GOVERNMENT OF GHANA

MINISTRY OF HEALTH

AND

MINISTRY OF ENVIRONMENT SCIENCE, TECHNOLOGY AND INNOVATION

NATIONAL GUIDELINES FOR HEALTH CARE WASTE MANAGEMENT IN GHANA

JANUARY, 2020

FOREWORD

Ghana's attempt to regulate health care waste management started in 2002 with the development of guidelines on health care waste management by the Environmental Protection Agency (EPA). In 2006, the Ghana Health Service (GHS) also developed the Health Care Waste Management Policy and Guidelines as a single document.

Although awareness on Health Care Waste Management (HCWM) has improved in recent years, there is the need for a systematic approach to improve on effective segregation, safe collection, and storage, as well as ultimate treatment before disposal.

This guideline seeks to ensure that HCW is managed effectively in compliance with existing International Conventions that Ghana is a signatory to, national laws and regulations, and others to be passed in future. Recommendations for better management of HCW in the nation's health care facilities have been presented in this document. Also, standard operating procedures (SOPs) have been developed to provide guidance to various levels of the health facilities.

Health and safety concerns and guidance have been addressed as part of these guidelines to ensure that managements of institutions put in place measures to limit exposure of their staff and the general public to the hazardous components of health care waste. Responsibilities have been assigned to various units, agencies and stakeholders for efficient and effective implementation of the guidelines. It is hoped that provision will be made for the supply of all necessary Personal Protective Equipment (PPE's) and their use enforced during the performance of all activities that potentially generate infectious waste as well as those that go into the handling of such waste.

The need for training to enhance common knowledge of safe HCW management has been outlined. Monitoring and evaluation during the implementation of the waste management systems has also been emphasised.

The importance of ensuring the availability of financial resources to make the system function cannot be overemphasized. It is hoped that all facility managers will include waste management in their list of priorities and consequently make necessary budgetary allocations towards capacity building of its staff and secure the tools necessary for efficient waste management on an on-going basis.

This document is the outcome of a collaborative effort of personnel of the Ministry of Health (MoH), Ministry of Local Government and Rural Development (MLGRD) and the Environmental Protection Agency (EPA), among others. It is therefore hoped that this collaboration will be enhanced in the application of this guidelines with each organization playing its rightful role in order to give the necessary impetus to ensure proper management of HCW in Ghana.

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ACKNOWLEDGEMENT

The Ministry of Health (MoH) in partnership with United Nations Development Programme (UNDP), the World Health Organization (WHO) and Health Care Without Harm (HCWH) commissioned the revision of this policy as part of the Global Environmental Fund (GEF) funded Health Care Waste Project in Ghana implemented by UNDP.

We acknowledge the valuable contribution and direction throughout the assignment by the representatives of the Ministry of Health (MoH), Ghana Health Service (GHS), Ministry of Local Government and Rural Development (MLGRD), Ministry of Finance (MoF), Ministry of Sanitation and Water Resources (MSWR), Chemicals Controls and Management Centre (CCMC) and the Built Environment Department of the Environmental Protection Agency.

We also acknowledge health facility managers from the model facilities, representatives from Zoompak medical waste treatment facility, HCWM Project, all sub-sectors within the health sector, private sector, civil society, research and educational institutions who were members of the Technical Working Group. Their views have helped to shape a policy that is reflective of the interests of all stakeholders in the health sector in an effort to create a sustainable system of health care waste management.

Finally, our warmest appreciation goes to all members of the Health Care Waste Technical Working Group without whose effort this document would not have been able to see the light of the day.

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GLOSSARY OF TERMS

Best Available Technique (BAT) – using latest or state of the art technologies that are appropriate for treating health care waste and are proven to be environmentally friendly in terms of emissions and energy consumption.

Best Environmental Practices (BET) – "the application of the most appropriate combination of environmental control measures and strategies" in this case to reduce health and environmental impacts of health care waste management activities.

Hazardous Waste: This refers to waste considered hazardous due to their potential for creating a variety of health risks as a result of their actual or presumed biological, chemical and/or radioactive contamination.

Health Care Waste: All untreated solid and liquid waste (both hazardous and non-hazardous) generated during the administration of medical care, veterinary care or the performance of medical research involving humans and animals. These include infectious, pathological, radioactive, pharmaceutical and other hazardous wastes.

Infectious Waste: Waste that is potentially contaminated with pathogenic organisms like bacteria, viruses, parasites and fungi in sufficient quantities to cause disease in susceptible hosts.

Non-Hazardous Waste: Refers to as domestic or municipal waste which includes waste such as paper, fabrics, glass, food residues and containers waste not contaminated with blood, body fluids, or other harmful agents or materials.

Pathological Waste: Tissues, organs, body parts, foetuses, etc. that have the potential to be infectious and are therefore sometimes classified as a sub- category of infectious wastes.

Persistent Organic Pollutants (POPs): POPs are synthetic organic chemicals either intentionally or non-intentionally produced/released into the environment, and are resistant to environmental degradation through chemical, biological, and photolytic processes.

Service Industry: They are service providers such as "Wanzams", Barbers, Tattooists and Hairdressers/Cosmetologists etc.

Sharps: All items that pose a risk of injury and infection due to their puncture and cutting properties.

Unintentionally Produced POP (UPOPS): are organic chemicals unintentionally produced/released into the environment from anthropogenic activities such as burning of waste.

ABBREVIATIONS

BAT	Best Available Techniques
BEP	Best Environmental Practices
BED	Built Environment Department
CCMC	Chemicals Controls and Management Center
CHAG	Christian Health Association of Ghana.
CHPS	Community-Based Health Planning and Services
EMU	Estate Management Unit
EPA	Environmental Protection Agency
GEF	Global Environmental Fund
GHS	Ghana Health Service (GHS)
GAEC	Ghana Atomic Energy Commission
HASS	Health Administration and Support Services
HCF	Health Care Facility
HCWMC	Health Care Waste Management Committee HCWH Health Care Without Harm
HCWM	Health Care Waste Management
HEFRA	Health Facility Regulatory Authority
ICD	Institutional Care Division
IEC	Information, Communication and Communication
IPOPS	Intentionally Produces Organic Pollutants
LI	Legislative Instrument
M & E	Monitoring and Evaluation
MLGRD	Ministry of Local Government and Rural Development
MOH	Ministry of Health
MSWR	Ministry of Sanitation and Water Resources
MMDAs	Metropolitan, Municipal and District Assemblies
OEHU	Occupational and Environmental Health Unit
PHD	Public Health Department
POPS	Persistent Organic Pollutants
PPE	Personal Protective Equipment
PVCs	Poly Vinyl Chlorides
SDGs	Sustainable Development Goals
SOP	Standard Operating Procedure
TBAs	Traditional Birth Attendants
UNDP	United Nations Development Program
UPOPs	Unintended Persistent Organic Pollutants
WHO	World Health Organization

1. INTRODUCTION

1.1. Background

Health care facilities generate different kinds of waste during patient care and daily operations which has the potential to contribute to infections among hospital staff, patients, caregivers, and pollution of the environment. The dangers associated with health care waste have contributed to the global attention it has received from many countries and stakeholders. Making a deliberate effort to manage such waste properly to safeguard human health from various risks associated with such waste and protecting environmental integrity is an important public health imperative.

Health Care Waste (HCW) includes all solid and liquid waste (both hazardous and non-hazardous) generated related to medical procedures or the performance of medical research involving humans and animals. In addition, it includes the same types of waste originating from minor and scattered sources that are produced in the course of health care undertaken in the home (e.g. home dialysis, self-administration of insulin, recuperative care).

The greater percentage of health care waste generated by health facilities are not hazardous (75-90%) and can be managed like domestic/municipal waste whilst the remaining percent (10 - 25 %) is considered hazardous. The hazardous component requires special arrangements for management (WHO, 2014).

Examples of hazardous health care waste are pathological waste such as tissues and body fluids, pharmaceuticals (expired or unused medicines, etc.), sharps (syringes, disposable scalpels, scalpel blades, etc.), non-sharp infectious waste (swabs, bandages, disposable medical devices etc.), chemicals (solvents, disinfectants, etc.) and radioactive (spent sources of radioactive materials, etc.), nano-medical waste as well as wastewater including effluents from mortuaries. These pose risks either due to their hazardous nature or potential to cause injuries/harm.

To help bring about the needed improvement in health care waste management, it is critical to have an up-to-date policy and guidelines for directing best practices among health facilities. In this regard, United Nations Development Programme (UNDP) and Ministry of Health, Ghana, in collaboration with other stakeholders have revised the Health Care Waste Management policy and Guidelines 2006 to reflect current global best practices. The revisions also addressed the concerns and objectives of the Stockholm and Minamata Conventions as well as the Sustainable Development Goals. This document has been developed to help implement the goal of the revised national policy on HCWM (2018).

1.2. Scope

This document provides direction to health care facilities in Ghana to comply with the requirement of the Hazardous and Electronic Waste Control and Management Act, 2016 (Act 917) and the revised national policy to ensure safe management of health care waste. This document applies to all health institutions including public, private, quasi-governmental, non-governmental, faith-based and traditional practitioners that operate in the country at all levels of the health care system: Tertiary/Teaching/Specialist Hospitals, Regional Hospitals, District Hospitals and Sub-district Health

Institutions (i.e., Health Centres/Clinics and Community Clinics).

Others include Health Research Institutions, Laboratories, Home-based Care, Nursing Homes, Alternative Health Care Providers, (including traditional healers and Traditional Birth Attendants (TBAs)), Dentists, Mortuaries, Funeral Homes and Undertakers, Pharmacies, Veterinary Hospitals and Chemical Shops

This document is equally applicable to home-based care for persons with infectious diseases as wellas those in the "service industry" such as "Wanzams", Barbers, Tattooists, Hairdressers/Cosmetologists, etc. Institutions and companies with responsibility for collection, transportation, treatment and disposal of waste are also expected to comply with the provisions of the guidelines.

The document covers solid and liquid hazardous and non-hazardous health care waste as well as gaseous emissions along the complete logistic chain: procurement, generation, segregation, collection, storage, transport, treatment and disposal.

2. CLASSIFICATION AND HEALTH CARE WASTE MANAGEMENT STEPS

2.1. Categories of Health Care Waste

Health care waste includes all untreated solid, liquid and gaseous waste (both hazardous and non-hazardous) generated during the administration of medical care, or the performance of medical research involving humans and animals.

Generally, between 75-90% of the waste produced by healthcare facilities is non-risk or "general" health care waste, comparable to domestic waste. The remaining 10-25% of health care waste is regarded as hazardous. These guidelines therefore identify two broad categories of health care waste. These are:

i. Hazardous Wastes: This refers to waste with properties that make them dangerous or potentially harmful to human health or the environment. Health care waste is considered hazardous when there is a potential for creating a variety of health risks as a result of actual or presumed biological, chemical and/or radioactive contamination. Due to their potentially hazardous nature, these wastes require special care from their point of generation until final disposal.

ii. Non-hazardous or General waste: This is also referred to as domestic or municipal wastes. It includes waste such as paper, fabrics, glass, food residues and containers waste not contaminated with blood, body fluids, or other harmful agents or materials;

2.2. Classification of Health Care Waste

The classification system adopted is based on the materials that constitute the waste, and the treatment options and method of storage available, as shown in Table 1. These categories are a general guide and are not meant to be all-inclusive and specific to all situations that may be encountered in a health care facility. Therefore, as questionable situations arise, each health care facility must decide if a particular device, material or substance should be regarded as hazardous waste, based on available information and guidance from the Ministry of Health, Ghana Health Service, Environmental Protection Agency or the Metropolitan, Municipal and District Assemblies.

Highly infectious waste refers to cultures, waste from autopsies, dead animals' carcasses and other wastes that have been infected or come in contact with risk group 4 pathogens (examples are the Marburg, Ebola and Lassa viruses that cause viral haemorrhagic fever). These highly infectious agents spread from the reservoir to a susceptible host by direct contact with infected blood or other body fluids or indirect contact with objects/instruments contaminated. Medical devices such as needles, syringes, personal protective equipment, textiles that have been exposed to such highly infectious agents can equally transmit these agents. Therefore, safe handling, treatment, storage, transport and disposal of waste that is suspected or known to be contaminated with highly infectious agents is of public health importance.

Table 1: Classification of Health Care Waste in Ghana

TYPE	CLASSIFICATION AND DESCRIPTION	CONTENT/EXAMPLES
I	**HAZARDOUS WASTE** These are types of waste from hospitals which may be infectious, toxic or radioactive and therefore require special management.	• A, B, C, D, E, F, G
A	**INFECTIOUS WASTE** This refers to health care waste that is suspected to contain pathogens (bacteria, viruses, parasites, or fungi) in sufficient concentration or quantity to cause disease in susceptible patients, health care workers and the public. This may further be classified under the following sub-classification	• A.1, A.2
A.1	**Infectious waste** Refers to health care waste contaminated by pathogenic agents which are NOT considered to be highly infectious	• Laboratory cultures, waste from isolation wards, used swabs, bandages/ dressings, equipment, gloves, linen, blood transfusion bags, urine, faeces, etc. that have been in contact with patients infected by pathogenic agents which are NOT considered to be highly infectious
A.2	**Highly infectious waste** Refers to health care waste contaminated by highly infectious pathogenic agents (Risk group 4 pathogens)	• Laboratory cultures, waste from isolation wards, used swabs, bandages/ dressings, equipment, gloves, linen, blood transfusion bags, urine, faeces, etc. that have been in contact with patients infected by highly pathogenic agents like Ebola virus, Lassa virus, Marburg virus etc.
B	**SHARPS** These are sharp or pointed-edged items that can cause cuts or puncture wounds. Whether or not they are infected, such items are usually considered as hazardous health care waste and are dealt with here as a separate category.	• Needles, syringes, surgical blades, scalpels, broken test tubes, ampoules, glass instruments, pipettes, etc.

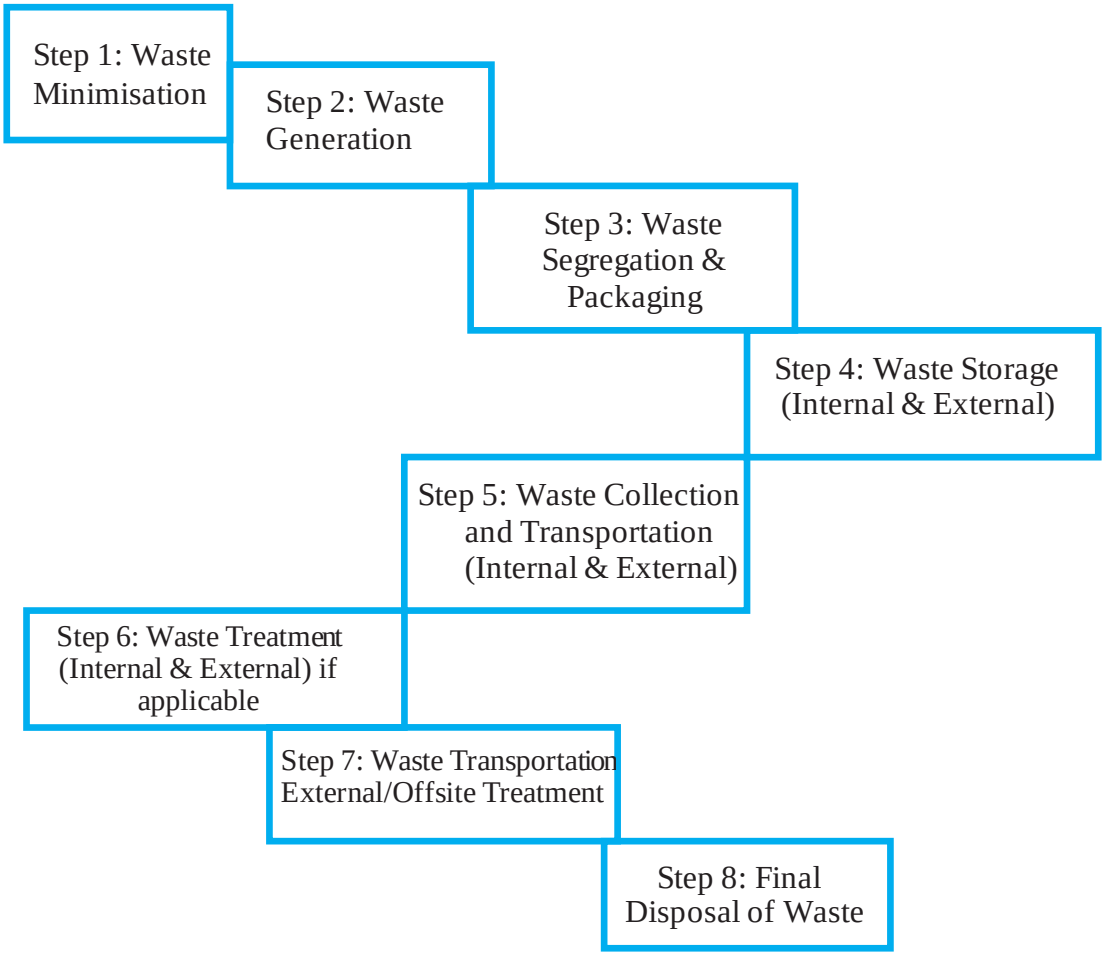
TYPE	CLASSIFICATION AND DESCRIPTION	CONTENT/EXAMPLES
C	**PATHOLOGICAL/ORGANIC HUMAN/ANIMAL TISSUE** This type of waste includes amputated limbs and other body tissues resulting from surgical operations, autopsy (post- mortem), and deliveries and require special treatment.	• Body tissues, internal body organs, amputated limbs, placentas, abortuses / dead foetuses
D	**PHARMACEUTICAL WASTE** These are Pharmaceuticals that are expired or no longer needed, fake medicines; items contaminated by or containing pharmaceuticals, Cytotoxic waste containing substances with genotoxic properties	Expired or unused medicines (solid/liquid), Residuals of medicines in chemotherapy that may be cytotoxic, genotoxic, or mutagenic
E	**CHEMICAL WASTE** Waste containing chemical substances	• Laboratory reagents • Photographic developer • Fixer solution • Disinfectants • X-ray photographic film • Acid, Alkali, organic substances, Solvents • Waste with high content of heavy metals, e.g. batteries; broken mercury containing thermometers and
F	**RADIOACTIVE WASTE** Refers to waste containing radioactive substances	• Solid-papers, gloves, cotton swabs, needles (sharps), equipment, etc. contaminated with radioactive substances. • Liquid-patient excretion, rest of solution administered to patient, gastric content • Sealed/spent radiation sources • Technetium generators • Radium needles.

TYPE	CLASSIFICATION AND DESCRIPTION	CONTENT/EXAMPLES
G	**WASTE RESIDUES** This refers to waste from waste handling processes	• Incinerator ash such as bottom ash, fly ash, air pollution control ash • Leachate
II	**NON-HAZARDOUS WASTE**	• **H**
H	**GENERAL WASTE** This component of health care waste is comparable in composition to domestic/ municipal waste. This refers to waste that is not contaminated with blood, body fluids, or other	• Paper, cardboard, plastic materials, kitchen waste, metal, sweepings from lawns, corridors, offices, workshop, stores, etc.
H.1	**GENERAL WASTE: RECYCLABLE**	• Paper, cardboard, plastics, bottles
H.2	**GENERAL WASTE: (NON- RECYCLABLE)** These include non-infectious waste materials that cannot be recycled.	• Soiled paper/ cardboard/ plastic materials • Organic waste from • kitchen and garden.

2.3. Stages in Health Care Waste Management

The stages in Healthcare Waste Management (HCWM) are prevention, generation, minimisation, segregation, packaging/labelling, internal storage, internal transportation, external/ central storage, treatment and final disposal. All these stages should take place within the facility and are to be followed by transportation to a treatment plant, (on or offsite) and final disposal. The stages in HCWM are summarized in Figure 1.

Figure 1: General Steps in Health Care Waste Management



NB: For the purpose of this document, external/central storage refers to storage of waste collected from various interim or internal storage points (wards, etc.) and are stored at a point within the health facility before they are transported to the external treatment plant or final disposal site.

In each institution, the head of the facility must ensure that the steps in the guidelines are followed to ensure adequate collection, treatment, and disposal of the health care waste. Furthermore, micro-planning should be carried out starting from the facility and sub-district levels upwards to the regional level to ensure that the most cost-effective means of collecting, transporting, treating and final disposal of the waste is adopted.

HCWM is most effective when proper methods are employed at each step bearing in mind the following considerations:

i. The nature of waste, level of toxicity to the environment and risks to health.
ii. The quantity of waste generated by each patient daily (kg/bed/day)
iii. Legal - the prevailing regulations on health and environment
iv. Financial – investment and running costs as against the facility's budget.
v. Technical – best available techniques that are proven to be efficient, environmentally safe and the options exist in the African sub-region are used. This does not mean chasing for latest

technology on the market. This should also include the technical expertise required for managing the entire system.

vi. Sustainability – availability of energy sources and other utilities (e.g. fuel, water and electricity) to run equipment. Operations of the system should be self-sustaining.

vii. Local community preferences – whilst some communities may have an aversion for some treatment options available for some types of waste for cultural, religious and other reasons; (e.g., use of steam autoclaves or incineration of body parts), others may welcome treatment options solely on the basis of technological feasibility and environmental friendliness. For whatever approved reasons treatment options are chosen by a locality.

Health care institutions and waste management companies shall ensure that safety and efficiency are not compromised and adverse effects on the environment minimized.

3. WASTE PREVENTION AND MINIMISATION OPTIONS

Waste prevention and minimisation options for general health care facilities can be classified into ***source reduction***, which can be achieved through material substitution, process or equipment modification or better operating practices; or ***recycling***. Figure 2 shows the details of health care waste management stages which can be adopted to help minimise waste generation.

In accordance with the Minamata Convention, health care facilities should not procure mercury-containing thermometers or sphygmomanometers but plan for the introduction of mercury free-alternatives. They also need to ensure the safe collection, handling and environmentally sound disposal of devices to be replaced or substituted. In order to reduce the generation of mercury containing dental waste, the use of mercury containing dental amalgam should be phased down. For example, this can be done by promoting the use of pre-dosed encapsulated forms of amalgam, or amalgam separators, or composite material, all of which can minimize amalgam waste.

Approaches to effective reduction in waste generation include improved management oversight, tracking, inventory control, and computerised data base tracking systems. Specific measures include:

i. Keep individual waste streams segregated:
   - Keep hazardous waste segregated from non-hazardous waste. All waste contaminated with a hazardous substance becomes hazardous.
   - Keep hazardous chemical wastes segregated from infectious wastes.
   - Keep recyclable waste segregated from non-recyclable waste.
   - Minimize hazardous waste quantities by substituting more hazardous products with less hazardous alternatives
   - Minimize hazard level of hazardous waste by dilution of hazardous waste.
   - As much as possible, use items only when necessary (e.g. staff should use the required PPE at the appropriate time)

ii. Ensure that the identity of all chemicals and wastes is clearly marked on all containers.

iii. Centralise purchasing and dispensing of medicines and other hazardous chemicals.

iv. Monitor drug and chemical flows within the facility from receipt as raw materials to disposal as hazardous wastes. This may be partially or fully automated by the use of computer systems and computer-readable barcoded labels for incoming chemicals, similar to those used in supermarkets.

v. Apportion waste management costs to the departments that generate the wastes.

vi. Improve inventory control by:

- requiring users of chemicals with limited shelf life to use up old stock before ordering or using new stock ("first in first used").

- procure materials that will result in minimal waste generation.
- ordering hazardous chemicals only when needed and in minimal quantities to avoid out-dated inventory.

vii. Employees should be trained in waste prevention and minimisation methods.

viii. Implement an institution-wide waste reduction programme.

Other approaches to waste minimisation include:

i. Requiring that all new materials (cleaning compounds, process chemicals, etc.) that may result in waste generation be tested in small quantities before being purchased in bulk so as to avoid having to dispose of large quantities of unused materials that do not perform as expected.

ii. Encouraging drug and chemical suppliers to become responsible partners in a waste minimisation programme by ordering from suppliers who will provide quick delivery of small orders, accept return of unopened stock, and are willing to offer offsite management of hazardous wastes.

3.1. Waste Minimisation Options

The waste reduction practices apply to all waste streams. In addition, better operating practices that apply to certain specific waste streams are summarised and shown in Table 2.

Table 2: Waste Minimisations Methods for Health facilities

Waste Category	Waste Minimization Method
Chemotherapy and Anti neoplastics	• Reduce volumes used • Optimize drug container sizes in purchasing • Return outdated medicines to manufacturer • Centralize chemotherapy compounding location • Minimize waste from compounding hood cleaning • Provide spill clean-up kits • Segregate waste
Formaldehyde	• Minimize concentration of formaldehyde solutions • Minimize waste from cleaning of dialysis machines and Reverse osmosis units • Use reverse osmosis water treatment to reduce dialysis-cleaning demands • Capture waste formaldehyde • Investigate reuse in pathology, autopsy laboratories

Waste Category	Waste Minimization Method
Photographic chemicals	• Cover developer and fixer tanks to reduce evaporation, oxidation. • Recover silver efficiently • Recycle waste film and paper • Use squeegees to reduce bath losses • Use counter-current washing
Solvents	• Substitute less hazardous cleaning agents, methods for solvent cleaners. • Reduce analytic volume requirements • Use pre-mixed kits for tests involving solvent fixation • Use calibrated solvent dispensers for routine tests • Segregate solvent wastes • Recover/reuse solvents through distillation
Mercury	• Substitute electronic sensing devices for mercury-containing devices • Recycle uncontaminated mercury waste using proper safety controls
Waste Anaesthetic Gases	• Employ low leakage work practices, Purchase low-leakage equipment. Maintain equipment properly to avoid leaks.
Other hazardous Chemicals	• Inspection and proper equipment maintenance for ethylene oxide sterilizers. • Substitute fewer toxic compounds, cleaning agents. • Reduce volumes used in experiments. • Return containers for reuse, use recyclable drums. • Neutralise acid waste with basic waste. • Use mechanical handling aids for drums to reduce spills. • Use automated systems for laundry chemicals. Use physical instead of chemical cleaning methods.
Radionuclides	• Use less hazardous isotopes whenever possible. • Segregate and properly label radioactive wastes and store short-lived radioactive wastes in isolation on site until decay permits disposal in the general waste stream.

3.2. Waste Prevention and Green Procurement

The preferred management option is simply not to produce the waste, by avoiding wasteful ways of working. Waste prevention allows reduction in the costs for purchase of goods and services for both waste treatment and disposal. It also lowers the liabilities associated with the disposal of hazardous waste. Green procurement allows for procuring materials that has reduced environmental and health impacts in the provision of health care services so that waste generated would have minimal environmental consequence and ensure sustainability. This should be factored into procurement of logistics and services for health care delivery. For instance, substituting mercury containing devices with non-mercury devices in which the alternative will have minimal environmental effect as compared to mercury should be seen as green procurement.

4. WASTE GENERATION

Health care waste is generated from various sources based on the specific operational activities of the unit. These sources can be classified as major or minor. Teaching/Specialist Hospitals, Regional Hospitals, and Research Centres form the major sources. Districts Hospitals, Polyclinics, Private Laboratories, Health Centres/Post, Dental Clinics, Pharmacies, Veterinary, Maternity Homes, and Alternative Health Care Providers form the minor sources.

The quantity and type of waste produced depends on type of health care facility, the level of services offered, the capacity of the hospital and number of people utilizing the available services.

i. Facilities should take the necessary steps to know the quantities of waste generated by the departments and units for proper planning of resources needed to manage them.

ii. Records should be kept for the departments and units by weighing the quantities or measuring the volumes of waste generated by assigned staff.

iii. In deriving unit generation values, the following parameters need to be considered:

- Number of hospital beds
- Number of in-patients and out-patients (bed occupancy rate)
- The range of services provided
- Any other activity that leads to the generation of health care waste

iv. Departments generating more waste should plan through waste minimization strategies (segregation, recycling, proper procurement, etc.) to reduce the quantities appropriately. For effective planning, each level of the health care system should make an assessment of their waste generation. This includes all wastes generated during clinical care (including surgery), routine and mass immunization.

v. The assessments should be collated by the District Health Management Teams (DHMT) in each district to obtain the district waste generated and further, by the Regional Health Management Teams (RHMT) to estimate regional level waste generation. The regions should then submit returns on these levels quarterly to GHS headquarters. The Teaching Hospitals and GHS should submit their returns to the MOH, or an appropriate body or department designated by the MOH, which should further collate the statistics into a composite estimate of the national health care waste. A sample form for assessment of waste generation for use by health facilities and other levels of the health care system is shown in Appendix 1.

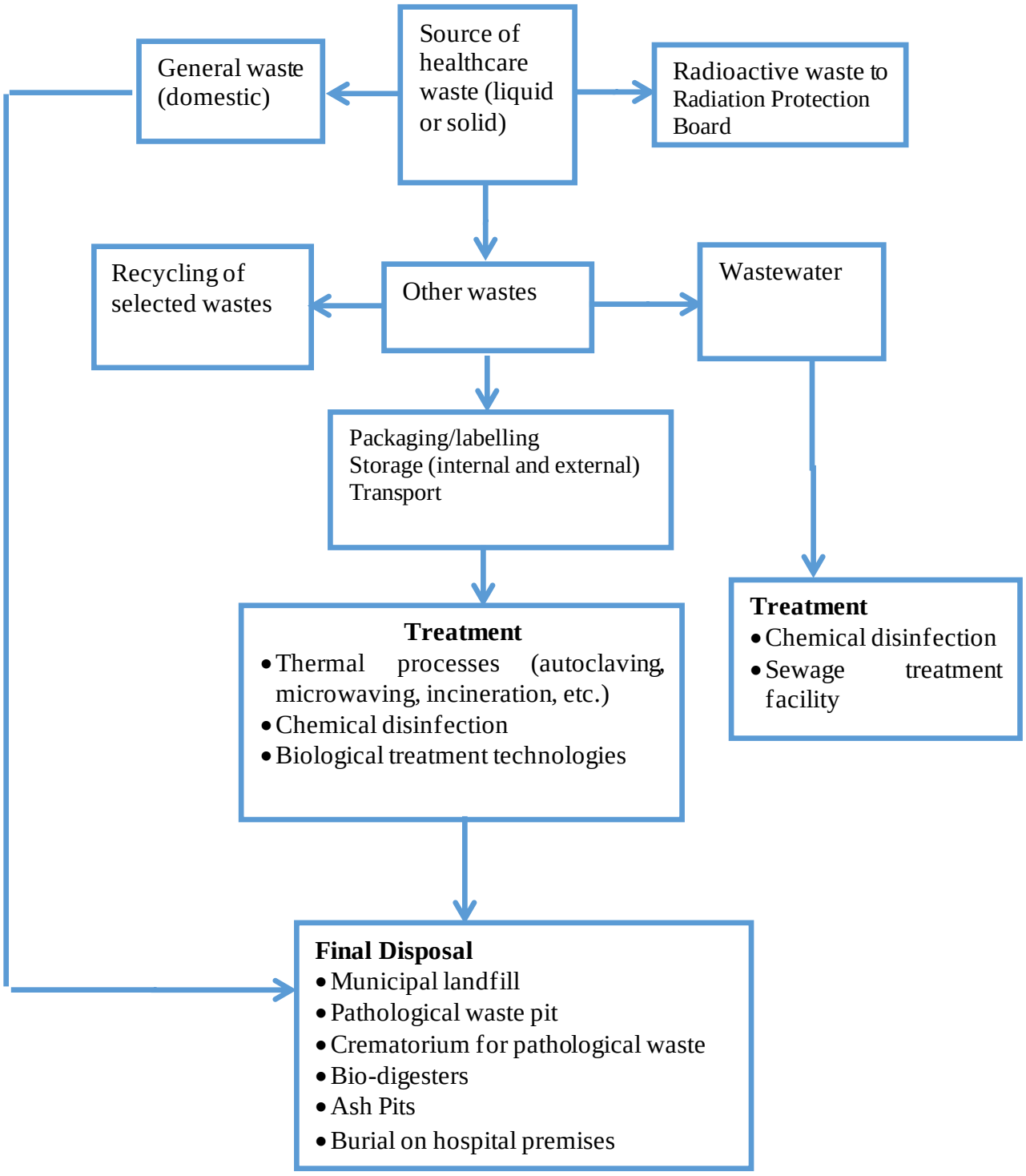


Figure 2: A Flow Chart for the Management of Health Care Waste

5. WASTE SEGREGATION AND CONTAINMENT

5.1. Waste Segregation

The key to minimisation and effective management of health care waste is identification and segregation of the waste. Staff must be aware of the rational for segregation as well as colour codes for containers and bags used for different types of wastes.

The following guidelines shall apply to waste segregation and packaging:

i. Different types of waste require different methods of handling, treatment and disposal. There is the need to segregate health care waste into the various sub-categories at the point of generation for safety reasons and to facilitate minimisation as well as an application of appropriate treatment and disposal methods.

ii. Handling, treatment and disposal of waste by sub-category will help to reduce costs as the type of waste influences the disposal method used, hence disposal costs. Non-segregation of the waste renders all clinical waste generated infectious or hazardous and results in higher management costs and higher environmental effects.

iii. Segregation should be done at source; that is, as close as possible to the point of generation of the waste and should always be the responsibility of the waste producer.

iv. Each waste stream segregated must be placed in an appropriately colour-coded container as stipulated in the guidelines under colour coding with the correct hazard symbol as indicated in Appendix 6.

v. Instruction posters regarding the procedure for waste segregation (as shown in the SOP) should be pasted in all areas where segregation takes place and other vantage points to remind staff and inform users of the facility on correct or proper segregation requirements.

vi. There shall be affixed to every waste a label which indicates the classification or the content of the segregated waste to aid further handling.

vii. All health care facilities shall train their staff on health care waste definition, classification and segregation periodically. Health care waste management training should be incorporated and strengthened in both pre-service and in-service training of health personnel.

5.2. Containment

Segregated waste should be properly contained at the point of generation in a suitable storage container that fit the characteristics of the type of health care waste. Containment at the point of generation should be considered as an important first step in getting the waste into their rightful categories for onward handling by assigned staff. For example, sharps are to be contained in puncture proof containers to prevent accidental injuries among waste handlers and keep the hospital environment clean and safe. Containment should be done to conform to the colour coding system and appropriate signage's approved by this guidelines and regulation on health care waste management in the country.

The following measures should be taken to ensure safe management of waste at the points of generation:

i. 40-60 litres pedal bins are recommended for containerisation of general and infectious waste at the wards.

ii. Rigid containers should be lined with colour coded plastic bags at the opening folding outward over the rim to plastic bags to minimize contamination of the surrounding. The top of the container should have a wider diameter than the base;

iii. Storage time shall be reduced as much as practicable but not longer than one day. Multiple daily removals of the waste is recommended. Sharp waste containers shall be removed when ¾ (75%) full.

iv. Disposable bags for infectious waste shall be of the appropriate size with a minimum of 570 microns and maximum of 100 microns in thickness;

v. Infectious and hazardous waste shall be segregated at the point of origin rather than at the transfer or external storage site to facilitate appropriate packaging, colour coding, and transportation;

vi. Filled bags shall be sealed off using a plastic strip which when fastened cannot be re-opened; the bags should be sealed when ¾ full. To serve as a reminder, the bags should have a conspicuous mark showing the ¾ mark.

vii. Sharp waste:

- shall be stored in puncture-resistant containers made of thick cardboard, or strong plastic/stainless steel;
- shall not be manipulated by hand (e.g. by breaking or bending) before disposal and needles shall not be recapped before discarding since this is a common cause of puncture injury;
- containers (puncture resistant) shall be placed as close as possible to the area where sharp items are used;
- containers should be sealed/covered and removed when ¾ full.

viii. Pharmaceutical and chemical waste should be collected on demand and stored separately from other wastes.

5.2.1. Colour Coding and Labelling

Colour coding of waste containers and plastic bags is one of the efficient ways of achieving segregation of waste and for sorting out items such as paper, plastic, glass and metal for recycling. In this case, it helps to segregate infectious and non-infectious waste for proper treatment and disposal.

The recommended colour coding scheme for Ghana is as follows:

BLACK - General waste (e.g. kitchen waste, paper, cardboard, sweepings etc)

YELLOW - Infectious waste (e.g. patient waste, sharps, and cultures/specimens) with the biohazard label

- Radioactive waste with the radioactive symbol to conform with new UN symbols)

RED - Pathological waste and highly infectious waste

BROWN - Non-infectious hazardous waste (e.g. expired medicines, vaccines, chemicals, etc.)

Table 3 shows the colour coding for the storage container and the appropriate labelling. Colour coding

for the plastic bags should always correspond or match with the waste containers both at the internal and external storage sites.

Labelling involves naming of waste storage containers to show the type of waste it can contain with the appropriate hazard symbol. The storage containers shall be labelled as infectious waste, general waste, sharps pathological waste, pathological waste based on the classification in Table 1. This shall correspond with the colour codes in Table 3.

All health care waste should be appropriately labelled and stored in colour-coded containers according to the recommendations provided in Table 3. Containers used must be appropriate for the type of waste being handled. These containers must be robust, should be coverable, puncher or leak proof and resistant to corrosion. After use, they must be well sealed to prevent spillage during handling and transportation.

Table 3: Colour Coding for Storage Containers and Appropriate Labelling

Waste Type	Description of Waste	Colour Code	Label
NON-HAZARDOUS WASTE			
H	General Waste	**Black** plastic bag and container of appropriate size	General Waste
H1	Recyclable	**Black** plastic bag and container of appropriate size	Recyclable
H2	Non-recyclable	**Black** plastic bag and container of appropriate size	Non-recyclable
HAZARDOUS WASTE			
A	**Infectious Waste**		
A1	Patient Waste	**Yellow** plastic bags, bins and other containers	Infectious substance symbol.
A1	Culture/Specimen	**Yellow** plastic bags, bins and other containers	Infectious substance symbol.
A2	Highly infectious waste	**Red** safety box - puncture-resistant containers	Infectious substance symbol.
B	Sharps	**Yellow** safety box - puncture-resistant containers	Infectious substance symbol.

Waste Type	Description of Waste	Colour Code	Label
C	Pathological/Organic Human Tissues	**Red** plastic bags and bins	Label as pathological waste
D	Pharmaceutical Waste	**Brown** plastic bags, bins and containers	Written label: pharmaceutical waste
E	Chemical Waste	**Brown** plastic bags, bins and containers	Relevant hazard symbol
	Photographic Chemical Waste • Photographic developer • Fixer solution • X-ray photographic film	**Brown** plastic containers • To be recycled or reused • To be neutralized	Label in accordance with the hazards
	Laboratory Waste	**Brown** containers with appropriate labels	
	i. Acids		Label as "Acid"
	ii. Alkalis		Label as "Alkali"
	iii. Solvent		label as "Solvent"
	iv. Organic Substances		label as "Organic substances"
	v. Heavy metal e.g. Mercury		Label as "Heavy metal"
F	i. Radioactive waste	Yellow containers with radioactive symbol:	Radioactive substances symbol

Waste Type	Description of Waste	Colour Code	Label
	ii. Solid-combustible/non-compactable	Durable plastic bags which can be sealed	(Reference to Appendix 6 – Hazard symbols)
	iii. Non-combustible / non-compactable	Puncture-resistant containers (metal or plastic)	
	iv. Liquid-Aqueous	Thick walled polythene bottles or organic-glass containers but should have secondary container to prevent them from breaking	
	v. Spent sealed sources	Container in which the source was originally received.	
G	Incinerator Ash and Sludge	Where separated, • metal containers labelled "Ash • metal containers labelled "Sludge" Otherwise • metal containers labelled "Ash and Sludge"	

6. STORAGE AND TRANSPORTATION

6.1. Storage

Storage refers to the manner in which the waste is contained during the time lapse between its generation and collection for final disposal.

This is classified into Internal Storage and External/Central Storage. Consideration for storage must be based on the classification or type of waste being dealt with and the potential risk of infection to healthcare workers and waste disposal staff. Labels on containers should be permanent and legible for the entire storage period.

6.1.1. Internal Storage (On-site storage)

Internal storage is the temporary placement of packaged and labelled waste collected from the source of generation into colour coded containers (trolley bins) at designated places outside the working area or at a utility room before transfer to external storage points and should not exceed 24 hours. Internal storage considerations should be based on the classification or type of waste being dealt with and the potential risk of infection to healthcare workers and waste disposal staff. The following measures should be taken to ensure safe management of waste at the points of generation:

i. Every site within the health care facility (e.g. ward, theatre, laboratory, pharmacy, kitchen, laundry, etc.) should be provided with a sufficient number of 240 litre trolley waste bins with the right colour codes to guide in segregation.
ii. Waste stored at this area should be transported to the treatment point or external/central storage area within 24 hours to avoid spillage and overloading of trolley or waste bins.
iii. Infectious and hazardous waste shall be segregated at the point of origin rather than at the transfer or external storage site to facilitate appropriate packaging, colour coding, and transportation;

6.1.2. External/Central Storage

External/Central storage refers to the transit point where waste is stored after removal from internal storage (from different wards or departments) to the time it is collected and transported for treatment onsite and final disposal offsite. The frequency of removal of waste stored depends on the volume and nature of waste generated. Where treatment facility is located in the facility, the central/external storage should be done in the waste management area where the treatment plant is located.

The external/central storage location for health care waste should be designated within the health care facility. Space for external storage should be incorporated into a building design when new construction is undertaken. These storage areas should be sized according to the quantities of waste to be generated and the frequency of collection. These areas must be totally enclosed and separated from supply rooms or food preparation areas. Only authorised staff should have access to the waste storage areas. Loading docks, space for compactors and balers for cardboard, staging areas for sharps boxes, recycling containers

and secure storage for hazardous items such as batteries should all be provided. Equipment for accidental spill/leakage needs to be available. There should be sufficient lighting, ventilation and water supply system for proper operations and cleaning of the area. Regular cleaning of waste containers and waste area should be done at least once per week. Provisions should be made for staff personal hygiene (soap for hand washing) and safety.

i. General non-hazardous waste storage

General non-hazardous waste should be stored and kept for collection to the communal landfill/dumpsite or communal waste incinerator. It should be collected at least every week. Segregated general waste with potential for recycling should be handed over to recycling companies or buyers. The storage area should be enclosed, paved and connected to a public road. The gate should be big enough that the collection vehicles can enter.

ii. Infectious and sharp waste storage

The storage place must be identifiable as the infectious waste area by using the biohazard symbol. Floor and walls should be sealed or tiled to allow easy cleaning and disinfection. Storage times for infectious waste (e.g., the time gap between generation and treatment) should not exceed the following periods:

- Warm climate: 48 hours during the cool temperature/ 24 hours during the hot temperature.
- If a refrigerated storage room is available, infectious waste can be stored for more than a week at a temperature no higher than 3° C to 8° C.

iii. Pathological waste storage

Pathological waste is considered biologically active and gas formation during the storage should be expected. To minimize the possibility of this happening, storage places should have the same conditions as for the infectious and sharps wastes. Where possible, waste should be stored under refrigerated conditions when final disposal is outside the facility.

In some cultures, body parts are passed to the family or are buried in designated places. Body parts should be placed in sealed bags prior to release to the family to reduce the risk of infection and the process properly supervised by the environmental unit to ensure safe disposal by the family.

iv. Pharmaceutical waste storage

Pharmaceutical waste should be segregated from other wastes. International and local regulations should be followed for storage. In general, pharmaceutical wastes can be hazardous or non-hazardous, liquid or solid waste in nature and each type should be handled differently. The classification should be carried out by a pharmacist or another expert on pharmaceuticals. Waste from cytotoxic medicines should be separated and stored in leak-proof bags or containers and labelled for easy identification and collection.

v. Storage of Radioactive waste

Radioactive waste should be stored in compliance with national regulations and in consultation with the Radiation Officer and Ghana Atomic Energy Commission (GAEC). It should be placed in containers that prevent dispersion of radiation and stored behind lead shielding.

Radioactive waste should be stored in containers that prevent dispersion of radiation and stored behind lead shielding.

Waste that is to be stored during radioactive decay should be labelled with the type of radionuclide, date, period before full decay and details of required storage conditions.

The decay storage time for radioactive waste differs from other waste storage as the main target will be to store the waste until the radioactivity is substantially reduced and the waste can be safely disposed of as normal waste. A minimum storage time of 10 half-life-times for radioisotopes in wastes with a half-life of <90 days is a common practice. Infectious radioactive waste should be decontaminated prior to disposal. Sharp objects such as needles, Pasteur pipettes, and broken glass should be placed in a sharp container.

Liquids associated with solid materials, such as assay tube contents, should be decanted or removed by aspiration. Radiation levels outside storage areas should not exceed 2.5 micro Sv/hr. After decay time all radioactive labelling should be removed from any items to be disposed of as non-hazardous waste.

vi. Storage of other hazardous waste

When planning storage places for hazardous chemical waste, characteristics of the specific chemicals to be stored and disposed of must be considered (i.e. inflammable, corrosive, explosive). The storage area should be enclosed and separated from other waste storage areas. Storage facilities should be labelled according to the hazard level of the stored waste. Hazardous waste storage facilities should be ventilated and cooled down if needed.

6.1.3. General requirements for storage

i. Storage bins shall be placed in roofed built-in areas protected from water, rain, wind, animals and pests such as rodents, cockroaches, etc. and scavengers;

ii. Central storage of infectious waste should be stored in secured and covered larger storage bins.

iii. The General waste which forms the large amount of the HCW should be stored in larger containers e.g., skips with covers

iv. Facilities for central storage should be removed from kitchen, laundry, ward, etc. but be within the precincts of the facility and shall be easily accessible to collection vehicles.

v. The facility shall be well lighted, marked, enclosed and surrounded by an impervious wall of appropriate height and provided with a gate and lock.

vi. The walls and floors shall be smooth, without cracks, impervious, easy to clean and disinfect; cleaning and disinfection must be carried out regularly.

vii. The site shall be spacious and well ventilated and may, for cost-effectiveness in managing wastes in small facilities, accept waste from other Health Care Facilities if it has the capacity to store the increased volume and the type of waste.

viii. All loading and unloading of waste shall take place within the designated collection area around the storage point;

ix. Hazardous health care waste shall not be compressed during collection;

x. Waste bins shall be washed and disinfected after each collection and more frequently as required.

xi. Refrigerators/freezers for storing pathological organic tissues should be considered and provided in the external storage facility. This will ensure that the temperature of body parts will be such as to prevent further decomposition or multiplication of pathogens; where refrigeration is not available, these materials should be disposed of within 24 hours.

xii. Bio-hazard symbols and other warning signs shall be conspicuously posted on doors to prevent people from unnecessarily gaining access to the area.

xiii. Access (entrance) to storage area shall be securely locked when unattended.

xiv. Storage areas shall have sufficient space to afford easy access or removal of waste.

xv. Only authorized persons shall have access to central storage area.

xvi. Staff should be trained to understand the principles of segregation and to follow procedures for colour coding, storage and documentation.

xvii. Adequate spill kit and personal protective equipment such as disposable gloves, overall, nose mask, etc. must be provided at the storage sites. The kit must include absorbent materials, disinfectant, buckets, shovels, etc. for staff to clean up any spills and must be easily accessible.

xviii. Provision shall be made for wash-room facilities for those who handle these wastes e.g. basins, shower, water and soap/detergents, etc.

xix. Records on waste stored and processed including the type of waste, volumes and/or weight, and the persons who processed them at the various stages should be kept.

6.2. Collection and Transport

6.2.1.Internal Collection

i. Health care waste shall be collected one-way from internal collection to external/central storage site without returning to the point of generation. A sufficient sized wheeled container shall be used for the transfer (waste collection trolley or 1201 bin and above should be used based on the amount of waste generated).

ii. Transfer of waste bags from internal to central/external storage shall be done with care to prevent rupturing or opening of bags which can contaminate the hospital environment;

iii. Vehicles (carts, trolleys, wheeled bins and containers, etc.) used for transporting waste from internal to external/central storage sites shall be made of a smooth surface material (e.g., plastic) for easy cleaning and disinfection.

6.2.2. External Collection

Collection and transportation of healthcare waste from Healthcare Facilities should dovetail into the general waste management plan of the MMDA's (See Manual on Preparation of District Waste Management Plans in Ghana, 2002).

At the institutional level, all healthcare waste should be sorted on site before collection and transportation. The recommended colour coding must be used. This will allow for easy identification of content of

containers thus preventing careless handling and the risk of secondary infection. Wastes from health facilities shall be packaged and transported separately based on the adopted classification as shown in Table 2. Highly infectious waste should not be transported on public roads without the appropriate authorisation and escort.

Transporters of waste should be trained in:

- identification of different waste streams.
- records on waste collected, including the type of waste, volumes and/or weight, date, time and the persons who collected them should be kept.

Where the facility is not equipped to carry out on-site treatment and disposal of health care waste the institution should appoint a Waste Management Contractor licensed by the MMDA's to collect and transport its wastes to a designated site for treatment and or disposal.

i. Wastes from health facilities shall be packaged and transported separately based on the adopted classification as shown in Table 3.

ii. Companies transporting hazardous waste need to be licensed by EPA in accordance with the waste class transported.

iii. Transport documentation is needed for the transport of hazardous waste.

iv. All necessary care must be taken to prevent odour nuisance to the neighbourhoods during transportation;

v. All vehicles used for the transportation of health care waste shall carry the appropriate hazard marks on all sides;

vi. Where infectious wastes and other wastes have been mixed together, they must be considered infectious and managed as such;

vii. Potentially hazardous health care waste must be transported directly to the disposal or treatment site within 24 hours in warm climate and 48 hours in cold climate possible time;

viii. Vehicles used for transportation of this waste must be so constructed as to prevent the scattering of packaged wastes, odour nuisance, maintain good cold temperatures, and must be leak proof;

ix. Waste must not be compacted or subjected to any other treatment that could cause bags or containers to rupture before and during transportation;

x. Labels should be firmly attached to containers or waste liners so that they do not become detached during transportation and handling;

xi. For transportation of infectious and sharp waste over long distances, the use of refrigerated trucks is recommended;

xii. All bins and containers used for storage (internal and central/external), collection and transportation of waste shall be regularly cleaned and disinfected.

xiii. A spillage kit in case of accidents should be available in the cabin of the vehicle.

xiv. A driver should be trained on the transport of hazardous waste and wear appropriate PPE

6.2.3. Requirements for Collection and Transport Containers /Trolleys

i. General Requirement

Containers for waste collection should meet the following requirements: They should;

- be labelled with the designated hazardous symbol in case of external transport of the container
- be non-transparent;
- be impervious to moisture;
- be of sufficient strength to prevent damage during handling or use;
- be leak proof;
- have close fitting lids;
- be fitted with handles for easy manipulation;
- be light weight and convenient for lifting;
- be designed to minimize physical contact; and
- follow the recommended sizes of containers for internal & external storage.

ii. Cleaning and Disinfection of HCW Containers

Detailed washing and disinfection procedures for reusable collection equipment and storage containers, as well as equipment used for internal transport (trolleys, wheelbarrows, bins, etc.) should be in place in all health facilities. The container, trolley bins, etc. should be washed and disinfected daily. Waste liners should be used only once. There should also be an appropriate site selected for this activity to take place. Necessary tools for carrying out this activity should be in place. These include brushes, detergents and soaps, appropriate disinfectants, as well as personal protective gear including gloves, masks, safety glasses and wellington boots.

6.2.4. Requirements for the Transportation of Radioactive Waste

i. Radioactive waste containers must be brightly coloured (normally yellow), marked "Radioactive Waste" and should bear the international radioactive symbol to distinguish it from containers meant to receive other types of waste.

ii. All radioactive waste packages or containers should have labels bearing the radiation symbol on them. The label should be completed and signed by the officer in charge of waste management in the organization.

iii. The labels should be firmly attached to the containers or packages so that they do not become detached during transportation and handling. The printing on the labels should be permanent and legible for the entire storage and transportation period.

iv. Radioactive waste should be adequately packaged and contained for transport to ensure safety, not only of those involved in the transport operation, but also for those who could be affected as a result of transport operations in accordance with the International Atomic Energy Agency (IAEA) Regulations for the Safe Transport of Radioactive Material (Requirements, 1996, Safety Standards Series ST-1, IAEA, Vienna)

v. Drivers transporting radioactive material must be suitably trained and carry contingency plans on the vehicle detailing action to be taken in the event of an accident.

vi. The Safe Transport of Radioactive Materials guidelines of Radiation Protection Institute of the Ghana Atomic Energy Commission should be complied with.

7. HEALTH CARE WASTE TREATMENT AND DISPOSAL METHODS

Treatment of health care waste is very important for ensuring a break in transmission of potentially infectious agents from the waste to susceptible persons; make it easy and safe for disposal. The overall objective of HCW treatment is to reduce the potential hazard posed by health care waste and to protect the environment. From the waste hierarchy, treatment is next to disposal, implying that all measure for minimization should be adopted to reduce the amount of waste substantially so that treatment will focus on the potentially infectious waste. After treatment, the treated waste (residue) should be properly packaged as indicated by the appropriate SOP for land disposal, preferably at a landfill site.

7.1. Overview of HCW Treatment Technologies

7.1.1. Thermal processes

The traditional treatment technology that has been used over long time and across the globe has been based on thermal processes. These processes rely on heat to destroy pathogenic organism in the waste. There are two main categories of such treatment method which are low-heat and high-heat designs. Examples of low-heat thermal processes include autoclaves, microwaves, etc. whilst high-heat options include incinerators, pyrolysis and gasification. The non-incineration treatment technology options (e.g. autoclave, hydroclave, etc.) which do not cause any adverse health and environmental effects are preferred to low temperature incinerators that have been found to be polluting the environment with dioxins and furans (e.g. De-Montfort incinerators). Irradiation treatment processes encompasses designs using irradiation from electron beams, cobalt-60 or ultraviolet sources.

7.1.2. Chemical processes

Chemical treatment methods use disinfectants such as dissolved chlorine dioxide, bleach (sodium hypochlorite), peracetic acid, lime solution, ozone gas or dry inorganic chemicals (e.g. calcium oxide powder). The processes often involve shredding, grinding or mixing to increase exposure of the waste to the chemical agent. Besides chemical disinfectants, there are also encapsulating compounds that can solidify sharps, blood or other body fluids within a solid matrix before disposal. Another example of a chemical process is a system that uses heated alkali to digest tissues, pathological waste.

7.1.3. Biological processes

These processes utilize natural living organisms to degrade organic matter component of HCW under aerobic or anaerobic conditions. Biological treatment systems can use enzymes to speed up the destruction of organic waste containing pathogens. The natural decomposition of pathological waste through burial is another example of a biological process.

One example for a biological treatment method are the Bio-digesters. These are normally designed to allow for decomposition of organic waste under anaerobic conditions (without oxygen) which results in fermentation to produce methane gas.

Pathological waste which is organic in nature can be treated in conjunction with other organic waste from

the kitchen and wastewater in a bio-digester to harness gas to supplement energy needs of the health facility. The digester can be made of metal fabricated to specifications or constructed using burnt bricks also to specifications. Waste such as plastics, bottles and other non-biodegradable materials should not be put into bio-digesters. To operate such facility efficiently, the following should be considered:

- Properly segregated organic waste should be added to pathological waste for digestion.
- Stacks should contain 40–75% moisture, into which little oxygen can penetrate.
- Waste for bio-digesters should contain 80–99% moisture so that the organic material is a suspension in the liquid. If necessary, water can be added to reach the desired moisture content.
- The digester should be seeded with animal dung to provide enough anaerobic bacterial to start the decomposition activity.
- Parameters such as C:N ratio [1:25 or 1:30], water content, temperature [thermophilic range (55–70 °C)], and pH which are critical to the performance of anaerobic digestion systems should be regularly monitored.
- Periodic inspection and maintenance of the digester is important to ensure it efficient functioning.

7.1.4. Mechanical processes

Mechanical treatment processes include several shredding, grinding, mixing and compaction technologies that reduce waste volume, although they cannot destroy pathogens. In most instances, mechanical processes are not stand-alone health-care waste-treatment processes, but supplement other treatment methods such as autoclaving, chemical treatment, etc.

7.2. Overview of HCW Treatment Approaches

In general, there are three approaches for the treatment of HCW:

i. **On-site (OS) treatment** – This the simplest and the commonest treatment approach where a healthcare facility treats its own waste using its treatment technology within its premises. The hospital does not receive waste from other facilities and therefore, operation and maintenance cost are the responsibility of the facility. Mostly, the capacity of the treatment technology is selected to meet the healthcare waste generation capacity of the health facility.

ii. **Cluster treatment (Cluster)** – This approach is where a hospital treats its waste plus waste from other health facilities in a small area. This can be done within a sub-metro, metropolis, and municipalities or a defined area using facilities within a certain radius of the treatment hospital or site. This approach allows for a number of facilities to leverage on existing treatment technology in another facility to treat healthcare waste at an agreed fee among the facilities or free based on the hierarchy of health service.

    That is, a district hospital hosting the treatment technology can accept to treat infectious healthcare waste from polyclinics, clinics, health centres, CHPS, private health facility, etc. for free or at agreed fee. The benefits include reduced operation and maintenance cost to the facilities involved

in the cluster. However, the challenges include the difficulties of transporting infectious waste and unwillingness to pay agreed fees for treatment which may shift the burden to the hosting health facility or make the system unsustainable. Therefore, the terms for involvement in the cluster operations should be clearly spelt out.

iii. **Central Treatment (CT)** – This is where a dedicated treatment plant with larger treatment capacity collects and treats wastes from many health facilities in an urban centre or at the regional level. This approach is more suitable for private sector companies to be involved in healthcare waste collection and treatment services. The private sector will establish and operate such treatment facility for profit and in compliance with existing laws, polices and regulations.

The benefits to the health sector are enormous since health facilities would avoid the challenges of meeting regulatory standards for treatment, transportation, operation and maintenance challenges but pay for services. The cost of setting-up a number of such treatments technologies at each facility is avoided and funds can be deployed to address other needs. This will ensure sustainability of the operation of such treatment technologies and contribute to safe healthcare waste management in Ghana.

7.3. Evaluation of Treatment Options

The guidelines accept any of the available treatment technologies utilizing the above processes. The recommended options for HCW treatment technologies that can be adopted for various waste streams are provided in Table 4 to guide each level of health institutions. They are based on technology available, their environmental friendliness and cost considerations. Where the treatment technology (e.g. autoclaves, incinerators, etc.) has the capacity to handle more waste than the individual institution generates, it can be strategically located to serve more than one institution for optimization and cost reduction (e.g. cluster or central treatment).

With regards to HCW treatment approaches, the recommendations are that, where the volume of waste generated is minimal, segregation and transportation of waste to a cluster or central treatment facility may be much cheaper than procuring treatment technologies for a facility. Such considerations are important for facilitating the rational use of resources. This necessitates a process of micro planning at all levels.

There are various health care waste treatment technology options. The treatment option should be carefully evaluated on the basis of the following factors which shall be integrated into the comprehensive framework of healthcare waste management plan. These are:

- Disinfection efficiency
- Health and environmental considerations
- Volume and mass reduction
- Occupational health and safety considerations
- Quantity of wastes for treatment and disposal capacity of the system
- Types of waste for treatment and disposal

- Infrastructure requirements
- Locally available treatment options and technologies
- Options available for final disposal
- Training requirements for operation of the method
- Operation and maintenance considerations
- Available space
- Location and surroundings of the treatment site and disposal facility
- Investment and operating cost
- Public acceptability
- Regulatory requirements
- Risk of toxic emissions

7.4. Disposal Options

The safest disposal method for treated health care waste which is considered as non-hazardous waste (e.g., sterilised/disinfected infectious waste, decayed radioactive waste) is controlled disposal at a properly engineered sanitary landfill site. Ash should be encapsulated in an ash pit. Other waste such as human parts may be buried in pathological waste pits, directly at cemeteries or after cremation.

The choice of disposal option depends greatly on availability of space and/or adequate facilities to ensure the minimisation of risk to public health and the environment.

7.4.1. Landfilling in Municipal Disposal Sites

Treated health care waste may be landfilled with municipal waste. However, health care waste should not be deposited or scattered on the surface of open dumps and must be protected to prevent access by scavengers. It may be deposited in one of the following two ways:

- In a deeper pit (1-2 m) excavated in mature municipal waste (at least 3 months since being landfilled) which is then filled back with the mature waste that was dug out. Scavenging in this part of the site must be prevented.
- In a shallow hollow excavated pit in mature municipal waste immediately in front of the base of the working face (the surface where waste is being tipped). After deposit the waste should be covered the dame day. Scavenging should be prevented.

In case of a disease outbreak involving especially virulent pathogens (such as cholera), an intermediate layer of both lime and soil cover must be added before fill back with mature waste. Access to this area should be restricted and closely supervised by the responsible staff to prevent scavenging. The waste should be buried in approved cemeteries or cremated at a crematorium. intermediate soil cover

7.4.2. Pathological Waste Disposal

Pathological waste such as placentas, amputated limbs, organs, still birth, laboratory animal samples and

other body tissues, body fluids that are removed during surgery, autopsy but excludes corpses, teeth and contiguous structures of bone and gum as well as body fluids removed during surgery, autopsy, or other medical procedures. The treatment and disposal of pathological waste such as placenta and foetal remains may have some sociocultural, religious and aesthetic norms and practices which should be respected. Methods for dealing with such waste include interment (burial) in cemeteries or special burial sites, disposal into designed pits and burning in crematoria or specially designed incinerators. Contaminated body tissue can be treated using alkaline digestion in designed pits.

To dispose of any human tissue or body part, it is important for the officer in-charge of the facility and at the waste management unit to satisfy her/himself of the approval to dispose of such waste. These approval issues should include among other things:

- the details of body part to be disposed of.
- brief information of patient to allow for easy records and identification.
- a written and signed consent letter or form from patient or representative before disposing such waste.

Health facilities should liaise with the Metropolitan, Municipal and District Assemblies to designate a place for disposal or safe burial of such waste. The traditional authority should be engaged to provide land for such purpose. The allocated land may be within a designated cemetery or as appropriate. The operation and management of such pit has been detailed in the standard operating procedure for easy reference.

a. Pathological Pit

This is a pit specially designed and constructed to receive human part that can decompose naturally. This facility has no intention to harness the gas that may be generated but with the purpose ensuring safe disposal and decomposition of pathological waste. Waste to be considered in pathological pit includes:

- body parts,
- placenta,
- the still born/ abortuses

The siting, designing and constructing of pathological waste pit shall be as follow:

ii. Site selection

- The site should be located away from publicly accessible areas
- Should not be located close to critically hygienic areas (e. g kitchen, water sources, etc.)
- Should to be located away from dwelling areas because of possible odours
- Should not be in waterlogged areas
- Geological, hydrogeology and hydrological factors should be taken into consideration
- The site should be located at least 30 meters away from the nearest groundwater source.

iii. Design and Construction of Pathological Pit

- Size of the pit should be informed by the pathological waste generation rate of the facility
- The pit should have infiltration area (0.5 litres per pit) which will allow water to infiltrate into the soil
- Bottom of the pit should be at least 1.5 meter above groundwater level or water table
- The top should be about 0.5 m high above ground level
- The pit should be constructed with concrete or blocks to line the soil and prevent caving in of the pit and the bottom line with concrete to slow the infiltration rate.
- The design can be rectangular or circular (1-2m diameter)
- The opening should be a movable slab
- A vent pipe should be installed to allow for exchange of gases
- Fence the pit area to restrict access with lockable gate (See appendix 4 for sample design of pathological waste pit)

b. Crematorium for Pathological Waste

Cremation has become one of the preferred options for the treatment and disposal of fetal remains, dead bodies, placenta, amputated body part and other pathological waste. However, before cremating any body part, all the necessary protocols and clearances must be secured before do so. The following shall guide facilities and operators of crematorium:

- Pathological waste to be cremated should be well packed with biohazard symbol to alert handlers.
- Proper documentation should accompany such waste such as:
  - When the material was acquired, and where from
  - What has been consented to
  - When the material is transferred elsewhere, and to whom
  - Disposal details
- Sitting of crematorium should conform to standards as will be given by EPA and the responsible local government authority (MMDAs). Preferably, it should be sited around cemetery and far away from dwelling/inhabited places.
- The cremation technology should:
  - Operate at higher temperature (above 1000 oc)
  - Temperature Control for the Primary & Secondary Chamber
  - Temperature Actuated Fuel and Air Control systems
- Cremation of human tissue is possible provided that:
  - An application for the cremation of the tissue has been made by an appropriate person on the proper forms; and
  - Certificate on release of body parts has been provided by the holder or, if not possible to

provide such a certificate, other evidence that the body parts were removed in the course of a post-mortem examination.

- Treating pathological waste through cremation outside the health facilities should be well monitored by authorities (HeFRA, EPA and MMDAs).
- After cremation, the ash remains may be demanded by family members or patient for burial. In such cases the facility should hand it over with right documentation.
- Burial of crematoria ash should be done at the approved cemetery and in appropriate burial facility to prevent leaching into groundwater resources.

Please refer to the Mortuaries and Funeral Facilities Act, Act 563 and the Revised National Environmental Sanitation Policy, 2010.

c. Safe Burial

In hospitals that use minimal programmes for health care waste management, particularly in rural areas, the safe burial of waste on hospital premises may be the only viable option available. However, the following measures should be followed:

- Access to the disposal site should be restricted to authorised personnel only
- The burial site should be lined with a material of low permeability, such as clay, if available, to prevent pollution of any shallow groundwater that may subsequently reach nearby wells.
- Only patient waste and pathological/ human tissue should be buried. If general waste were also buried on the premises, available space would be quickly filled up.
- The burial site should be managed as a landfill, with each layer of waste being covered with a layer of earth to prevent odours, as well as to prevent rodents and insects proliferating.

Please refer to the Mortuaries and Funeral Facilities Act, Act 563 and the Revised National Environmental Sanitation Policy, 2010.

7.5. Overview of Treatment and Disposal Options for Different Waste Types

The recommended treatment and disposal options are listed in Table 4 to be used by healthcare facilities.

Table 4: Treatment and Final Disposal Options

Waste Type	Treatment / Level of Health System	Final Disposal/Recycling
General waste (Food waste, paper, packaging materials, plastics etc.)	• Recycling (cardboard, paper, plastics, glass), Bio digestion, Composting, Incineration (controlled combustion) • Health Centre/Clinic Composting. • District – Composting, Bio digestion • Regional Hospitals • Bio-digestion, Composting. • Teaching Hospital– Composting, Bio-digestion	Reuse/Recycling of plastics, papers, packaging materials, etc. Sanitary Landfill, Protected pits
Infectious waste (Sharps, Patient waste)	• Non-incineration (Autoclave, hydroclave, microwave) – District, • Regional and District Teaching Hospitals Chemical disinfection- All levels • Incineration (high temperature) District, Regional and Teaching Hospitals	Sanitary Landfill with general waste (after treatment), Consider recycling of syringe not needle, Landfill ash (ash) residues but requires treatment e.g., encapsulation, Stabilization
Highly infectious waste	• Non-incineration (Autoclave, hydroclave, microwave) - District, Regional and Teaching Hospitals • Chemical disinfection- All levels • Incineration (high temperature)- District, Regional and Teaching Hospitals • Chemical disinfection - All levels • Incineration (on-site and emergency cases) – All levels	Sanitary landfill

Waste Type	Treatment / Level of Health System	Final Disposal/Recycling
Pathological waste: Pathological, Organic, Human tissue	• Chemical disinfection - All levels • Pathological/placenta pit - District/Regional and Teaching Hospitals • Bio-digestion- (connect to the general sewage system) - Regional/Teaching hospitals • Approved Burial Grounds (with chemical disinfection for infected waste) - Health Centres	Landfill
Pharmaceutical waste: Pharmaceutical tablets and capsules; Syrups and injectables; Cytotoxic medicines; Vaccines	• Refer to regulation on Pharmaceutical waste • High temperature (1100°C) incinerators	Landfill
Chemical waste: Photographic chemical waste; Photographic developer solution; Fixer solution; X-ray photographic film	• Recover silver - central treatment at all levels by approved service contractors • Incineration at high temperature (1100°C)	Recover silver Landfill
Radioactive waste	• Storage decay Immobilization in consultation with Ghana Atomic Energy - All levels	Specially designed landfill
Chemical: Acids, Alkali	• Dilute with large volumes of water (12x) - All levels	Wastewater treatment/ sewage system
E-waste	• Refer to E-waste regulations	Recovery, Landfill
Heavy Metals (Hg, Pb, etc.)	• Recovery and Complexation • Stabilization centralized approved service contractors at all levels	Waste water treatment/ sewage system
Wastewater	• Primary, secondary and tertiary treatments	Sedimentation tanks, stabilization/oxidation ponds, Trickling filter with some chemical disinfection

Table 5: Summary of Advantages and Disadvantages of Treatment Options

Treatment Method	Advantages	Disadvantages
Incineration	• Adequate for all infectious waste and most pharmaceutical and chemical waste • Drastic reduction of weight and volume of the waste. • Heat recovery is possible.	• High investment and operating cost. • Difficult to operate and maintain. • Operation requires qualified technicians. • Significant emissions of atmospheric pollutants. • Need for periodic removal of slag and soot.
Steam Disinfection by Autoclaving	• Simple to operate. • Environmentally sound. • Relatively low investment and operating costs. • Good disinfection efficiency under appropriate operating conditions.	• Cannot be used for all types of waste. • Operation requires qualified technicians. • Shredders subject to frequent breakdown
Chemical Disinfection	• Highly efficient disinfection under good operating conditions. • Some chemical disinfectants are relatively inexpensive. Shredding process reduces volume (not mass).	• Requires highly qualified technicians for operation of the process. • Uses hazardous substances that require comprehensive safety measures.
Irradiation & Microwaving	• Effective in destroying pathogens	• Technology require highly qualified operator/technician. • May be expensive. • Applicable only to infectious waste.
Biological (Composting and Bio-digestion)	• Effective for biodegradable waste • Potential for energy recovery and production of compost. • Uses natural process, hence inexpensive.	• Applicable to only biodegradable materials. • Gas recovery may be limited if technology not well operated and maintained.
Mechanical	• Good to complement other treatment technologies reduce volume destroy waste to prevent recognition	• Shredders are subject to frequent breakdowns and poor functioning. • Can increase treatment cost.

Table 6: Advantages and Disadvantages of Disposal Methods

Disposal Method	Advantages	Disadvantages
Landfilling for non-hazardous waste	• Simple and inexpensive. • Relatively safe if access to site is restricted and where natural infiltration is limited.	• Safe only if access to site is limited and certain precautions are taken • Suitable for treated waste only
Pathological Pit	• Effective for biodegradation of body parts and tissues • Uses natural process, hence inexpensive • Operated in-situ, hence safe and inexpensive • Can be upgraded to recover gas.	• Applicable to only biodegradable body part. • Poor construction can contribute to groundwater contamination
Burial	• Effective for biodegradable waste • Uses natural process, hence inexpensive • Operated in-situ, hence safe and inexpensive	• Contamination of groundwater if not lined proper. • Produce offensive odour if not covered with laterite regularly.
Ash Pit	• Important for disposal of incineration and crematorium ash (residues) • Can be flexible (both onsite or • offsite) • Stabilises heavy metals in ashes	• Can contaminate • groundwater resources if not well constructed and lined. • Explosion due to heat build-up

8. WASTEWATER TREATMENT AND DISPOSAL

Wastewater from Health Care Facilities is of similar quality to urban wastewater but may also contain various potentially hazardous components if the recommendations in Table 4 are not followed.

Hazardous components of wastewater from Healthcare Facilities include the following:

i. Bacteria, viruses and helminths discharged from treating patients with infectious diseases.
ii. Hazardous chemicals from cleaning and disinfection operations.
iii. Pharmaceuticals from pharmacies and various wards/units.
iv. Radioactive isotopes.

Wastewater in category (i) and other general liquid effluents should be connected to the sewerage system if available, or to other technically sound on-site systems. However, during epidemics or where highly infectious patients are involved, high risk type wastes should be pre-treated by chemical disinfection before disposal.

Waste in categories ii, iii and iv must be segregated and treated appropriately with best available treatment options like wastewater treatment plants or in underground drainage system with addition of strong disinfectant such as 0.5% sodium hypochlorite for a contact time of 30 minutes.

The use of bio-digesters is an option for treatment of wastewater from toilets and latrines. Wastewater from kitchens and biodegradable potentially infectious waste can also be handled via this means. It is however not advisable to treat other infectious waste by this method. The biogas (methane) produced may be used in kitchen appliances (stoves and refrigerators).

The recommended treatment option for many chemical wastes such as vaccines (liquid) is high temperature incineration (Table 4). Currently, there is no or limited treatment facility for such wastes. For the long term, efforts will be made to acquire at least one suitable incinerator for their treatment. Until then, disposal of liquid chemical wastes will comprise dilution with large volumes of water, neutralization (where indicated) and washing down the drain. Chemical decontamination is to be used for organic substances and solvents.

8.1. Connection to a Municipal Sewage Treatment Plant Without Pre-treatment

It may be acceptable to discharge the sewage of Health Care Facilities to municipal sewers without pre-treatment, provided that the following requirements are met:

- Municipal sewers are connected to efficiently operated sewage treatment plants that ensure at least 95% removal of bacteria.
- The sludge resulting from sewage treatment is subjected to composting or anaerobic digestion leaving no more than one helminth egg per litre in the digested sludge.
- The waste management system of the health institution maintains high standards ensuring that significant quantities of toxic chemicals, pharmaceuticals, etc. are not discharged into

sewers.

- Excreta from patients being treated with cytotoxic medicines are collected separately as far as possible and adequately treated.

8.2. On-site treatment of wastewater

If the requirements in connection to a municipal sewage treatment plant cannot be met, an efficient on-site management system should be established. This could be a septic tank and soak away, sedimentation tanks with aerators, or a waste stabilisation pond system.

If a septic tank and soak away are to be used, the septic tank must be adequately dimensioned to ensure good solids removal to guarantee trouble-free operation of the soak away. Sludge removed periodically from the septic tank must be disposed of hygienically at a recognised treatment/disposal facility.

The final effluent from a stabilisation pond facility should meet the EPA standards. (50mg/l BOD, 30mg/l suspended solids and 10 faecal coliforms/100ml). The faecal coliform standard is particularly important, and retention times must be such as to ensure good bacterial die-off

The sludge must be treated by disinfection or thermophilic composting so as to contain not more than 1 helminth egg per kilogram and not more than 1000 faecal coliforms per 100g. It may be landfilled but should on no account be used for agricultural purposes.

8.3. Minimal Safety Requirements

- Sewage from health care establishments should never be used for agricultural or aquaculture purposes.
- Hospital sewage should not be discharged into natural water bodies that are used to irrigate fruit or vegetable crops, to produce drinking water, or for recreational purposes.
- Healthcare facilities that are not in the position to afford a wastewater treatment system should isolate patients with enteric diseases in wards where their excreta can be collected in appropriate containers for appropriate chemical disinfection; for example, this is of utmost importance in cases of cholera outbreaks.
- No chemicals or pharmaceuticals should be discharged into the sewer.
- Small-scale rural health care establishments that apply minimal waste management programmes must discharge their treated wastewater into a soakaway. However, this must take place outside the catchment area of aquifers used to produce drinking-water or to supply water to the health care establishment.

9. CONTINGENCY MEASURES

The contingency measures are steps already taken to address any emergency issue should they occur in the implementation of this guidelines or any other activity related to health care waste management.

9.1. Spillage Procedures

Whilst all efforts should be made to avoid loss or spillage of any kind, in the event of the latter occurring, a clear procedure must be followed. A ready supply of all necessary equipment must be in place for use whenever such an event occurs. It is important that information and training for staff is provided prior to any such eventuality.

The aim of a spillage procedure is to:

i. Contain the spillage.
ii. Limit the escape
iii. Protect staff, patients and visitors. Protect the environment.
iv. Have persons move away from the area of spillage. Restore the area to normalcy as quickly as possible.
v. Minimize the effect of the spillage on normal service provision.

9.2. Procedure for handling Spillage of infectious waste

The main risk is that of cross infection, and the procedure consists of donning protective clothing consistent with the risk, in most cases disposable gloves, and apron if appropriate, and placing the waste items into the appropriate yellow bag; or into a sharps box in the case of needles, blades or other sharp items, taking special care not to receive a sharps injury. Sharps must not be retrieved by hand.

The following guidelines shall therefore apply:

i. Staff cleaning spills shall wear protective clothing suitable for the spillage at hand.

ii. Standard cleaning equipment including a mop and cleaning bucket plus cleaning agents shall be readily available for spills management and shall be stored and sign-posted in an area known to all staff.

iii. The procedure for spill management will depend on the following:

- Nature of the spill, e.g. blood, urine and faeces.
- Possible pathogens that may be involved.
- Size of the spill i.e. small, large
- Form of the spill i.e. spot, splash and puddle.
- Type of surface involved i.e. linoleum, carpet, wood, laminated, terrazzo, etc.
- Area involved i.e. preparatory laboratory, teaching, common access areas, etc.

- Likelihood of bare skin contact with the soiled area.

iv. For a small spill, disinfect using a disinfectant cleaning solution preferably chlorine based such as Bleach.

v. For a large spill, flood with the disinfectant, mop and clean the area with disinfectant cleaning solution using a mop and allow to air dry or where available, with absorbent paper which is then placed in a yellow bag.

vi. Large spills of cultures or concentrated infectious agents shall also be flooded with high-level disinfectant (e.g. Bleach) before cleaning and then decontaminated with fresh disinfectant.

9.3. Procedure for handling Spillage of chemical waste

The essential steps are:

i. Contain the spillage to prevent further spread.

ii. Prevent exposure of:

   a. Other persons in the vicinity.
   b. Staff dealing with the spill.

iii. Absorb and dispose as quickly as possible.

iv. Decontaminate the area and return it to normal use.

Similar principles apply to any other chemical spillage. For chemicals like *glutaraldehyde* which readily evaporate to produce very irritant fumes, a respirator designed for use with organic vapours should be worn. The liquid should be mopped up as quickly as possible with absorbent, disposable materials, which must then be double bagged and removed to the open-air waste storage compounds as soon as possible.

The area of the spill should be well ventilated and will require sufficient time for the vapour to disperse before being reoccupied.

Mercury is another chemical whose handling should be mentioned. The main risk is that of skin absorption on contact with mercury, and by inhalation of mercury vapour which may slowly vaporise into the air from exposed surfaces of mercury. The risk is increased in hot, confined areas.

Mercury readily combines with other metals to form ‘amalgams; which in turn emit mercury vapour, and from which mercury may be absorbed by skin contact. Prevent contact with rings, by removal of jewellery, or wearing of disposable gloves, and with any metal equipment, as they may be difficult or impossible to decontaminate.

The aim of the spillage procedure is to collect any significant quantity of free mercury (that could possibly be recycled) and to chemically combine any small remaining residues as quickly as possible with a hot suspension of sulphur and slaked lime (calcium hydroxide) that may be obtained from the facility's laboratory. Damaged obsolete mercury containing devices like blood pressure apparatus, thermometers should be replaced with non-mercury containing devices. After drying out, the powder mixture is collected into a tightly capped plastic bottle.

10.HEALTH AND SAFETY

The Ministry of Local Government and Rural Development through the District Assemblies jointly with the Ministry of Health and its implementing agencies as well as other corporate and individual employers within the health sector are responsible for providing the necessary resources for correct and effective health care waste management. Managers in healthcare facilities and other organizations are expected to provide safe systems of work for staff generating, handling, storing, transporting, treating and carrying out final disposal of waste.

They are to institute a system of regular medical screening for communicable diseases and immunizations for all staff involved in waste management. These should include Hepatitis B and C, tetanus, HIV (optional), etc.

They are to provide appropriate information and training for all relevant staff.

They are to conduct regular monitoring and periodic reviews of the system, so that deficiencies are corrected within a reasonable timescale and the system continuously improved in the light of experience gained.

Individual employees of the health sector are expected to exercise reasonable care to protect themselves and others who may be affected by their actions or inactions.

In order to avoid any injuries, transmission or infection of people, health care waste handlers must:

i. Co-operate in matters of health and safety.

ii. Correctly use personal protective equipment and any other work equipment designated for the task.

iii. Correctly apply the information and training received at induction and subsequently in handling issues such as:

- Taking all necessary measures to ensure that re-usable containers are effectively disinfected before re-use.
- Providing adequate service storage areas for health care waste.
- Making provision for minimal manual handling of health care risk waste by ensuring that tools and equipment to facilitate handling are in place.

iv. Report any perceived hazards in their working environment or deficiencies in the safe system of work to their manager.

v. In the event of an injury arising out of waste handling, it must immediately be reported to the relevant manager or supervisor and action taken based on the infection prevention, OHS and HIV / AIDS policies of the sector.

10.1. Record Keeping and Documentation

Each health institution is required to maintain records of its waste management. In addition to stores and logistics management records at the institutional level issues regarding the type of waste, where it is generated, when separated, by whom and every other subsequent action until final disposal or handing over to an accredited waste disposal company, when such is the case, shall be documented. The following are important specific information which should be documented by each institution:

i. Information on Waste types and Handling Processes
   - Date.
   - The type and volume/ weight of waste generated;
   - The waste stream and volume/weight of waste generated;
   - The type, origin and weight of waste received from other health care facilities (in cases where treatment facilities are shared);
   - The means of transportation, type and volume transported;
   - The particulars of the commissioned waste contractor (name of company, type of license, site of treatment and/ or final disposal);
   - Treatment method and quantities per method: e.g. volume incinerated, volume at every point of intermediate treatment,
   - On-site Disposal Methods, i.e. volume finally disposed of.

ii. Records of environmental performance for incinerators should also be sent to the above authorities every six months and other regulatory agencies such as EPA.

iii. The DHMTs and RHMTs shall ensure record compilation and analysis by the health facilities under their jurisdiction.

iv. The health institution shall keep these records for a minimum of 5 years, before being sent to the archives. Monthly returns shall be prepared and submitted to the District Assembly.

Besides this, annual reports shall be prepared by each health institution and copies sent to the representative EPA Regional office and District Assembly of the institution. The annual report must also contain a section on waste management.

10.2.Enforcement and Compliance

Health Facilities Regulatory Agency (HeFRA) shall ensure enforcement and compliance with legislations. The internal activities of the health facilities that can compromise on quality of service delivery are therefore expected to be monitored by the Agency as part of their regulatory activities. The Agency shall therefore monitor operational activities of healthcare facilities as set out by

Act 829 to ensure the safe management of health care waste within health facilities.

District Assemblies shall assign responsibility for monitoring and controlling health care waste management activities outside the hospitals to the Environmental Health and Waste Management Department, with the aim of establishing long-term sustainability in health care waste management. The Environmental Health Staff of the District Assemblies shall ensure compliance with the following:

- Segregation (sharps, pathological, other hazardous and radioactive waste from other waste). Posters shall be used to facilitate identification.
- Approved collection routines, including packaging and labelling.
- On-site treatment procedures like sterilisation, disinfection and incineration. It should be ensured that the incinerator plant continually bums its materials at 850 degrees and above to eliminate the release of dioxins.
- Use of appropriate, labelled and adequate containers for both internal and external storage.
- Transportation, including technical standards and certification of contractors.
- Worker safety measures.
- Disposal at sanitary landfills, cemeteries and crematoria.

11. TRAINING AND CAPACITY BUILDING

Capacity refers to the capabilities (knowledge and skills) available to the health care facility for health care delivery. It includes a mix of technical and managerial capacity required to promote, protect and improve health. It is essential that the right calibre of personnel is recruited to supervise waste management activities in the health facilities. It is essential that training in the safe and correct management of health care waste is provided to health care workers and waste handlers.

Health facilities should:

i. Develop training materials on health care waste management to facilitate pre- service and in-service training. The material should be easy to understand and not too technical to confuse people.

ii. Incorporate health care waste management in pre-service and in-service training of health workers. Orientation programmes for newly recruited staff of health facilities should include health care waste management to prepare new staff for the job. Annual training programmes should include health care waste management to re- enforce the proper health care waste management practices in old staff.

iii. Ensure all staff undergo in-service training in health care waste management. To help ensure uniformity in health care waste management practices, provision should be made for all categories of staff to be trained in-house. Those who may exempt themselves due to one challenge or the other should be covered under special training.

iv. Communicate Standard Operating Procedures and national HCWM guidelines to all persons involved in HCWM. All facilities should have a copy of the national standard operating procedure (SOP) to guide staff in performing specific task related to health care waste management. Sample pages may be pasted on the wall close to where the activity is normally performed to remind staff of the procedure and requirements.

v. Ensure that health facilities recruit personnel with requisite qualification and experience in the relevant field to manage health care waste. Staff with responsibility to manage health care waste should have at least a diploma in Environmental Health but degree in any relevant field is preferable. The relevant shall include environmental science, biomedical waste engineering, water supply and environmental sanitation, environmental engineering, etc. those with day to day responsibility of handling stored waste (Orderlies) shall have completed Junior High School or Middle School. Those with secondary school or O-level certificate shall have more advantage to be recruited.

vi. The major generating departments should have a training program for all staff who may generate or handle infectious and hazardous materials. Training should include:

- Hazards from infectious waste (biological hazards)
- Chemical hazards.
- Spill prevention.
- Preventive maintenance
- Emergency preparedness and response, including spill clean-up

12. WASTE MANAGEMENT PLANS/IMPLEMENTATION ARRANGEMENT/ STRATEGY

12.1. Introduction

Each facility should develop a waste management plan which should detail internal written procedures for handling health care waste. A checklist of what such a waste management plan or procedures should contain is found in Appendix 7.

Each health care facility must prepare and implement a waste management plan. The plan should set out procedures for the proper management of health care waste in terms of minimisation, generation, segregation and labelling, packaging, storage, transportation, treatment and disposal. The plan should also address issues of management and the allocation of resources.

Surveys on the generation of waste will be the basis for identifying opportunities and setting targets for waste minimisation, reuse, recycling, reduction in cost and the potential liabilities associated with handling, transport and disposal.

Each facility shall develop a contingency plan to provide guidance to waste management and other staff as well as visitors to facilities on measures to be implemented in the event of unexpected incidents. This plan is to include among others measures to manage spillages, fire, flooding and other hazards peculiar to the locality.

Health care waste management involves more than one sector. Inter-sectorial collaboration is therefore necessary for the effectiveness of the implementation of the programmes since the key players come from different ministries with their individual command structure. Various emergency/contingency plans should be in line with the national Chemical Biological Radiological and Nuclear (CBRN) emergency response plan.

12.2. Levels of Health Care Waste Implementation

The following constitute implementation actions to be instituted at various levels of the health care system:

12.2.1. Institutional Level

At the institutional level, each facility shall establish a HCWMC preferably led by the head of the institution to supervise advice and manage HCW.

The membership of the HCWMC shall comprise the Head of the institution, the Environmental Health Officer and three other senior officers (preferably Heads of relevant departments involved in generating or handling waste in the facility).

12.2.2. District Level

At the district level, DHMT will have responsibility for co-ordination and supervision of HCWM.

12.2.3. Regional Health Directorate

The regional health directorate shall be responsible for coordinating supply of logistics from Ghana health Service or other agencies and donors for distribution to health facilities for effective health care waste management. There shall be a committee from the regional health directorate to monitor the management of health care waste at all facilities annually. The directorate has the overall responsibility to collate health care waste management data for health facilities in the region. The Regional Occupational and Environmental Health Unit (OEHU) will provide the technical support for the implementation of the HCWM guidelines to ensure that all the occupational and environmental health concerns are properly addressed at the regional levels.

12.2.4. Regional and Teaching Hospital Level

At the regional and teaching hospital level, Clinical Care Units will have the overall responsibility for ensuring the implementation of the policy.

12.2.5. National Level

At the national level, the Ghana Health Service (GHS) will be responsible for monitoring the implementation of the policy among the various sub sectors across the country. Within the GHS, the Institutional Care Division (ICD) will have ultimate responsibility for implementation of infection prevention from HCWM. The Estate Management Department (EMD) of the Health Administration and Support Services (HASS) will assume day to day responsibility for coordinating waste management activities, ensuring that treatment and other related facilities are in functioning order and in the monitoring and supervision of the estate units within health facilities. This role will be performed in close co-operation with the ICD. Occupational and Environmental Health Unit (OEHU) will provide the technical support for the implementation of the HCWM guidelines. Together with the ICD and EMD will monitor the implementation of the guidelines at all levels.

12.3. Responsibility for HCWM Implementation

The MoH has ultimate responsibility for the implementation of these guidelines which are meant to provide guidance for the health sector as a whole. Each sub-sector namely, the Ghana Health Service, the Teaching Hospitals, Quasi-Government Hospitals, Mission Hospitals and the Private Sector Health Institutions are expected to comply with the provisions of the guidelines.

There are other ministries apart from the MoH, which play complementary roles in the management of health care waste. These include the Ministry of Sanitation and Water Resources, the Ministry of the Environment, Science, Technology and Innovation, Ministry of Local Government and Rural Development, Ministry of Defence, Ministry of Interior and the Ministry of Food and Agriculture. The

guidelines are, therefore, meant to dovetail the plans and responsibilities of these Ministries. Thus, whilst the MoH through the individual institutions is responsible for segregating, storing and treating HCW, the /metropolitan/ municipal/ district// assemblies under the Ministry of Local Government and Rural Development/ Ministry of Sanitation and Water Resources have to ensure that the waste is transported and disposed of in the appropriate manner. In practice therefore, the health institutions' responsibility translates into the proper segregation and labelling, treatment where possible and transport to the transit point. The metropolitan/ municipal/ district assemblies have to ensure that there are well trained and effective companies in the system to do the transportation and where necessary treatment and disposal.

Resources, the Ministry of the Environment, Science, Technology and Innovation, Ministry of Local Government and Rural Development, Ministry of Defence, Ministry of Interior and the Ministry of Food and Agriculture. The guidelines are, therefore, meant to dovetail the plans and responsibilities of these Ministries. Thus, whilst the MoH through the individual institutions is responsible for segregating, storing and treating HCW, the metropolitan/ municipal/ district/ assemblies under the Ministry of Local Government and Rural Development/ Ministry of Sanitation and Water Resources must ensure that the waste is transported and disposed of in the appropriate manner. In practice therefore, the health institutions' responsibility translates into the proper segregation and labelling, treatment where possible and transport to the transit point. The metropolitan/ municipal / district assemblies must ensure that there are well trained and effective companies in the system to do the transportation and where necessary treatment and disposal.

12.4. Health Care Waste Management Committee

Proper management depends on good administration and organisation, financing and active participation of trained and informed staff. There is the need to form a Waste Management Committee to develop the waste management plan. In larger institutions, the committee shall comprise a Chairman and several members, including the following:

- Head of the Health Institution- Chairman
- All Departmental Heads
- Infection Prevention and Control Officer/Hygienist
- Radiation Control Officer
- Matron/Sister I/C
- Finance Manager
- Waste Management Officer/Environmental Health Officer or Public Health Officer
- Union Representatives of the Local Community.
- Representative of the Civil Society where available

In smaller facilities or establishments that are not directly involved in patient care, such as laboratories, the head of establishment should use his discretion to appoint the members of the HCMWC from among relevant staff.

The functions of the committee shall be to:

- Develop a waste management plan for the facility which will be integrated into the daily operations of the health institution
- Ensure that all on-going projects have made room for waste disposal system
- Consider and advise the management of the health care facility on all aspects of health care waste management within the health care facility
- Inspect health care waste generating points to ensure that waste 1s managed m accordance with acceptable standards of environmental sanitation
- Advise hospital management on measures to prevent epidemics which could emanate from HCW mismanagement

12.5. Assessment of Waste Generation

The aim and scope of assessment needs to be clearly identified at the planning stage. In order to develop a waste management plan, the Health Care Waste Management Committee needs to assess all waste generated in the health institution.

The waste management officer should be responsible to co-ordinate and analyse the results which shall include the following:

- Categorise waste according to the classification specified in this guideline.
- Determine average quantity of waste in each waste category. (Refer to sample form for assessment of waste generation in appendix 1)
- Waste management financing
- Infrastructure and future expansion
- Data collection and compilation

12.6. Development of the Plan

The HCW management team shall base the waste management plan on the assessment report. Members should:

1. Review existing waste management arrangements m their respective areas of responsibility
2. Evaluate existing practices in accordance with this guideline
3. Develop a draft HCW management plan for discussion, addressing the following:
   - Present situation (HCWM practices, personnel, equipment, logistics, etc.)
   - Quantities of HCW generated;
   - Possibilities of HCW minimisation, reuse and recycling;
   - HCW segregation and potential hazards;
   - Internal Handling and storage. Transport of HCW.

- Identification and evaluation of external HCW transportation, treatment, disposal options and associated costs;
- Record keeping;
- Training needs of staff;
- Estimation of costs relating to HCW management
- Strategy for implementation;
- Consultation with contractors;
- Security measures;
- Management information systems; and
- Procurement programmes.

Note: Officials from the District Assembly and other agencies responsible for health care waste management should be invited to assist in the development of the HCW management plan (See appendix 7 for sample HCWM plan).

12.7. Implementation of the Plan

In implementing the plan, the following steps shall be considered:

- Develop work plan (weekly, quarterly and annual)
- Occupational safety activities and measures
- Finance and budgeting
- Procurement programme
- Acquisition of consumables and equipment
- Training of all staff
- Monitoring and evaluation
- Preparation of annual reports
- Annual review of plan

12.8. Financing

Each health institution is financially liable for the safe management of the HCW it generates. Health Care Facilities therefore need to assess the costs of HCW management and how these can be reliably met. Costs can be divided into several categories as follows:

1. Capital costs which comprise equipment acquisition and installation. Recurrent costs:
   a) Labour and supplies for segregation and labelling, collecting, packaging and handling, internal treatment and storage
   b) Operation and maintenance of equipment and facilities

2. Provision of services by contractors who provide services like external transport, treatment, recycling or final disposal of HCW.

Each of these cost build-up elements must be separately estimated, based on actual data rather than guesswork or a simple factoring of the previous year's budget. In order to gather such data, detailed and accurate accounting records must be kept and analysed regularly. Hidden costs such as depreciation should also be taken into account, especially where a service is to be undertaken by the private sector.

Once costs for the planning period are estimated, a financing plan should be drawn up. This must be realistic and achievable. Because HCW management must be done reliably and continuously, it is not advisable to rely on subventions from local or national government, but rather on internally generated fund by the health care facility itself.

However, alternative sources of funding may be needed for major investments. Such funding may be solicited from the following:

- Private sector
- Central government
- Multilateral/Bilateral Donors
- NGOs

12.9. Recommendations on Cost Reduction

Cost reductions can be achieved by taking particular measures at different stages in the management of HCW:

Comprehensive Planning

- Development and implementation of a comprehensive health-care waste management strategy, within the framework of the facility's waste management plan, which includes the recommendations below.
- Planning collection and transportation activities in such a way that all operations are safe and cost-efficient.
- Possible co-operative use of regional transportation, treatment and disposal facilities, including private sector facilities, where appropriate.

On-site Management

- Comprehensive management of chemicals and pharmaceuticals stores
- Substitution of disposable medical care items by recyclable items
- Efficient segregation of HCW to avoid costly or inadequate treatment of HCW.
- Improved HCW categorization to simplify segregation and labelling, treatment, and recycling.

Measures at Personnel level

- Establishment of training programmes for workers to improve productivity (quality and quantity of work)
- Protection of workers against occupational risks and hazards (e.g., Provision of PPE)

Choice of appropriate treatment or disposal method

- Selection of a treatment and disposal option that is appropriate for waste type and local circumstances.
- Use of treatment equipment of appropriate type and capacity

Documentation

- HCW management cost documentation, assessment and evaluation makes it easier to identify priorities for cost reduction and to monitor progress in the achievement of objectives.

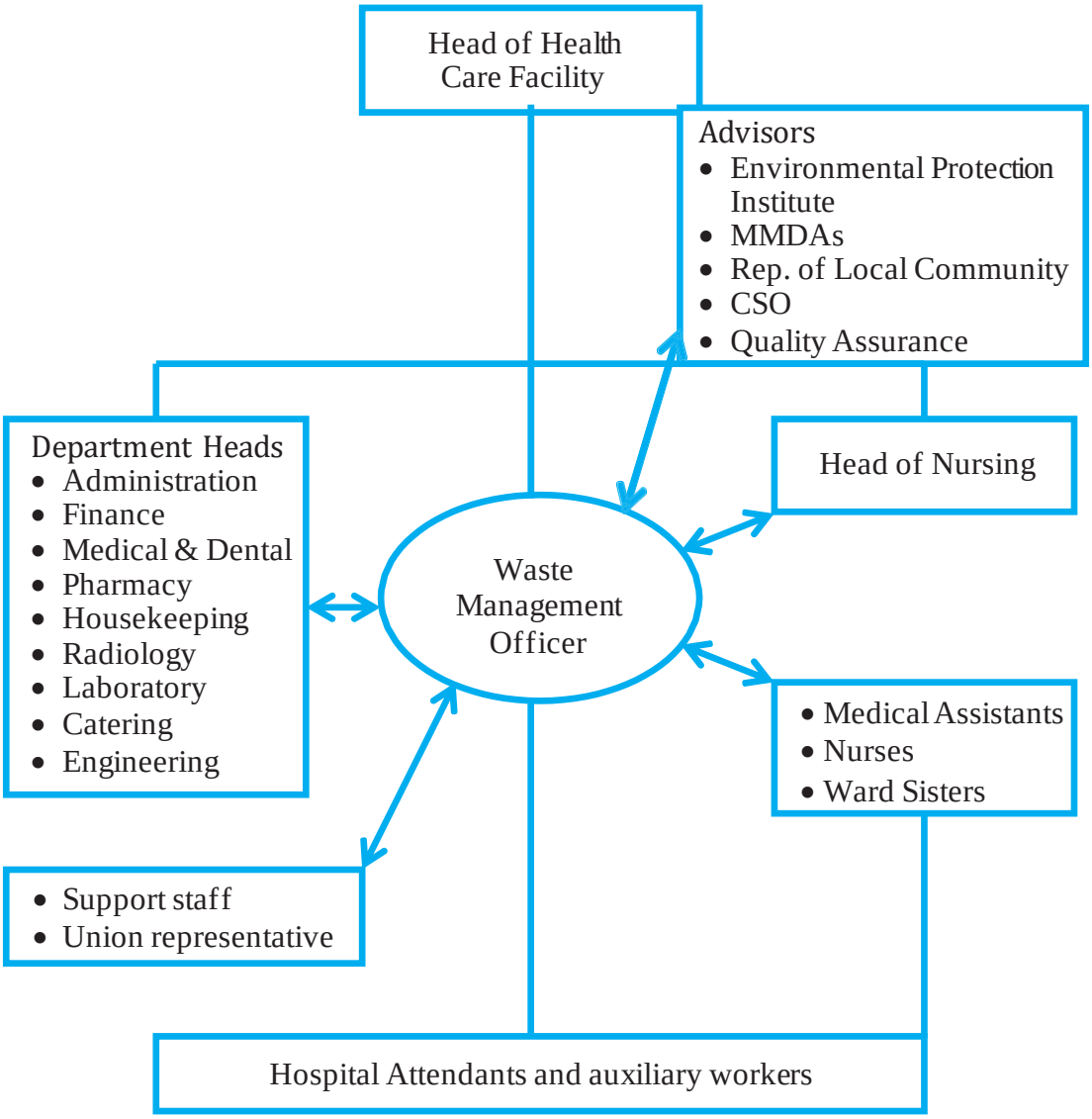


Figure 3: Typical Waste Management Structure for a Health Institution

13.MONITORING, AUDITING AND REVIEW

13.1. Monitoring

The objective of monitoring and control is to ensure that problems and risks involved in

HCWM are identified while preventing the development of future problems and enhancing safety.

Monitoring and review are very critical functions for the effective implementation of any programme. No matter how well a programme is planned and implemented, there are chances that some details may be overlooked.

Effective control of HCW and monitoring of activities and operational state of facilities should be carried out regularly and systematically, in order to maintain and improve its management. Measures should be adopted to ensure that problems and risks involved are identified and pre-empted while enhancing safety.

Though the HCWM committees are to advise on the on the management of HCW, daily supervision is to be carried out by the HCW control manager (line manager of labourers and auxiliary staff involved in HCW management) who in tum is answerable to the head of the institution. The institutional heads therefore have overall responsibility for ensuring that procedures are in place, are being implemented and sanctions enforced where appropriate. They are expected to work closely with the HCWM committee which they (or their representative) chair and conduct regular spot checks to ensure compliance.

In addition to daily and weekly inspections of procedures, the following parameters are to be monitored:

i. Adherence to Standard Operating Procedures (SOPs) which help to operationalize these guidelines for persons involved at each stage of handling waste should be monitored frequently by supervisors in the health facility, by the DHMTS and the RHMTS. The SOPs cover areas like HCW minimization, segregation and labelling, transportation, storage, treatment and final disposal. In addition, it should cover the disinfection of reusable health care risk waste containers based on standards for disinfection as required by this guideline.

ii. Minimum environmental performance requirements for controlled combustion treatment facilities like incinerators should be carried out at the onset of use of the facility and at least once yearly based on guidelines to be provided by the EPA and Operations and Maintenance (ONM) advice of the equipment manufacturer

Where it may be considered more effective to conduct these determinations centrally, arrangements should be made to organize testing from the national level.

Good supervision and monitoring, as processes are underway are critical in addition to post audits, to assure the discovery of errors and their correction in good time. They also provide the opportunity to review the plans as well as training programmes in order to make them more effective. Periodic reviews are also important in assessing program impact. Thus, the effectiveness of the programmes will be assessed from both the point of view of management processes and programme impacts.

13.2. Auditing

13.2.1 Periodic Internal Management Audit

Each regional directorate should arrange to carry out its own internal audit on HCW management practices in their facilities at least once annually, and follow up any serious incident which is relevant to HCW management procedures. This is in an effort to amend procedures where appropriate in order to improve the management of the HCW. The results of the audit should be forwarded to GHS / MOH headquarters and communicated to health institutions involved.

13.2.2 External Random Audit

Random audits on HCW management will be carried out each year by the GHS / MOH which may delegate the Occupational and Environmental Health Unit, Institutional Care Division or other appropriate department to carry out this function on its behalf.

Additionally, audits offered by audit bodies external to the GHS/MOH will be encouraged, to facilitate objective evaluations which favour comparisons with international norms on HCW management.

13.2.3 Audit Tool

Audit tools designed for measuring compliance with clinical waste procedures should be used for audits. An example of such an audit tool is found at Appendix 2, and standard indicators that can be used to supplement the audit tool can also be found in appendix 3.

13.3 Reviews

There should be a review of the performance of the HCWM programme two years after the launch of the policy and at the end of the fifth year to assess the compliance and the impact of the programme. These reviews will use the findings of studies conducted on HCW practices in the hospitals as baseline and will assess the progress of the programme against the key indicators established. The types of waste disposal methods in use, emissions from incinerators and whether the composition meets the standards set by the relevant authorities and other issues will be tracked.

APPENDIX 1: SAMPLE FORM FOR ASSESSMENT OF WASTE GENERATION

Name of the Health Care Facility …… Month…….Week…….

Town/Village ……District …….……

Region …….

Waste Collection Point	Waste Category (Specify)	**Quantity of Waste Generated per Day (Weight and Volume)**													
		Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday	
		Kg	Litre	Kg	Litre	Kg	Litre	Kg	Litre	Kg	Litre	Kg	Litre	Kg	Litre
Total/Vol/Wt															

APPENDIX 2: CLINICAL WASTE AUDIT TOOLS

S/N	CRITERIA	Y	N	N/A	COMMENTS	REMEDIAL ACTION
1.	The waste Management Policy is available to staff.					
2.	The Policy on the safe disposal of immunization waste is available to staff					
3.	Waste Management Posters are on display					
4.	Broken glass and crockery are disposed of in a safe manner, according to local arrangements.					
5.	Used batteries are segregated for 'Special Waste Collection'					
6.	Cardboard boxes are stored flat, in a safe manner, prior to collection.					
7.	Waste bins are foot operated and in good working order, and lined with the correct colour bag.					
8.	Waste bins are in clean condition.					
9.	Waste bins are correctly labelled, and display additional information to users, where appropriate.					
10.	Contents of yellow bags are appropriate.					
11.	Contents of black bags are appropriate.					
12.	Contents of red bags are appropriate.					
13.	Contents of brown bags are appropriate.					
14.	Waste bags are securely sealed when ¾ full and correctly labelled.					
15.	Bags waiting for collection are safely stored away from the public					
16.	If heavy gauge bags are required, an appropriate cord tie is used to secure the bag					
17.	Random member(s) of staff understand the waste Management Policy					
18.	Records on HCW types and quantities collected for disposal					
19.	Records on external transportation are kept					
20.	Feedback information on external treatment and final disposal sites are kept					

(Sharps Packaging and Storage)

	CRITERIA	Y	N	N/A	COMMENTS	REMEDIAL ACTION
1.	The box used is as specified in the safe Use and Disposal of Sharps Policy					
2.	The box is assembled in accordance with manufacturer's instructions					
3.	The sharps container is safely sited in a suitable position (chosen by risk assessment) for convenient use, but inaccessible to young children					
4.	The sharps container is filled according to the manufacturer's instructions.					
5.	The contents of sharp boxes are appropriate.					
6.	The sharps container is free from protruding sharps					
7.	The sharps containers are available according to local needs.					
8.	The sharps containers are labelled with ward names / number, and dated when full					
9.	Full sharps containers are securely fastened prior to collection					
10.	Full sharps containers are safely stored prior to collection.					
11.	Correct responses obtained from a random member of staff, to the question: "What action would you take following a needle stick injury?					

APPENDIX 3: MEASURABLE STANDARDS/INDICATORS FOR MONITORING

A. Internal Packaging and Storage

Separation of waste (at point of generation)

1. Storage bins / bags
    - Siting (proximity, security, and safety)
    - Size and capacity
    - Number (every point of waste generation must have a bin)
    - Specifications / required storage conditions
    - Labelling / coding
1. Frequency of HCW removal
2. Keeping of relevant records

Compliance with existing regulation

B. External Packaging and Storage

1. Segregation of waste
2. Storage area
    - Siting (proximity, security, safety, accessibility)
    - Capacity of area to receive off-site waste as well)
    - Capacity of bins
    - Marking of area with relevant caution sign (e.g. biohazards sign)
    - Labelling and coding at the storage area
    - Ventilation
    - Refrigeration facility temperature not more than 4° C for type C waste
3. Other provisions
    - Drainage facility
    - Washing facility
    - Provision of spill kits and protective clothing
4. Frequency of waste removal
    - Amount of waste generated per day
    - Marking of area with relevant caution sign (e.g. biohazards sign)
    - Labelling and coding at the storage area

5. Documentation
6. Compliance with existing regulation

2. External Transportation
3. Identification of HCWM contractor (accredited or certified)
4. Conditions for transportation
    - Non-compaction of waste
    - Vehicles should have bio-hazard marks
5. Equipment/vehicles (to prevent scattering, spillage, odour nuisance and leakage).
6. Compliance with existing regulation

C. External Treatment and Disposal

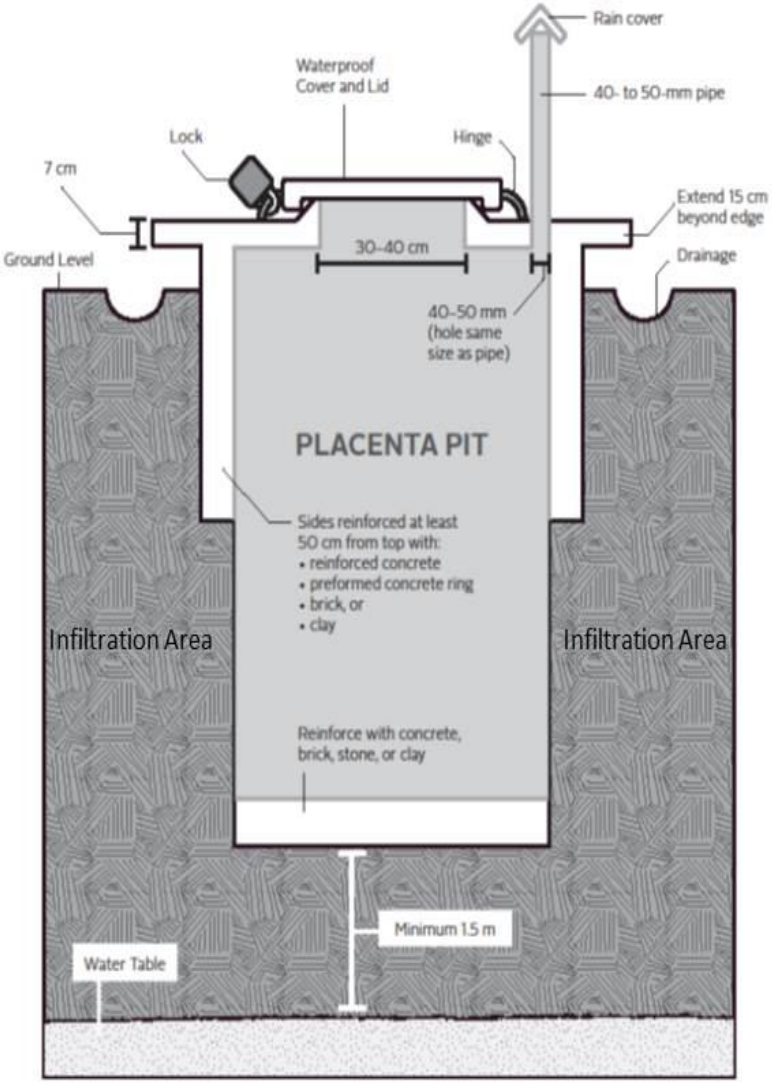
1. Incineration
    - Temperature of chamber
    - Provision of exhaust
    - Provision of gas treatment equipment
    - Disposal method of residue
    - Operation and maintenance
    - Proper records/documentation
    - Compliance with existing regulation
2. Sterilisation and Disinfection by Heat
    - Temperature of autoclave
    - Period of sterilisation
    - Pressure of steriliser (for steam)
    - Adequate records: recording of used of chemical indicator showing the efficient decontamination
    - Regular maintenance / replacing of filter etc.
3. Chemical disinfection
    - Provision of shredder
    - Disposal of chemical liquids
4. Sanitary Landfill
    - Separate cells for different hazardous wastes
    - Covering with chlorinated lime and soil
    - Marking of each cell
    - Fencing of each cell in landfill area
    - Adequate records

- Control of scavengers
- Documentation
- Compliance with existing regulation

D. Administration

1. Establishment / functioning of a Waste Management Committee
2. Availability of waste management plans
3. Collection and Analysis of data
4. Documentation (assessment and evaluation report, implementation review report)

APPENDIX 4: PIT FOR PATHOLOGICAL WASTE



APPENDIX 5: PIT FOR ASH FROM INCINERATION

The design of the ash pit should conform to guidelines prescribe for the pathological pit. It should however be sealed to prevent leaching of heavy metals into groundwater resources.

Details of ash pit are as follows:

- Size of the pit should be informed by the pathological waste generation rate of the facility.
- The pit should be completely lined to prevent leaching of hazardous substances into groundwater.
- Bottom of the pit should be at least 1.5 meter above groundwater level or water table.
- The top should be about 0.5 m high above ground level.
- The pit should be constructed with concrete or blocks to line the soil and prevent caving in of the pit and the bottom line with concrete to slow the infiltration rate.
- The design can be rectangular or circular (1-2m diameter).
- The opening should be a movable slab.
- A vent pipe should be installed to allow for exchange of gases
- Fence the pit area to restrict access with lockable gate

APPENDIX 6: HAZARD SYMBOLS

Biological material

Radioactive material

Toxic material

Flammable material

Ultraviolet material

Non-Ionizing material

Oxidizing material

APPENDIX 7: SAMPLE HEALTHCARE WASTE MANAGEMENT PLAN

Name of Health Facility

Location Address

Tel:

Introduction

This document details out the plan proposed to address healthcare waste management issues in Jama Nkorso Hospital. The document has been prepared through consultation with expert in the field and based on operational activities to be carried out by the Hospital.

The document is very critical since it is a requirement by the Health Facilities Regulatory Authority (HeFRA) for obtaining permits to operate the health facility. It is also important because it is a
requirement by law to have a plan for managing health care waste as enshrined in the Hazardous and E-waste Management Act 2016, (Act 917) and Legislative Instrument (LI) 2250.

Improving Health care waste management will contribute to meeting Ghana's obligation towards achieving Goal 3- good health and well-being, Goal 6 -clean water and sanitation, Goal 11 on sustainable cities and communities, and Goal 13 - climate action.

Brief Profile of the health facility

Jama Nkorso Hospital is a privately owned hospital registered under the sole proprietorship arrangement of Registrar Generals regulation as required by Act 123. The hospital which was registered on the 24th June 2017 is yet to begin full operation due to some regulatory requirements which are dully completed. The hospital is considered as a primary hospital based on the classification scheme operation and service. The facility is established to provide general health care services such as OPD services, maternity, accident and emergency services, paediatric and morgue operations. The hospital is a 30-bed capacity with potential for expansion.

Organizational Structure

The hospital is headed by the Chief Executive who I the owner of the facility. Directly under him is the Medical Director who is responsible for all the clinical activities in the hospital, an administrator for the daily operation of the hospital head of nursing and unit heads. Unit heads report to their respective heads as Clinical or Administrative head.

Organization of HCWM in Health Facility

Waste management activities are structured under the administrative functions hence under the direct supervision of the administrator. There is an administrative officer who is responsible for housekeeping which includes waste management activities. Logistics have been provided for waste containment at the point of generation and clear responsibilities have been given to orderlies attached to the wards to see it their timely emptying at their wards. The hospital does not

have any treatment facility except pathological pit and therefore would engage the services of private waste company for waste collection, treatment and disposal.

Waste generation

Jama Nkorso Hospital is expected to generate both solid and liquid waste from the operational activities. The solid healthcare waste shall consist of the hazardous and non-hazardous waste categories. The hazardous materials would normally include the sub-categories listed as follows:

- Sharps - e.g., used needles, syringes, scalpels, surgical blades, etc.
- Pathological - e.g., placenta, body parts, etc.
- Infectious waste – e.g., laboratory cultures, stocks, blood specimen, blood socked cotton wool, soiled bedding materials, etc.
- Chemical waste – acids, bases, formaldehydes, hypochlorite, etc.
- Pharmaceutical waste – expired medicines, broken medicines in syrup forms, etc.

The non-hazardous or general waste expected to be generated are then recyclable (clean plastic bottles, papers, carton boxes, etc.) and non-recyclable (soiled plastics, papers, etc.)

a) Liquid waste
   - Wastewater from sinks, hand washing basins, wash rooms
   - Wastewater suspected to contain pathogenic organisms
   - Wastewater from toilet systems (Black water)

Estimated Quantities of Waste to be generated

- Sharps: It is estimated that about 20 litre of sharp waste shall be produced per week from operational activities.
- Pathological waste: Delivery rate is estimated to peak at 20 deliveries per week which should produce approximately 30 kg of placenta (1.5kg per delivery by 20 deliveries). The facility is not expecting frequent surgery activities therefore it is estimated that a total of 4kg of other pathological waste shall be generated, giving a total of 34 kg of pathological waste per week.
- Infectious Waste: The amount of infectious waste is expected to be minimal at 0.2kg/bed/day which shall be 6.0kg/day (0.2kg/bed/day by 30 beds). This should provide
- the types or categories of healthcare waste to be generated and their estimated quantities based on bed capacity of the facility. The type of waste should include liquid and solid waste.

Pharmaceutical waste shall be minimal because the dispensary unit will keep to first come first go principle to avoid drug expirations. Broken ones shall be returned to the suppliers if detected at the point of supply.

Waste segregation, containment, labelling and collection

The waste to be generated shall be segregated at the point of generation into specified colour coded bins with liners in conformity with the existing national guidelines on healthcare waste management. The hospital shall segregate:

- Sharps into puncher proof paper boxes or plastic containers of capacities 5 or 10 litres depending on their availability. The containers shall be well labelled for sharps and biohazard symbol embossed.
- Pathological waste into well labelled leaked proofed plastic containers with lid (5 litre capacity), with biohazard symbol. Red colour codes shall be used.
- Infectious waste into yellow lined containers or yellow containers with yellow liners as the case maybe at the wards using 40 -80 litre waste bins. The container shall have the biohazard symbol embossed and infectious waste boldly written on the containers. The same colour code shall be followed for storage outside the wards. However, when highly infectious wastes are generated (e.g., Ebola waste) it shall be segregated into red colour coded bins with red liners with inscription "highly infectious Waste" embossed with biohazard symbol.
- Chemical waste into leak-proof containers with covers and type of chemical waste clearly indicated (e.g., "Chemical waste – acids",). The appropriate hazard symbol shall also be embossed to warn handlers of the danger.
- Pharmaceutical waste into brown coded waste bins with "pharmaceutical waste" boldly written and the appropriate hazard symbol embossed. The bins shall be lined with brown plastic material to continue the chain of segregation.
- General waste into black colour coded bins with black plastic liners throughout the wards and outside the wards. Waste bins of 40-80 litre capacities shall be used at the wards and 120-240 litres shall be used outside the wards. The bins shall be clearly labelled as general waste.

The segregated waste which is packaged in the colour codes described above shall be collected at different frequencies depending on their type and quantities. However, the hospital shall follow the following plan for collection:

- Sharps shall be collected from the wards when packaging containers are ¾ full
- Pathological shall be collected after each shift of operation (twice per day).
- Infectious waste shall be collected from the wards twice a day (morning and evening) and emptied into the large containers which shall also be emptied daily.
- Chemical waste generated from the laboratory and are not diluted into the sinks shall be collected monthly depending on the quantities. Expired ones shall be collected annually in collaboration with the Chemicals Management Unit of Environmental Protection Agency (EPA).

- Pharmaceutical waste shall be collected every six months for destruction in collaboration with Stakeholders such as Food and Drugs Authority, EPA, District Assembly and certified Waste Treatment Company.
- General waste shall be collected from the wards twice a day (morning and evening) and emptied into the large containers which shall also be emptied daily.

Collected waste will be stored within the hospital compound for three days before collection by private service provider for transportation to treatment site. The location of waste storage area within the facility compound shall be well fenced and shed provided to protect the waste from the rains and also prevent unauthorized access. The location of the storage area is clearly shown in the building plan of the hospital as appendix 1.

Waste minimization strategy

The hospital will adopt range of actions to reduce the quantity of waste to be generated by the hospital in line with waste minimisation concept. To achieve this the following shall be pursued:

- Waste reuse - some waste product generated from the facility shall be reused to minimize the amount of waste. This shall include reuse of wash bottles, paper carton for storing recyclable bottles and papers.
- Recycling - Plastic bottles, clean papers and carton boxes shall be segregated and sold to recycling companies or middle men interested in recycling such materials. Used bottles with non-hazardous chemical and infectious agents shall be sold to reduce waste quantities.
- Review Clinical Procedures: clinical procedures that can be avoided to reduce waste generation shall be employed in routine practice. Example, where medicines can be administered to avoid the use of sharps it shall be preferred to reduce the waste generated.
- Procurement Process: Procurement practices shall be reviewed to favour items that have multiple uses.

Treatment and disposal

Jama Nkorso Hospital has not gotten the financial outlay to acquire and install an ultra--modern healthcare waste treatment technology currently. The hospital plans to do this investment in the next five years.

- However, waste such as the pathological waste shall be treated using the placenta pit located on-site. The placenta pit is constructed lined pit with a designed life of 10 years. This means it has high capacity to accommodate any increase in pathological waste within the next five years of operations.
- The hospital shall contract the services of Zoompak Ghana Limited to provide haulage and treatment services for the first five years of operation. The Company which has the

certification for transporting and treating healthcare waste uses non- incineration treatment technology. Specifically, the company uses autoclave for treating infectious waste. The disposal shall be done at the municipal waste disposal site in the Municipality.

- Chemical waste transportation, treatment and disposal shall be is contracted to ZEEL Treatment Solutions. The company which has the approval to treat chemical and hazardous waste is operating an ultra-modem catalytic combustion process.
- Pharmaceutical waste shall be collected every six months for destruction in collaboration with Stakeholders such as Food and Drugs Authority, EPA, District Assembly and certified Waste Treatment Company. The services shall also be contracted to ZEEL Treatment Solutions
- Wastewater with faecal matter (Black water), wastewater from the wards and hand washing basins shall be collected through the under-drain system and channelled into waste stabilization ponds to be sited on the hospital premises. The wastewater treatment technology is natural, inexpensive but requires land availability. It is able to deal with both pathogenic, organic and other wastewater contaminants.

Required materials and Human Resources

To efficiently handle all the categories of waste to be generated, a number of logistics shall be required. These include consumable and non-consumable items. Consumable items such as sharp containers, colour coded plastic liners, waste segregation posters, printed biohazard symbols, disinfectants and detergents shall be required. Other consumable items shall be needed for the occupational health and safety practices of workers. Non-consumable items such as waste bins of various capacities usually, 5L, 40 - 80 L, 120-240 litre bins shall be required at wards and outside the wards. These shall reflect the colour for the storage of the various categories of waste to be generated by the hospital.

A total of ten workers shall be employed for the housekeeping activities at the hospital. They shall run two shifts of eight working hours per day. Those to be recruited for the work shall be senior high school graduate or technical equivalent that should be able to read and write.

Responsibilities of Staff and Clients

The Housekeeping officer shall be responsible for supervising the ten-housekeeping staff. The housekeeping staff shall be responsible for handling waste generated at the various wards and units, collection from the outside the wards to the waste storage area. The weeding and cleaning of the compound shall be assigned to such staff that shall be rotated. Those handling the waste shall be responsible for changing waste bin liners, removal and cleaning of the waste bins. They shall also be responsible for the disposal of the placenta and pathological waste into placenta pit.

Clients visiting the facility shall be educated on waste segregation and disposal requirements by

the OPD and ward in-charges. Patients' caregivers shall be sensitized to contribute to safe management of healthcare waste in the facility.

Occupational Health and Safety Requirements

Health and safety of staff is very important to Jama Korso Hospital's operation, hence proper attention shall be paid to all staff. The various category of waste generated present their inherent hazards. For the various categories of waste, the underlisted are the hazards and safety measures.

Table 7: Waste type, hazards and safety Measures

S/N	Waste category	Associated hazards	Safety Measure
1	Sharp waste	Needle pricks injury, infection transmission	Avoid recapping of needles Use puncher proof box Use PPE
2	Pathological waste	Ethical objections, could be infectious	Store in
3	Infectious waste	Transmit infectious agents	Always use PPE. Contain in prescribed colour coded bins
4	Chemical waste	Bums, irritations, etc.	Always use PPE
5	Pharmaceutical waste	Toxic	Store in prescribed colour coded containers
6	General Waste	Attach rodents	Store safely and prompt collection

The hospital shall provide proper personal protective equipment for staff to meet their health and safety needs. Training shall be given on how and why to use the PPE, general safety

practices, fire safety and simulations. Awareness about the hazards of healthcare waste will be created through trainings and use of communication materials such as signage.

Those handling the healthcare waste shall be screened for Hepatitis B and vaccination shall be given to those who shall test negative. Those who will test positive will be supported to go for treatment.

Training requirements

All staff of the hospital shall be trained on healthcare waste management in general. Particular attention shall be paid to waste segregation, colour coding, labelling and packaging for all staff, as part of infection prevention strategy of the hospital. Waste handler shall be taking through all the waste management, hand hygiene and infection prevention. Refresher training shall be organised twice a year for all staff. This training shall be included in orientation programmes of the Hospital for new recruits and students on vacation internship or housemanship.

Financing

The capital and operational cost for managing healthcare waste shall be financed by the hospital. This shall cover the cost of consumables and non-consumable items required for the management of the healthcare waste. Funds shall be set aside monthly to replace worn-out non-consumable items like waste bins. Maintenances of placenta pit and other healthcare waste management related items shall be from the operations of the hospital.

It is estimated that an initial amount of GH¢13,000 shall be required for the first three months of operation to cover the cost of materials and services to be provided by the private companies. The estimated cost of installing ultramodern treatment facility in the hospital is GH¢120,000. This shall be acquired through borrowing and savings from the hospital's operations for the next five years.

Record Keeping and Monitoring

Effort shall be made to gather data on quantities of waste generated from each unit or ward for the different types of waste. This will help the hospital to plan for waste minimisation initiatives and see which areas will require more effort and support. The data collected shall be used to inform management decisions on healthcare waste management and serve as monitoring data for regulating institutions.

Regular monitoring report shall be produced by the Housekeeping Officer of the hospital to management. Management shall also undertake weekly inspection at the various wards, units and waste storage areas to assess the state of waste management in the facility. Reporting on healthcare waste management shall be an integral part of the annual report of the hospital.

Implementing plan/ strategy

Implementation shall begin as soon as the operating permits and licences are secured by the hospital management. However various activities shown in the Table 2 shall be followed to ensure proper healthcare waste management at the hospital.

Sample Action Plan for HCWM

The following action plan is a rough guidance of the activities and responsibilities which should be elaborated. It is recommended to establish task groups / forces with different expertise in order to fulfil the comprehensive work in an effective way of high quality.

Goal: Contribute to infection prevention and Control in the James Town Health Centre through improved healthcare waste management

Table 8: Sample Action/Implementation Plan

Subcategory	Task	Resources	Timeline	Output	Responsibility	Cost GH¢
Objective 1: Keep up-to-date data on quantities and type of health care waste generated for the departments						
Sharps	• Weighing of waste at waste storage area • Recording of waste quantities					
Infectious waste	• Weighing of waste at waste storage area • Recording of waste quantities					
Pathological	• Records of numbers of birth • Weighing of body parts from surgical rooms					
Chemical and pharmaceutical waste	• Weighing of waste at waste storage area					
General Waste	• Weigh general non-recyclable waste • Weighing of general recyclable waste					
Objective 2: Ensure proper segregation and containment (60%) of waste at the point of generation						
Create awareness	Conduct 3 training sessions for clinical staff on waste generation, classification, color coding, segregation and storage Produce awareness creation posters					

Subcategory	Task	Resources	Timeline	Output	Responsibility	Cost GH¢
Objective 3: Ensure safe storage, collection and transportation						
Internal storage (sharp, pharmaceuticals etc.)						
External storage of various categories of waste (sharp, pharmaceuticals etc.)						
Collection and transportation						
Objective 4: Improve on HCW Treatment and Disposal practices of the hospital						
All infectious waste						
Chemical waste						
Pharmaceutical waste						
Cytotoxic waste						
[1] Radioactive waste						
Wastewater from facility						
Disposal of all treated and general waste						
Objective 5: protect the health and safety of staff						
Objective 6: Continuously build the capacity of staff in HCWM and IPC activities						
Objective 7: Monitor and evaluate HCWM implementation activities						

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