

2.2 Training of OHCWs

Training of OHCWs

All members of the oral health care team should be aware of procedures required to prevent the transmission of infection. Each member should understand why infection control procedures are necessary [36]. OHCWs have a duty and responsibility to themselves, patients and colleagues to comply with necessary steps to prevent cross infection. Regular monitoring and recordkeeping of procedures are essential, such as monitoring of the sterilisation process. All new personnel, particularly housekeeping or cleaning personnel without any formal education, must be appropriately trained in infection control procedures necessary in oral health care and each personnel member should be able to do the following [36]:

- State how infections are transmitted;
- State or define what the infection control protocol or policy is;
- Demonstrate what personal protection equipment (PPE) is needed, when to use it, and how to use it efficiently;
- Demonstrate what to do when an accident or personal injury happens; and
- Make recommendations on a regular basis to make sure that the infection control programme is as up to date as possible.

Training is provided at three levels:

Informal training:
One-on-one learning, e.g. when a specific area or topic is discussed amongst personnel members.

In-service training:
In-service training is where the everyday working situation is used as a teaching and learning environment.

Formal training:
Formal training takes place in a classroom setting, e.g. specific lectures, assignments and continuous work assessments.

Training steps to follow for training:

Training should be provided to all OHCWs at an appropriate level of their vocabulary, education and literacy:

1. On initial employment;
2. when assigned new tasks and / or procedures are introduced;
3. at least annually; and
4. when incidents occur or it is observed that there are breaches in infection control protocols.

Records of all training sessions should be kept on file.

2.3 Implementing infection control programme(s)

Implementing infection control programme(s)

Each oral health care facility should have a written infection control programme. Application of this document provides a framework for minimum standards of care to protect personnel members, and ultimately patients, and should include the following:

- General recommendations;
- training programme for employees;
- immunisation plan for vaccine preventable diseases;
- exposure prevention and post-exposure management (including follow-up of personnel exposed to infectious organisms or potentially harmful materials);
- medical condition management, work-related illnesses and restrictions; and
- updated and current health records of employees.

Steps to follow for the infection control programme:

1. Responsibility should be assigned to *one* personnel member to organise and supervise the infection control programme (plan); the infection control coordinator.
2. A written infection control programme should be developed, which is unique for each facility or practice. Information about the infection control programme should be contained in easily accessible folders: one containing the infection control and safety procedures; and the other containing information about products and chemicals used in the facility, including their safety data sheets (SDS) obtained from suppliers or distributors of these products.
3. OHCWs should be trained in the various topics covered by the infection control programme.
4. The infection control programme should be reviewed regularly.
5. An annual audit should be conducted of infection control in each facility.

Duties of the infection control coordinator

The duties of the infection control coordinator involve the continuous reviewing of the infection control programme in an oral health care facility. This also includes reviewing the handling of hazardous materials and all records relating to health and safety matters.

Steps to follow for the infection control coordinator:

1. Develop all infection control policies and procedures including post-exposure protocols, the frequency of updates, and policies for the evaluation and documentation of the programme and compliance for procedures.
2. Provide training and maintenance of records for training of infection control policies and procedures for new and current personnel.
3. Prepare, review, and update personnel health records and health related matters such as vaccination and training records for current and new personnel including procedures for post-exposure medical evaluation and follow-up.
4. Training of cleaning personnel, particularly regarding issues related to personal protection including exposure control during cleaning procedures.
5. Management of equipment and PPE required to accomplish infection control.
6. Decontamination of equipment prior to transport for repair.
7. Develop and manage the inventory list and the safety data sheets (SDS) of chemicals and products used in the oral health care facility.
8. Develop standard operating procedures for sterilisation including mechanical, chemical, and biological monitoring.
9. Management of disposal of health care risk waste (HCRW).
10. Development of procedures and practices to open lines of communication for personnel and patients to voice concerns and make suggestions for improvement for infection control practices..

2.4 Keeping and maintaining records of employees

Keeping and maintaining records of employees

Records and evidence of training of OHCWs should be maintained; for example of, immunisations of OHCWs; exposure prevention and post-exposure management; medical conditions, work-related illness, associated work restrictions; and contact dermatitis and / or latex hypersensitivity. All medical records of employees should be kept confidential [44].

Example of vaccination records:

Date	Personnel member	Vaccination type	Medical practitioner	Antibody status as necessary	
				Date	Results

Example of training records:

Date	Personnel member (indicate if new)	Signature: personnel member	Names and qualifications of trainer(s)	Content of training provided

Example of a incident reporting form:

[Insert name of the oral health care facility]

General information

Last Name: _____ First Name: _____

Injury person ID: _____ Facility ID: _____

Date of injury: _____ Time of injury: _____

Job category of the injured worker: (check one box only)
☐ 1 Practitioner (attending / permanent personnel; specify if specialty) _____
☐ 2 Dental therapist
☐ 3 Dental hygienist
☐ 4 Dental assistant
☐ 5 Student; specify _____
☐ 6 Cleaner / Housekeeper
☐ 7 Dental technician, specify if other laboratory personnel _____
☐ 8 Other, describe: _____
Department or section where incident occurred: _____

Was the source patient identifiable? (check one box only)
☐ 1 Yes ☐ 2 No ☐ 3 Unknown ☐ 4 Not applicable

Was the injured worker the original user of the sharp item? (check one box only)
☐ 1 Yes ☐ 2 No ☐ 3 Unknown ☐ 4 Not applicable

The sharp item was: (check one box only)

☐ 1 Contaminated (known exposure to patient or contaminated equipment)

→ Was there blood on the device? ☐ 1 Yes ☐ 2 No

☐ 2 Uncontaminated (no known exposure to patient or contaminated equipment)

☐ 3 Unknown

Reported by:	Date / time reported:

Incident details

Type of incident [tick a category]:

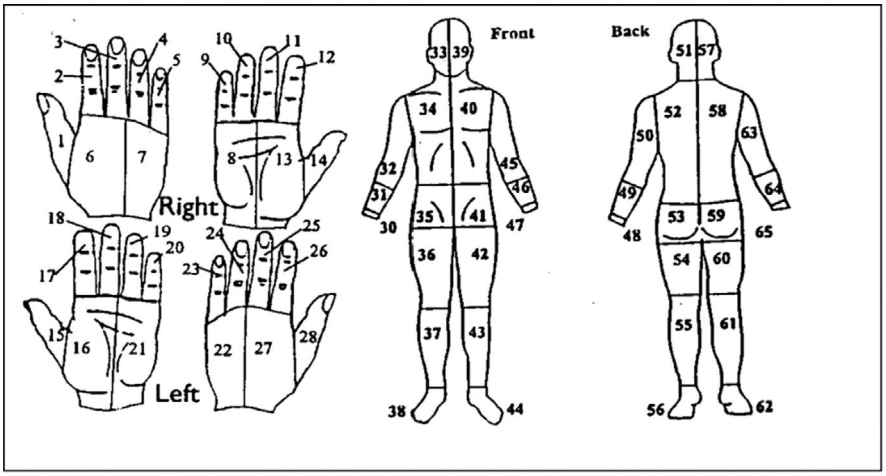
☐ 1 Superficial *(little or no bleeding)*

☐ 2 Moderate *(skin punctured, some bleeding)*

☐ 3 Severe *(deep stick / cut, or profuse bleeding)*

☐ 4 Other ; specify _____

Incident details [mark the location of the injury in the box below]:



Incident details:

Initial action(s) taken:

Date initiated:

Investigation and management

[Insert name and job descriptor of the investigating person]	Date of commencement of investigation:

Investigations, findings, actions and recommendations:

Post-incident reporting	

YES / NO

Details of post-incident reporting:

GUIDELINES SECTION 3

Environmental- and Work Controls

Why?

Environmental- and work controls are instituted to protect all OHCWs in and around the workplace. These controls minimise the spread of infections and reduce the risk of accidental injury to personnel, patients, visitors, and exposure of the community. In the work environment, OHCWs are constantly in contact with traumatised tissue, saliva and blood; they work with sharp instruments, and are constantly exposed to sprays and spatter of blood and body fluids from dental handpieces and other equipment. These exposures may lead to the transmission of infectious microorganisms and agents posing a health risk to OHCWs and patients.

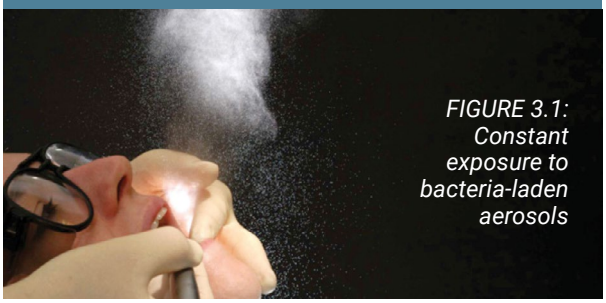


FIGURE 3.1: Constant exposure to bacteria-laden aerosols

What?

The environment of an oral health care facility includes daily exposures to all surfaces, the water supply and waste, as well as a constant exposure to saliva, blood and other potentially infectious material (OPIM). Environmental controls prevent the spread and reduce the concentration of bacteria-laden aerosols. These controls address three main themes: Key design features of the environment to improve safety or removal of hazards; management of contamination of surfaces and the handling of health care risk waste. Environmental controls also include the use of instruments and equipment that eliminate or isolate hazards. Safe work practice controls guide the manner in which personnel perform given tasks. This ultimately results in safer behaviour and includes procedures that reduce the likelihood of exposure to potentially infectious materials.

How?

3.1 Implementing environmental controls and safe work practices

Implementing environmental controls and safe work practices

Environmental controls and safe work practices should be used to prevent or minimise exposure to pathogens.

Examples of *environmental controls* include:

- Appropriately labelled, with a biohazard label, puncture-resistant, sharps containers that are located as close to the work area as practical;
- sharps containers with properly marked fill lines, so that it can be replaced before overfilling;
- needle guards;
- devices with injury protection features, such as self-sheathing needles or scalpels;
- dental units designed to shield burs on handpieces;
- closed or covered containers for transporting contaminated instruments to the processing area;
- ultrasonic cleaners, washer / decontaminators, instrument cassettes, or other devices to minimise handling during clean-up procedures; and
- evaluation of new instruments and equipment that become available on the market and acceptance into the program if they meet needs.

Examples of *safe work practice controls* include:

- Recap anaesthetic needles using one-handed scoop-technique or mechanical device to hold the needle sheath;
- minimise uncontrolled movements of sharp instruments under force, such as scalers;
- use instruments instead of fingers to retract tissues during suturing and anaesthetic injections;
- pass instruments with sharp ends pointing away from all persons;
- announce passes of an instrument and pass behind or over the abdomen of patients;
- maintain appropriate care in the handling and passage of syringes and other sharp instruments;
- use ultrasonic cleaner, washer / decontaminator, or other effective device to minimise handling during cleaning procedures;
- use utility gloves during instrument cleaning; and
- use mechanical instruments and equipment to decontaminate sharp instruments.

EXAMPLES OF HOW ENVIRONMENTAL AND SAFE WORK PRACTICE CONTROLS CAN BE IMPLEMENTED:

Environmental and safe work practice controls	Maintenance schedule	Responsible person
sharps containers safety scalpels needle recapping instruments	inspect daily discard after use inspect after use	coordinator dental assistant dental assistant

It is the responsibility of the designated person for infection control in each oral health care facility to review practices and bring matters of concern under the attention of management. Those who are ultimately liable for any possible damage incurred by personnel and patients must act in a timely, responsible and appropriate manner on the information and recommendations.

3.2 Preventing chairside exposures

3.2.1 REDUCE AEROSOLS TO MANAGE INFECTIOUS LOAD

Reduce aerosols to manage infectious load

Different studies indicated that many oral health care procedures produce aerosols and droplets that are contaminated with infectious agents and blood [22, 43, 45]. These aerosols represent a potential route for disease transmission. Cross-contamination can be prevented by adherence to the following:

1. The treatment procedure should never be interrupted, for example, by leaving the clinical treatment area, or answering the telephone.
2. Limit touching to instruments and materials essential for patient treatment only. Avoid touching unprotected surfaces, patient file, drawers, cabinets or containers.

Airborne contamination can easily and inexpensively be achieved by incorporating several infection control steps in routine precautions during all oral health care procedures:

Steps to follow to reduce aerosols to manage infectious load:

1. Allow every patient to rinse with a pre-operative antimicrobial mouthwash, e.g. 0.2% chlorhexidine for 30 seconds, or one minute (two 30 sec. rinses best) with 1% hydrogen peroxide (virucidal) before the procedure commence. This is to reduce bacterial loads in the oral cavity and in the bacterial aerosol and spatter generated during oral health care treatment. This rinsing with antimicrobial mouthwash also prevents post-operative infections in the patient.
2. Apply standard precautions for all patient procedures and use additional PPE barriers, such as disposable uniforms and face shields, when performing procedures with increased aerosols, for instance when using the ultrasonic scaler, high-speed handpiece or surgical procedures. This would need to be included in the IPC office manual and would be used for all patients when performing procedures with increased aerosols so that patients do not perceive that it is being done due to their disease status.
3. As far as possible, apply single-use, disposable items such as environmental barriers, gloves, masks, suction tips, propylaxis brushes and cups, etc.
4. Use high-volume evacuation (HVE) or high-volume suction to limit the amount of aerosol and saliva spatter, in particular when using the dental handpiece, ultrasonic scaler and abrasion instruments and equipment to reduce the bacterial aerosol and spatter generated by these instruments and equipment.
5. Use rubber dam whenever possible to reduce contact with oral fluids during the procedure. This also protects patients from swallowing or aspirating objects.
6. Flush air- and waterlines before the start of the working day and after each patient to reduce the microbial loads in these lines and replace the water in the lines with fresh water.
7. Pour chemicals rather than spraying them, for instance, immersion of impression materials and equipment in disinfectants. Surfaces should be cleaned with disinfectant impregnated wipes.
8. Clean the filters of the air conditioning system and vacuum pump routinely as prescribed by the manufacturer.
9. Use a lid to cover ultrasonic cleaners and other containers with chemical solutions.
10. Minimise the use of latex products.
11. Use powder-free gloves.
12. Use a vacuum dust collection system or wall- / window mounted extraction fan during dust-producing procedures in the dental laboratory.

FIGURE 3.2: Aerosols generated during oral health care procedures

3.3 Incident exposure management

Incident exposure management[46, 47]	
An exposure incident is defined as a specific incident involving contact with blood or OPIM to the eye, mouth, other mucous membrane, non-intact skin. e.g. exposed skin that is chapped, abraded, or afflicted with dermatitis, or parenteral under the skin, e.g. needle stick or sharp instrument, that occurs during the performance of an employee's duties [48, 49]. Management route once an individual has been exposed to blood or OPIM:	
1. Incident exposure site	• Administer first aid as necessary. • Wash wound and skin with large volumes of water and soap. • Application of caustic agent, e.g. bleach or injection of antiseptics or disinfectant into wound is not recommended. • Flush mucous membranes with water. • Flush eyes with clean water or eye irrigants.
2. Report exposure	• Report exposure incidents to supervisor to allow immediate medical follow-up. • If post-exposure prophylaxis (PEP) is indicated it should be initiated within 1 – 2 hours after exposure. • If the infectious status of the source patient is unknown, try to obtain blood from source (informed consent) or treat as if positive.
3. Determine risk of exposure	• Identify the type of fluid, e.g. blood, visible bloody fluid, or other potentially infectious fluid or tissue. • Identify the type of exposure, e.g. percutaneous injury, mucous membranes or non-intact skin exposure. • Assess the risk of infection by using available information. *Testing infectious status of the source patient:* • Determine the HIV / HBV / HCV status of the source patient as soon as possible. It is recommended that a reliable rapid test be used. • Testing on the source patient should be performed with informed consent. • If the source patient refuses to have his / her blood taken, it must be assumed he / she is positive. • The Department of Health guidelines [50] suggest when a recent existing blood sample is available; a test may be conducted without the consent of the source patient.
4. Referral of OHCW to medical professional	• After an exposure incident, immediate professional medical evaluation and follow-up should be provided at no cost to employee. • Blood should be drawn for HIV / HBV / HCV testing with the employee's consent. • The administering of the post-exposure prophylaxis will be determined by the medical professional after the risk assessment has been completed. *Information provided to medical professional:* • The activity of the exposed employee at the time of the incident. • The type of incident. • Results of the source patient's blood test if available, subject to the consent to release the information. • Post-exposure prophylaxis, if indicated, should commence within 24 hours of the incident.

5. Counselling of affected person	• Counselling is a vital component of the required post-exposure follow-up procedure. • Counselling of the employee concerning his / her infection status, including results and interpretation of tests, should be undertaken by a trained counsellor.
6. Identify and change unsafe work practices	• Observe procedures and procedures to identify risks. • Review exposure incident logs and look at the circumstances causing injuries. • Interview personnel members about "near miss" incidents. Record the circumstances of the "almost exposures or injuries". • Review and evaluate new technologies and developments to reduce risks.

3.4 Single use or disposable items

Single use or disposable items	
The use of disposable items is recommended, when heat-tolerant items that can be sterilised, cannot be applied. Examples include the following:	
1. Personal protective equipment	• Examination gloves, surgical gloves, over gloves and finger-cots; • side shields for prescription glasses; • surgical masks with or without eye protection and dome shaped masks; and • protective uniforms or gowns, shoe covers, patient bibs.
2. Surface barriers	• Headrest covers, chair covers, bracket table cover, radiographic tube covers, radiographic switch control covers, and barriers for work surfaces; • plastic barriers for light handles, light switches, chair controls, saliva ejectors and high speed evacuation syringes / hose sleeves, air / water syringes / hose sleeves, high and slow-speed handpiece sleeves; • barrier sleeves for composite curing lights, intra-oral video camera wands, intra-oral radiology film barriers; and • sterilisation pouches and instrument tray covers.
3. Items used intra-orally	• Single-use-disposable needles and burs, anaesthetic cartridges, air- / water syringe tips, saliva ejector and high-volume evacuator tips; • matrix bands, Mylar strips, wooden wedges, packing cords, articulating paper strips, Thompson's markers and sandpaper discs; • dispensing tips for flowable and condensable composites, enchants dispensing tips, irrigation syringes, monojet syringes, plastic impression trays, fluoride trays, plastic composite mixing rays, plastic mixing spatulas, composite brushes, unit dose composite carpules and bonding agents; • plastic, disposable tips for the air- / water syringes; and • rubber dams, tongue blades, cotton swabs, cotton rolls, floss, prophylaxis paste cups, floss threaders, disposable prophylaxis handpieces, bite blocks for bitewing radiographs.

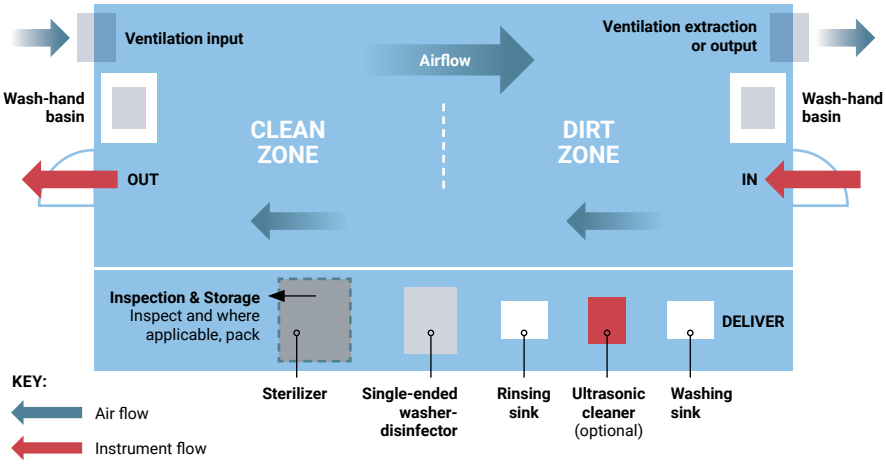
3.5 Treatment planning and time management

Treatment planning and time management	
Numerous supplies and materials are used during patient care. The storage and distribution of these materials and supplies present a major challenge to infection control. The majority of problems relate to surface asepsis during frequent touching and to avoid cross-contamination. The following will contribute to the prevention of cross-contamination:	
1. Aseptic retrieval	• When an item needs to be retrieved from a container, sterile forceps should be use for aseptic retrieval. NOTE: never use saliva-coated, gloved fingers to retrieve items from a container. • Barrier protection and disinfection of handles of storage drawers prevents cross-contamination.
2. Unit dosing	Unit dose entails to have all possible dental consumables and materials required for a particular procedure available at commencement of the treatment. All unused material or consumable should be regarded as contaminated and disposed of and not recycled for use on next patient. *Included in the following is an example of unit dosing during an amalgam restoration:* Unit dosing to avoid splash or spatter during an amalgam restoration: • Re-usable protective eyewear or disposable side shields for the OHCWs; • disposable mask; • a pair of disposable examination gloves; • disposable plastic over gloves; • disposable gown; and • a bib and protective eyewear for the patient. Environmental barriers during an amalgam restoration: • Head rest / back cover; • light handles; • chair controls; • high-volume evacuator and saliva ejector syringe sleeves; • sleeves for the highspeed handpiece; • bracket table; and • work surface / bench. Materials during an amalgam restoration: • Sterile examination set; • sterile assorted burs in a bur block; • sterile high-speed handpiece; and • restorative instrument kit, including matrix band, retainer and an interproximal wooden wedge. Single-use-disposables during an amalgam restoration: • Single-use-disposable air / water syringe tips, high-volume evacuator and saliva ejector tips; • articulating paper; • cotton rolls and 2 x 2 gauze; • topical anaesthetics and cotton tip applicator, sterile needle, syringe and a carpule of a local anaesthetic; and • cavity liner, calcium hydroxide cement, including the mixing tip and tray and adequate amalgam capsules.

3.6 Ergonomic design for areas to accommodate traffic flow and safety

Ergonomic designs for areas to accommodate traffic flow and safety [51, 52]	
Traffic flow in the oral health care facility involves the movement of personnel and patients in the facility to a variety of areas, such as, the waiting area, the bathroom and clinical treatment areas, etc. Because of exposure risk through accidental contact, for instance when OHCWs carrying contaminated instruments in an area where passing patients and other personnel are present, areas should be designed to limit such contact. Otherwise, control measures need to be put in place to accommodate the transport of contaminated instruments and materials. Examples of areas to be included in the design of the facility, include amongst others the following:	
1. Instrument processing areas	Treatment areas should preferably be adjacent to or central to the instrument processing areas.
2. Zoning of clinical, processing and administration areas	Treatment and processing areas should preferably be separated from administrative areas, personnel lounge, food areas and bathrooms. Divide the facility into the following workspace areas: • Clinical or procedural areas; • processing areas; • laboratory areas; • administrative areas; • personnel lounge / eating areas; and • bathroom areas.
3. Design of the clinical area	Clinical area should preferably comprise of the following features: • Plumbing-backflow prevention instruments and equipment; • treatment of water lines, in particular the use of filtration or specific water running to dental units; • plumbing, electrical and other service lines; • power switches with respect to sterilisers, printers and biological incubators; and • a water supply system that has sufficient number of stop valves.
4. Housekeeping surfaces	Housekeeping surfaces should preferably include the following features: • Minimal horizontal surfaces to prevent collection of dust; • seam-free, impervious and easily cleanable; and • no carpet in treatment areas.
5. Counter- / bench surfaces	Counter- / bench surfaces should preferably include the following features: • Rounded, with fluent intersections between vertical components and horizontal surfaces; • post-formed; • minimal work surfaces, emphasising the use of automix or no mix materials; and • free of clutter; items placed into drawers or cupboards.

6. Cupboards	Cupboards should preferably include the following features: • Internal waste containers; • limited touching, e.g. to push flaps or open doors; • drawers with changeable inserts; and • handles that can easily be cleaned.
7. Basins and taps	Basins and taps should preferably include the following features: • Deep basin, to prevent splashing during instrument washing; • stainless steel or plastic; • elbow controlled taps, or automatic taps or foot-operated taps; and • automatic liquid soap and disposable towel dispensers.
8. Dental units	Dental units should preferably include the following features: • Surfaces that facilitate effective cleaning; • smooth, impervious materials with contoured edges to eliminate junctions and joints; • resist degradation by disinfectants; • contain no spittoon or cuspidor; • water lines that allow effective management and treatment; • foot operated or automatic controls; • bracket table to hold treatment trays; • dental chair, headrest and stools with smooth, seamless upholstery of non-absorbent material resistant to disinfectants; and • programmable chairs with controls that limit touching.
9. Storage space	Storage requirements should preferably include the following features: • Away from personnel recreation areas; • separated safe storage of chemicals and materials; and • cool and dry.
10. Waste disposal and storage	Waste storage requirements should preferably include the following features: • Designated disposal containers positioned at the point of waste production; and • secure areas for temporary storage of contaminated waste disposal containers prior to pick-up.



Notes:

1. The use of an ultrasonic cleaner is optional. Where such a cleaner is not provided, handling difficulties will be reduced by siting the washing sink near the rinsing sink or by combining both sinks through the installation of a double sink assembly,
2. Practices may increase the number of washer-disinfectors and sterilizers if capacity and service continuity dictates.

FIGURE 3.3: Example of traffic flow diagram in the sterilisation area

Adapted from.HTM 01-05 Decontamination in primary care dental practices. *Health Technical Memorandum 01-05* Oct 2008, [53]

3.7 Instrument processing areas

Instrument processing areas [51, 52]	
Instrument processing areas should preferably include the following features: • Easy accessible location, specifically designated for processing, physically separated from patient treatment areas. • Separate zones into five-workstation layout (Figure 3.4).	
1. Equipment	Equipment areas should preferably include the following features: • Build a list of requirements for equipment and consider speed, capacity, electrical needs, plumbing, labour costs, costs for consumable supplies and waste disposal. • Check with instrument and equipment manufacturers to verify compatibility between handpieces and instruments, as well as cleaning and sterilisation methods. • ultrasonic cleaner or instrument washer; • gravity or vacuum autoclave; • products to meet speed of work, capacity and budget requirements; and • reports from dependable service companies to learn about product reliability and performance.
2. Cabinet options	• Install or renovate fixed cabinetry and countertops; or • install a modular off-the-shelf sterilisation center.
3. The processing stations	Receiving, decontamination, and cleaning station ideally containing the following: • Adequate counterspace for trays / cassettes; • waste containers; • containers located under counters with countertop access; • biohazard containers for medical waste; • wall-mounted or under-the-counter sharps containers; and • an automatic instrument washer / washer-disinfector; or large, recessed ultrasonic cleaning units (which reduce noise and improved visibility and access) Rinse station ideally containing the following: • A large basin with a flat bottom; • a high-arch, swinging faucet with single lever or foot control for rinsing instruments after cleaning; and • spray nozzle with a long hose to simplify rinsing. • Packaging station ideally containing the following: • at least 60 cm of counter space for draining, sorting, and wrapping instruments; • a “surgical milk” anti-corrosive / lubricating rinse for hinged and / or carbide instruments (if desired); • handpiece cleaner / lubricator and the required compressed-air outlet; • a shallow drawer for sterilisation wrap, pouches, autoclave tape, and chemical indicators; and • cabinets and racks for pouches and clean patient-care items. • Sterilisation station ideally containing a table-top autoclave, chemical vapour steriliser, or dry heat steriliser. The newer pre- and post-vacuum steam autoclaves (also known as Class-B sterilisers) have faster cycle times and eliminate the need for prolonged “open-door” drying after the heat cycle.

	• Two sterilisers permit alternative cycling and provide a backup in case of equipment malfunction. • To accommodate cassettes use a steriliser with at least a 25 cm diameter chamber. • Storage station ideally containing enclosed sterile-storage cabinets or drawers, or a closed pass-through area at least 6 cm off the floor and separate from areas where non-sterile items are stored. • Never store sterilised items where they may become wet. Wet packs are not considered sterile. Avoid storing such items above autoclaves, next to or under basins, or adjacent to ultrasonic cleaners

FIGURE 3.4: Workflow from "dirty to clean" in the processing area
(Adapted from: Sterilisation center design [51])

GUIDELINES SECTION 4

Surface Contamination Management

Why?

During most patient treatment procedures, spatter and aerosols are produced as a direct result due to using air and water driven equipment. The surfaces in and around the dental unit, where oral health care procedures are executed, become contaminated with aerosol spatter, and after touching surfaces with gloved hands. The constant exposure and contamination of the surfaces in oral health care facilities are of particular concern, as these surfaces become colonised with infectious agents, resulting in potential reservoirs for disease transmission. The degree and frequency of hand contact, together with the potential for cross-contamination of surfaces by saliva and other body fluids while performing procedures in and around the oral cavity, is therefore an important potential health hazard to be managed.

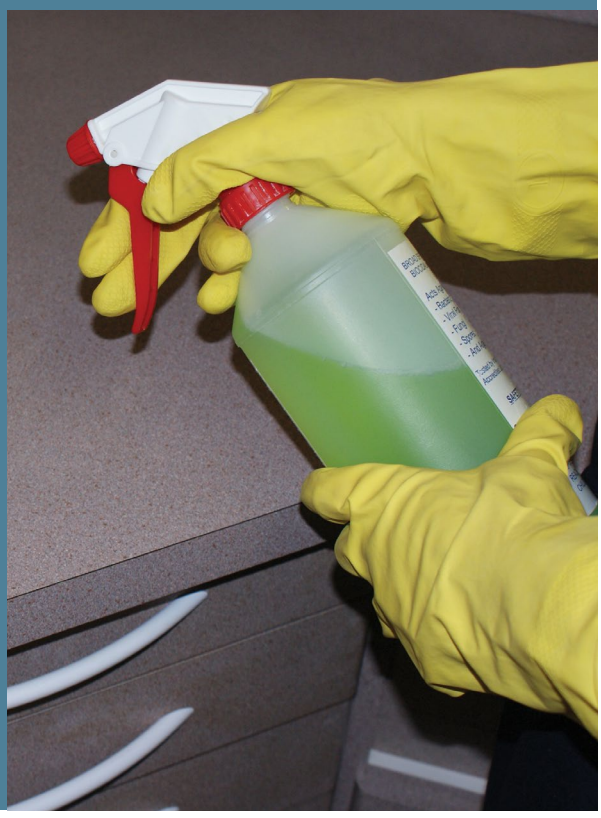


FIGURE 4.1: Surface contamination management

What?

Surface contamination management involves programmes that protect OHCWs and patients from being exposed to risk factors within an oral health care facility. The frequently touched contact areas in and around the clinical dental unit, where oral health care procedures are executed, become heavily contaminated. Such areas include light handles and switches, dental unit switches, buttons of the 3-in-1 syringe, ultrasonic handle, and the control buttons of the dental chair. These frequently touched areas often cannot be disinfected easily and effectively between patients, but can be covered with protective barriers such as clear plastic cling wrap, aluminium foil or impervious plastic sleeves. These barriers must be removed quickly and effectively to decontaminate the treatment area between patient treatments, before being safely disposed of with the other health care risk waste items.

Surface cleaning prevents transmission of infection via direct contact with hands and equipment, but is more labour intensive and takes more time to execute. In the event of spillage of blood or other body fluids, a method of one step cleaning and disinfection is necessary for effective decontamination. The CDC has divided the surfaces in health care facilities into two categories; namely clinical contact surfaces and housekeeping surfaces [54]. The management of both these potentially contaminated surfaces is an important measure to prevent disease transmission. Comprehensible distinction should be made between clinical contact and housekeeping surfaces, because the decontamination treatments of these surfaces would distinctly differ. Barrier protective coverings could be applied, and if not barrier-protected, surfaces should be disinfected between patients with an intermediate- or low-level disinfectant with TB, HBV and HIV destruction capabilities.

How?

4.1 Managing clinical contact surfaces
4.2 Managing housekeeping surfaces
4.3 Deciding whether to use barriers or disinfectants
4.4 Selecting chemical germicides

4.1 Managing clinical contact surfaces

4.1.1 BARRIER PROTECTIVE COVERINGS

Barrier protective coverings [52]

Managing clinical contact surfaces involves three categories of surfaces that need to be maintained, namely touch surfaces, transfer surfaces; as well as splash, spatter and droplet surfaces.

CLINICAL CONTACT SURFACES:

Touch surfaces	*Touch surfaces* are directly touched and contaminated during treatment procedures, e.g. dental light handles, dental unit controls, chair switches, chairside computers, pens, telephones, containers of dental materials, and drawer handles.
Transfer surfaces	*Transfer surfaces* are not directly touched, but often are touched by contaminated instruments, e.g. instrument trays and handpiece holders.
Splash, spatter and droplet surfaces	*Splash, spatter and droplet surfaces* include other surfaces which the members of the oral health care team or contaminated instruments or supplies do not actually come in contact with, e.g. countertops and floors.

STEPS TO FOLLOW FOR CLINICAL CONTACT SURFACES:

1. Apply an appropriate surface barrier to clinical contact surfaces before the treatment procedure commences.
2. Apply barrier protective coverings, e.g. clear plastic cling wrap, aluminium foil or impervious plastic sleeves to clinical contact surfaces that are frequently touched with gloved hands during patient treatment or become contaminated with blood or OPIM.
3. Apply barrier protective coverings to difficult to clean surfaces, e.g. light handles and chair switches.
4. If a surface is contaminated, clean and disinfect before applying new barriers.
5. Change the barriers routinely between patients and when visibly dirty or damaged.
6. Disinfect the protected surfaces at the end of each day or if contamination is evident.

APPLICATION AND REMOVAL OF BARRIER PROTECTIVE COVERINGS THROUGHOUT THE WORKING DAY:

At the beginning of the working day	• Securely apply appropriate barrier protective coverings to all clinical contact surfaces before seating the first patient.
Between patient visits	• Remove barrier protective coverings after patient treatment with gloved hands. • Care should be exercised not to contaminate the surface beneath the barrier protective coverings. • Clean and disinfect any surface if exposed or accidentally touched when removing the barrier protective coverings.

	• Discard used barrier protective coverings in the contaminated health care risk waste containers. • Remove and discard contaminated gloves, wash hands, and apply fresh barrier protective coverings (as directed above before treating the next patient.
Waste segregation at chairside	• Tape a fluid-proof bag to the instrument tray or use a disposable cup. • Segregate all health care waste immediately after any treatment procedure and dispose of the barrier protective coverings with other contaminated items correctly into the health care risk waste container. For more details refer to Guidelines Section 11 on Waste management.
At the end of the day	• Remove barrier protective coverings, clean and disinfect all clinical contact surfaces using the spray-wipe-spray-wait technique.

4.1.2 SURFACE DISINFECTION WITH THE SPRAY-WIPE-SPRAY-WAIT TECHNIQUE

Surface disinfection with the spray-wipe-spray-wait technique [52]

Although the application, removal and disposal of protective surface barriers is a fast and effective process, the use of the slower the spray-wipe-spray-wait technique still remains prevalent in many oral health care facilities [31].

Surface disinfection with the spray-wipe-spray-wait technique should be applied in the following instances:

- When protective surface barriers are not feasible;
- at the end of the working day;
- when surfaces are visibly dirty with blood or saliva; and
- in dental laboratories, as gloves and other barrier protective coverings are not used routinely.

Steps to follow for applying the spray-wipe-spray-wait technique:

1. Protective utility gloves and other appropriate personal protective equipment (PPE), including mask and eyewear should be worn when executing the spray-wipe-spray-wait technique procedure to protect OHCWs against occupational exposure to infectious agents and hazardous chemical products.
2. Select a suitable chemical germicide for the purpose of cleaning and disinfecting.
3. Check the label of the selected disinfectant to ensure microbial activity and compatibility of the product with the surface where it will be applied. The level of cleaning or disinfection required should be considered when selecting a product. Refer to Table 4.1 to select an appropriate disinfectant, depending if the surface is visibly contaminated with blood or not, and also considering the type of surface to be cleaned and disinfected.
4. Prepare a fresh solution of the disinfectant according to manufacturer's instructions. When the container is empty, wash the container thoroughly and fill it with freshly prepared disinfectant solution. Correct dilution, shelf-live and expiry dates should be adhered to so that disinfectant activity is ensured.
5. Clean surfaces by:
    - Spraying the surface with the cleaning and disinfecting agent.

- Vigorously wipe the surface with paper towels.
- Apply new towels when cleaning and disinfecting different surface areas.
- Apply several towels when cleaning and disinfecting large surface areas.
- Apply several towels when cleaning and disinfecting body spills or areas larger than 5 cm in diameter.

Alternative method to clean the surface:

- Clean the surface with a pre-moistened appropriate disinfectant wipe by following manufacturer's instructions. It is important to note that some wipes are effective only over a limited area of approximately 1 m^2.

1. After cleaning, disinfect the surface.

- Spray the disinfectant over the entire surface.
- Use towels to disperse the disinfectant evenly over the entire surface.
- Allow the surface to remain moist for the required contact time according to the manufacturer's instructions. Wipe the surface dry before the arrival of the next patient.

Alternative method to disinfect the surface:

- Saturate the surface with a pre-moistened disinfectant wipe.
- Allow the surface to remain moist for the required contact time as stated in the manufacturer's instructions. Wipe the surface dry before the arrival of the next patient.

Contamination	Clinical contact surfaces	Housekeeping surfaces
With no blood contamination, e.g. dust, food, etc.	Low- or intermediate level disinfectant plus HBV and HIV kill claim or tuberculocidal activity	Low- or intermediate level disinfectant or detergent and water
With blood contamination	Low- or intermediate level disinfectant plus tuberculocial activity	Low- or intermediate level disinfectant with tuberculocial activity

TABLE 4.1: Selecting disinfectants for surface decontamination

FIGURE 4.2: Surface disinfection using a pre-moistened disinfectant wipe

4.2 Managing housekeeping surfaces

Managing housekeeping surfaces [29, 55]

Steps to follow when cleaning and disinfecting housekeeping surfaces:

1. When using cleaning and disinfecting products follow the manufacturers' instructions carefully.
2. Use appropriate PPE when cleaning and disinfecting housekeeping surfaces.
3. Depending of the nature of the surface and the type and degree of contamination, housekeeping surfaces should be cleaned with a detergent and water or a low-level disinfectant. The use of liquid chemical sterilants / high-level disinfectants for disinfection of environmental surfaces is discouraged.
4. When housekeeping surfaces, e.g. floors, walls, and basins, are visibly contaminated by blood or OPIM, they should be cleaned immediately with detergent and water or hospital disinfectant / detergent on a routine basis, depending on the nature of the surface, the type and degree of contamination.
5. For cleaning floor surfaces microfiber pads should be used, rather than conventional string mops, as they are ergonomically lighter to use and provide a cleaning surfaces that are 40 times greater than conventional string mops.
6. Fresh cleaning or disinfecting solutions should be prepared daily.
7. Clean walls, blinds and curtains in patient treatment areas when they are visibly dusty or dirty.

Steps to follow when cleaning spills of blood and other potentially infectious materials:

1. The cleaner should wear examination gloves and other appropriate PPE.
2. Check the label of the disinfectant to ensure microbial activity and compatibility with the surface. Refer to Table 4.1 when selecting an appropriate disinfectant, which will depend on the size of the spill and porosity of the surface to be cleaned.
3. Remove visible spills of blood, OPIM or other organic material with paper towels or other absorbent materials. Discard the used paper towels in a leak-proof, colour-coded health care risk waste container with a biohazard label.
4. After removal of visible spills, clean and decontaminate the surface with an appropriate disinfectant.

Steps to follow when cleaning and disinfecting cleaning equipment:

1. Decontaminate cleaning equipment that has been contaminated with blood or OPIM by soaking it for 10 minutes in a 0.5% chlorine solution or other suitable disinfectant.
2. Cleaning equipment should regularly be cleaned, including buckets, cleaning cloths, brushes and string mops and microfiber pads.
3. All cleaning water and solutions should regularly be replaced, however if cleaning water and solutions are. visibly dirty, they should be replaced. When cleaning water and solutions have been used for cleaning of blood or OPIM spills or contaminated areas such as clinical treatment rooms, they should also be replaced.
4. Rinse the cleaning equipment in clean water.
5. Dry the cleaning equipment before storage. Ensure that they are completely dry before re-use, because wet cloths and mop heads are heavily contaminated with microorganisms.
6. It is recommended that microfiber pads are used instead of conventional string mops, because they are light and ergonomically easy to use. These pads contain fibers that facilitate easy cleaning and dry storage. Most of these pads can be washed in a washing machine and dries much quicker in contrast with conventional string mops.

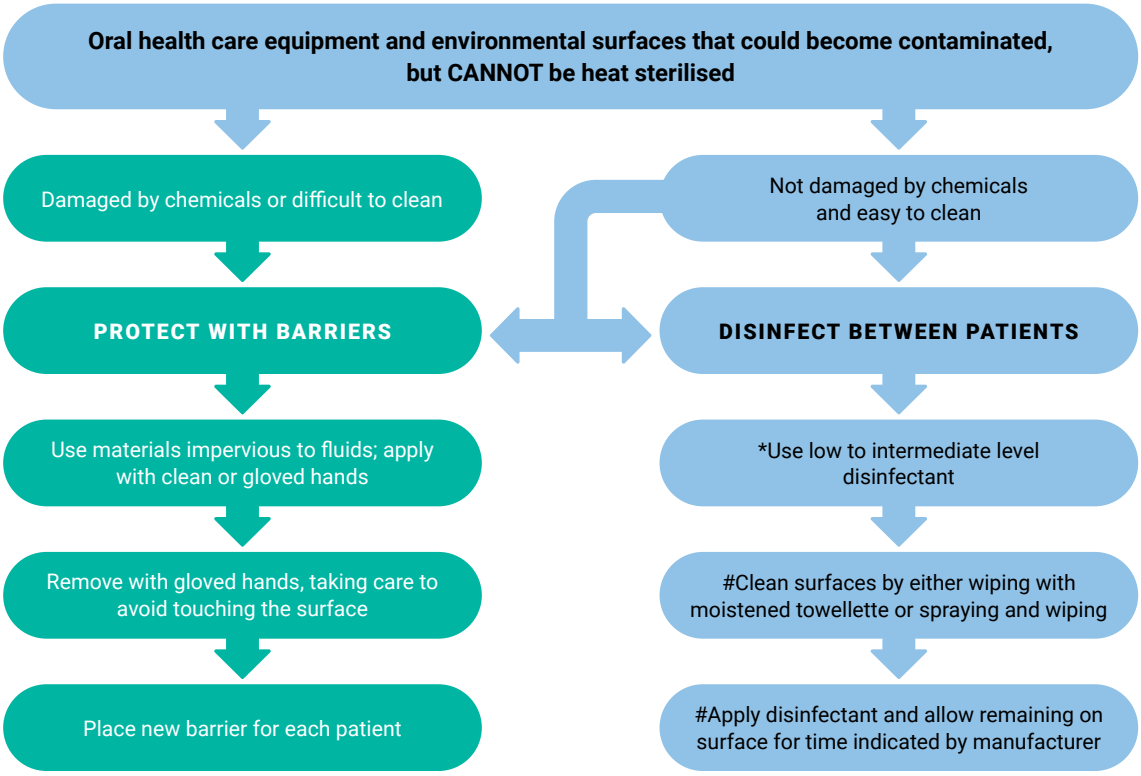
FIGURE 4.3: Microfiber cleaning pads

4.3 Deciding whether to use barriers or disinfectants

Deciding whether to use barriers or disinfectants

Managing clinical contact surfaces is performed by applying barrier protective coverings or by cleaning and disinfecting surfaces. Listed in Box 4.1 are the options to assist oral health care workers in deciding where to use barriers or disinfectants while performing oral health care procedures:

BOX 4.1: Deciding whether to use barriers or disinfectants [56]



** Intermediate level disinfectants for areas / items contaminated with blood or OPIM.*
 # Can be combined in a single step when the wipe contains both a cleaning and disinfecting agent.

4.4 Selecting chemical germicides

Selecting chemical germicides

Selecting chemical germicides is the area in health care that causes the most confusion and uncertainty. It is difficult to select chemical germicides because of the wide variety of available products. Earle H. Spaulding developed a rational approach to disinfection and sterilisation more than 30 years ago [57]. Spaulding classified instruments into three categories, namely critical, semi-critical, or non-critical items. This classification categorised instruments according to the associated risk of disease transmission when used, and through this classification, prioritising the need for sterilisation after use. According to the Spaulding's classification, critical items enter sterile tissue or vascular systems and will be in contact with blood; semi-critical items make intra-oral contact with saliva and mucous membrane or non-intact skin; while non-critical items may or may not make contact with skin and / or mucosa of OHCWs or patients.

The CDC modified Spaulding's classification when they also incorporated surfaces into Spaulding's categories. The non-critical environmental surfaces in oral health care facilities are divided into clinical contact and housekeeping surfaces [29]. This modification to the Spaulding classification, based on scientific information, simplified the application and eventual choices of procedures and products. When applying the modified Spaulding classification, the device, equipment, instrument or surface can now be categorised to determine whether an item should be sterilised, disinfected, or barrier-protected.

When selecting chemical germicides, OHCWs should first determine the intended purpose of the product and then ensure that the product meets the specific requirements. The manufacturer's specifications should be consulted for correct use of the product. For instance, a disinfectant or sterilant should not be selected if a detergent or cleaning product is required. Additional product information, including scientific papers, validation certificates and Safety Data Sheets (SDS), can be sourced from the suppliers.

The germicides commonly used in oral health care can be classified into four main categories (Table 4.2). These categories include liquid sterilants and / or high level disinfectants, intermediate- or sometimes called hospital level disinfectants, as well as low level disinfectants or surface disinfectants, and antiseptics.

TABLE 4.2: Examples and application of the different chemical germicide categories

Categories	Examples	Application
Sterilants	Aldehyde products, peracetic acid and hydrogen peroxide	Use only on items that are destroyed in a heat steriliser, e.g. plastic items. No spore test can be done and items become contaminate and unsterile once it is removed from the solution. *Sterilisation times in liquid sterilants:* Aldehyde (10 hrs) Special hydrogen peroxide (6 hrs) Hydrogen peroxide peracetic acid (3 hrs) Glutaraldehyde – phenate (12 hrs)
Disinfectants (high level)	Glutaraldehyde, glutaraldehydephenate, hydrogen peroxide, peracetic acid, orthophthaldehyde	Disinfection is a method designed to kill most microbes and it is less lethal than sterilisation. Use only on items that are destroyed in a heat steriliser, e.g. plastic items.
Disinfectants (intermediate- and low-level)	Hydrogen peroxide, sodium hypochlorite, chlorine dioxide, iodophors, synthetic phenols and quaternary ammonia compounds.	Intermediate level disinfectants inactivate *Mycobacterium tuberculosis* and will be applied on clinical contact surfaces and non-critical surfaces with visible blood. Low-level disinfectants have no tuberculocidal activity and are applied on housekeeping surfaces e.g. floors and walls without visible blood. These include the quaternary ammonium compounds.
Antiseptics (for intra-oral and extra-oral use)	Active chlorine dioxide germicides, essential oil compounds, iodinated compounds, chlorhexidine compounds, cetylpyridium compounds, sanguinarine based compounds, parachlorometaxylenol compounds and other bacteriostatic / bactericidal compounds	Antiseptics are germicides applied to living tissue and skin. In general, antiseptics are only used on the skin and not for surface disinfection. Many mouth rinse products are available. Super oxidized water and saline are popular products to use as antiseptics. Iodine solutions have long been used as antiseptics on skin or tissue. Some antiseptics can only be used on intact skin and not in the oral cavity.

The manufacturer's recommendations for correct formulation and use should be adhered to in all situations. Important factors to consider when selecting chemical germicides are:

- Convenience (how simple it is to use);
- spectrum of microorganisms killed and killing time;
- effectiveness as determined by substantiated claims made on product labels;
- best functional characteristics, including odour, residue, compatibility and staining;
- cost; and
- toxicity.

TABLE 4.2: Modified CDC / Spaulding classification of contaminated surfaces and reference guide for selecting chemical germicides

Spaulding / CDC classification	Examples of instruments and equipment	Relative risk Process classification	Disinfectant product classification and exposure time
Critical items *Enters sterile tissue or vascular system / Blood will contact these items*	Surgical instruments & handpieces Extraction forceps Surgical evacuation tips & Implant components Periodontal scaling instruments & tips Surgical burs, rubber dam clasp, endodontic files **Single-use alternatives:** Blades, needles, matrices	**Highest risk** **Sterilisation** (To destroy all microorganisms) Heat stable items: Steam sterilisation (Autoclave) Heat sensitive items: Chemical sterilisation (Sporocidal) Immersion and prolonged contact time Discard disposables	**Chemical sterilants** (**cold sterilants**) Glutaraldehyde 2.4% (10h at 25°C) 7,5% Stabilized hydrogen peroxide 6h (corrosive) 0,2% peracetic acid 12min at 50-56°C
Semi-critical items *Intra-oral contact with saliva and mucous membrane or non-intact skin*	Restorative instruments & handpieces Metal impression trays Syringes, Air / Water syringes (metal) Fox plate (plastic), sensor holders **Single-use alternatives:** air / water syringes, suction tips, evacuation tips, saliva ejectors, impression trays, prophylaxis brushes and cups	**Intermediate risk** **High-level disinfectant** Destroys all microorganisms except bacterial spores. Heat stable items: Sterilisation (autoclave) Heat sensitive items: High level disinfection Disinfection by immersion Discard all disposables	**Germicides** Glutaraldehyde 2.4% (45 min at 25°C) *Ortho*-phthalaldehyde 0.55% (12min at 20°C) Hydrogen peroxide 6% - 7% 25min Peracetic acid 0.2-0.35% 5min
Non-critical items Clinical contact surfaces with intra-oral contact: *May contact skin and / or mucosa of OHCWs or patients after handling, or repair*	**Clinical contact surfaces** Impressions, prostheses	**Low risk** **Intermediate-Level Disinfectant** Can kill most vegetative bacteria, including Mycobacterium tuberculosis, most viruses and most fungi but not necessarily kill bacterial spores Disinfection by surface spray. Thorough rinsing; Followed by intermediate-level disinfection.	**Surface disinfectant** Quaternary / Alcohol combination 70-90% Ethyl or isopropyl alcohol Sodium Hypochlorite: 5-6 % Household bleach diluted 1:500 Phenolic germicidal Iodophor germicidal
Non-critical items Clinical contact surfaces with no intra-oral contact: *Touches intact skin or surfaces contaminated by hand, aerosol, spilling or spatter*	**Patient care instruments and equipment** **Contaminated by hands or spatter** X-ray head, Rinn apparatus, rubber dam frame, light handles and switches, shade guides, instrument trays, unit handles, chair-side computers, blood-pressure cuffs, nitrous-oxide face masks	**Low risk** **Intermediate-level disinfectant** Can kill most vegetative bacteria, including Mycobacterium tuberculosis, most viruses and most fungi but not necessarily kill bacterial spores Disinfection by surface spray	**Surface disinfectant** Quaternary / Alcohol combination 70-90% Ethyl or isopropyl alcohol Sodium Hypochlorite: 5-6 % Household bleach diluted 1:500 Phenolic germicidal Iodophor germicidal Alternative: barrier protection.
Environmental surfaces: patient care *Usually contact OHCWs, but not patients*	**Patient care items** Dental unit surfaces, laboratory and radiographic equipment, computers, keyboards, drawer handles, lights, chairs, stools, clinical bench-tops	**Very low risk** **Low-level disinfectant** Can kill most vegetative bacteria, including, some fungi, and some viruses in a practical period of time (<10 minutes) Disinfection by surface spray or wipes Sanitise with detergent (sufficient in absence of visible blood or saliva); **intermediate-level disinfectant** when blood is present	**Surface disinfectant** Quaternary / Alcohol sprays & wipes 70-90% Ethyl or isopropyl alcohol Household bleach diluted 1:500 Alternative: barrier protection.
Environmental surfaces: housekeeping *Rarely contact OHCWs or patients*	**Housekeeping** Floors, walls, cupboards, doors, ceilings	**Minimal risk** **Low-level disinfectant** Can kill most vegetative bacteria, including, some fungi, and some viruses in a practical period of time (<10 minutes) Disinfection by surface spray or wipes Sanitise with detergent (sufficient in absence of visible blood or saliva); **Intermediate-level disinfectant** when blood is present	**Surface disinfectant** Quaternary / Alcohol sprays & wipes 70-90% Ethyl or isopropyl alcohol Household bleach diluted 1:500 Alternative: barrier protection.

Adapted and modified from: OSAP Infection Control in Practice Vol. 1 No. 3, (2002), Rutala, Weber *et al.*, (2008)

4.5 Surface management during dental radiography procedures

Surface management during dental radiographic procedures [29, 58]	
Before taking radiographs	1. Use disposable or heat-tolerant intra-oral accessories when available. Clean and heat-sterilise heat-tolerant instruments and equipment before use. 2. Protect radiography equipment, such as the radiographic tube head and control panel, with clean surface barriers. 3. Set out all necessary supplies, equipment, and instruments in single patient unit-doses before seating the patient. A single patient unit-dose for radiographic records includes: gloves, paper cup(s), paper towel(s) and film mount or paper envelope. Dispense film from the central supply area into a clean disposable container. 4. Instruct the patient to rinse with a pre-procedural mouth rinse. 5. Provide the patient with a lead apron with thyroid collar for protection against any scatter radiation. 6. Wash hands, dry thoroughly, and put on powder-free examination gloves.
While taking radiographs	1. Wear gloves when taking radiographs and handling contaminated film packets. Wear other PPE, e.g. surgical mask, protective eyewear and clothing, if spatter is likely to occur. 2. Touch as few surfaces as possible. 3. Stay behind the protective lead partition until after exposure of the radiographs. 4. Following exposure of the radiographs, with gloves still in place, dry the film with disposable gauze or paper towel to remove blood and / or saliva. 5. Drop each film packet into a container, such as a paper or plastic cup, without contaminating the container's outside. 6. Repeat to complete the radiographic series.
After taking radiographs	1. Place the film-holding instruments and equipment in the designated area. 2. If *film barrier pouches* have been used, carefully peel back the barrier and allow each film packet to fall from its pouch into a clean disposable container (plastic cup) for transport to the developing area. Use care to avoid contaminating the film packet and the cup. 3. If *barrier pouches* have not been used, follow the instructions for handling film without barriers (listed below). 4. Discard all contaminated disposable items. 5. Carefully remove contaminated barriers. 6. Remove gloves and wash hands. 7. Remove the lead apron and dismiss the patient. 8. Disinfect all uncovered surfaces that were contaminated. 9. If barriers were not used, radiographic equipment that has come into contact with gloved hands or contaminated film packets must be cleaned and then disinfected after each patient procedure. 10. Clean and disinfect any surfaces that had become contaminated by using a low-level with HIV and HBV claim, or intermediate-level with TB claim, disinfectant.

Developing film	1. Remove gloves and wash hands. 2. Transport the exposed films in disposable a container to the processing area. 3. Take care to avoid contaminating the developing equipment. 4. Use barriers or clean and disinfect any surfaces that had become contaminated.
Handling film without barrier pouches	1. Place paper towel on the working surface. 2. Place the container with exposed films next to paper towel. 3. Secure the door and turn out light (if applicable). 4. Put on gloves. 5. Remove film from container in which it was placed after exposure. 6. Open the film packet and allow film to drop onto paper towel. 7. Separate the lead foil from the film and dispose of the empty packet. 8. After all film packets have been opened, discard the disposable container in the contaminated waste container and the lead foil in a container for recycling. 9. Remove gloves and wash hands. 10. Process the film by handling it on the edges only. 11. Mount the film and label accordingly.
Panoramic- / cephalometric films	1. Wash hands prior to taking extra-oral radiographs. 2. Cover the bite guides with protective barriers. Alternatively, disposable or re-usable heat-tolerant bite guides can also be used. 3. Cover the chin rest, head positioning guides and hand grips with protective barriers. 4. Handle the extra-oral cassettes only with cleaned hands (no gloves). 5. After exposure, remove the barriers and discard it in the household waste container.
Using manual processing or daylight loader for film	1. Wash hands prior to opening the lid of the loader. 2. Place paper towel, cup and powder-free gloves inside the loader's compartment. 3. Place the container with contaminated films next to the disposable cup. 4. Close the lid and place hands through the sleeves into the compartment. 5. Put on gloves. 6. Remove the film from the container and open the packets one by one. 7. Allow the film to drop onto the paper towel or processor film feed slot. 8. Dispose of the film packet contents into the disposable cup. 9. Repeat the process until all exposed films packets have been opened. 10. After all the packets have been opened, remove gloves and also dispose into the cup. 11. Separate the lead foil from the film packets. 12. Feed all the films into the processor, handling them by the edges only. 13. Remove hands from the loader. 14. Wash and dry hands. 15. Lift the lid of the loader compartment and remove all contents. 16. Mount the film and label appropriately. Alternatively, films may be filed into the patient file in a labelled envelope.

4.6 Surface management when using digital- and high-technology equipment

Surface management when using digital- and high-technology equipment [29, 58]

Today, a variety of sophisticated equipment is available to modern oral health care facilities. Examples are, lasers, microscopes, intra-oral imaging, digital radiology, computerised clinic management systems, computer-controlled local aesthetic systems, chairside porcelain milling equipment, and digital impression technologies. When any new equipment, product or material is utilized or implemented in the oral health care environment, planning and application of infection control procedures are required by all members of the oral health care team. The gold standard for reprocessing intra-oral oral health care equipment and instruments is heat sterilisation and should be applied, as far as possible, to all new equipment and instruments. When heat sterilisation is not possible, chemical germicides should be used, and the use of protective barriers and disposable products increased.

Steps to follow for surface management when using digital- and high-technology equipment:

1. Barrier protect semi-critical instruments and equipment, such as digital radiography sensors and other high-technology instruments, including intra-oral cameras, electronic periodontal probes, occlusal analysers, and lasers that cannot be reprocessed by heat sterilisation or alternatively high-level disinfect.
2. The manufacturer's recommendations for application of cleaning agents and germicides on digital radiography sensors, high-technology intra-oral instruments and equipment, and computer components these devices should be adhered to.
3. Consult manufacturers' instructions regarding appropriate barrier and disinfection / sterilisation procedures.
4. Protect clinical contact surfaces, including the computer keyboard and mouse, cords and portable equipment with protective barrier covers.

4.7 Managing infection control in the dental laboratory

Managing infection control in the dental laboratory [1, 29, 59]

In the dental laboratory, the infection control procedures should be no different than anywhere else in the oral health care facility. The same infection control principles and standard precautions also apply in the laboratory. Pumice and other polishing materials and equipment have been identified as to pose a potential cross-contamination risk in the dental laboratory. Direct contact through multiple applications of the material from the same container for various patients' apparatus, increase the risk of cross-contamination. Application of the unit dosing concept is suggested to prevent this type of contamination. Unit dosing means to have consumables, instruments and materials dispensed for one patient. The total amount of the consumables and materials needed for a particular procedure should be dispensed, irrespective of it being used during the procedure. Table 4.3 provides examples of items used in the dental laboratory and methods of decontamination applied for these items:

TABLE 4.3: Methods of decontamination in the dental laboratory

Items for decontamination	Methods of decontamination
Impressions and stone casts	Surface disinfection or immersion disinfection followed by rinsing in water
Removable prostheses, bite-registration / blocks	Surface disinfection or immersion disinfection followed by rinsing in water
Metal, porcelain and porcelain fused to metal crowns and bridges	Ultrasonic cleaning and sterilisation
Burs / finishing / polishing burs / discs, garnet, cuttle etc.	Ultrasonic cleaning and sterilisation
Compound / green-stick compound for border-molding	Unit-dose per patient and discard the unused items
Flame torch / bunsen burners etc.	Clean and disinfect after each patient (wait till it cools down)
Re-usable metal impression trays	Ultrasonic cleaning and sterilisation
Plastic impression trays Articulators	Discarded after one use
Rag wheels and rotary polishing brushes	Cleaned / sanitised and disinfected Ultrasonic cleaning and sterilisation at least once daily
Lathes, trimmers and work surfaces	Sanitisation and disinfection at least once daily
All other devices, including mixing bowls, wax knifes, buffalo knife spatulas etc.	Use of surface barriers as needed Sanitisation, disinfection and sterilisation as needed
Counter / work surfaces / bench	Use of a disposable brown paper (heavy gauge) as laboratory bench / table / work surface cover, disposed after use. Work surface sanitised and disinfected at the end of each day

Steps to follow when using pumice and other polishing materials and equipment in the dental laboratory:

1. Mix enough pumice with bleach (or other disinfectant) and water, diluted 1:10, for use in one appliance.
2. Add one drop detergent, if desired.
3. Change the pumice daily.
4. Clean and disinfect the polishing machine daily.
5. Heat sterilisation of the pumice brushes and rag wheels is preferable.
6. If heat sterilisation not possible, clean and disinfect pumice brushes and rag wheels daily.

Steps to follow when cleaning and disinfecting dental laboratory surfaces:

1. Wear PPE when handling or working with laboratory items.
2. Consider all dental impressions and dental laboratory fabricated appliances as contaminated with saliva and / or blood, therefore care should be taken to avoid cross-contamination until they have been disinfected.
3. Disinfect all dental impressions and dental laboratory fabricated appliances in the clinical area *before transporting them to the laboratory* using a disinfectant with intermediate activity and TB claim.
4. Dental impressions and dental laboratory fabricated appliances should be rinsed, handled in an aseptic manner when transferred to and from the laboratory - loosely wrapped in a plastic bag, while still wet with the disinfectant.
5. Follow the manufacturer's instructions concerning the stability of the specific impression materials in the presence of disinfectants and recommended contact time. Table 4.4 refers to a guide for disinfection methods of the various types of impression materials. NOTE: Do not transport impressions and prostheses in a chemical disinfectant, because excessive contact time with the disinfectant may damage the material. Chemical germicides may cause chemical burns to the human skin or mucosa if the item is not properly rinsed before handling.
6. When materials, such as dental impressions, are sent to off-site laboratories, include a note that describes the disinfectant protocol used.
7. Clean and heat-sterilise all heat tolerant equipment used intra-orally, e.g. impression trays, face bow forks.
8. Follow manufacturers' recommendations for instruments and materials that become contaminated, which normally do not come in contact with the patient; including laboratory burs, polishing points, rag wheels, articulators, laboratory work pans, and lathes / chucks. Heat-sterilise those items that are heat-tolerant.
9. If equipment is heat-sensitive, clean and disinfect in a chemical germicide with TB claim.
10. If an appliance is excessively contaminated, it should be cleaned in an ultrasonic cleaner containing detergent, rinsed under running water and then disinfected.
11. Drain and clean laboratory ultrasonic cleaners daily.
12. Clean and disinfect pressure pots and water baths daily, because they are particularly susceptible to contamination with microorganisms.
13. Barrier-protect or clean and disinfect environmental surfaces in the same manner as in the clinical oral health care treatment area.

TABLE 4.4: Selecting disinfecting materials and processing methods for dental laboratory work

Material	Acceptable disinfecting agents	Comments
Alginate	iodophors; dilute sodium hypochlorite solution	Preferred technique is immersion (<10 minutes). Avoid distortion by wrapping impressions in damp towel and store in zipper bags.
Polysulfide	iodophors; dilute sodium hypochlorite solution; complex phenolics*	Preferred technique is immersion. Disinfectants requiring more than 30 minutes exposure are not recommended.
Silicone	iodophors; dilute sodium hypochlorite solution; complex phenolics*	Preferred technique is immersion. Disinfectants requiring more than 30 minutes are not recommended.
Polyether#	iodophors#; dilute sodium hypochlorite solution# ; complex phenolics#*	Preferred technique is spraying. Hydrophilic nature of material causes dimensional changes and swelling if immersed in disinfectant for long time (>10 minutes).
Zinc Oxide Eugenol impression paste	iodophors	Preferred technique is immersion. Should not be disinfected with chlorine-containing solutions.
Reversible hydrocolloid	iodophors; dilute sodium hypochlorite solution	Do not immerse in alkaline glutaraldehyde.
Compound	iodophors; dilute sodium hypochlorite solution	Phenolic spray can be used.
Impression trays	**Acceptable processing methods**	
Aluminium	heat sterilise via autoclave, chemical vapour, or dry heat; ethylene oxide sterilisation	
Chrome-plated	heat sterilise via autoclave, chemical vapour, or dry heat; ethylene oxide sterilisation	
Custom acrylic resin	discard after intra-oral use on a patient; disinfect with tuberculocidal hospital disinfectant for re-use during the same patient's next visit	
Plastic	discard	

Polyethers can be sensitive to immersion. Use with caution and consult manufacturer's recommendations.

* Complex phenols cannot be re-used and cost significantly more than bleach or iodophors. For these reasons, some experts contend that their practical use is limited to spraying. Prepare according to manufacturer's recommendations.

GUIDELINES SECTION 5

Equipment Maintenance, Service or Repair

All technical equipment or apparatus in health care facilities should be monitored, calibrated, and serviced routinely to prevent malfunction and failure of safety precautions. All health care employers that use equipment are legally obligated to ensure that a maintenance schedule is in place for equipment used in an oral health care facility. Documented evidence of routine performance testing, maintenance, service and / or repair should be kept as proof that the equipment is maintained and therefore function correctly, risks of cross-contamination are kept to a minimum and a clean environment is continuously maintained.

Why?

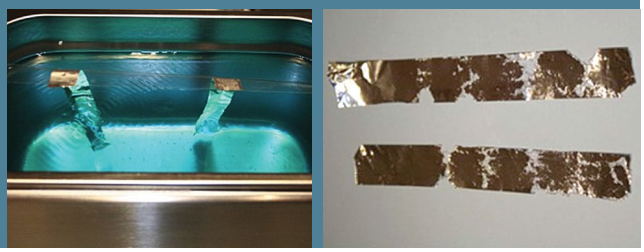


FIGURE 5.1: Performance testing of the ultrasonic cleaner with the aluminium foil test method

What?

Maintenance, service or repair involves programmes that ensure efficient and effective functioning of essential equipment in the oral health care facility. An audit trail of evidence of equipment testing and maintenance, based on the user history of the equipment, may be a piece of crucial documentation in case of any complaint filed against the facility.

How?

5.1 Maintenance and service of sterilisers and associated equipment

5.2 Recordkeeping of maintenance and service data for a minimum period of 5 years

5.1 Calibration, maintenance and service of sterilisers and equipment

Calibration, maintenance and service of sterilisers and equipment [35]	
A skilled person, trained in steriliser preventive maintenance service must be appointed by the health care facility. The maintenance and service of sterilisers and associated equipment should be routinely performed routinely.	
Steps to follow for calibration, maintenance and service of sterilisers and equipment: 1. All equipment should be cleaned regularly and maintained to ensure optimum function. 2. When handpieces and other instruments need repair, they must be cleaned and sterilised before sending it for repair. 3. When handpieces and other equipment are send for repair, a sterilisation confirmation statement should accompany the equipment. 4. All filters of equipment should be checked every six months or otherwise, in accordance with the manufacturer's instructions. A comprehensive filter replacement schedule should be kept.	
Steam sterilisers	The operator must check that: • The floor of the steriliser is free of debris; • the chamber drain is clear; • the recording device is functioning correctly; • all gauges and timers are functioning correctly; and • the door gasket and seals are not damaged.
Dry heat sterilisers	The operator must check that: • The chamber is free of debris; • the temperature gauge and timer are functioning correctly; and • the door gasket and seals are not damaged. NOTE: clean the loading tray, rack and internal walls of all sterilisers, when cool. Follow manufacturer's instructions when determining the cleaning agent and frequency of cleaning. The frequency of cleaning should be at least weekly and when dirty.
Portable ultrasonic cleaners	The operator must check that: • When in use, clean the external tank, lid and gaskets daily; • when in use, daily perform efficacy tests, e.g. aluminium foil test; • visually inspect and clear water strainers and drain filters daily; • inspect that base plates are not excessively eroded; and that • ensure that switches, gauges and lights are functioning correctly. Check the function of ultrasonic cleaners, using the aluminium foil test method, as follows: • Cut a strip of light-weight aluminium foil to the size of the width of the tank and twice its depth. • Fill the tank of the ultrasonic cleaner, add detergent to the tank and put on the ultrasonic cleaner and let it run for 5 minutes. • Lower the foil into the tank vertically until almost touching the bottom. • Operate the ultrasonic cleaner for 20 seconds. • Remove the foil and observe the distribution of perforations and pitting. • Evenly distributed indentations are indicative of an effectively functioning ultrasonic cleaner. If the indentations are not evenly distributed, the ultrasonic cleaner needs to be send in for repair.

Table 5.1 includes a summary of what should be routinely performed during the maintenance and service of sterilisers and associated equipment:

TABLE 5.1: Monitoring, calibration, maintenance and cleaning of sterilisers and associated equipment

Equipment	Monitoring	Calibration	Maintenance	Testing and cleaning
Steam sterilisers	Performance testing *Daily* Air removal and steam penetration test *Daily / weekly* Leak rate / vacuum test Cycle monitoring (every load) Printout of cycle parameters or direct observation and recording of cycle parameters or Class 4, 5 or 6 chemical indicator (where no printout is available). Biological indicator.	Annually or as recommended by the manufacturer	Monthly or 6 monthly or annually or as recommended by the manufacturer.	*Daily check* Floor of the steriliser is free of debris. Chamber drain is clear. Printer, gauges, timers are functioning correctly. The door gasket is undamaged. Water level in reservoir is correct. *Cleaning* Dust external surfaces. Chamber and loading shelves cleaned weekly when cold. Water reservoir drained weekly.
Dry heat sterilisers	*Every Pack / Load* Class 1 chemical external indicator specific for dry heat. Biological indicator. Temperature measurement.	Annually / or as recommended	Monthly or 6 monthly or annually or as recommended by the manufacturer.	*Daily check* Floor of the steriliser is free of debris. Printer, gauges, timers are functioning correctly. The door gasket is undamaged. *Cleaning* Dust external surfaces. Clean chamber and load shelves weekly when cold.
Ultrasonic cleaners	Daily performance testing e.g. foil test		Annual electrical safety check.	*Daily check* Check filters, base plates; wipe external surfaces; empty tank at least daily or more frequently if necessary. Continuously check for correct functioning of switches, gauges and lights.
Washer disinfectors	Document time and temperature with every cycle. Continuous performance checks for temperature, cleanliness of items. Daily test for chemical residue.	6-12 monthly, depending on calibration history; after repair. Quarterly temperature check.	Monthly or 6 monthly or annually or as recommended by the manufacturer.	*Daily check* Clean jets, filters, doors, door gaskets and external surfaces. Check that detergent and rinse dispensers are clear and functioning correctly. Check filters and door seals.
Heat sealers	Daily check of seal integrity pre- and post-sterilisation.	On commissioning; 12 monthly after repair.	Adjust the gap between heating elements in accordance with manufacturer's specifications, at least quarterly.	*Daily check* Wipe external surfaces. Continuously check for correct functioning of switches, gauges and lights.
Incubators for biological indicators	Temperature check at time of use.	Annual temperature check.	Follow the manufacturer's instructions.	Follow the manufacturer's instructions.

5.2 Recordkeeping of maintenance and service data for a minimum period of 5 years

Recordkeeping of maintenance and service data for a minimum period of 5 years [35]	
Routine calibration checks and maintenance of all measuring instruments and equipment, timers, gauges and displays should be carried out by a skilled person, using measuring equipment certified by a recognised certification body.	
Steps to follow for recordkeeping of maintenance and service data: 1. Prior to the first use, sterilisers and other equipment should be performance tested by the supplier. 2. Performance testing data should be contained in a record for each piece of equipment. 3. Maintain ongoing records of performance tests, calibration and maintenance results.	
Sterilisers	Process challenge instruments and equipment may be used for monitoring a sterilisation process. The performance of a commercially available process challenge device should be correlated to the specific sterilisation method and steriliser and demonstrated to be equivalent to the type of load.
Associated equipment	*Ultrasonic cleaners:* Carry out daily performance tests, to ensure ultrasonic transducer function. *Instrument washers:* Visual inspect items being processed for cleanliness and absence of residues. *Heat sealers:* Process, examine and test pieces for each type of packaging material daily. Examine these for integrity and strength of seal before and after being subjected to a steam sterilisation process.

GUIDELINES SECTION 6

Air- And Waterline Management

Why?

Most dental unit waterline systems consist of a complex maze of waterlines, control blocks, valves, barbs and connectors of various sizes, and manufactured from a variety of metals, plastics and rubbers. The delivery of water and air during oral health care procedures is an essential coolant in the working site, especially while using the high-speed handpiece that operates at speeds faster than 400 000 revolutions per minute (rpm). In most oral health care facilities, the water that is used for oral health care treatment is delivered directly from the municipal water supply. Very few facilities are equipped with bottled or self-contained water systems, to which the treatment water or irrigants are added. The inside surfaces of the thin plastic tubing of the waterlines become heavily contaminated with high counts of bacteria, fungi, viruses and protozoa. This evolving biofilm allows infectious agents to survive and thrive in the waterlines, leading to concern about the possible health effects on oral health care workers and patients exposed to dental unit water. Unless specifically designed procedures are performed to prevent, eliminate, trap or destroy biofilms in dental unit waterlines, the colonization of these lines with infectious microorganisms cannot be avoided.

FIGURE 6.1: Narrow lumen of dental unit air- and waterlines

What?

The formation of biofilms in liquid environments is a common phenomenon. The specific design and structure of the narrow tubing or lumen of dental unit air and waterlines, and the typical way water is used during oral health care procedures, exacerbates the problem. Air and waterline management involves programmes that would monitor and ensure that the quality of the water used during oral health care procedures is of an acceptable standard to prevent health hazards to personnel and patients exposed to it. Water of poor microbial quality is not consistent with accepted infection prevention or control recommendations. Mechanisms to keep the water clean and prevent any microbial growth need to be maintained to ensure delivery of an acceptable standard of dental unit water. Dental treatment water or irrigants should contain less than 500 cfu/ml of heterotrophic mesophilic microorganisms. Apart from the microbial quality, the water should not have high endotoxin content and should at least be of a similar quality to drinking water. Patients and personnel with HIV / AIDS, diabetes, transplant recipients, chemotherapy patients, and those with a weakened immune system are more susceptible to microbial contaminants found in water [60].

Many dental units, in particular some older models, are directly connected to the municipal water supply. Although it is generally accepted that this water supply is of good quality as it is treated water, this may not always be true. For example, Bloemfontein, a large city in the Free State Province of South Africa, experienced a boil-water alert in 2007 [61]. For the two weeks during which the alert applied, city consumers and oral health care providers were in a state of panic, and all the water for human consumption or use had to be boiled. Very few citizens realised the implications of such an alert and health care providers were caught unprepared to deal with the situation. With the ever-increasing reports on poor water quality in South Africa, oral health care providers need to take note of the serious health hazard a boil water alert implies, not only for their patients, but also for their own protection.

Various semi-critical items of oral health care equipment, that touch the mucous membranes, are attached to the air or waterlines of a dental unit. Among these devices are high- and low-speed handpieces, prophylaxis angles, ultrasonic and sonic scaling tips, air abrasion devices, and air and water syringe tips. Studies have indicated that not only do the outer surfaces of handpieces become heavily contaminated during oral health care procedures, but there is also an increased possibility for the retention of viruses and bacteria inside the high-speed and prophylaxis handpieces.

How?

6.1 Maintenance of dental unit water
6.2 Monitoring water quality
6.3 Applying dental waterline treatment protocol
6.4 Response to boil water advisories
6.5 Maintenance of dental handpieces and equipment attached to air- / waterlines

6.1 Maintenance of dental unit water

Maintenance of dental unit water [29, 62-64]

The exposure to water of poor quality and aerosols produced during oral health care procedure may be a serious health risk to patients and personnel with HIV / AIDS, diabetes, transplant recipients, chemotherapy patients, and those with a weakened immune system. Most of all, exposing patients and personnel to water of poor quality during the delivery of oral health care procedures does not comply with the principles of infection control. Therefore, oral health care providers have an obligation to maintain and monitor dental unit water quality as part of the infection control programme in the oral health care facility.

Steps to follow for maintenance of dental unit water:

1. For routine dental treatment, use water that meets quality standards for drinking water, <500 cfu/ml of heterotrophic water bacteria or <200 cfu/ml of anaerobic heterotrophic bacteria.
2. There are various water quality maintenance systems available. Therefore it is recommended that a local dental unit distributor is contacted to find out which of the available systems is compatible with and appropriate to the dental unit and equipment used in the oral health care facility.
3. Follow recommendations for monitoring water quality provided by the manufacturer of the unit or waterline treatment product. Clean these systems / containers on a weekly basis to prevent contamination.
4. Discharge / flush all water- and air lines for two minutes at the start of the work day and for a minimum of 20 to 30 seconds after each patient; including handpieces, prophylaxis angles, air abrasion instruments and equipment, ultrasonic scalers and air / water syringes.
5. For older dental units that are not equipped with anti-retraction valves, it is recommended that a dental unit technician is consulted for replacement with anti-retraction valves and rings.
6. Use sterile water or saline delivery systems for procedures involving bone cutting, implantology and surgery and not water from the normal dental unit.

6.2 Monitoring water quality

Monitoring water quality [29, 64]

Oral health care facilities have an obligation to monitor water quality to be consistent with best practice principles while delivering oral health care. The following should be routinely performed to monitor water quality:

Steps to follow when monitoring water quality:

1. Make arrangements with the local municipal laboratory or other appropriate authority to collect water samples.
2. Water quality should be tested when a new equipment waterline treatment protocol is initiated, when changing the existing waterline treatment protocol or when new personnel are given the responsibility for treating dental waterlines.
3. A water testing schedule should be instated when implemented within the specific oral health care facility, in consultation with the supplier or agent of the dental unit.
4. Records should be kept of all water monitoring tests. It must be recorded in a logbook.

6.3 Applying dental waterline treatment protocol

Applying dental waterline treatment protocol [2, 38, 60]

There are two ways to treat dental unit water: a continuous delivery system from a container, e.g. a separate water bottle, or an intermittent system in which a solution is delivered to the waterlines on a scheduled basis. An increasing variety of products to treat dental unit water is available and these vary substantially in price. Some products require daily, weekly, or monthly. This step cannot be omitted nor can it be left incomplete, because the success of the treatment protocol rests on this step. When selecting a dental unit waterline treatment system, factors to consider include initial and annual cost, ease of use, compatibility with dental equipment and materials, and safety issues. The quality of the bottle systems vary substantially, therefore it is important to purchase a system from a reputable company. When purchasing a waterline treatment system, it is also important to estimate maintenance and replenishing costs prior to purchase. The purchased waterline system should be maintained and replenished according to manufacturer's instructions.

Steps to follow for general dental unit waterline system management:

1. Use anti-stagnation and continuous-circulation water systems.
2. Use sterile water instead of the municipal water supply in the dental unit waterlines.
3. Apply continuous disinfecting treatment.
4. Daily flushing of all outlets in the morning and before each patient treatment.
5. Use of filters upstream of the dental unit and equipment attached to air and waterlines.
6. Annual monitoring of the waterlines.

Steps to follow once each week for dental unit waterline treatment:

1. Prepare fresh 1:10 bleach solution (1 part household bleach to 9 parts water).
2. Remove dental unit water bottle or reservoir and discard residual water.
3. Air purge all dental unit water lines.
4. Fill dental unit water bottle or reservoir with bleach solution and place back into position.
5. Fill all dental unit waterlines with bleach solution.
6. Allow bleach filled bottle or reservoir and dental unit waterlines to stand for 10 minutes.
7. Remove water bottle or reservoir and discard bleach solution and discard bleach solution into basin. Run the tap of the basin for at least 1 minute.
8. Re-attach the water bottle or reservoir to the dental unit and air purge the waterlines to remove residual bleach.
9. Flush all waterlines with 500 ml of clean, freshly boiled water or water prepared by heat distillation, which is stored in containers that have been disinfected at least once per week or sterile bottled distilled water for irrigation or autoclaved water.
10. Air purge waterlines and allow to air dry until next clinical use.
11. When the dental unit is required, refill water bottle or reservoir only with sterile water or 1:10 bleach solution. Avoid touching water tube connecting the water bottle or reservoir with the dental unit with ungloved hands which may contaminate the system with skin or bacteria.

6.4 Response to boil water advisories

Response to boil water advisories [29, 65]

Although boil water alerts are infrequent, it is imperative that OHCWs know how to manage such a situation when it occurs. The following steps are essential to follow in case of a boil water alert:

Steps to follow while a boil water advisory is in effect:

1. If the dental unit is coupled to the municipal water supply, its use should be discontinued until the alert is cancelled. This includes use of the handpieces, ultrasonic scalers or any other dental equipment coupled to the municipal water supply.
2. Do not use municipal or "tap" water for oral health care treatment, patient rinsing, or hand washing. Use bottled or distilled water or tap water that has been brought to a rolling boil for one minute and cooled.
3. For hand washing, use alcohol-based hand rubs that do not require water for use. If hands are visibly contaminated, use bottled or boiled water if available, and soap for hand washing or an antiseptic wipe / towelette.
4. Do not rinse disinfected instruments with municipal or "tap" water.

Steps to follow when the boil water advisory is cancelled:

1. Follow recommendations given by the local municipality regarding adequate flushing of waterlines. If no guidance is provided, flush all dental waterlines and taps for 1 to 5 minutes before using for patient care.
2. Disinfect dental waterlines as recommended by the dental unit manufacturer or local distributor.

6.5 Maintenance of dental handpieces and equipment attached to air- / waterlines

Maintenance of dental handpieces and equipment attached to air- / waterlines [29, 64]

To decontaminate and sterilise semi-critical oral health care equipment attached to the air- or waterlines of the dental unit, neither surface disinfection nor immersion in chemical germicides should be used. The gold standard for sterilisation of handpieces would be autoclaving after debris have been removed from the head of the handpiece. Debris removal requires that handpieces are properly flushed with a pressurised handpiece cleaner. Following flushing, compressed air should be used to blow out the debris and cleaner before sterilisation. Pressurised air and running water through the handpiece is not sufficient to remove debris from the head. Figure 6.2 illustrates how a handpiece is connected to be cleaned, lubricated and disinfected or sterilised in available automated devices.

FIGURE 6.2: Cleaning, lubricating and disinfecting or sterilising dental handpieces

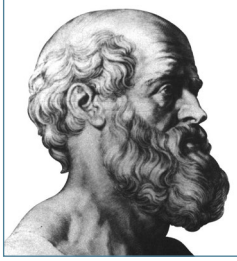
Although the flushing may be performed manually, the use of an automated machine for the cleaning process is preferred in order to ensure the safest environment for oral health care personnel and patients.

Steps to follow to ensure proper maintenance of equipment connected to the dental unit:

In the clinical area	• Use only single-use, disposable or heat tolerant equipment in a patient's mouth. • Tubing, handles, attached the saliva ejector or 3-in-1 syringe and other equipment that cannot be removed from the dental unit should be covered with surface barriers to protect them from contamination. When visibly contaminated, the equipment should be disinfected with an intermediate disinfectant prior to use on the next patient.
Cleaning and decontamination of dental handpieces	*Pre-sterilisation dental handpiece cleaning machines* • Automated pre-sterilisation dental handpiece cleaning machines are the preferred equipment for cleaning handpieces. These devices vary in design and sophistication, but all clean and lubricate the internal components of the handpiece. A typical machine cleans the air- and waterlines with a detergent spray solution, followed by cleaning and lubricating the bearings and gears with oil. The excess oil is purged and the interior dried with compressed air. The process takes about 35 to 40 seconds. Manufacturer's instructions on which type of detergent is compatible with handpiece equipment should be followed. Some models also include a handpiece vacuum sterilisation stage. *Thermal washer / disinfector safe handpieces* • Many of the modern handpieces are thermal washer / disinfector safe. Only instruments designated by the manufacturer as being suitable for cleaning in a washer disinfector and carry the washer-disinfector symbol, can be cleaned in a thermal washer disinfector. NOTE: Lubrication with service oil after the thermal washer disinfector stage is essential. *Manual cleaning of dental handpieces* Use the manufacturer's instructions to manually clean dental handpieces. While cleaning, all OHCWs should wear protective clothing, including utility gloves, protective eyewear / visor, and a mask. Manual cleaning of dental handpieces involves 2 stages: 1. Cleaning of the outer surface of the dental handpieces during removal from the dental unit; and 2. Cleaning and decontamination inner surfaces of the dental handpieces *Cleaning of the outer surface of the dental handpieces during removal from the dental unit:* • Flush handpieces with water for 20 seconds before removing from the coupling. (NOTE: Some handpieces should not run without a bur in place.) • Remove bur or rotary instrument. • Follow the manufacturer's instructions and only use detergents with a neutral pH to clean the outer surface of the handpiece. Detergents containing chlorine will corrode handpieces. Do not clean or immerse handpieces in disinfectants, or submerge handpieces in an ultrasonic bath. • Carefully wipe the outer surface of the handpiece with an alcohol wipe for the recommended contact time and allow to air dry. • Dry the water lines with compressed air and the outer surface of the handpiece with absorbent paper towel. *Cleaning and decontamination inner surfaces of the dental handpieces* • Check that the service oil canister has the correct nozzle attachment for the handpiece and that the O-rings (if present) on the nozzle are intact. O-rings prevent back flushing and spraying of oil onto the operator. • Shake the oil canister well; mixing the content of oil, cleaning solvent and

	absorbent paper towel around the head of the handpiece while inserting the nozzle into the handpiece. • Spray service oil once for approximately 1 second through the lumen of the handpiece onto the disposable soft paper towel. • Clean off any excess oil with an absorbent cloth and the place the handpiece, with head downwards, in a rack to drain off excess oil.
Sterilisation of dental handpieces	1. Follow the manufacturer's instructions for cleaning, lubrication, and sterilisation of handpieces and other intra-oral instruments carefully, as these are critical steps to ensure performance and durability. 2. Package cleaned dental handpieces, instruments and equipment that are not used immediately, in bags, wraps or packs compatible to the sterilisation process. 3. Steam-sterilise dental handpieces and other intra-oral instruments that can be removed from the air and waterlines of dental units at 134 to 137°C for 3 minutes after each patient treatment session. 4. When post-sterilisation lubrication of the handpiece is recommended, the use of separate canisters of oil for pre- and post-sterilisation lubrication is advised to prevent cross-contamination. In these cases packaging can only be done post-sterilisation lubrication. This is not ideal, as exposure of any kind and handling post-sterilisation may cause contamination. 5. Follow the manufacturer's instructions for periodic maintenance of anti-retraction mechanisms and replacement of O-rings.

Personal Protective Equipment Usage



> It is more important to know what sort of person has a disease than to know what sort of disease a person has."
>
> HIPPOCRATES

Why?

Personal protective equipment (PPE) is a major component of standard and transmission-based infection prevention and control precautions. In the oral health care setting in particular, PPE should be worn to protect the skin and mucous membranes from exposure to potentially infectious and hazardous materials contained in the spray and spatter where oral health care procedures are executed. PPE provides a physical barrier between the body and the source of contamination. When used routinely and properly, PPE can be very effective in providing protection against possible exposure.

FIGURE 7.1: Personal protective equipment applied in oral health care

What?

PPE routinely used in oral health care include outer protective clothing, masks, protective eyewear, face-shields, single-use-disposable gloves, and sterile or non-sterile and utility gloves. According the Occupational Health and Safety regulations, all OHCWs who are at risk of exposure to potentially infectious or hazardous material must wear PPE, as these protect both the OHCWS and patients from exposure to blood, body fluids and chemical hazards.

How?

7.1 Types of PPE that are applied in oral health care
7.2 Putting on and removing PPE
7.3 Preventing and managing reaction to gloves and other latex products
7.4 Preventing exposure during procedures involving surgery
7.5 Providing protection when exposed to laser / electro-surgery plumes or surgical smoke

7.1 Types of PPE that are applied in oral health care

Types of PPE that are applied in oral health care [1, 29, 66]

PPE must always be worn as standard precaution, whether the infectious status of the patient is known or not. The following are typical PPE used during oral health care procedures:

Types of PPE	Examples	Application
Outer protective clothing	Uniforms, jackets, gowns, aprons	Protect skin and / or clothing
Protective footwear and caps	Normal footwear *with* closed toes Protective footwear and caps for sterile surgical procedures	Wear normal footwear when routine dental procedures are performed. Wear protective footwear and caps when sterile surgical procedures are performed.
Masks	Surgical masks are cloth or cone styles with filtration capacity of at least 95%	Protect the skin on the face and mucous membranes of the mouth and nose.
Respirators	N95 respirators	Protect mouth / nose as well as the respiratory tract from airborne infectious agents.
Protective eyewear	Glasses with removable or solid side shields	Protect the eyes. Protective eyewear can also protect the wearer from mucous membrane exposures to droplets of potentially infectious, respiratory secretions.
Full face shields or chin length visors	If a face shield is worn, a mask is still required.	Protect face, mouth, nose, and eyes all at once.
Gloves	All types of gloves, including single-use-disposable gloves, sterile or non-sterile, vinyl overgloves and utility gloves	Protect hands and serves as a barrier to prevent cross-contamination or injury.

Factors influencing PPE selection:
The type and application of PPE are selected based upon the potential hazard presented by the procedure to be executed. Each procedure should be scrutinized individually for potential hazards anticipated from a particular procedure to be performed. In order to make the right choices when PPE are selected for a particular procedure, the following factors should be considered:

Type of exposure anticipated	Consider splash / spray versus touch precaution
Design and features	A variety of PPE is available in different styles and materials. These designs and features need to be considered on a continuous basis in order to make the best choice; not only to accommodate personal styles, but also make a selection for a particular facility in every type of application.
Durability	Shelf life needs to be considered continuously. Gloves for instance, perforate after a while or when exposed to high temperatures and sunlight. This is an important consideration for efficient stock control.
Sizing or fit	A comfortable fit will encourage compliance.
Appropriateness for the task	When performing ultrasonic scaling for instance, additional and more effective protection is required against the spatter generated during the process. This includes wearing of chin-length full face shield / visor. When performing manual cleaning of instruments, the hands are more prone to injury and then protected by wearing chemical- and puncture-resistant utility gloves amongst others. If only a brief assessment on a patient is performed, the use of examination gloves only will be appropriate.
Allergies and sensitivities	Allergies and sensitivities are often caused by PPE construction materials. Gloves must preferably be low in extractable proteins, <50 µg/g, low in residual chemicals and powder free. Products containing latex should be avoided.
Cost effectiveness	Cost is always a factor, but effectiveness should never be compromised. When selecting protective clothing for instance, different options, such as, outsourcing to a laundry service, buying disposable items in bulk or washing uniforms at the workplace should be considered.

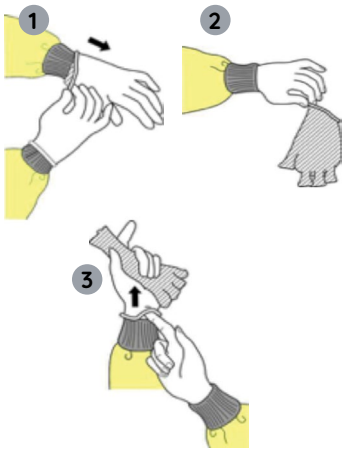
7.2 Putting on and removing PPE

Putting on and removing PPE [1, 29, 66]

When putting on and removing PPE a consistent routine should be followed to ensure protection in all areas. Execute steps in the proper sequence and dress up correctly. After seating patient and completing routine hand washing, the OHCW should put on PPE in the following order:

1. Gather all PPE needed for the procedure.
2. First put on protective clothing over street clothes, including laboratory coats, clinic jackets and gowns. Include protective footwear, when required.
3. Next, put on the mask. Avoid contamination by handling the mask on the ear loops or strings only
4. Then put on protective eyewear, including glasses or face shields.
5. Finally, when ready to begin the procedure, do a final routine hand wash and thoroughly dry hands with disposable paper towel.
6. Holding one glove at the cuff, place the opposite hand inside the glove and pull it onto the hand. Repeat the procedure for the second glove. Adjust for fit.
7. Lastly, open the instrument cassette, tray or pouch, in the presence of the patient, explaining why the instrument container has been sealed and sterilised.
8. Patient treatment can now commence.

Steps to follow when removing PPE:
Care should be taken to prevent cross-contamination of surfaces, hands, clothes, skin and mucous membranes following the patient treatment. To prevent further contamination, a clear distinction should be made between dirty and clean zones. The working sequence should also be adjusted so that a path from dirty to clean zones can be followed.

PPE	Steps to follow when removing PPE
Gloves 	Change gloves between each patient and as treatment interruptions require. To remove examination gloves: 1. Use a gloved hand to grab the other glove on the outside of the cuff area. Pull downwards, turning the glove inside-out, as it pulls away from the hand. 2. With the, now bare hand, grab the inside and uncontaminated area of the cuff of the remaining glove. Pull downward to remove the glove, turning it inside out. 3. Thoroughly wash and dry hands before putting on new gloves.
Masks 	Change masks between patients or during a procedure when damp or wet. This could happen from external contamination or from condensation of exhaled air. Replace mask every 20 minutes, more or less. 1. When wearing gloves, hold mask by the body to remove. When not wearing gloves, only handle at the ties or elastic strap of the mask.

Eyewear 	Clean and disinfect re-usable eye and face protection between patients. 1. With the gloves still in place, remove protective eyewear (glasses, goggles, face shields) and place on a disposable towel. 2. Wash eyewear with soap and water and disinfect according to the manufacturer's instructions.
Protective clothing / uniform 	To remove visibly dirty clothing. 1. Fold the contaminated area of the protective clothing / uniform away from the body and be careful not to contaminate hands. 2. Discard disposable protective clothing / uniform. 3. Place re-usable protective clothing / uniform into the designated container for contaminated laundry.

It is important that one should remember to remove the contaminated PPE once the procedure is done.

FIGURE 7.2: Contaminated PPE should be removed after procedure

7.3 Preventing and managing reaction to gloves and other latex products

Preventing and managing reaction to gloves and other latex products

Although rare, allergic contact dermatitis and life-threatening reactions to latex may occur when OHCWs are exposed to latex or other allergens in the oral health care facility [36]. Some individuals are more sensitive than others and this may result in potentially serious consequences. Although these reactions may present a challenge to manage, several strategies can be implemented to reduce exposure to allergens. Oral health care facilities should be adequately prepared and appropriately equipped with procedures in place to respond to allergic emergencies occurring amongst personnel [67,68]. Contact dermatitis is classified as either an irritant or allergic reaction. This may develop from frequent and repeated use of hand hygiene products, exposure to chemicals and glove use [29]. It must be stated that a large proportion of irritation and allergic reactions that OHCW demonstrated to latex gloves in the past, can be attributed to poor quality gloves, rather than the latex itself [67]. Presently, the powder or other chemicals left in the gloves during manufacturing are often also causes of reactions.

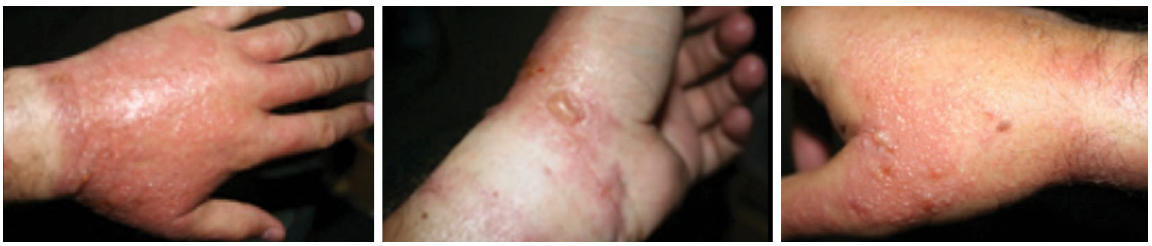


FIGURE 7.3: Irritant contact dermatitis reaction to gloves

Irritant contact dermatitis	This condition is very common and is seen as dry, itchy, irritated areas of skin within the glove boundary [29]. It is caused by physical skin irritation. It can be improved by rinsing and drying the hands well after washing, avoiding contact with the irritant and also by often applying moisturising cream or lotion [1].
Allergic contact dermatitis (type IV or delayed hypersensitivity)	The onset of this condition in allergic prone individuals is usually delayed by 4 to 48 hours. This hypersensitivity is commonly caused by bonding materials, composite filling materials, glutaraldehyde and rubber manufacturing chemicals [1]. Other causes include exposure to chemicals such as methacrylate. Areas of appearance of allergic contact dermatitis include the back of the hands and between the fingers where the skin is thin [68]. Cold weather tends to aggravate the condition [68]. It is recommended that an afflicted worker should seek medical advice as soon as the allergic reaction appears. Recurrence can be avoided by selecting powder-free gloves manufactured from latex-free materials [36].
Latex hypersensitivity anaphylaxis	This condition is potentially a life-threatening allergic reaction. It is an immune response which can manifest within minutes after skin or mucosal contact with the chemicals in natural rubber latex [1].

Steps to follow to avoid and manage dermatitis and hypersensitivity reactions in OHCWs [1, 29]:

1. **Education**
   Know the signs and symptoms of dermatitis and hypersensitivity reactions.
2. **Health screening**
   Ensure that all OHCWs dermatitis and hypersensitivity reactions are recorded in their medical history file. A qualified physician should be consulted (allergist or dermatologist) to confirm the cause of the reaction and future management thereof.
3. **Managing latex allergic OHCWs**
   All OHCWs who are allergic to latex gloves must use non-latex gloves and must avoid the use of any latex products. Nitrile and polyurethane gloves are recommended, as they do not contain latex and these gloves are more cut and puncture resistant than latex gloves. All employees allergic to latex gloves must be provided with safe alternatives at the employer's expense. OHCWs with past or current symptoms of contact dermatitis because of a latex allergy must use a liquid soap with lotion in order to improve the dermatitis and maintain the integrity of the skin. If the dermatitis persists after use of the liquid soap with lotion, the use of powder-free non-latex gloves is recommended. All working areas that maybe contaminated with latex powder or dust should be cleaned. If latex-related complications occur during or after an exposure, emergency assistance should be sought immediately. Be vigilant about latent allergens causing respiratory or anaphylactic symptoms among OHCWs with latex hypersensitivity.

7.4 Preventing cross-contamination or injury during surgery procedures

Preventing cross-contamination or injury during surgery procedures

All oral and maxillofacial surgery procedures are usually invasive and should be performed in a sterile working environment. Therefore, when cutting or penetrating tissue there is an increased risk of exposure to potentially infectious material. Therefore a higher level of precaution should be implemented to prevent exposure during procedures involving surgery.
NOTE: Biopsy specimens should be regarded as being potentially infectious material.

Steps to follow during surgical procedures [29]*:*

1. Perform surgical hand antisepsis using a product with antimicrobial properties.
2. Put on sterile surgeon's gloves and protective clothing.
3. Use sterile saline or sterile water as a coolant or irrigation solution when performing oral surgical procedures.
4. Use instruments and equipment specifically designed for delivering sterile irrigating fluids, e.g. bulb syringe or single-use disposable products. Sterilisable or disposable tubing should also be used.
5. Biological verification of each pack used during surgical procedures, including implants, must be performed.

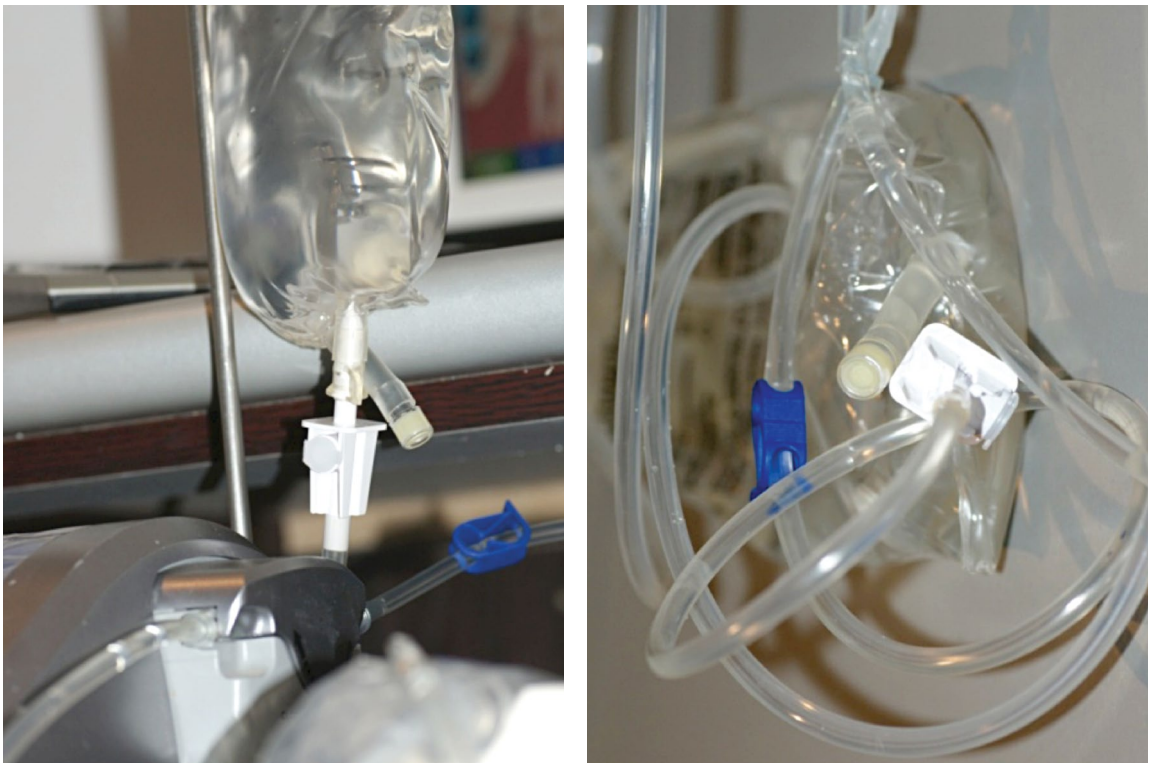


FIGURE 7.4: Sterile saline or water used with disposable tubing during surgical procedures

Steps to follow when taking biopsy specimens [29]*:*

1. Wear gloves at all times when handling biopsy specimens.
2. Place biopsy specimens in a sturdy, leak-proof, transparent container for transportation.
3. Take precautions to avoid contamination of any kind.
4. Label the container or impervious bag with the biohazard symbol.
5. Clean and disinfect the outside of the biopsy specimen container or bag if it accidentally becomes visibly contaminated.

7.5 Providing protection when exposed to laser / electro-surgery plumes or surgical smoke

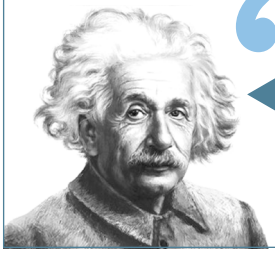
Providing protection when exposed to laser / electro-surgery plumes or surgical smoke

The use of laser and electro-surgery in modern oral health care is becoming increasingly more popular. Lasers generate plumes or smoke that could be laden with potentially infectious patient material. Electro-surgical procedures tend to burn tissues creating smoke and other possible by-products. One concern is that infectious material in the laser plumes may reach the nasal mucosa of the OHCW or patients while performing an oral health care procedure.

Steps to follow when exposed to laser / electro-surgery plumes or surgical smoke [29]*:*

1. Apply standard precautions, such as high-filtration surgical masks and possibly full face shields.
2. Use central room suction units with in-line filters to collect particle matter from minimal plumes.
3. Use dedicated mechanical smoke exhaust systems with a high-efficiency filter to remove substantial amounts of laser-plume particles.

Personal- and Hand Hygiene Practices



> Not everything that can be counted counts, and not everything that counts can be counted."
>
> ALBERT EINSTEIN

Why?

Hand hygiene has been singled out as the most important way to reduce the risk of disease transmission in health care settings. Studies have indicated that when hand hygiene improves, health care associated infections decline. In oral health care there is frequent touching of many different surfaces, often contaminated with saliva and other potentially infectious materials. This increases the risk of disease transmission. Although OHCWs often wear gloves and other PPE as precaution, it should not be considered to be a substitute for proper hand hygiene.

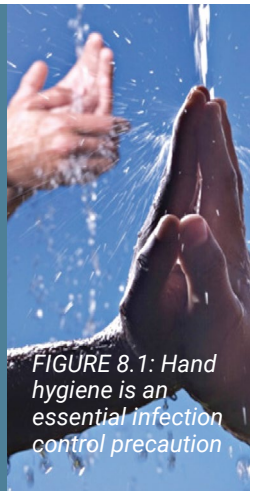


FIGURE 8.1: Hand hygiene is an essential infection control precaution

What?

Cleaning is a very important first step in any skin decontamination or disinfection process. Surfaces in the oral health care facility become contaminated from patient material, either by direct spray or spatter generated during oral health care procedures, or through contact with the oral health care personnel's gloved hands. These surfaces can then secondarily contaminate other instruments, equipment, hands or gloves. Besides cleaning and decontaminating instruments or environmental surfaces, OHCWS should diligently practice personal hygiene, including frequent hand hygiene practices throughout the working day. Hand hygiene includes proper hand washing, hand asepsis and surgical hand hygiene procedures.

How?

8.1 Personal hygiene practices

Personal hygiene practices [1]

Personal hygiene refers to the process of physical removal of dirt, blood, body fluids and transient microorganisms from the body by means of washing and / or destruction of microorganisms. Oral health care professionals should be impeccable about their personal hygiene, as most oral health care procedures executed in the dental chair, are in close proximity of the patient's intimate space. When an OHCW presents with a bad body odour, this is usually indicative of poor hygiene, which will negatively impact the professional image of the oral health care facility.

Protective clothing should either be disposable or wash tolerant at the higher temperatures in order to facilitate destruction of microorganisms. Wash protective clothing separately from other clothes using a "hot" washing machine cycle at a setting of 50°C or above. The heat produced by ironing also promotes the destruction of microorganisms remaining on clothes.

Steps to follow for personal hygiene practices:

1. OHCWs should preferably start the day with a general body washing session.
2. OHCWs should maintain good oral hygiene, use anti-perspirants and avoid excessive use of deodorants and perfumes.
3. Keep hair clean and neat. The hair of OHCWs must be held back and kept from falling into the face or necessitate constant touching.
4. Facial hair, such as beard or moustache, should be neat and trimmed.
5. OHCWs should be encouraged the wearing of clean and neat professional clinical attire. Disposable gowns may be worn as alternative to washable uniform.

Steps to follow for premises hygiene practices :
For more details on the schedule and routine of housekeeping and premises cleaning also refer to Guidelines Section 3: Surface protection and cleaning.

8.2 Hand hygiene practices

Hand hygiene practices [1, 18, 23, 29]

Practising effective hand hygiene is an essential infection control precaution. It has been found that it does not matter as much with **what** you wash, rather than **how** you wash. The basic mechanisms include the washing process itself, rinsing, appropriate time of exposure to the cleaning agent, post-wash asepsis and dermatological considerations. For detail on prevention and management of skin reactions, refer to Guidelines Section 7. Hand hygiene can be achieved by hand washing or by using an alcohol based hand rub. Alcohol-based hand rub is an acceptable alternative to hand washing between different patient treatments, as long as the hands are not visibly soiled or dirty. When visibly soiled or dirty, hand washing should be performed.

The products used to perform hand hygiene should preferably be supplied by a touch-free fore-arm or elbow operated dispenser, e.g. a touch-free, wall mounted dispenser which can be refilled with a disposable container of soap, foam or gel when empty. Figure 8.1 illustrates the areas on the hands that are frequently neglected or missed during hand washing. Specific attention should be given to these areas.

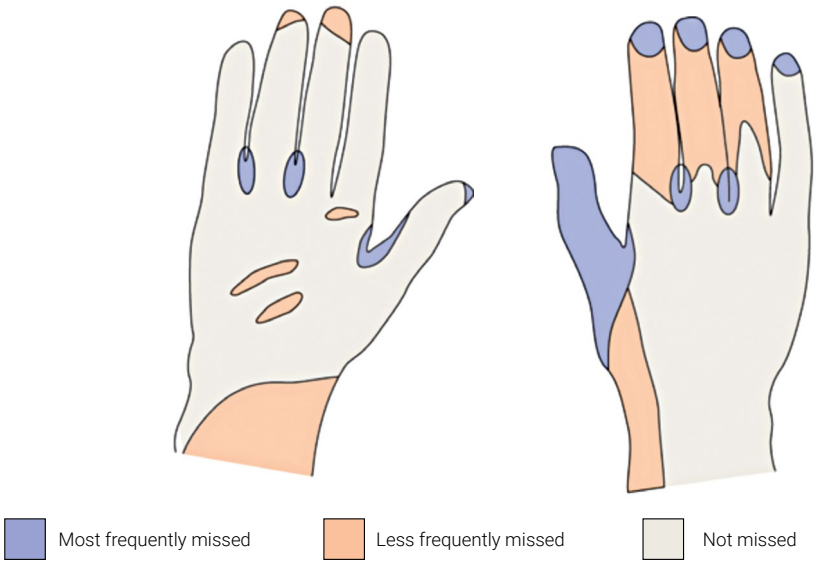


FIGURE 8.2: Areas of the hands often neglected during hand washing [69]

Hands should be washed:

- Before and after treating each patient;
- after removing gloves and before putting on a new pair of gloves;
- after touching objects barehanded, including surfaces contaminated by with blood, body fluids, secretions (including saliva) and excretions;
- after using the toilet or blowing / wiping the nose;
- before eating, drinking, smoking, applying cosmetics or lip balm, changing contact lenses;
- after smoking;
- before leaving any clinical area, laboratory or instrument processing area for any reason; and
- whenever hands feel dirty or are visibly soiled.

Recommendations:

- Cover any obvious cuts, bruises or abrasions with adhesive waterproof dressings, because these are easy portals for the entry of infectious agents.
- The use of bar soap is not recommended, as bar soap can be a source of contamination due to frequent touching by different people.
- When soap containers are empty, wash, dry, and only then refill. Containers with liquid soap should not be "topped up", because infectious agents can be transferred into the container.

Table 8.1 shows the different hand hygiene methods, the particular agent applied for each method, the specific technique and suggested duration of the wash, and suggested application:

TABLE 8.1: Hand hygiene methods and suggested application [2]

Methods	Agent	Technique	Duration (minimum)	Indications
Choice 1: *(to remove dirt and transient microbes)* Routine hand wash ***Choice 2:*** *(to remove dirt and transient microbes and reduce resident microbes)* Antiseptic hand wash	Water and non-antimicrobial detergent (e.g. plain soap*) Water and antimicrobial agent / detergent (e.g. chlorhexidine, iodine and iodophors, chloroxylenol [PCMX], triclosan)	1. Wet hands and wrists under cool running water 2. Dispense enough soap / cleaning agent to cover hands and wrists 3. Rub the soap / cleaning agent into all areas, with particular emphasis around nails and between fingers before rinsing with cool water 4. Dry hands completely with disposable towels before putting on gloves 5. Use a towel to turn off the faucet if automatic controls are not available NOTE: repeat steps 1 to 3 in the beginning and end of each day for two consecutive 15 second washes	15 seconds 10 seconds	When visibly dirty† After barehanded touching of inanimate objects likely to be contaminated by blood or saliva Before and after treating each patient (e.g. before glove placement and after glove removal) Before leaving patient-care, laboratory, or instrument processing areas Before regloving after removing gloves that are torn, cut or punctured
Choice 3: *(to kill microbes when <u>no visible dirt</u> is present on the skin)* Antiseptic hand rub	Alcohol-based hand rub†	1. Apply the product to palm of one hand 2. Rub hands together, covering all surfaces of hands and fingers, until hands are dry† 3. Follow manufacturer's recommendations regarding volume of product to use	Rub hands until the hand rub is dry*	
Surgical antisepsis before surgery ***Choice 1:*** *(to remove dirt and transient microbes and kill some resident microbes)*	Water and antimicrobial agent / detergent (e.g. chlorhexidine, iodine and iodophors. chloroxylenol [PCMX], triclosan)	1. Remove rings, watches and bracelets 2. <u>Gently</u> remove debris from underneath fingernails using a nail cleaner under running water 3. Wet hands and wrists under cool running water 4. Using an antimicrobial agent, scrub hands and forearms for the length of time recommended by the manufacturer's instructions before rinsing with cool water 5. Dry hands completely (using a sterile towel is ideal) before putting on sterile surgeon's gloves	2-6 minutes with multiple scrub and rinse cycles	Before putting on sterile, surgeon's gloves for oral surgical procedures
Choice 2: *(to remove dirt and kill transient and some resident microbes)*	Water and non-antimicrobial detergent (e.g. plain soap*) followed by an alcohol-based surgical hand-scrub product with persistent activity	1. Follow manufacturer instructions for surgical hand-scrub product with persistent activity	Follow manufacturer instructions for surgical hand-scrub product with persistent activity	

*Pathogenic organisms have been found on or around bar soap during and after use. Use of liquid soap with hands-free dispensing controls is preferable.

†60%-95% ethanol or isopropanol. Alcohol-based hand rubs <u>should not</u> be used in the presence of visible dirt or organic material. If using an alcohol-based hand rub, apply adequate amount to palm of one hand and rub hands together, covering all surfaces of the hands and fingers, until hands are dry. Follow manufacturer's recommendations regarding the volume of product to use. If hands feel dry after rubbing hands together for 10-15 seconds, an insufficient volume of product was applied. The drying effect of alcohol can be reduced or eliminated by adding 1%-3% glycerol or other skin-conditioning agents.

Steps to follow routine hand washing technique [35, 69, 70]:

1. First wet hands with water and then apply ordinary or antimicrobial liquid soap to hands. Use *enough soap to cover all surfaces* of the hands.
2. Vigorously rub hands together for at least 15 seconds, covering all surfaces of the hands and fingers, with particular attention to the thumb and fingertip areas. Refer to Figure 8.4 for areas of the hands that are often missed during hand washing.
3. Rinse hands for at least 10 seconds with cold or lukewarm water. Avoid using hot water, because repeated exposure to hot water may increase the risk of skin irritation or cracking.
4. Dry hands thoroughly with a disposable paper towel. Cloth towels and towelling hanging on rolls become severely contaminated after use or when wet and should therefore be avoided or replaced after each use.
5. Water supply should preferably be touch free operated, e.g. with automated sensor control or fore-arm operated. If the tap handles are manual, use the disposable paper towel to open and close.

NOTE: Repeat steps 1 to 3 in the beginning and end of each day for two consecutive 15 second washes.

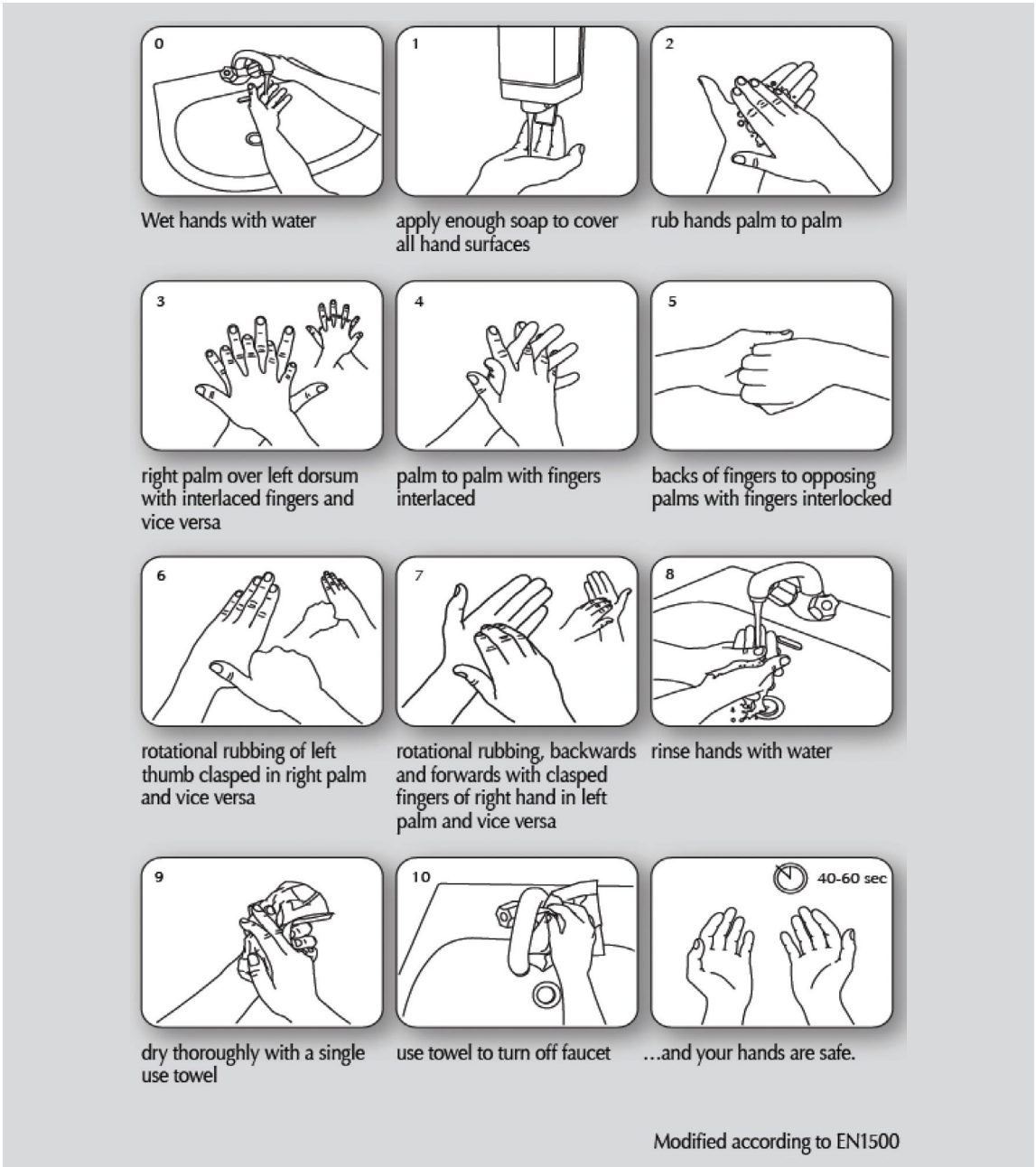


FIGURE 8.3: Routine hand washing technique [71]**.**

Steps to follow alcohol-based hand rub technique:

1. Use the correct volume of the alcohol-based rub as recommended by the manufacturer, as the volume is directly related to its efficacy.
2. Apply the alcohol-based rub to the palm of one hand and rub hands together; covering all surfaces of the hands and fingers. Continue until the hands are dry.
3. If the hands feel dry after just 10-15 seconds of rubbing, too little of the alcohol-based rub has been used.

FIGURE 8.4: Alcohol-based hand rub technique [71].

Steps to follow surgical hand asepsis technique [72]:

1. Remove rings, watches and bracelets.
2. Remove debris from under fingernails using a nail cleaner or orange wood stick under running water.
3. Perform surgical hand asepsis.

3.1. Using antimicrobial soap:

- Scrub hands and forearms for the length of time recommended by the manufacturer of the particular product in use (usually 2 to 6 minutes).
- Dry thoroughly with sterile towels before putting on sterile gloves.

3.2. Using alcohol-based surgical hand-scrub with persistent activity:

- Follow the manufacturer's instructions.
- Pre-wash hands and forearms with liquid soap and dry hands and forearms completely before applying the alcohol-based rub.
- Allow hands and forearms to dry thoroughly after application of the alcohol-based rub.
- Put on sterile gloves.

8.3 Other hand hygiene considerations

Other hand hygiene considerations [29]

Studies have demonstrated that skin underneath rings is more heavily contaminated than comparable areas of skin on fingers without rings. Further studies are needed to establish if wearing rings results in greater transmission of pathogens, but it is recommended to rather remove jewellery or make sure to clean underneath them during hand hygiene procedures.

Hospital outbreaks and death of pre-natal babies have been reported and linked to nurses with long, artificial nails. Health care workers who have artificial nails are more likely to harbour gram-negative pathogens on their fingertips than their colleagues who have natural nails. It is recommended to rather have short, clean nails in order to comply with hand hygiene procedures in oral health care facilities.

Steps to follow for fingernails and artificial nails:

1. Keep fingernails short enough to allow thorough cleaning underneath them and prevent glove tears.
2. Trim sharp nail edges or broken nails to prevent glove failure.
3. Long artificial or natural nails can make putting on gloves more difficult and also cause gloves to tear easier. Research has indicated that artificial fingernails or extenders increase fungal and bacterial infections.
4. Freshly applied nail polish on natural nails does not increase the microbial load from periungual skin if fingernails are short. However, chipped nail polish can promote bacterial growth.

Steps to follow for general hand hygiene considerations:

1. Use hand lotions or creams to minimise adverse effects after hand antisepsis or regular hand washing to prevent drying or cracking of the skin. Use these from tubes and not large containers, as multi-dose pots of cream may become contaminated [4].
2. Avoid creams and lotions with petroleum or mineral oil base as these degrade glove material and compromise the effectiveness [68].
3. Provide alternative hand hygiene products for OHCWs suffering from allergies or adverse skin reactions to standard hand hygiene products [71].

GUIDELINES SECTION 9

Sterilisation Practices

Why?

Most instruments that are used during oral health care procedures become contaminated when they are in contact with mucosa, body fluids and / or penetrate tissue. Contaminated instruments must therefore be decontaminated and sterilised before safe re-use [73]. When selecting procedures or products to perform sterilisation or disinfection procedures, the aim is to effectively break the chain of infection [74]. Each oral health care facility should apply a validated instrument sterilisation process that *monitors* and *documents* conditions for the prevention of disease transmission [29]. It is most desirable to sterilise ***all*** instruments, handpieces and other supplies and equipment that are used for invasive procedures inside the oral cavity [29, 74].

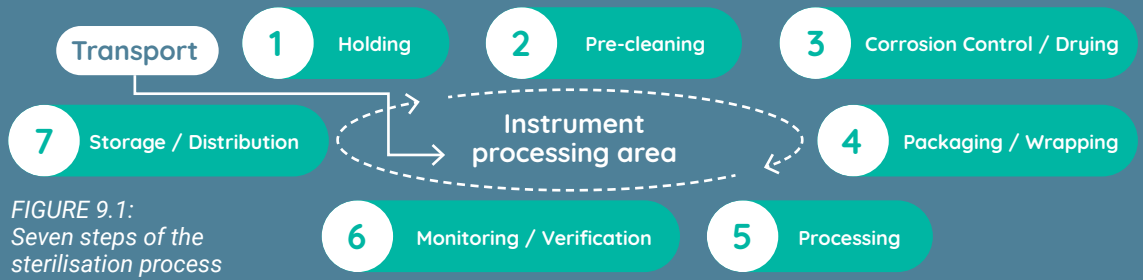


FIGURE 9.1: Seven steps of the sterilisation process

What?

Sterilisation practices involve programmes that refer to a validated process, intended to destroy all viable microorganisms, including resistant bacterial spores. The sterilisation process is presently the only acceptable clinical method that ensures safe re-use of instruments in oral health care.

How?

9.1 Applying the modified CDC / Spaulding Classification

Applying the modified CDC / Spaulding Classification

Cleaning and sterilisation of instruments can be performed immediately following an oral health care procedure, or after the treatment area has been disinfected and prepared for the following patient. This can be performed by the dental assistant or person designated to the processing area, for example a cleaner. This worker should wear the following PPE when processing contaminated instruments:

- Protective uniform or apron;
- a mask utility;
- protective eyewear if there is a potential for splash and spatter; and
- gloves.

Each oral health care facility should classify all contaminated instruments, equipment and surfaces in different categories (Table 9.1) in order to determine the method of processing. The different categories are based on intended use and potential risk of disease transmission.

TABLE 9.1: Modified CDC / Spaulding classification of contaminated items [1]

Classification	Description	Relative risk	Recirculation
Critical items	Used to penetrate soft tissue or bone in sterile areas of the body. E.g. surgical and cutting instruments (scalpels), forceps, chisels, periodontal scalers, burs.	Highest risk	These instruments should be heat-sterilised after each use; alternatively, apply single-use disposables.
Semi-critical items	Touch only mucous membranes (do not penetrate soft tissues). E.g. hand instruments, mirrors, mouth props, curing light guards, cheek protectors.	Intermediate	These instruments and equipment should be heat-sterilised after use; If instrument will be damaged by heat it should receive, at minimum, high-level disinfection; alternatively, apply single-use disposables.
Non-critical surfaces with intra-oral contact	May come in contact with skin and/ or mucosa of OHCWs or patients after handling, or repair. E.g. impressions, prostheses.	Low	Thorough rinsing; Followed by intermediate-level disinfection.
Non-critical surfaces with no intra-oral contact	Come in contact with unbroken skin. Examples include blood-pressure cuffs, nitrous-oxide face masks.	Low	Sanitise with detergent (sufficient in absence of visible blood or saliva); Follow by intermediate-level disinfection (if visibly contaminated); or barrier protection.
Environmental surfaces: patient care	Usually in contact with OHCWs, but not patients E.g. dental unit surfaces, laboratory and radiographic equipment.	Very low	Sanitise with detergent (sufficient in absence of visible blood or saliva); when blood is present; Follow by intermediate-level disinfection; or barrier protection.
Environmental surfaces: housekeeping	Rarely in contact with OHCWs or patients. E.g. floors, walls, and countertops.	Minimal	Sanitise with detergent (sufficient if no visible blood or saliva present); When blood is present, follow with intermediate-level disinfection.

Locked cassettes

The use of locked cassettes eliminates the sorting and handling of individual instruments, and furthermore reduces the risk of infection from contaminated instruments. The use of locked cassettes results in savings of, on average, five minutes during instrument reprocessing, as well as fewer damaged instruments, since the instruments are locked in position during reprocessing [75].

FIGURE 9.2: Locked cassettes

9.2 Sterilisation methods in oral health care

Sterilisation methods in oral health care

Any dental instrument that enters the oral cavity should be classified either as a critical or semi-critical surface in accordance with Spaulding's classification (Table 9.1). These instruments should be sterilised for re-use through methods such as autoclaving, chemiclaving or dry heat (Table 9.2). Chemical immersion methods with extended exposure times of 10 to 12 hours, using an approved chemical sterilant, can be used for items that are heat sensitive. Table 9.2 provides examples of sterilisation methods applied in oral health care facilities:

TABLE 9.2: Sterilisation methods in oral health care [47]

Method	Sterilising parameters	Advantages	Disadvantages / Precautions
Steam under pressure: Gravity displacement (Type N*)	Wrapped cycles: 15-30 min @ 121°-123°C for rubber and plastic Total time: 55-75 min Depend on load.	Time efficient Good steam penetration Can process wide range of materials without damage	Corrosion of non-stainless steel metal items No closed containers Hard water deposits possible Possible wet packs after cycle May damage heat-sensitive plastics and rubber Sharps may become blunt Re-circulated water may become contaminated Unwrapped items become non-sterile immediately Requires adequate ventilation
Steam under pressure: Pre- and post-vacuum (Type B*)	Wrapped cycles: 5 min @ 132°-135°C ~ 15 min dry time Total time: 40-55 min Depend on load.	Excellent time efficiency Superior steam penetration Can process wide range of materials without damage: solids, liquids, hollows, textiles Shorter cycles, increases throughput	Corrosion of non-stainless steel metal items No closed containers Hard water deposits possible Possible wet packs after cycle May damage heat-sensitive plastics and rubber Sharps may become blunt Require Bowie-Dick as well as spore tests Unwrapped items immediately become non-sterile Requires adequate ventilation Long term maintenance costs higher than other technologies
Steam under pressure: Steam-flush Pressure-pulse (Type S†)	Wrapped cycles: 14-17.5 min @ 132°-135°C ~ 1 hour dry time Total time: 47-74 min Depend on load, chamber size and brand.	Good time efficiency Excellent steam penetration Can process wide range of materials without damage: solids, hollows	Corrosion of non-stainless steel metal items No closed containers Hard water deposits possible Possible wet packs after cycle May damage heat-sensitive plastics and rubber Sharps may become blunt Textiles not recommended Unwrapped items immediately become non-sterile Requires adequate ventilation Must pass Bowie-Dick as well as spore tests May require extended drying time for autoclaves without post-vacuum drying cycle
Unsaturated chemical vapour	Wrapped cycles: 20 min @ 132°C ~ no dry time Total time: 30 min	Time efficient No corrosion or rust Packs dry quickly after cycle	Special solution required Requires adequate and controlled ventilation Must dry items thoroughly prior to processing No closed containers or liquids May damage heat-sensitive plastics and rubber May not be appropriate for handpieces Cloth wraps may absorb chemicals Unwrapped items immediately become non-sterile
Dry heat: Static air	60-120 min @ 160°C	No corrosion or rust Does not blunt sharps Dry items after cycle May use closed containers (but must pass spore test)	Long cycle times May damage heat-sensitive plastics and rubber Must dry items thoroughly prior to processing May not be appropriate for handpieces If the door is opened when the cycle has started cycle must be re-started No closed containers or liquids Unwrapped items immediately become non-sterile
Dry heat: Forced air	12 min @ 190°C	Time efficient No corrosion or rust Does not blunt sharps Dry items after cycle	May damage heat-sensitive plastics, rubber and other materials Must dry items thoroughly prior to processing May not be appropriate for handpieces If the door is opened when the cycle has started cycle must be re-started No closed containers or liquids Unwrapped items immediately become non-sterile

*Types B and N are most frequently used in oral health care facilities [53].

†Type S is most frequently used in oral health care facilities in South Africa [76].

9.3 Sterilisation process

Sterilisation process [1]

Prior to sterilising contaminated instruments, instruments have to be removed from the clinical area and transported to the sterilisation processing area in a safe manner.

Removal and transport of contaminated instruments and equipment from clinical area to sterilisation processing area

1. After treatment of a patient all contaminated materials must be removed in preparation of the clinical area for the next patient. Dispose of all disposable items and sharps in the appropriate manner.
2. Place all re-usable patient treatment instruments and equipment in a rigid, leak-proof puncture-resistant container with lid or closed cassette for transport.
3. Transport the container to the processing area in such a manner that the risk of exposure to persons and the environment is minimised.
4. Place the container in the contamination area of the processing room. If the instruments are to be cleaned immediately, proceed to step 2, number 5 of the sterilisation process or alternatively continue with step 1.

SEVEN STEPS TO FOLLOW IN THE STERILISATION PROCESSING AREA:

Step 1 Holding the contaminated instruments and equipment

1. With puncture-resistant utility gloves in place, carefully transfer the contaminated instruments from the transfer container to a previously prepared holding solution with a non-corrosive surfactant, e.g. enzymatic cleaner or dishwasher detergent in an appropriate container. When using a closed cassette place the cassette directly into the holding solution with a non-corrosive surfactant.
2. Change holding solution at least daily or more often if cloudy or otherwise visibly contaminated.
3. The container must be cleaned and decontaminated when replacing the solution.

Step 2 Pre-sterilisation cleaning

1. The cleaner should wear puncture-resistant utility gloves, face and eye protection, protective clothing or uniform, and plastic apron.
2. If instruments and equipment were placed individually in holding solution (step 1), use a cheatle forceps to remove the instruments from the holding solution and then rinse under running water to remove residual solution or any loose debris. NOTE: do not reach into the solution with hands, even with utility gloves in place, because the holding solution may be heavily contaminated.
3. If the closed cassette was placed into the holding solution (step 1) use a cheatle forceps to remove the cassette from the holding solution and then rinse under running water.
4. After rinsing, proceed with the cleaning process, preferably using a hands-free, automated mechanical cleaning device, such as ultrasonic cleaning or instrument washer / disinfector.
5. Manual scrubbing can be applied in appropriate cases, such as to remove stubborn materials or debris. The routine use of manual scrubbing instead of automated mechanical cleaning is discouraged, as it requires maximum direct contact with contaminated instruments. This contact increases the chances for cuts and punctures through the gloves and should be prevented by rather using an automated cleaning process.
6. For details on cleaning methods, see 9.4.

Step 3 Corrosion control and drying

1. Use one of the following techniques to dry instruments and equipment: air dry, pat dry under several layers of disposable towel, place in an instrument dryer with a fan and heated air, or dip the cleaned instruments into a container with 90% isopropyl alcohol [77]. Allow enough time for instruments and equipment to dry completely before packing or wrapping.

2. With utility gloves still in place, inspect instruments and equipment for residual debris or damage. Replace or remove damaged instruments. Repeat the cleaning process if needed.
3. Lubricate and / or apply rust inhibitors to handpieces and forceps according to manufacturers' recommendations. Open and lubricate all hinged instruments and equipment.
4. Separate instruments and equipment in functional sets. Add additional patient treatment material that will be required for treatment, e.g. cotton rolls, etc.

Step 4 Packing or wrapping

1. After cleaning package sharp instruments in such a way that the tips are exposed to the sterilising agent without perforating the packaging material.
2. Package loose instruments in single layers, but do not wrap too tightly, to ensure exposure to the sterilising agent.
3. Wrap, bag or package instrument sets, including all implantable devices, in materials or containers that are compatible with the sterilisation process to be used.
4. Place a chemical indicator with the instruments, inside each package.
5. For verification of the sterilisation process, a biological indicator should be placed inside one of the sterilisation packages on a weekly basis. Place biological indicators in all packs with implantable devices.
6. Maintain the integrity of packages by following only the manufacturers' recommendations for sealing packages. Never use staples, pins, or paper clips to seal packages.
7. If the chemical indicator is not visible on the outside of the package, place external process tape indicator outside on the package.
8. Label information may be written on the outside of the sealed area of packages. Do not use ink on paper packaging materials.

Step 5 Sterilisation

1. Load the steriliser according to manufacturers' instructions. To prevent overloading of the steriliser, place packages on their edges, in single layers, or on racks to assure circulation of the sterilising agent around the instruments.
2. Select and run appropriate sterilisation cycles for wrapped instruments, operating the steriliser according to manufacturers' instructions. Routinely check the operating parameters, including time, temperature and pressure gauges on the steriliser.
3. When the sterilisation cycle is complete, allow the packages to dry before removing them from the steriliser. Allow packages to cool down before handling to avoid injury or burning.

Step 6 Monitoring of the process

1. Check the chemical indicators to ensure that all packages have been subjected to the sterilisation process.
2. Retrieve the biological incubator for incubation and analysis. NOTE: do not use the instrument packs if any of the indicators suggest malfunction.

Step 7 Storage and delivery

1. Store the instruments in a clean and dry environment in a manner that maintains the integrity of the packages until they are used. Rotate packages so that those with the oldest sterilisation dates will be used first. Enclosed cabinets or cupboards will increase the assurance that sterility of the package is maintained.
2. Deliver packages to the point of use in a manner that maintains the integrity of the packages and sterility of the instruments until they are used. Inspect the integrity of each package to verify it has not become torn, punctured or wet. Damp packages should not be considered sterile. If dry and intact, the package can be opened aseptically, preferably where and when the patient may observe this. If the integrity of the packet has been compromised, do not use the instruments for patient treatment, but repeat the processing cycle.

9.4 Cleaning methods of instrument and equipment in oral health care

Cleaning methods of instrument and equipment in oral health care

Prior to the sterilisation process instruments and equipment are cleaned to physically remove debris or organic matter. It also reduces the number of microorganisms on an instrument or device. Cleaning should be performed effectively to avoid interference with the sterilisation process. Different cleaning processes used for application in oral health care facilities today, including instrument washers and washer disinfectors, ultrasonic cleaners, and manual cleaning, are presented in Table 9.3:

TABLE 9.2: Cleaning methods

Cleaning method	Steps to follow for cleaning
Cleaning of contaminated instruments in a washer / washer disinfector	Cleaning of instruments with a washer disinfector is best practice. If a facility does not have a washer disinfector, it should be incorporated into future plans [38]. 1. PPE must be in place. 2. Load the machine according to manufacturer's instruction and in such a way that the water will come into contact with all surfaces. 3. Turn on the machine, selected the appropriate cycle and start the cycle. 4. After the cycle is complete, partially open the door for 10 to 15 minutes to allow the content to cool down. 5. Visually inspect the instruments for remaining debris and damage. Repeat the cleaning if necessary. 6. Proceed to packaging and the sterilisation processing (steps 4 to 7). 7. An ultrasonic cleaner may be used as a supplementary cleaning method, for example to remove stubborn materials or debris.
Ultrasonic cleaning of contaminated instruments	In the absence of a washer / washer disinfector, ultrasonic cleaning of instruments and equipment is recommended: 1. Use and service the ultrasonic cleaner according to the manufacturer's instructions. 2. PPE must be in place, including heavy-duty utility or nitrile gloves. 3. Prepare solutions according to the manufacturer's instructions. 4. Select solutions specifically formulated for use in the ultrasonic cleaner, preferably a detergent or enzymatic cleaner and not a disinfectant. 5. Rinse instruments or cassettes before the ultrasonic cleaning cycle, including all instruments that have been in a holding solution. 6. Place instruments and / or cassettes in an ultrasonic basket and submerge completely into the cleaning solution, taking care not to touch the sides of the cleaning chamber or to splash the solution. 7. Close the lid of the ultrasonic cleaner and leave covered for the complete cycle. 8. Set the timer to clean loose instruments for 3 to 6 minutes and cassettes for 10 to 20 minutes. 9. Do not interrupt the cleaning cycle to add instruments. 10. Once the cycle has been completed, thoroughly rinse the instruments and / or cassettes. Visually inspect the instruments for remaining debris and damage; repeat the cleaning if necessary. 11. Allow the instruments to air dry or carefully pat them dry with several layers of / or thick paper towelling. 12. Dispose of and replace the solution in the ultrasonic cleaners at least once daily, and more often if it appears cloudy, or when it becomes visibly contaminated. 13. Perform efficacy tests, such as the aluminium foil test, on a daily basis and document results in a log book (Table 5.1).

Manual cleaning of contaminated instruments	Manual cleaning should only be carried out when automated methods of cleaning are inappropriate or unavailable. Although this cleaning method is very simple and easy to execute, it carries a much greater risk for accidental injury compared to the other cleaning methods. Personnel members performing this cleaning method, should be trained accordingly and specific safe working methods and precautions must be applied [1, 22, 43]: 1. Wear thick, puncture-resistant utility gloves for protection against accidental injury, protective eyewear and mask for protection against splashing and spraying. 2. Clean no more than one or two instruments at a time. 3. Use a long-handled, kitchen-type brush to keep the scrubbing hand as far as possible away from the sharp instrument tips. 4. Scrub the instruments by holding them low in a basin. 5. Brush while the instruments are submerged in a cleaning solution or detergent to avoid spattering. Follow scrubbing by thorough rinsing with a minimum of splashing. 6. Wash instruments under water with the sharp end of the instrument held away from the body. Take extra care when cleaning instruments that are sharp at both ends. 7. Visually inspect the instruments for remaining debris and damage, and repeat the cleaning if necessary. 8. Let instruments air dry or carefully pat dry with several layers of towelling. NOTE: to avoid accidental injury, do not rub the instruments. 9. Wash the brush that was used to remove debris and materials from the instruments by cleaning and soaking in disinfectant after use. 10. At the end of all clinical procedures for the day all brushes used for cleaning must be autoclaved or soaked overnight in a high-level disinfectant.

9.5 Monitoring sterilisers and sterilisation failure / troubleshooting

Monitoring sterilisers and sterilisation failure / troubleshooting [29, 78]	
Monitoring of steriliser function can be accomplished by the following means: 1. Mechanical monitoring of gauges, lights, timers, charts to measure time, pressure and temperature, mechanical parts subject to wear and malfunction. 2. Chemical monitoring using cards, vials, strips and indicator tapes placed inside or outside pack or tray. 3. Biological monitoring using cards, vials, and strips, which is the most reliable means of determining sterilisation. Chemical indicators *imply* steriliser performance; while biological indicators *prove* actual destruction of resistant bacterial spores.	
Steps to follow to monitor steriliser function: 1. Use mechanical, chemical, and biological indicators according to the manufacturer's instructions to ensure the effectiveness of the sterilisation process. Maintain accurate sterilisation records of mechanical, chemical, and biological indicators. 2. Monitor each load mechanical indicators and chemical indicators as mentioned above. 3. If the mechanical or chemical indicators indicate inadequate processing, withdraw these packs from circulation and reprocess. 4. Use a biological indicator with a matching control from the same batch number at least once per week. *5. Steps to follow when a biological indicator tests positive for spores:*	
5.1 In the case of a positive spore test	• Remove the steriliser from service and review sterilisation procedures to determine whether operator error could be responsible. • Retest the steriliser by using biological, mechanical, and chemical indicators after correcting any problems. • If the repeat spore test is negative, and mechanical and chemical indicators are within normal limits, place the steriliser back in service.
5.2 If the repeated test is positive, review procedures to identify problems	• Review all records of all chemical monitoring since the date of the last negative spore test. • Review all packaging procedures performed by personnel; steriliser loading and operating procedures, as well as the procedures on how to handle the biologic indicators for spore testing.
5.3 Retest and observe the cycle	• Correct any procedural problems identified. • Conduct a repeat spore test. Place a chemical indicator next to the spore test in the chamber and operate the same cycle that previously failed. • Observe the steriliser, including the lights, buzzers, gauges, and readouts during the cycle for any physical signs of a problem. • Observe the chemical indicator and obtain results of the repeat spore test. • It the repeat test result is negative and the chemical indicator changed colour, the steriliser can be placed back into service with another spore test to be performed on the next cycle.

5.4 If the repeat spore test is positive	• Contact the appropriate person for repair or replacement. Do not use the steriliser until inspected or repaired or the exact reason for the positive test has been determined. • Recall as far as possible all items processed since the last negative spore test and reprocess. • Before placing the steriliser back in service, re-test the steriliser with biological indicator tests in three consecutive empty chamber sterilisation cycles.
5.5 If one or more of three re-tests are positive	• After one positive spore test, take the steriliser out of service until the problem is solved. • The backup steriliser should have been routinely spore tested.
5.6 Test the repaired steriliser	• Spore test a repaired steriliser and do not replace the steriliser back in operation unless the spore test is negative.

9.6 Processing heat sensitive items with liquid chemical sterilants

Processing heat sensitive items with liquid chemical sterilants

Follow manufacturer's instructions closely if liquid chemical sterilants, also called high-level immersion disinfectants, are used. The use of liquid sterilants is discouraged because of the following reasons:

1. Some chemical germicide fumes irritate the skin, the mucous membranes of the eyes and the respiratory tissues, causing occupational asthma among OHCWs.
2. After cleaning and chemical sterilisation these items must be rinsed with sterile water to remove toxic or irritating residues.
3. Items that have been chemically sterilised cannot be stored.
4. Chemical sterilisation cannot be verified with biological indicators.
5. To achieve sterility extended exposing times of up to 12 hours with complete immersion may be required. Shorter exposing times may achieve disinfection only.

Steps to follow for processing heat sensitive items with liquid chemical sterilants:

1. PPE must be in place.
2. Thoroughly clean and dry items to be chemically processed.
3. Place items to be chemically processed in a perforated tray. Alternatively, place individual instruments in the solution without splashing using a forceps.
4. Fully immerse the perforated tray or individual instruments in the container filled with chemical sterilisation solution.
5. Cover the container filled with chemical sterilisation solution with a lid and allows instruments to remain in the solution for the entire contact time recommended. Do not add additional instruments during this period.
6. Handle processed instruments aseptically. Use sterile forceps and rinse processed items with sterile water, then dry with sterile towels.
7. If items are not to be used immediately, place them in clean packaging material.
8. Periodically, test the chemical sterilisation solution's concentration using applicable test kits or strips. Replace solution according to manufacturer instructions, and / or when the solution is visibly dirty or the level is low.

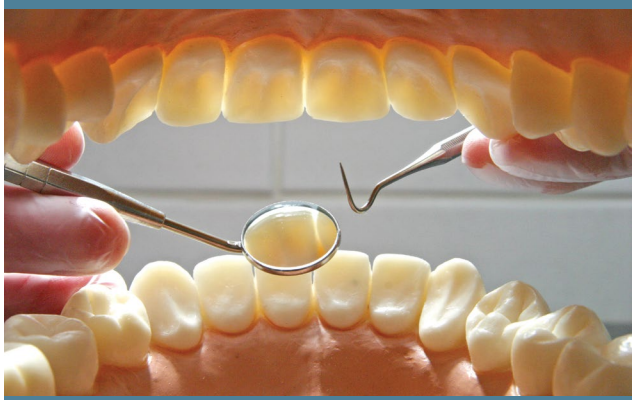

SWANN-MORTON
ENGLAND B.S.

GUIDELINES SECTION 10

Safe Sharps Handling

Why?

All contaminated sharps are a potential source for infection. Incorrect handling of sharps may result in penetrating injuries. Contaminated needles and other contaminated used sharp items need to be disposed of correctly. Failure to dispose of used sharps into approved sharps containers poses a real health hazard, not only to oral health care workers in the workplace, but also to community members who may be accidentally exposed to these sharps.



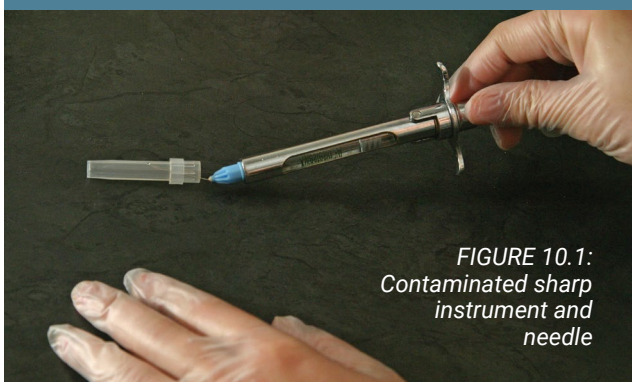


FIGURE 10.1: Contaminated sharp instrument and needle

What?

Safe sharps handling implies programmes that incorporate safer work practices and environmental controls, to organise and secure instruments in the oral health care environment. Improved engineering controls can remove or isolate hazards that relate to sharps in the workplace. Any injury or incidents that do occur should be reviewed and reported in order to suggest and implement preventive measures or improvements. Effective communication among the members of the oral health care team will promote a culture of safety.

How?

10.1 Sharps used in oral health care

Sharps used in oral health care [22, 29]

Contaminated needles and other contaminated sharps should not be bent, recapped, removed, sheared or purposely broken. An exception to this is allowed if the procedure would require that the contaminated needle be recapped or removed and no alternative is feasible. If such an action is required, then the recapping or removal of the needle must be performed by the use of a mechanical device or a one-handed technique. The following are some examples of sharps used in oral health care:

- Burs;
- scalpel blades;
- suture needles, dental syringe needles;
- glass and glass anaesthetic cartridges;
- metal matrix bands;
- wires;
- endodontic files and reamers;
- orthodontic wires and instruments; and
- wedges.

Steps of caution to follow when handling sharps:

1. Sharp items, including needles, scalers, burs, laboratory knives and wires that are contaminated with patient blood and saliva, should be handled as being potentially infective.
2. A mirror or retractor, instead of fingers, should be used to retract or palpate tissue during procedures with sharps, including burs, suturing and administration of anaesthesia.
3. Never pass any sharp item in a manner that may injure personnel members or the patient. Passes of sharps should be announced or a neutral zone created to secure the pass.
4. Never recap needles using two hands. A one-handed "scoop" technique or a device designed for holding the needle cap should be used when recapping.
5. Never bend, break, or remove needles before disposal.
6. All sharp waste items should be disposed of immediately after use in a solid, puncture proof, leak proof, spill proof sharps container close to the point of use. Nothing should be removed from the container after disposal.
7. Waste containers or sharps holders should be positioned as close as possible to the clinical areas where the items are used or other locations where these are generated.
8. All sharps should be identified and removed from the instrument tray prior to instrument cleaning.
9. The dental burs should be removed from the handpieces before replacing any other instruments. To avoid injuries, the handpieces should be positioned facing towards the unit and away from personnel passing by.

Steps of caution to follow when handling contaminated sharp instruments:

1. Never wipe debris from instruments such as scalers, probes or other sharp instruments holding gauze in the hand or around any finger. Also avoid wiping instruments on the patient's bib or paper towel. Rather tape 3 to 4 cotton rolls together on the instrument tray and wet 1 or 2 of these with clean water. It will then be easier to remove debris and visible bioburden from the sharp instruments by inserting the sharp end of the instrument into the wet cotton roll and then remove remaining loose debris and excess moisture on the dry cotton roll.
2. Avoid injuries on fingers with contaminated instruments by avoiding fulcrum or use of a finger rest on the same tooth when scaling or using cutting instruments.
3. Avoid picking up or manually cleaning more than two instruments at a time.
4. Be especially cautious when handling double-ended instruments.
5. Wash hands immediately after removal of gloves.

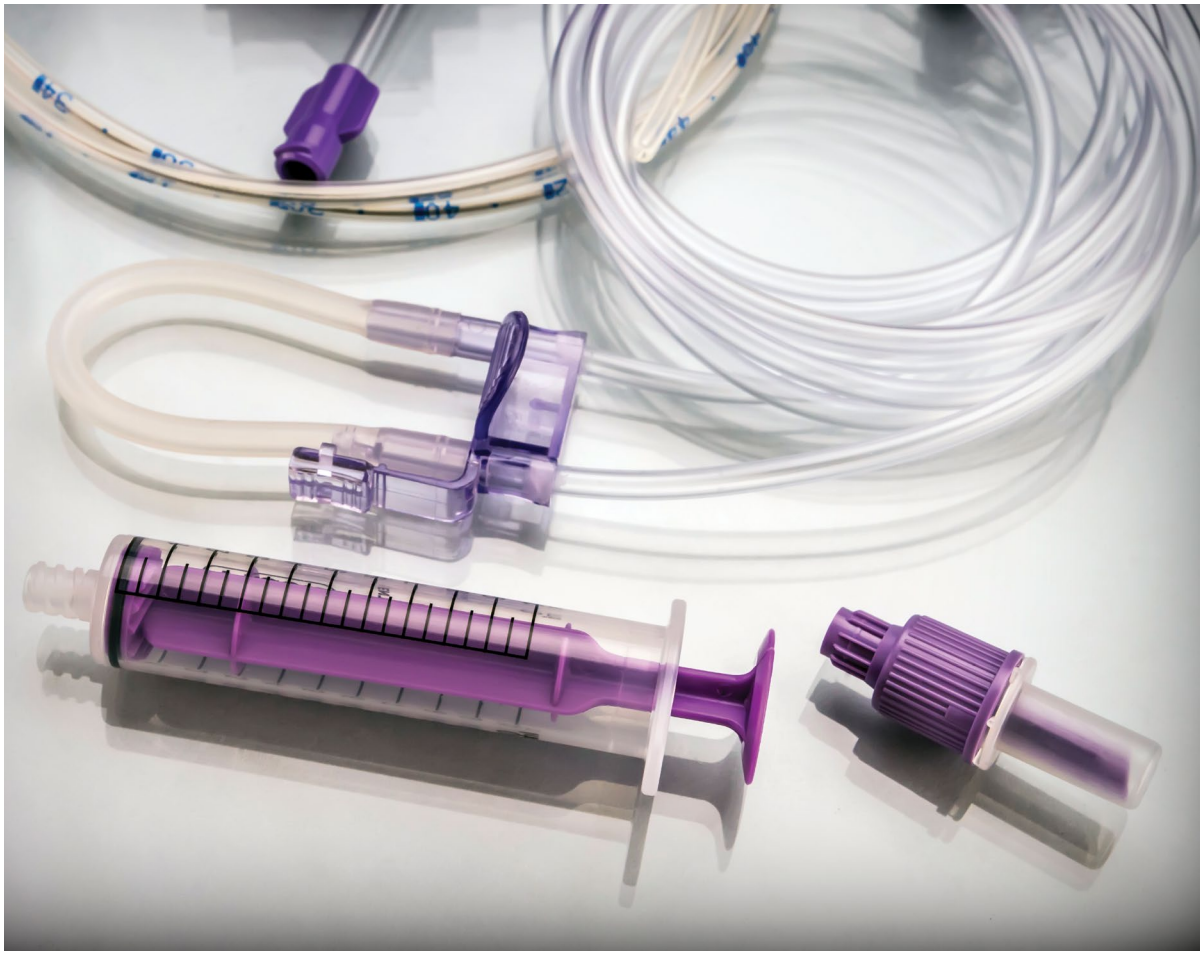
10.2 Parenteral medications

Parenteral medications [29]

Parenteral medications involve medications that are injected into the body. Cases of disease transmission have been reported where parenteral medications have been administered, thus stressing the importance to handle parenteral medications safely and to prevent transmission of infections.

Steps to follow for parenteral medications:

1. Do not administer medication as prepared or diluted in a syringe to more than one patient, even if the needle on the syringe is changed.
2. Use single-dose vials for parenteral medications when possible.
3. Leftover contents of single-use vials should be disposed of immediately and nothing saved for later use.
4. Use fluid infusion and administration sets, e.g. intra venous (IV) bags, tubing and connections, for one patient only and disposed of appropriately. The consequences of contamination might result in life-threatening infection.
5. The following apply if multi-dose vials are used:
    - Cleanse the access diaphragm with 70% alcohol before inserting a device into the vial and avoid touching the diaphragm.
    - Use a sterile device to access a multi-dose vial and avoid touching the access diaphragm. Both the needle and syringe used to access the multi-dose vial must be sterile.
    - Keep multi-dose vials away from the immediate patient treatment area to prevent contamination from spray or spatter.
    - Discard the multi-dose vial if sterility is compromised.



10.3 Safe disposal of sharps

Safe disposal of sharps

Percutaneous injuries are the single greatest risk of transmission of a bloodborne infection to an oral health care worker in the oral health care facility. Percutaneous exposures may result from injuries by contaminated needles, burs, scalpels, broken glass, exposed ends of dental wires, or other sharps that penetrate the skin.

Steps to follow for safe disposal of sharps:

1. Dispose of sharps in a container compliant with South African National Standard (SANS) (Table 11.1).
2. Do not recap, bend or remove needles from disposable syringes.
3. Dispose of the needle and disposable syringe as a unit into the sharps container.
4. If needed in a particular area, safely carry a rigid, closed sharps container to that area.
5. Never direct the tip of a sharp instrument to any person or any part of the body.
6. Use the one-handed method when re-capping a used needle.
7. Disposed of glass and ampoules in the sharps container.

Examples of Do's and Don'ts to consider when using sharps waste containers [79]:

Do's	Don'ts
1. Put sharps containers as close to the point of use as possible and practical, ideally within an arm's reach. The containers should be easy to see, recognise and use. 2. Attach containers to walls or other surfaces if at all possible. 3. Mark containers clearly to avoid usage as garbage containers or for discarding cigarettes. 4. Place containers at a convenient height so personnel can use and replace them easily. 5. Mark the fill line at the three quarters full level.	1. Shake a container to settle its contents and make room for more sharps. 2. Place containers in high traffic zones, such as corridors outside clinical areas where people could bump into them or be injured. 3. Place containers on the floor or anywhere they could be knocked over or easily reached by a child. 4. Place containers near light switches, overhead fans or thermostat controls where people might accidentally put their hand into them.

10.4 Management of contaminated dental burs and endodontic files

Management of contaminated dental burs and endodontic files

Dental burs and endodontic files during oral health care procedures are generally contaminated with blood and pulpal nerve tissue and thus pose a risk for prion related diseases. The risk of transmission of Creutzfeldt-Jacob and other prion diseases through oral health care is unknown, but is thought to be very low if appropriate infection control measures are taken [80]. Prions have been identified in the brain and neurological tissue, in the tonsils, eye tissue, and pituitary glandular tissue and also in dental pulpal tissue of experimental animals [81]. Prions are resistant to conventional physical and chemical decontamination processes and therefore additional measures need to be taken.

Steps to follow for contaminated dental burs and endodontic files [29, 38, 80]*:*

1. Consider items that are difficult to clean, e.g., carbide and diamond burs, endodontic files and broaches, including needles and anaesthetic cartridges, as single-use, disposable items and discard after one use.
2. Use single-use, disposable critical and semi-critical instruments and equipment, or if possible patient-specific instruments and equipment that are destroyed after use.
3. Keep hand instruments moist until it can be cleaned and decontaminated.
4. Clean hand instruments thoroughly and rinse well by using an automated mechanical device. Run through an empty cycle before any further routine use.
5. Process instruments by using the longest cycle (up to 1 hour of sterilisation time and with prior rigorous cleaning of the instruments).
6. Use a complete cycle at 134°C and 103 Kpa (15 psi) for a minimum sterilisation time of 18 minutes. *The use flash sterilisation procedures on any endodontic instruments is discouraged.*
7. Schedule procedures involving neurovascular tissue at end of day to permit more extensive cleaning and decontamination.

GUIDELINES SECTION 11

Waste Management

Why?

All types of health care waste (HCW) are generated at oral health care facilities, including hazardous health care risk waste (HCRW) and also general health care (household) waste [82]. Special emphasis is placed on HCRW, which poses the greatest risk to health, safety and the environment, depending on the particular type of HCRW, how it is handled, as well as the manner in which exposure might take place. Health care general waste is classified as non-hazardous and is thus not considered a risk. The disposal of the HCRW generated in oral health care facilities can have adverse effects on the health and well-being of the personnel of the facility, its patients, any visitors and the general public, if not properly managed.

FIGURE 11.1: The indiscriminate disposal of health care waste may adversely affect health and the environment.

What?

Waste management programmes involve the proper handling and disposal of waste generated in the oral health care facility. Waste management minimises the spread of infections and reduces the risk of accidental injury.

How?

11.1 Classification of health care waste

Classification of health care waste - modified from SANS 10248 [82]

Health care waste (HCW) is categorised into health care general waste (HCGW) and health care risk waste (HCRW). Both these types of waste are generated in oral health care facilities. HCGW is the non-hazardous component of HCW that includes many of the same substances as domestic waste. This is generated amongst others during the administrative and housekeeping functions of oral health care facilities and may include a number of recyclable materials.

HCRW has been classified as hazardous and includes infectious waste, pathological waste, sharps, chemical waste, and radio-active waste. HCRW is often referred to as regulated medical waste. In oral health care facilities all these types of waste, with the exception of radio-active waste, can be generated. Three of the components of HCRW have the potential to cause microbial contamination, namely infectious waste, pathological waste and sharps.

SANS has developed a national colour coding system, which is used in oral health care to indicate the level of hazard associated with the particular waste type. Table 11.1 provides the different HCW categories, the SANS colour coding and international hazard labels applied and also examples of these as generated in oral health care.

TABLE 11.1: Health care waste categories, SANS colour coding, international hazard label and examples

Waste	Waste sub-category	Colour coding and international hazard label	Examples in oral health care
Human or animal anatomical waste	Infectious anatomical waste	**RED** and the international infectious hazard label 	Includes any parts from a body, e.g. extracted teeth, other surgical removals and biopsy specimens.
	Infectious animal anatomical	**ORANGE** and the international infectious hazard label	None
	Non-infectious animal anatomical	**BLUE**	None
Infectious non-anatomical waste	None	**RED** and the international infectious hazard label 	All types of waste that is likely to contain pathogenic microorganisms or agents. In oral health care facilities anything that has been in contact with saliva is considered as infectious, e.g. disposable items such as gloves, masks, cotton rolls, saliva ejectors, suction tips and others.

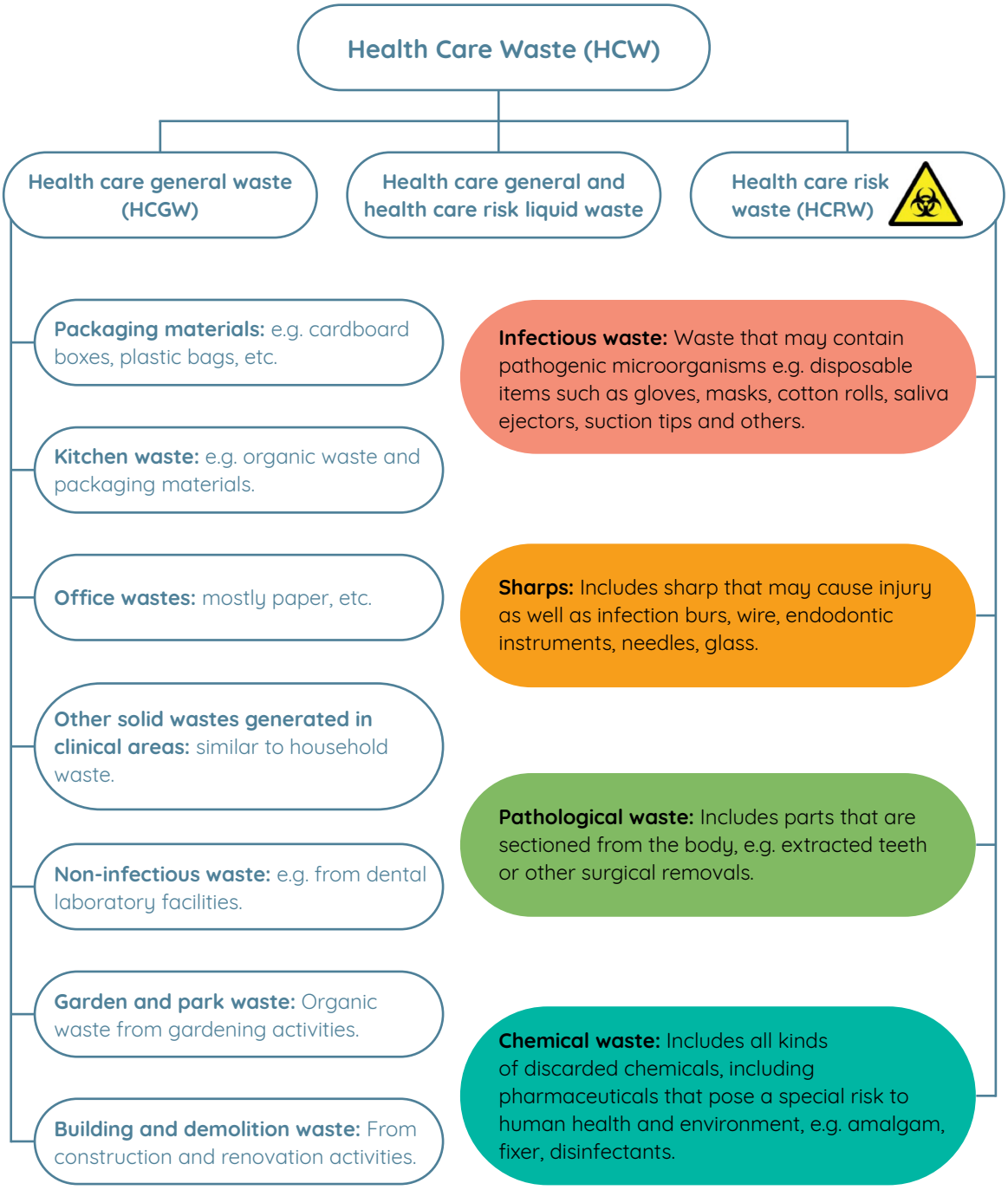
Sharps	None	**YELLOW**, the words "**DANGER**" "**CONTAMINATED SHARPS**" and the international infectious hazard label	Includes any sharp object likely to contain pathogenic microorganisms or agents that may cause injury as well as infection. Examples of sharps used in oral health care include burs, scalpel blades, suture needles, dental syringe needles, glass and glass cartridges, metal matrix bands, wires, endodontic files and reamers, orthodontic wires and instruments, and wedges.
Chemical waste including pharmaceutical waste	Chemical or pharmaceutical waste	**DARK GREEN** and the appropriate international hazard label	Includes all kinds of discarded chemicals, including pharmaceuticals that pose a special risk to human health and environment, e.g. amalgam, fixer, disinfectants.
	Cytotoxic pharmaceutical	**DARK GREEN** and the cytoxic hazard label	Amalgam products
Radioactive waste	None	**No colour coding** only the appropriate international radiation hazard label	This includes solid, liquid and gaseous waste contaminated with radio-nuclides. Radio-active waste is normally not generated in oral health care facilities.
General waste	Similar to municipal waste and not contaminated	**No hazard label** Black, beige, white or transparent plastic bags can be used.	Health care general waste, includes normal household and administrative waste, paper, packaging materials, cardboard boxes, plastic bags, etc.

11.2 Segregation of health care waste and colour coding

Segregation of health care waste and colour coding

In an oral health facility it is advised that waste is segregated in the different waste categories and disposed of in the colour coded containers according to SANS. Listed in Box 11.1 are the primary health care waste categories as generated in oral health care facilities.

BOX 11.1: Primary health care waste categories in oral health care facilities



11.3 Waste management activities in oral health care facilities

Waste management activities in oral health care facilities [83]

According to the National Environmental Management: Waste Act, No. 59 of 2008, waste management activities include any activity listed in the *Gazette* under section 19, namely:

- The generation of waste, including any activity or process that is likely to result in the generation of waste:
- the accumulation and storage of waste;
- the collection and handling of waste;
- the reduction, re-use, recycling and recovery of waste;
- the transportation of waste;
- the transfer of waste;
- the treatment of waste; and
- the disposal of waste.

Steps to follow to handle, store and dispose of HCW:

1. Develop a medical waste management programme for each facility in accordance with local regulations.
2. OHCWs who handle and dispose of HCRW should be appropriately trained and informed of possible health and safety hazards when handling and disposing of such waste.
3. Waste should be segregated when and where it is created.
4. Segregation should be into specific containers that are designed with safety standards to protect patients, OHCWs, waste handlers, the public and the environment to minimise handling and simplify safe disposal of the various types of waste generated in oral health care facilities.
5. Appropriate PPE should be worn while performing the segregation, e.g. thick utility gloves, protective eyewear and mask. In accordance with the classification of the primary health care waste categories mentioned in BOX 11.1 above, waste should be segregated as follows:
    - Health care general waste (HCGW) should be disposed of with normal domestic waste in black, beige, white or transparent plastic bags.
    - Health care general and health care risk liquid waste, e.g. blood, suctioned fluids or other liquid waste can carefully be poured down in the drain, utility basin or toilet. Local municipal regulations should be checked.
    - Infectious waste e.g. used disposable items such as saliva or blood contaminated gloves, masks, cotton rolls should be disposed of in colour-coded, labelled biohazard containers with fluid-resistant red plastic bags to contain non-sharp HCRW.
    - Sharp items, such as needles, scalpel blades, orthodontic bands, broken metal instruments and burs, should be disposed of in appropriate, SANS compliant, puncture-resistant sharps biohazard containers.
    - Pathological waste e.g. extracted teeth or other surgical removals described under 11.4 mentioned below.
    - Chemical waste e.g. all kinds of discarded chemicals, including pharmaceuticals that pose a special risk to human health and environment, e.g. amalgam, fixer, disinfectants.
6. The containers should be closed immediately, before removal or replacement, to prevent spillage or protrusion of contents during handling, storage, transport, or shipping.
7. HCRW should be stored separately from general waste in securely sealed containers until picked up and removed.
8. All areas used for the storage of HCRW containers should be identified, secured and locked to prevent access to these areas by unauthorised persons.
9. Disposal of waste from clinical areas should preferably be performed on a daily basis. Waste should not be allowed to accumulate within the facility.
10. HCRW should be transported and removed separately from general waste by a licensed health care risk waste transporter to a permitted health care risk waste treatment facility.
11. If the waste is removed by a health care risk waste transporter, records of such transports and safe disposal should be kept as evidence.
12. All health care facilities should keep records, monitor performance and make improvements that demonstrate management of the risks associated with HCRW.

11.4 Disposal and management of extracted teeth

Management and disposal of extracted teeth

Extracted teeth are classified as infectious anatomical waste. Specific precautions need to be followed to prevent cross-contamination and exposure risk following extraction of teeth. If the extracted teeth do not contain any filling material it should disposed of with the hazardous HCRW in the waste container that should be incinerated. However, if the extracted teeth contain amalgam fillings, a different route of disposal should be followed to avoid incineration. Amalgam waste products pose an extreme environmental health hazard if mercury vapour is released. If extracted teeth are to be used for training purposes, decontamination and sterilisation of the teeth also need to be performed prior to usage to prevent cross-contamination or exposure to an infectious or a hazardous risk.

Steps to follow for extracted teeth:

1. Dispose of extracted teeth as HCRW or return to the patient (upon request).
2. Clean and place extracted teeth in a leak-proof container, labelled with a biohazard symbol, and maintain hydration for transport to training institutions or a dental laboratory.
3. Heat-sterilise teeth that do not contain amalgam before they are used for training purposes.
4. If extracted teeth containing amalgam restorations are to be used for training purposes, it should be immersed in 10% formalin solution for 2 weeks.
5. Disposal of extracted teeth containing amalgam should be in a container that will not be incinerated. This to prevent the release of mercury vapour at high temperatures to the environment and thus creating a health hazard. Commercial metal recovery companies also might accept extracted teeth with amalgam for recycling the metal.

PART III:

Audit-Feedback Instrument

Assessment,
Feedback and Review
of the Programme

3


sirona
INTEGO

PART III

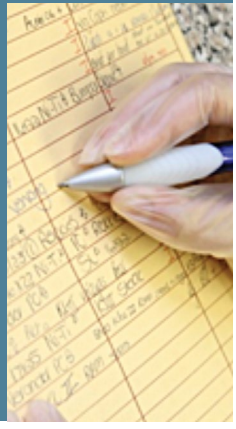
Audit-Feedback Instrument

> "Leadership is a verb. Leadership is action. Leadership is communicating the future – now."
>
> MARC COOPER

Why?

When entering the oral health care environment no person should ever be placed at increased risk for disease transmission or injury. All employers have a legal obligation under the Occupational Health and Safety Act 28 to ensure that all their employees are appropriately trained and proficient in the procedures for working safely. Furthermore, employers and all employees are responsible to ensure that any person on the premises, including patients, workers, contractors or visitors, is not placed at any avoidable risk as far as is reasonably practicable. In oral health care these may include occupational exposure to a given pathogen, which may lead to disease transmission, but also included are any other substance or equipment hazardous to health and safety.

FIGURE 12.1: Personnel communicating in an oral health care facility.



What?

Assessment, feedback and review of the infection control programme involves assessment of standard operating procedures and clinical practices, and includes the following:

- Having a periodic "walk through the facility";
- doing an observational assessment to offer opportunity for improvement;
- identifying deficiencies or problems;
- preventing breakdown by incorporating maintenance plans;
- reviewing occupational exposures;
- applying a checklist or audit tool;
- building up a portfolio of evidence of periodic assessments; and
- documenting suggestions for improvements in procedures and equipment.

How?

12.1 Assessment of current procedures
12.2 Achieving compliance
12.3 Scheduling events on the calendar and in appointment books

12.1 Assessment of current procedures

Assessment of current procedures

The aim of programme evaluation is to do a risk assessment in order to identify hazards and to consider improvements for best clinical practice and standard operating procedures. These evaluations must assess the workplace and clinical procedures, and furthermore address the use of specific products and equipment in order to suggest improvements. New technologies and product improvements should be identified on a constant basis and upon further assessment these can be implemented.

The evaluation process can help all oral health care professionals to determine priorities and enhance the decision-making process to reach the **ultimate balance of risk, benefit and cost.** Oral health care teams will be able to reduce potential or actual risk if approached systematically to identify, assess, learn from and manage all risks and incidents. In addition to reducing potential or actual risk, this provides opportunities to identify problems and improve oral health care services rendered from the facility [4].

Steps to follow to assess current procedures:

1. Schedule a programme for assessment of processes and procedures within each oral health care facility at an established frequency.
2. Do an audit at least annually (formally and informally) to provide a mechanism for the analysis of results, feedback and adjustment.
3. Review activities in order to ensure quality outcomes.
4. Develop specific operating procedures for each task in such a way that everyone involved with a particular task take notice of it, can be trained accordingly and can use that specific procedure every time they perform the task.
5. Maintain a safe working environment for patients and personnel.

12.2 Achieving compliance

12.2.1 MANAGEMENT COMMITMENT AND LEADERSHIP

Management commitment and leadership

Good infection control is paramount for the safe and efficient running of any oral health care facility. Failure to implement quality care procedures and comply with infection prevention and control guidelines can jeopardise the health of the oral health care workers employed in the facility and their families, as well as patients cared for in the facility. When management establish clear goals and communicate a health and safety commitment to all employees and patients the facility will be a more desirable place for oral health care treatment.

Steps to follow for management commitment:

1. The employer set the example by establishing goals and communicate this to all employees.
2. Have written reviews of changes in products, procedures, guidelines and regulations.
3. Facilitate in safety meetings and assessments, for example to demonstrate new equipment and techniques, or to review certain aspects of injuries or “near injuries”.
4. Commit to adequate supply of resources, including appropriate PPE, environmental controls and other products necessary for safe oral health care.
5. Incorporate health and safety rules at each facility by the implementation of standard operating procedures.
6. Observe and manage the rules.

12.2.2 ASSIGNMENT OF RESPONSIBILITY

Assignment of responsibility

The reduction of human errors is closely related to good practice management and an effective oral health care team. To avoid errors it is recommended that the responsibility for management of the infection control programme be assigned to a knowledgeable and accountable member in the team.

Steps to follow for assignment of responsibility:

1. Designate a responsible personnel member to train employees, answer questions and manage the implementation of the infection control programme.
2. Share concerns and make suggestions.
3. Adhere to health and safety procedures, rules and regulations.

12.2.3 IDENTIFICATION AND CONTROL

Identification and control

Although oral health care has an increased risk associated with disease transmission, the routine application of standard operating procedures and other control measures helps to keep the risk to a minimum. Knowledge about the associated risks and the application of control measures will ensure safety in the workplace for patients as well as the oral health care workers.

Steps to follow for identification and control:

1. Routinely assess the work site and procedures.
2. Use appropriate PPE, work practice and environmental controls.
3. Take action to address hazards.
4. Have a written protocol.
5. Management should enforce procedures.
6. Modify work habits when necessary.

12.2.4 IMPLEMENTING TRAINING

Implementing training

A safe workplace does not happen without effort and training. Adequate knowledge needs to be provided on a regular basis, especially when new plans, equipment, products and procedures are implemented.

Steps to follow for implementing training:

1. Ensure all employees receive basic training.
2. Provide specialised training when indicated.
3. Provide knowledge on an ongoing and effective training programme to develop the correct attitudes and behaviours to protect personnel and patients.
4. Develop safe working habits to reduce injuries.

12.2.5 RECORDKEEPING AND ANALYSIS

Recordkeeping and analysis

Errors can only be corrected if discussed and observed objectively. During the busy, everyday routine of the work practice these errors may often be missed due to lack of time to attend to the problem. Recordkeeping and analysis provides the opportunity to rethink and consider corrections or improvements.

Steps to follow for recordkeeping and analysis:

1. Maintain records of injuries and illnesses of all employees.
2. Perform exposure control management by investigating accidents, determining causes and providing corrective action.
3. Assess injuries and "near injuries" for trends and similar causes.
4. Initiate corrective action when required.
5. Tailor the programme design to meet the needs for each oral health care facility.
6. Work together to achieve success through teamwork and common goals.

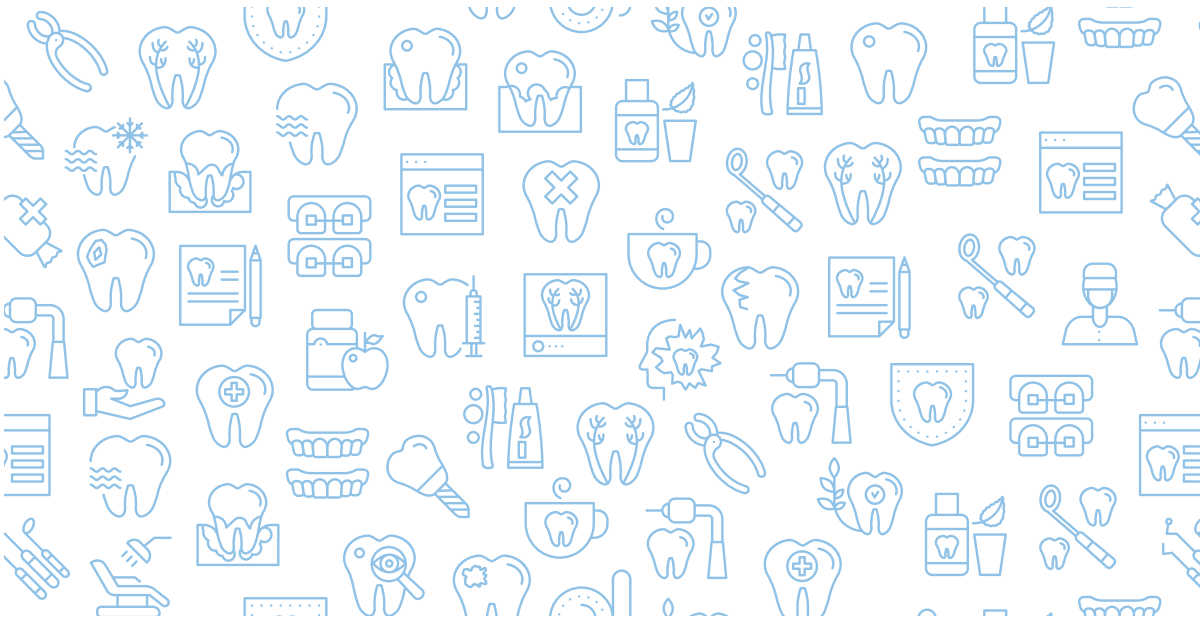
12.3 SCHEDULING EVENTS ON THE CALENDAR AND IN APPOINTMENT BOOKS

Scheduling events on the calendar and in appointment books

In oral health care scheduling and the appointment book of the facility dictates workflow and priorities within the oral health care facility. Provision should be incorporated in the annual calendar and appointment book of each provider. Scheduling events and actions of the infection control programme will ensure a commitment and efficient management of routine day-to-day, weekly and monthly tasks. Furthermore, education and meetings in this regard can also be better planned and executed.

Steps to follow for events on calendar and in appointment books:

1. Properly plan and schedule well in advance in appointment books.
2. Plan training sessions.
3. Keep records of routine day-to-day tasks, weekly and monthly tasks a full year in advance.



13 Selected Definitions

Alcohol-based hand rub: An alcohol-containing preparation designed for reducing the number of viable microorganisms on the hands.

Antimicrobial soap: A detergent containing an antiseptic agent.

Asepsis: The absence of living pathogens on biological tissue.

Bio burden: Microbiological load (i.e. number of viable organisms in or on an object or surface) or organic material on a surface or object before decontamination, or sterilisation. Also known as *bio load* or *microbial load*.

Biological indicators: The most accepted method for monitoring a steriliser's function. Usually consists of the spores of *B. stearothermophilus, which* are highly resistant to heat.

Clean: Removal of visible organic and inorganic debris.

Cavitation: The process in which waves of acoustic energy are propagated in aqueous solutions to disrupt the bonds that holds bio burden onto instruments.

Colony-forming unit (*CFU*)*:* The minimum number (i.e., tens of millions) of separable cells on the surface of or in semisolid agar medium that give rise to a visible colony of progeny. CFUs can consist of pairs, chains, clusters, or as single cells and are often expressed as colony-forming units per millilitre (CFUs/ml).

Contagious: A disease is transmitted by contact with infected patients via body fluids, secretions or excretions.

Cross infection: Transferring of microorganisms from one person to another.

Control: To monitor a process so as to minimise the parameters of the process falling outside of clearly defined borders.

Decontamination: Use of physical or chemical means to remove, inactivate, or destroy pathogens on a surface or item so that they are no longer capable of transmitting infectious particles and the surface or item is rendered safe for handling, use, or disposal.

Dental treatment water: Non-sterile water used during oral health care treatment, including irrigation of nonsurgical operative sites and cooling of high-speed rotary and ultrasonic instruments.

Disinfectant: A chemical agent used on inanimate objects (e.g., floors, walls, or basins) to destroy virtually all recognised pathogenic microorganisms or agents, but not necessarily all microbial forms (e.g., bacterial endospores).

Disinfection: Destruction of pathogenic and other kinds of microorganisms by physical or chemical means. Disinfection is less lethal than sterilisation, because it destroys the majority of recognised pathogenic microorganisms or agents, but not necessarily all microbial forms (e.g. bacterial spores). Disinfection does not ensure the degree of safety associated with sterilisation processes.

Droplet nuclei: Particles ≤5 µm in diameter formed by dehydration of airborne droplets containing microorganisms that can remain suspended in the air for long periods of time.

Droplets: Small particles of moisture (e.g., spatter) generated when a person coughs or sneezes, or when water is converted to a fine mist by an aerator or showerhead. These particles, intermediate in size between drops and droplet nuclei, can contain infectious microorganisms and tend to quickly settle from the air such that risk of disease transmission is usually limited to persons in close proximity to the droplet source.

Endogenous infections: Infections caused by commensals and normal flora of the body moving from one anatomical site to another site where they should not normally occur.

Endotoxin: The lipopolysaccharide of gram-negative bacteria, the toxic character of which resides in the lipid protein. Endotoxins can produce pyrogenic reactions in persons exposed to their bacterial component.

Exogenous infections: Infections caused by microorganisms, which are not normally present in the body.

Germicide: An agent that destroys microorganisms, especially pathogenic organisms. Terms with the same suffix (e.g., *virucide*, *fungicide*, *bactericide*, *tuberculocide*, and *sporicide*) indicate agents that destroy the specific microorganism identified by the prefix. Germicides can be used to inactivate microorganisms in or on living tissue (i.e., antiseptics) or on environmental surfaces (i.e., disinfectants).

Hand hygiene: General term that applies to hand washing, antiseptic hand wash, antiseptic hand rub, or surgical hand antisepsis.

Immunisation: Process by which a person becomes immune, or protected against a disease. Vaccination is defined as the process of administering a killed or weakened infectious organism or a toxic; however, vaccination does not always result in immunity.

Implantable device: Device placed into a surgically or naturally formed cavity of the human body and intended to remain there for ≥30 days.

Independent water bottle or reservoir: Container used to hold water or other solutions and supply it to handpieces and air and water syringes attached to a dental unit. The independent bottle or reservoir, which isolates the unit from the public water system, can be provided as original equipment or as a retrofitted device.

Infect: Invasion of a host organism by another organism, usually a microorganism, causing a disease or contamination of the host.

Infection: Presence and multiplication of microorganisms within the body. This intimates that the organism has succeeded in penetrating the defence mechanisms of the body e.g. penetrating epithelial surfaces, which may or may not be covered in secretions.

Infectious: Capable of being transmitted by infection with or without direct contact. Denoting a disease due to the action of a microorganism.

Infection control: Prevention of spread of infectious diseases from person to person and from inanimate objects to persons.

Intermediate-level disinfection: Disinfection process that inactivates vegetative bacteria, the majority of fungi, mycobacteria, and the majority of viruses (particularly enveloped viruses) but not bacterial spores.

Latex: Milky white fluid extracted from the rubber tree *Hevea brasiliensis* that contains the rubber material cis-1,4 polyisoprene.

Microfilter: Membrane filter used to trap microorganisms suspended in water. Filters are usually installed on dental unit waterlines as a retrofit device. Microfiltration commonly occurs at a filter pore size of 0.03--10 µm. Sediment filters commonly found in dental unit water regulators have pore sizes of 20--90 µm and do not function as microbiological filters.

Microorganism: Microscopic organism.

Nosocomial: Infection acquired in a hospital as a result of medical care.

Occupational exposure: Reasonably anticipated skin, eye, mucous membrane, or parenteral contact with blood or OPIM that can result from the performance of an employee's duties.

OPIM: Other potentially infectious materials. OPIM is a term that refers to 1) body fluids including semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, pericardial fluid, peritoneal fluid, amniotic fluid, saliva in oral health care procedures; any body fluid visibly contaminated with blood; and all body fluids in situations where differentiating between body fluids is difficult or impossible; 2) any unfixed tissue or organ (other than intact skin) from a human (living or dead); and 3) HIV-containing cell or tissue cultures, organ cultures; HIV- or HBV-containing culture medium or other solutions; and blood, organs, or other tissues from experimental animals infected with HIV or HBV.

Parenteral: Means of piercing mucous membranes or skin barrier through such events as needle sticks, human bites, cuts, and abrasions.

Persistent activity: Prolonged or extended activity that prevents or inhibits proliferation or survival of microorganisms after application of a product. This activity can be demonstrated by sampling a site minutes or hours after application and demonstrating bacterial antimicrobial effectiveness when compared with a baseline level. Previously, this property was sometimes termed *residual activity*.

Prion: Protein particle lacking nucleic acid that has been implicated as the cause of certain

neurodegenerative diseases (e.g., scrapie, CJD, and bovine spongiform encephalopathy [BSE]).

Retraction: Entry of oral fluids and microorganisms into waterlines through negative water pressure.

Shelf life: The time a liquid sterilant concentrate can be stored prior to use.

Sterile: Free from all living microorganisms; usually described as a probability (e.g., the probability of a surviving microorganism being 1 in 1 million).

Sterilisation: Use of a physical or chemical procedure to destroy all microorganisms including substantial numbers of resistant bacterial spores. This is usually achieved by steam, ethylene oxide or gamma radiation

Surfactants: Surface-active agents that reduce surface tension and help cleaning by loosening, emulsifying, and holding dirt in suspension, to be more readily rinsed away.

Ultrasonic bath: A device, which removes debris from the surfaces of instruments by a process of cavitation. Also referred to as ultrasonic cleaner.

Ultrasonic cleaner: Device that removes debris by a process called cavitation, in which waves of acoustic energy are propagated in aqueous solutions to disrupt the bonds that hold particulate matter to surfaces. Also referred to as ultrasonic bath.

Use life: The time a mixed solution from a concentrate can be stored prior to use.

Vaccination: See immunization.

Vaccine: Product that induces immunity, therefore protecting the body from the disease. Vaccines are administered through needle injections, by mouth, and by aerosol.

Washer-disinfector: Automatic unit that cleans and thermally disinfects instruments, by using a high-temperature cycle rather than a chemical bath.

Wicking: Absorption of a liquid by capillary action along a thread or through the material (e.g., penetration of liquids through undetected holes in a glove).

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Soli Deo Gloria!

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