

# INTERNATIONAL JOURNAL OF PUBLIC HEALTH

© 2024 by the authors. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY 4.0) license.

## Challenges and Opportunities in Healthcare Waste Management in Malawi

Khairuddin Mohamed Yusof<sup>1</sup>, Salleh Mohammad Yasin<sup>2</sup>, Dato' Kew Siang Tong<sup>3</sup>

### Author Affiliations

1. University of Malaya, Malaysia

2. Universiti Kebangsaan Malaysia

3. International Medical University, Kuala Lumpur, Malaysia

### Abstract

Healthcare Waste Management (HCWM) is essential for protecting public health, safeguarding the environment, and ensuring safety within healthcare facilities. Although HCWM is globally recognized and aligned with several United Nations Sustainable Development Goals—particularly those related to health, sanitation, and environmental sustainability—it remains inadequately resourced in many countries, including Malawi. Malawi's healthcare system, encompassing both public and private sectors, has established regulatory frameworks and policies to guide HCWM, such as the Malawi Standards and the National Environmental Health Policy. This study aims to critically evaluate HCWM practices in Malawi by examining existing strengths and weaknesses, identifying key challenges, and proposing opportunities for improvement to promote a safer and more sustainable healthcare environment.

This study evaluates the nation's HCWM practices, identifies challenges, and recommends improvements to foster a safer healthcare system. The assessment of Healthcare Waste Management (HCWM) in selected Malawian healthcare facilities revealed inconsistencies in waste quantification, segregation, and treatment. Facilities exhibited unsafe waste transportation and storage, with prevalent use of inadequate incineration methods. Additionally, waste handlers lacked essential Personal Protective Equipment and were unvaccinated against Hepatitis B. Despite a comprehensive HCWM policy, notable gaps persist in the legal framework and practical application.

### Keywords

Health care waste, Bio hazards, Safety, Waste management policy, Capacity building

### Introduction

Healthcare Waste Management (HCWM) is a critical component of public health and environmental protection, as it ensures the safe handling, treatment, and disposal of waste generated in healthcare facilities (HCFs) [1]. Effective HCWM is vital for preventing the transmission of infections, safeguarding healthcare workers (HWs) and patients, and reducing adverse environmental impacts. In Malawi, as in many other countries, HCWM requires increased attention and strengthening to align with international standards and to adequately protect public health [2].

The healthcare system in Malawi is decentralized, comprising public, private for-profit (PFP), and private not-for-profit (PNFP) sectors. The public sector, including facilities under the Ministry of Health (MOH) and other government ministries, offers free healthcare services at the point of use. The PFP sector includes private hospitals, clinics, and traditional healers, while the PNFP sector is represented by religious institutions and non-governmental organizations.

The healthcare system is organized into primary, secondary, and tertiary levels, linked through a referral system. Primary-level care is provided by health surveillance assistants (HSAs) in communities, health posts, dispensaries, maternity clinics, health centers,

and rural hospitals. The secondary level consists of district hospitals and CHAM (Christian Health Association of Malawi) hospitals, providing referral services to lower-level facilities. The tertiary level comprises central hospitals, aiming to offer specialist health services at a regional level.

However, despite the critical importance of HCWM, its significance has often been under-recognized and under-resourced in Malawi. Effective HCWM can contribute to achieving several United Nations Sustainable Development Goals (SDGs), including good health and wellbeing (SDG 3), clean water and sanitation (SDG 6), decent work and economic growth (SDG 8), responsible consumption and production (SDG 12), and climate action (SDG 13) [3].

The significance of HCWM is well-recognized at the global level, and it aligns with various SDGs, contributing to improved health, sanitation, economic growth, responsible consumption, and climate action [4]. However, in many countries, including Malawi, HCWM has often been under-resourced, leading to adverse effects on the health of populations and workers. Proper HCWM is crucial for improving water quality, reducing pollution, and protecting the environment and public health [5].

Malawi has established regulatory frameworks and policies to guide HCWM practices [6]. Malawi Standards

(MS) 615: 2005, the Infection Prevention and Control Policy (2006) [7], the [8], and the National Environmental Health Policy 2018 [8] are some of the key policies and regulations that govern HCWM in the country.

The assessment of HCWM in Malawi is crucial to identify gaps and challenges in the current practices and develop effective recommendations for improvement. Implementing the suggested recommendations will contribute to a safer and healthier healthcare system for all in Malawi.

### Objective of the HCWM Assessment

This research aims to comprehensively evaluate the Healthcare Waste Management (HCWM) practices in Malawi by analyzing the existing strengths, weaknesses, and challenges. Key goals encompass

- Reviewing Malawi's regulatory and legislative landscape for HCWM and gauging its adoption.
- Documenting specifics of HCW including origin, type, and volume from sampled Healthcare Facilities (HCFs).
- Gauging current waste segregation standards in visited HCFs.
- Detailing HCW management practices, including transport, treatment, disposal, and relevant contractual engagements.
- Evaluating the prevailing training and awareness levels on HCWM among healthcare workers.
- Presenting cost implications related to HCW processes.
- Proposing enhancements for HCW segregation, treatment, and disposal in adherence to global benchmarks, with emphasis on primary healthcare facilities.

### Study Methodology

The study methodology for the Healthcare Waste Management (HCWM) assessment in Malawi is a combination of research and consultative approaches aimed at obtaining a comprehensive understanding of the HCWM situation in the country. Both qualitative and quantitative data were collected for the assessment. The following subsections describe the key elements of the study methodology:

**Desk-Based Literature Reviews:** Before and after the assessment, extensive literature reviews of relevant policies, codes of practice, and legislation related to healthcare waste management were conducted. This helped in gaining a better contextual understanding of the HCWM status in Malawi and informed the development and adaptation of data collection tools.

**Key Informant Interviews:** Key informants were engaged during the inception phase and the data collection process. Relevant stakeholders, including officials from UNICEF, the Ministry of Health (MOH), the Director of Sanitation, the Director of Local Government Services, and the EPI (Expanded program on Immunization) Manager at the national level, were interviewed. Key informants were purposefully selected based on their special roles, knowledge, and experience in HCWM in the country.

**Data Collection at Healthcare Facilities:** Data and information were systematically collected from selected healthcare facilities using the WHO RAT (Rapid Assessment Tool) for HCWM. The RAT, an internationally recognized questionnaire, was adapted

to the specific objectives and context of the assignment in Malawi. The tool comprises seven subject-specific subsections that allow for triangulating input from various stakeholders.

**WHO RAT (Adapted):** The core of the assessment was the WHO RAT for HCWM, which was enhanced and adapted to the Malawi context. Additional questions were added to capture data related to infrastructure, power supply, and space availability, which would aid in developing HCWM improvement recommendations and solutions.

**Stakeholder Engagement:** The assessment relied on the support and input of key HCWM stakeholders, such as the Ministry of Health, Ministry of Local Government and Rural Development, Department of Sanitation, EPI, and UNICEF. These stakeholders provided valuable insights and collaboration throughout the assessment process.

Assessment teams comprised experts from Crown Agents, representatives from District MOH (often the assistant Environmental Health Officer/HCWM focal of the district), and representatives from UNICEF Malawi. The teams visited 27 healthcare facilities spread across the country, covering rural and urban locations, over a three-week assessment period.

### Sampling Methodology

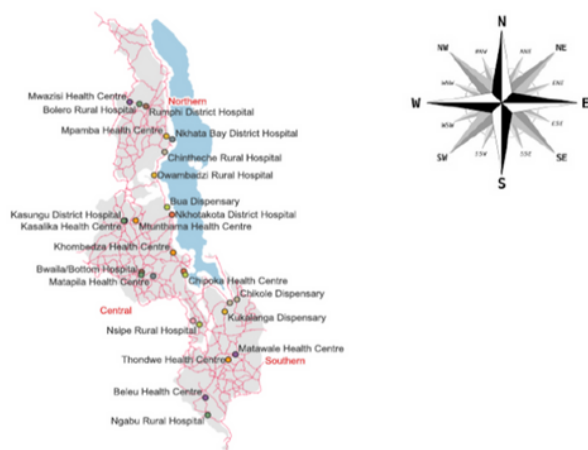
The scope of this assessment focused on primarily on facilities at primary healthcare level. This category consists of approximately 658 HCFs, which consisted of 29 district hospitals, 542 health centres and 87 dispensaries.

To form a representative sample using EVM sampling tool with 80% confidence, +/- 10% and a Rao Soft Statistical Sampling tool with 88% confidence, with 15% margin of error, we arrive at 26 facilities. However, with the time allocated for the assessment, 27 facilities were possible and assessed.

For the selection of the 27 facilities, the MOH, in consensus with UNICEF Malawi, the facilities were geographically equally distributed to ensure a regional spread throughout the country. The public HCFs ultimately selected for the assessment represented a range of services. Additionally, the HCFs selected for the HCWM assessment were located in both rural and urban locations and therefore provide representation from a socio-geographic perspective. It was also requested that some hospitals were included in the assessment to get an overall picture of HCWM throughout the healthcare system. The selected HCFs are made up of:

- Six (06) District/ Central Hospitals
- Eighteen (18) health centers including rural hospitals
- Three (03) Dispensaries

Overall, the study methodology and sampling allowed for a comprehensive assessment of healthcare waste management in Malawi, incorporating input from key stakeholders and ensuring representative facility selection across the country (Figure 1).



**Figure 1:** Malawi HCFs included in the HCWM Assessment, 2023.

### Data Analysis

During the assessment, the data and information gathered were deposited electronically into a central repository in MS Excel format. On completion of the assessment, the data was cleaned and structured in preparation for analysis in both MS Excel and Statistical Package for Social Sciences (SPSS).

Qualitative information provided by the key informants was analyzed through content analysis, which entailed the identification of common themes and issues for interpretation.

### Limitations of the study

Individual respondents at each HCF constituted the primary sources of data for the assessment and subsequent analysis. Therefore, some of the data and information is based on the respondent's recollection of experiences and own perceptions. To this extent, the RAT makes use of various similar questions, tools, and a means of increasing objectivity as much as possible.

### Result

The assessment covered various aspects of HCWM in selected healthcare facilities, including segregation practices, waste quantification, treatment options, storage, transportation, occupational safety, and compliance with international standards. The results are presented below:

**Waste Quantification:** Most healthcare facilities do not quantify waste properly. Only 4 out of 6 district hospitals attempted to weigh waste before incineration, but this practice was inconsistent due to incinerator issues or the non-availability of bin liners. Data provided on weights of infectious and non-infectious waste was approximated and not standard.

**Waste Segregation:** HCWM practices at the healthcare facilities were not consistent. Sharps were generally placed in single-use cardboard safety boxes, while the rest of the waste was often mixed without proper segregation. Some facilities attempted to separate infectious and non-infectious waste, but the approach was not standardized.

**Waste Transportation and Storage:** Waste was collected manually and transported without proper labeling. Many uncapped syringe hubs with intact needles were found near incinerators and waste transp-

ort passages, indicating unsafe practices. There was no on-site waste storage area in most facilities.

**Treatment Options:** Incineration was the primary treatment option for HCW in most facilities, but many used single-chambered kiln devices as burning chambers. Properly constructed incinerator pits were scarce, and some facilities resorted to open burning or dumping ash in open pits.

**Personal Protective Equipment (PPE):** There was a lack of PPE for waste handlers and incinerator operators, putting them at risk of infection. Waste handlers were not vaccinated against Hepatitis B, posing an occupational health hazard.

**Policy and Legal Framework:** While there is a comprehensive policy for HCWM in Malawi, there are gaps in the legal framework and current practices, from segregation to disposal.

Despite the gaps in HCWM, several healthcare facilities demonstrated commendable efforts in waste management in Laboratories, which in most facilities had proper waste containers labeled and color-coded for infectious and non-infectious waste, sharps, and highly infectious waste. Liners were used in these containers, and gene-extracted cartridges were stored separately.

Malawi's EPI campaign successfully promoted sharps waste management. Safety boxes were available in all facilities, and sharps were safely collected and disposed of. Also, none of the facilities were observed recapping needles, ensuring occupational safety.

Additionally, Healthcare facilities acknowledged their limited knowledge and resource constraints, indicating a willingness to address gaps in HCWM and some facilities implemented innovative practices, such as separate collection of glass vials and the construction of incinerators with an ash storage tank, promoting efficiency and safety.

### Discussion

The healthcare waste management (HCWM) practices identified in the Malawi study reflect concerns and trends reported globally. Comparing these findings with international literature highlights both widespread challenges and incremental progress in HCWM across different contexts. Similar to the situation in Malawi, waste quantification remains a significant difficulty in many low- and middle-income countries. For example, Coker et al. (2009) [9] reported that healthcare facilities in Nigeria lacked standardized weighing systems, resulting in inaccurate waste estimates and hindering effective waste management planning.

Improper waste segregation, as observed in Malawi, is also a common problem elsewhere. Studies from India report frequent mixing of healthcare waste, which increases the risk of infection transmission [10]. Effective segregation is a critical component of sound waste management and is essential for protecting healthcare workers and the public.

Likewise, unsafe transportation practices and inadequate on-site storage of healthcare waste are not unique to Malawi. Research conducted in Bangladesh [11] documented similar shortcomings in the handling, transportation, and storage of healthcare waste within healthcare facilities.

The reliance on suboptimal incineration methods in Malawi further reflects a broader global challenge. As noted by Chartier et al. [12], many developing countries

depend on low-standard burning practices because of limited financial and technical resources. Such methods pose serious risks to public health and contribute to environmental pollution.

Proper waste quantification is crucial for effective waste management. A study conducted in 22 developing countries in 2002 showed that a significant percentage of healthcare facilities did not employ appropriate waste disposal methods, ranging from 18% to 64% [13]. Improper waste quantification not only impacts the management of healthcare waste but also poses potential health risks to patients, staff, waste handlers, and the community [14].

However, the commendable efforts of Malawi's healthcare facilities, especially in laboratory waste management and the successful management of sharps through the EPI campaign, offer hope and a model for others. Innovative approaches, such as those seen in select facilities with separate glass vial collection and advanced incinerator designs, hint at the potential for grassroots innovations to tackle global challenges. Malawi's current state of HCWM, while presenting challenges, also offers valuable lessons and models for improvement. Comparing the situation in Malawi to global trends shows that while challenges in HCWM are pervasive, there are also consistent and scalable solutions available.

### Future perspectives

To improve HCWM practices, it is crucial to review and update the relevant regulations and legal framework to meet international standards [15]. Disseminating the HCWM regulations and Code of Practice widely to all healthcare facilities (HCFs) will promote adherence to proper waste management practices [16]. Designating focal persons for HCWM at the Ministry of Health (MOH) and Ministry of Local Government and Rural Development will ensure dedicated leadership in driving improvements.

Establishing an HCWM committee at each HCF will monitor progress and develop action plans for improvement [17]. Allocating a dedicated budget for HCWM at the district health office (DHO) level will ensure sufficient resources for waste management. Upgrading training materials and conducting regular training, including refresher courses, will enhance staff knowledge and compliance with proper waste segregation and handling procedures [18].

Improving the supply of adequate and applicable Personal Protective Equipment (PPE) will protect healthcare workers from potential hazards. Vaccinating all staff handling waste against Hepatitis B is essential for their safety. Conducting a waste data study and establishing a waste tracking system will help manage HCW more efficiently.

Standardizing waste movement containers and establishing onsite temporary storage areas will enhance waste handling within HCFs. Improving logistics contracts and investigating new waste treatment technologies will lead to safe and environmentally sound disposal.

In outreach clinics, setting up a robust waste transportation system and providing regular training for immunization and vaccination waste management will ensure the safe handling of waste. Exploring options for recycling waste treatment residuals and improving waste transport logistics will further enhance waste management practices.

Implementing a robust waste tracking database will allow for effective monitoring and reporting of waste quantities and compositions. These recommendations, if successfully implemented, will improve HCWM practices in Malawi, safeguarding the health of healthcare workers and communities while promoting environmental sustainability. Continuous training and awareness programs are essential to foster a culture of responsible waste management throughout the healthcare system.

### Conclusion

Our assessment revealed significant gaps between healthcare waste management (HCWM) practices in Malawi and established global standards. Nevertheless, some facilities demonstrated encouraging practices that could serve as models for improvement. Strengthening HCWM in Malawi will require addressing resource constraints, providing appropriate training, and ensuring sustainable financing for waste management initiatives. In addition, fostering public-private partnerships and strengthening the regulatory and legal framework are essential to advancing effective and sustainable healthcare waste management in the country.

### References

1. Kenny C, Priyadarshini A (2021) Review of Current Healthcare Waste Management Methods and Their Effect on Global Health. *Healthcare (Basel)* 9: 284.
2. Buluzi MS (2022) Assessing Adherence of Hospital Waste Disposal Management at Mangochi District Hospital.
3. Chartier Y, Emmanuel J, Pieper U, Prüss A, Rushbrook P, et al. (2014) Safe management of wastes from health-care activities.
4. Israel B, Adams K (2009) Waste in the 21st Century: A Framework for Wiser Management.
5. Njue PM, Cheboi KS, Shadrak O (2015) Adherence to Healthcare Waste Management Guidelines among Nurses and Waste Handlers in Thika Sub-county-Kenya. *Ethiop J Health Sci* 25: 295–304.
6. World Bank (2016) Infection Control and Waste Management Plan for Malawi.
7. Coker A, Sangodoyin A, Sridhar M, Booth C, Olomolaiye P, et al. (2009) Medical waste management in Ibadan, Nigeria: Obstacles and prospects. *Waste Manag* 29: 804–811.
8. Health Care Waste Management and the Sustainable Development Goals.
9. Patil GV, Pokhrel K (2005) Biomedical solid waste management in an Indian hospital: a case study. *Waste Manag* 25: 592–599.

10. Secretariat of the Basel Convention, and World Health Organization. Preparation of National Health-Care Waste Management Plans in Sub-Saharan Countries.
11. Ramodipa T, Engelbrecht K, Mokgobu I, Mmereki D (2023) Status of health care waste management plans and practices in public health care facilities in Gauteng Province, South Africa. *BMC Public Health* 23: 246.
12. MALAWI UNEP, Law and Environment Assistance Platform.
13. Haylamicheal ID, Desalegne SA (2012) A review of legal framework applicable for the management of healthcare waste and current management practices in Ethiopia. *Waste Manag Res* 30: 607–618.
14. Almuneeff MA, Memish ZA (2003) Effective medical waste management: it can be done. *Am J Infect Control* 31: 188–192.
15. The National Sanitation Policy.
16. Akulume M, Kiwanuka SN (2016) Health Care Waste Segregation Behavior among Health Workers in Uganda: An Application of the Theory of Planned Behavior.
17. De Neve JE, Sachs JD (2020) The SDGs and human well-being: a global analysis of synergies, trade-offs, and regional differences. *Sci Rep* 10: 15113.
18. Sapkota B, Gupta G, Mainali D (2014) Impact of intervention on healthcare waste management practices in a tertiary care governmental hospital of Nepal.