

# Waste management in dental practice

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In South Africa, there is concern that the total "red bin" refuse, generated as Healthcare Risk Waste (HCRW), far outweighs the available commercial treatment capacity, posing serious health and environmental risks.

Despite legislation prescribing methods for the safe disposal of hazardous waste, there is still illegal dumping and long-term storage of healthcare waste. As a result, healthcare workers, patients, waste handlers, waste pickers and the general public are exposed to health risks from infectious materials, (particularly from sharps), chemicals and other special healthcare waste, if disposal of these potentially dangerous items is not correctly handled.

There are many laws, regulations, by-laws and national standards governing management of healthcare waste. Section 24 of the Constitution of the Republic of South Africa, (Act 108 of 1996), provides that everyone has the right to an environment that is not harmful to their health or well-being. The Constitution also determines which tiers of Government shall be responsible for different aspects of waste management. The State was therefore obligated to put in place uniform measures, which in the first instance seek to reduce the generated waste amount and secondly, to ensure produced waste is re-used, recycled and recovered in an environmentally sound manner before the residue is safely treated and disposed of.

In pursuit of those objectives, the National Environmental Management Waste Act 59 of 2008, (Waste Act), for the first time provided a more holistic approach to waste regulation management. In addition, the Department of Health has recently published a draft paper entitled: "Infrastructure Design for Waste Management in Healthcare Facilities."

The Healthcare waste management system currently used in South Africa is based on implementation of the waste management hierarchy and the cradle-to-grave management of healthcare waste (HCW). The grading and separation of waste-management procedures into a hierarchy is shown in Figure 1.

The most preferred action, placed at the top of the inverted pyramid, is to completely avoid the generation of any waste. Where avoidance is not possible, re-use and recycling treatments reduce the load, making final disposal less of a problem.

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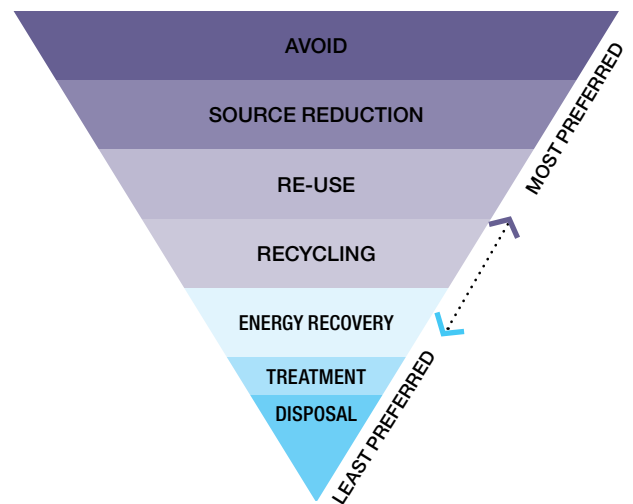


Figure 1: Waste-management hierarchy

The full processing of waste from the sites of generation, to its final disposal in landfill, is called the "cradle-to-grave" system of healthcare waste management. Seven steps are identified in this process. The "cradle" is the point at which the waste is generated, (for example, an injection is given and the needle must be discarded). The "grave" is the place where the waste is finally placed or disposed of (for example, the residue from the treatment of the infectious waste is incorporated into a suitable landfill).

## Definition of Waste

The Waste Act defines 'hazardous waste' as that which contains organic or inorganic elements or compounds that may, owing to their inherent physical, chemical or toxicological characteristics have a detrimental impact on health and the environment.

'Healthcare waste' consists of both health care general waste (HCGW) and healthcare risk waste (HCRW).

HCGW is that portion of waste that poses a minimum degree of risk to human health and the environment, i.e. from administrative and housekeeping activities, for example, paper, pens, plastics etc.

HCRW is that portion of healthcare waste that is hazardous and which is capable of producing disease or injury and includes the following:

- infectious waste (including highly infectious material)
- anatomical (excluding teeth) / pathological waste ("laboratory waste")

- c) sharps waste
- d) pharmaceutical waste
- e) radioactive waste
- f) cytotoxic / genotoxic waste
- g) sanitary waste.

Historically, incineration was the only method for treating HCRW. Due to global pressure against incineration it was phased out in 2003 in favour of alternative technology and current healthcare waste management (HCWM) includes a system of containers and equipment used for the segregation and containment of HCRW at source until it is finally treated and disposed of.

### Dental practitioners

According to the guidelines of the Medical and Dental Professions Board, the Health Professions Council of South Africa views the proper disposal of health care waste by healthcare practitioners as an essential element of good professional practice. It is the responsibility of all healthcare practitioners to have a healthcare waste management system in place or to have access to such a system.

In terms of the South African National Standard, the dentist retains overall responsibility for the management of healthcare risk waste generated in the practice. This requires that the waste is identified, segregated, and packed into the correct colour coded packaging. It is recommended that a contract be agreed with a waste management contractor for the final disposal of the healthcare risk waste. The contractor must be fully licensed and permitted to treat or dispose of each category of healthcare waste in terms of the law.

### Training

- Dentists must ensure that training is provided to all employees at the beginning of employment and to all contract workers who may be exposed to HCRW, and when new tasks or equipment are introduced.
- Training in working with healthcare waste must be repeated and revised at least once a year to ensure competence in the correct identification, classification, segregation, containerisation and storage of the waste.
- A focus of such training should be on restricting to safe limits or, ideally, preventing, the exposure of workers to HCRW.

### Workplace hygiene

- All practices must provide washing facilities with warm water and soap for their personnel to practise basic personal hygiene.
- Practitioners must ensure that employees do not eat, drink or smoke in areas where healthcare risk waste is handled and stored.
- Any protective gear supplied should be disinfected and cleaned on a regular basis.

### Health and safety

- All employees, especially those directly assisting the dentist, must be informed about the risks associated with the handling of healthcare risk waste and be familiar with the recommended steps of action in the event of injury or exposure to a hazardous substance.

- Personal protective equipment, for example, gloves, aprons, masks and goggles, shall be provided to employees and assistants who come into contact with and handle healthcare risk waste.
- It is recommended that all employees who have handled or been in contact with healthcare risk waste undergo yearly medical examination or check-up particularly after an occupational exposure to diseases, for example, hepatitis B.
- It is recommended that employees who decline immunisation be advised in writing about the occupational risks associated with the work environment.
- All injuries related to the management of healthcare risk waste shall receive medical attention as soon as is reasonably possible and shall be reported to the dentist or senior manager in the practice. This should include a written record of the incident a description of access to medical attention. A detailed investigation must be undertaken of the incident, identifying causes and recommending the implementation of remedial action to prevent the occurrence of similar incidents in the future.
- Healthcare workers must also report handling accidents or incidents, including spillages, inappropriate segregation, damaged containers and any involving sharps.

### Classification

There are nine classes of healthcare waste with at least five that are likely to be generated in dental practices:

- Class 2 gases which includes flammable and non-flammable non-toxic varieties;
- Class 5 oxidising substances and oxidising peroxides;
- Class 6 toxic and infectious substances;
- Class 7 radioactive materials that spontaneously emit ionising radiation;
- Class 8 corrosives which comprise substances that, by chemical action, cause damage to living tissue, to commonly used metals or to other packaging.

The management of any healthcare waste starts with correct identification of the waste, followed by classification, segregation and collection.

### Waste avoidance

Completely avoiding generation of any waste should be the first preference for dentists and their staff and all possible measures should be taken to achieve this. Where avoidance is not possible, minimise the amount of waste generated by source, by reducing the amount of packaging material when goods are initially delivered to the practice or by re-using and recycling.

Avoidance can also be achieved through measures such as:

- appropriate staff training programmes
- careful selection of supplies that are less wasteful or less hazardous,
- use of physical rather than chemical cleaning methods,
- monitoring the quantities of both hazardous and general waste sent for treatment and disposal.
- minimise production as much as possible,
- sterilisation of re-usable dental and other equipment using approved sterilisation procedures.

### Healthcare waste generation

It is recommended that only the generator of any HCRW must, in principle, touch or handle the waste. This means that once

**Table 1:** Healthcare waste categories, packaging colour code and international hazard labels

Waste category	Colour code	International hazard label
Human anatomical waste	Red	Infectious hazard label
Infectious human anatomical waste	Red	Infectious hazard label
Infectious animal anatomical waste	Orange	Infectious hazard label
Sharps	Red /Yellow	Infectious hazard label and the words "DANGER - CONTAMINATED SHARPS"
Pharmaceutical and chemical waste	Dark green	Appropriate hazard label for toxic substances complying with SANS 10228
Radioactive waste	No colour	Appropriate radiation hazard label
Healthcare general waste	Clear (transparent)	No hazard label

**Note 1** - Radioactive waste is included to complete the list, but should not normally be generated by registered healthcare professionals and non-healthcare professionals.

**Note 2** - Healthcare general waste can also be packed into black, beige, white or transparent packaging.

the waste has left the hands of the generator (dentist or other clinical staff), it must be in a container or liner that then prevents the risk of exposure to other people both on-site at the health facility and off-site when the waste is transported and treated. Where possible, the manual handling of HCRW should of course be reduced as much as possible.

### Waste segregation and containerisation

Good segregation of waste is the key to effective management of healthcare waste as this separates hazardous from the non-hazardous components and ensures appropriate containerisation and handling throughout the cradle-to-grave process. Effective segregation will also minimise the amount of waste that will require expensive treatment processes, thus reducing costs. It is of course important not to pay hazardous waste transport and disposal rates for general waste such as administrative and housekeeping items including packaging material, paper, plastics etc.

There are prescribed and very specific packaging, handling, storage, transport and disposal instructions for each type of hazardous HCW. These have been determined in accordance with the hazards posed by each type of waste and the treatment technologies required to safely deal with each type. Incorrect separation may have serious consequences. Once the non-hazardous general waste is separated from the hazardous waste, the principle of minimising the HCGW through re-use and recycling may be practised.

Dentists must ensure segregation takes place at or as near as possible to the source at which the waste is generated and that there are appropriate and clearly labelled containers available for staff to use.

Proper containerisation is a crucial factor for the safe and effective management of HCRW and requires the most environmentally friendly and simple receptacles of suitable sizes, designed to minimise risk of spillage, leakage or needle stick injuries. Regulations of both the Gauteng Department of Health and the Healthcare Waste Management Policy for Kwa-Zulu Natal provide for containers to be colour coded and marked to identify contents in accordance with SANS Code of Practice 10248 (Table 1). Training of staff to associate colour coding with appropriate categories of HCRW is essential.

## PACKAGING OF HEALTH CARE WASTE

No HCRW must leave the practice unless secured in custom designed containers which are rigid, leak proof and puncture resistant. Any HCRW containers must be packaged in accordance with SANS 10248 as amended.

HCW should be not allowed to accumulate in one container over long periods. It is preferable to use smaller volume containers that will also take up less storage space. This may also prevent unpleasant odour problems.

### Packaging for healthcare general waste

- Solid healthcare general waste must be placed into colour-coded packaging in terms of Table 1. The standards recommend that extracted teeth be placed in red colour-coded packaging for disposal.
- Plastic bags used for the collection of HCGW must be strong enough so as not to tear easily during handling and transportation.
- Containers for healthcare general waste must not be filled to more than three quarters capacity and must be securely closed to prevent spillage.

### Packaging for infectious healthcare risk waste

- Infectious HCRW must be placed in colour-coded packaging (Table 1).
- A plastic bag used for this purpose and used as a stand-alone intermediate container shall have a thickness of not less than 80 µm. It must be placed into a rigid container (a cardboard box or a reusable container) for transportation purposes.
- A plastic bag used as a liner in a disposable container or a reusable container shall have a thickness of not less than 60 µm.
- Any packaging used for anatomical and infectious waste shall be leak proof.
- All packaging must be filled to a maximum of three-quarters capacity.
- Plastic bags must be closed with non-PVC plastic ties, non-PVC plastic sealing tags of the self-locking type, or heat sealers purpose-made for healthcare waste and not with staples.
- All plastic bags and containers shall be clearly marked and labelled with the infectious hazard label, where possible. If a plastic bag is placed into another container the outer container shall be clearly labelled.

### Packaging for sharps

- All sharps containers shall be colour-coded (Table 1).
- A sharps container is to be used for the collection of all sharps, regardless of whether the sharps are contaminated or not.
- All sharps containers must be rigid, puncture proof, tamperproof and clearly labelled.

- Retractable needles and syringes shall be placed in a sharps container for disposal via the waste management contractor.
- Associated contaminated materials e.g. syringes, tubing, containers, preparation materials, vials and ampoules, etc, may be placed in the sharps container.

### Packaging for gas cylinders

Empty gas cylinders must be returned to the supplier and not packed with HCGW.

### Packaging for pharmaceutical waste

- Liquid pharmaceutical waste must be collected in metal or high density plastic containers that are sealed with a screw cap lid or tamperproof lid.
- Solid pharmaceutical waste should be collected in double layer green colour-coded plastics bags.

### Packaging for chemical waste and heavy metal waste

- The dark green packaging for chemical and heavy metal waste should be labelled with lettering which is clearly visible and legible as "Chemical Waste".
- Any amalgam scrap discarded into general waste may lead to soil and/or water contamination with mercury.
- Scrap amalgam in any form is not to be put into red bio-hazard bags or trash bags and must not be rinsed down the drain, nor removed with high speed suction unless there are traps and filters properly installed in the dental chair vacuum systems.
- Dental amalgam separators will remove the maximum amount of amalgam waste and are more efficient than filters and traps used in the chair-side dental units and vacuum lines.
- Droplets of spilled mercury can be recovered by using a syringe or eye dropper to suck up the mercury droplets. A vacuum cleaner should not be used to recover spilled mercury.
- Amalgam waste, when kept separate from other waste, can be safely recycled. The mercury can be recovered from amalgam waste through a distillation process and re-used in new products.
- Extracted teeth containing amalgam shall be treated with a disinfectant before being placed into green colour-coded containers and sent for recovery of the mercury. It is recommended that a disinfectant be added to the container where amalgam has come into contact with blood from a patient.

### X-Rays

- Used X-ray Fixer is considered a hazardous waste because of its high silver content.
- X-ray developer that is accidentally mixed with used X-ray fixer must be handled as a hazardous waste.
- In terms of the Hazardous Substances Act, Act 15 of 1973, beryllium is classified as a Group 1 category B substance. As such it should be considered hazardous. Chrome-containing cleaners for X-ray developer are considered a toxic substance that must be managed as a hazardous waste and should not be discharged in the sewer.

### Lead Foil or Lead Shields

Lead foils, shields, and aprons are considered hazardous waste unless they are recycled for scrap metal content, in

**Table 2:** Time limits for the storage of healthcare risk waste

Waste	Time limits
Anatomical waste	24 hours
Infectious waste	72 hours
Sharps containers	90 days
Pharmaceutical waste	90 days

which case disposal must be by a licensed waste management company.

### Disinfectants, Cleaners and other Chemicals

Most used disinfectants may be discharged directly to the sewage system. Residue left in containers may be rinsed down the drain; and the container may be disposed of in the garbage or recycled.

## INTERIM STORAGE OF WASTE IN A HEALTHCARE FACILITY

The owner of the dental practice is responsible for supervising and controlling the correct storage of healthcare waste.

The interim storage area shall be clearly marked and shall have:

- a hard-standing floor;
- be easy to clean, be well lit and have good ventilation;
- be secured to prevent unauthorized entry, for example, by children, or unauthorized personnel, animals and birds;
- be equipped with a fire extinguisher to deal with fire; and
- where possible, a spill kit for spillages.

The storage times for healthcare risk waste, (i.e. the delay between generation and treatment or disposal), shall not exceed time limits as shown in Table 2.

### On-site collection and transport of waste

- Establish a routine for waste collection.
- During the transport of healthcare waste, the risk of exposing uninformed persons to the healthcare waste is considerably increased. It is essential that this process be carefully controlled.
- Manual lifting and carrying of heavy containers should be avoided. If trolleys or containers are used to transport HCW, these should be cleaned and disinfected regularly with an appropriate disinfectant.
- Where a system of re-usable containers is being used, the collection of filled containers will also involve the delivery of clean, empty containers ready for re-use.
- The contracted waste disposal company must ensure that the healthcare waste is transported in an appropriate vehicle and that the methods of transport are monitored.

### Treatment and final disposal

The treatment and final disposal will not be discussed here as this does not take place on the dental premises. However, the dentist does have the responsibility to receive confirmation from the Waste Disposal contractor that appropriate disposal is ensured.