

# Waste Management Protocols at Iten County and Referral Hospital

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## ABSTRACT

**Abbreviations:** HCWM: Healthcare Waste Management; CME: Continuing Medical Education; HMT: Health Facility Management Team; HCFs: Collection Services in the Healthcare Facilities; PHO: Public Health Officer; PPE: Personal Protective Equipment

## Introduction

The management of hospital waste is an imperative environmental and public safety issue. This is as a result of the waste's infectious and hazardous character [1]. For example, contaminated needles and syringes present a threat because they are sometimes scavenged from waste areas and dump sites then reused [2]. While healthcare establishments are expected to safeguard the health of the community, inappropriate healthcare waste management system can adversely affect the environment, public health as well as health personnel and pose even greater health problems than the original diseases themselves [3]. Improper treatment of infectious waste leads to dangerous quantities of disease-causing agents-viruses, bacteria, parasites or fungi in the waste. These agents can enter the body through punctures and other breaks in the skin, mucous membranes in the mouth, inhalation into the lungs, swallowing, or being transmitted by a vector causing serious infections [1]. With all the risks highlighted, healthcare waste has not attracted the level of attention as other types of wastes despite significant improvement in provision of health-care (Oweis [4]).

## Purpose

To establish the waste management protocols in terms of knowledge, practices and policies.

## Specific Objectives

- Establish knowledge of staff about waste management.
- Assess the practices of staff in terms of healthcare waste segregation, transportation, treatment and disposal.
- Establish whether the hospital has policies in terms of training and waste disposal operating procedures.

## Study Site

The study was conducted at Iten Level 5 County Referral Hospital

## Methodology

### Description of the Study Site

The hospital is found in Elgeyo-Marakwet county in Iten which is a town located along the road between Eldoret and Kabarnet. It lies within the co-ordinates 0°40'23"N 35°30'30"E.

## Study Population

- Personnel involved in generation of health care waste.
- Personnel involved in management of health care waste.

This involved all the wards, theatre, laboratory, pharmacy, out-patient, imaging departments, mortuary, incinerator and pits.

## Inclusion Criteria

Healthcare workers within Iten county referral hospital who accepted to be included in the study.

## Exclusion criteria

- Healthcare workers outside Iten county referral hospital.
- Those who declined to participate in the study.

## Study Design and Sample Size Determination

Purposive sampling was performed so as to ensure that healthcare workers of all cadres, departments within the hospital setting and gender were well represented. Interviewer administered questionnaires were used.

## Data Collection Tools and Methods

- Observation of waste management practises such as segregation, storage, transport, treatment and disposal as well as available resources was done.
- Photography of the same was obtained.
- Self-administered questionnaire adopted from a previous study with modifications.

## Reliability and Validity of Findings

A pilot study was done.

## Minimization of Observer Bias

Standardized questionnaires were used.

## Ethical Considerations

Verbal consent was obtained from the Medical Superintendent to conduct the study. Consent was sought from the respondents before administration of the questionnaire and their anonymity was ensured by only using their designation as an identifier and not their names.

## Data Analysis

Data collected was entered in excel for cleaning and analysis. Descriptive statistics were generated for categorical and continuous variables.

## Results

### Knowledge of Healthworkers on Healthcare Waste

25 respondents were interviewed whereby there were 2 consultants, 4 medical officers, 2 clinical officers, 5 nurses, 2 lab technolo-

gists, 2 radiographers, 2 pharmacists, 2 mortuary attendants 2 cleaners and 2 incinerator operators. Out of these, 20(80%) had received training on healthcare waste management while 5 hadn't. These 5 included: the 2 mortuary attendants, 2 incinerator operators and one of the cleaners. 19 of the respondents who had received training on healthcare waste management reported to have received it as formal training as part of their curriculum in school before employment while 1 of them acknowledged of having been further trained by the public health department at the facility. They had largely been trained on segregation, handling and storage of waste.

### Healthcare Waste Management Practices-Segregation, Transport, Treatment, Disposal

A total of 15 areas were visited, these included: the wards (paediatric, surgical, internal medicine, obstetric and gynaecological) laboratory, emergency, pharmacy, mortuary, theatre, imaging and outpatient departments. It was noted that they all had 3 wastebins with liners and sharps boxes depending on the waste generated in the department. In addition, the wards had a separate receptacle for glass drug vials. The bins were colour-coded and had liners. Among these, it is only 53% of them that had the bin colour matching with the liner colour. All the respondents reported that the bins, liners and sharps boxes were adequate and in regular supply with the wards receiving three of each of the liners twice a week. 2 out of the 15 areas visited i.e. the pharmacy and laboratory had appropriate signage and labelling of the waste bins with standard operating procedures on waste segregation highlighted. The facility practiced a 3-bin segregation system. In this case, red colour was used for pathological or highly infectious waste. Yellow colour was used for the infectious waste while black colour was used for the non-infectious waste. On storage, 4(26.67%) of the areas had their bins and sharps boxes in an area away from traffic and patient flow with the rest, 11(73.33%), having the bins along corridors with heavy client flow or activity.

None of the area had an interim storage area where waste could be stored safely before collection and ward waste was stored outside the wards. On waste collection 10 (66%) of the areas i.e the wards and pharmacy reported that their waste was collected once a day while 3(20%) i.e outpatient, emergency and theatre had their waste collected twice daily. The laboratory which accounted for 7% of the areas had its waste collected more frequently which was more than twice a day. Waste from the mortuary was reported to be collected weekly. The waste was collected by the Robu cleaners. Transportation of waste was majorly through hand carrying 15 (60%), use of wheelbarrows 7(28%) and use of trolleys 3(12%) as testified by the respondents. In all instances, waste segregation was not maintained during transportation and the waste was transported through routes that were heavily used. Incineration of waste and open dumping into a pit and later openly burning were the major modes of treatment and disposal largely employed in the facility. Exceptions were the maternity department which had a placenta pit and the laboratory which had a pit where chemicals and reagents were disposed. The TB labo-

ratory also practised autoclaving of some of its waste before disposal. The facility also had a dumpster operated by the county government where some of its waste was disposed.

### Policies on Healthcare Waste Management

**Hospital Policy/Plan on Waste Management:** None of the respondents was aware if the hospital had a waste management policy or plan. On budgeting and financing for HCWM there was no vote head for it in the hospital's expenditure and it was lumped up with other operational costs.

**Hospital Waste Management Team:** On the existence of a hospital waste management team only 3 (12%) of the respondents were aware of its presence and its composition which was only limited to the public health officer. 5, (20%) of respondents were only aware of the existence of the team. More than two thirds, 17(68%) didn't know if the hospital had a waste management team nor its composition.

## Discussion

### Knowledge of Healthworkers on Healthcare Waste

Present study findings show that 80% of the workers had received training on Healthcare Waste Management (HCWM). Among these, it is only 1 who had received training at the facility by the public health officer. The knowledge respondents had was largely on segregation and handling and storage of waste. This agrees to a study performed by Sudhakar and Janakiram, 2010 on 'Dental health care waste disposal among private dental practices in Bangalore City, India,' in which 16.9% of the respondents felt that they had a lack of knowledge. In this case, the national HCW Plan training target of 68% had been achieved. There were however no continuing medical education (CME) or refresher courses offered to staff on HCWM. As such, they relied solely on knowledge received before they qualified and started working at the facility. Hence, there were gaps as far as proper waste management is concerned with segregation being a major area of inadequacy leading to there being no correlation between training and practice. 20% (5) of the respondents (2 mortuary attendants, 2 incinerator operators and one of the cleaners) claimed having no knowledge on HCWM. This is consistent with the findings of a study in Istanbul where casual workers similarly demonstrated insufficient knowledge on the most important problems of disposal of medical waste (Ozder, et al. [5]). Lack of training can be accredited to the lack of CMEs and refresher courses on the same.

The National guidelines on safe management of HCW require only technically trained persons be deployed in HCWM. The Hospital Management is required to facilitate education and training for all healthcare workers. The guidelines also recommend CME's and professional development to address the performance gaps by use of tools e.g. supervisory checklist. The Health Facility Management Team (HMT) is required to facilitate refresher training after critical review of existing waste management practices. Proper waste management requires

skill sets from minimization, segregation, transportation, collection handling and treatment to disposal.

### Healthcare Waste Management Practices-Segregation, Transport, Treatment, Disposal

Findings of the present study revealed members reporting adequacy and regular supply of waste bins and liners for waste management in the different departments visited. However, from observation it was noted that in about half of the cases, 47%, there was lack of adherence to colour coding for segregation. This concurs with a study performed by (Njue [4]) on 'Adherence to Healthcare Waste Management Guidelines among Nurses and Waste Handlers in Thika Sub-county- Kenya,' whereby adherence was low, 16.3%. These low levels can be attributed due to lack of adequate coloured bins for segregation and liners which contradicted the initial assertion of adequacy. According to the WHO Blue Book and National Guidelines for safe HCWM, health facilities are required to maintain waste segregation at all levels. Bins and liners are the main tools required to aid in waste segregation at source. The bins and liners should maintain the colour coding system and have the biohazard mark relevant to the type of waste in accordance to Kenya HCWM Commodity Specifications 2013. All health facilities are required to acquire the color-coded bins and liners as the basic compliance to the WHO and national standards of HCWM.

The National Guidelines on HCW requires each segregation point to have posters and signage i.e. waste segregation charts, which act as a reminder for health workers on placement of healthcare waste generated. This was lacking at the facility which contributed to the lack of adherence to proper waste segregation hence waste being mixed. The facility was noted to be practising a three-bin segregation system whereby there was a black bin for general waste, a yellow bin for infectious waste and a red bin for highly infectious waste. There was also a sharps box. In addition, in the wards, there was a separate receptacle for used drug vials. Despite this being the case, actual segregation of waste was not being practised and it was noted that the black and yellow bins were used interchangeably and, in some cases, the red and yellow bins.

This could be attributed to the bins and liners not having matching colours in accordance with the segregation protocol as was the case in 47% of the areas visited. In some places the bins had the recommended colours but the liners were of a different colour while in some the bins were of another colour like green and blue and the liners were the recommended red, yellow and black. Additionally, the absence of signage and SOPs at the point of segregation could have been a factor. Consequently, despite the fact that HCW's composition according to WHO is 80% general or non-infectious waste and 15% infectious and pathological waste the facility generated on average 53% general waste and 46% infectious waste with quantification data on the other waste categories unavailable. According to the Kenya National Guidelines on Safe Management of Healthcare Waste, it requires that waste

be segregated as per hazardous content. It is the responsibility of the waste producer to segregate as close as possible to the place at which the waste is generated. Waste segregation should be maintained in storage areas, during transportation, treatment and disposal.

Storage of waste bins and sharps boxes in the areas was largely in open places where traffic and patient activity was much instead of the recommended areas of less traffic and patient activity. There was no interim storage area for waste in the different departments visited and waste was either stored in an open area outside the department or transported to the treatment site. At the treatment site there was an interim storage area that was not well secured. In addition, the storage room was not refrigerated and waste was stored beyond the 12 hours awaiting treatment which is contrary to the National Guidelines for Safe HCWM hence posing increased health risks. This concurs with a study performed in Botswana in which the storage facilities and collection services in the healthcare facilities (HCFs) were not operating effectively and efficiently (Mmereki [6]). Collection of waste for treatment was adequate in that it was at least once a day for most areas with areas such as the laboratory which generated higher quantities of waste having the waste collected more frequently i.e. more than twice per day.

This was in line with the National Guidelines for Safe HCWM which states that infectious waste should be collected daily from the waste generation point; or at least twice in a busy area or when full. There however were no designated officers to do the collection and in most areas were done by the Robu cleaners prior to cleaning the departments while in some areas, a member of staff in the department did the collection which was not in line with national guidelines. The waste was largely transported to the treatment site by hand carrying (60%) with the alternative being the use of wheelbarrows which at the time of study happened to all have been broken down. The waste was transported through a route that had much patient activity and traffic. This was contrary to National Guidelines on HCW which recommend the use of colour coded trolleys to maintain segregation during waste transportation as well as specific transportation routes, avoiding where possible, areas where food is transported and prepared and places heavily used by people. Findings of this study contrasted those of Istanbul where improvement and modifications of the routing system for the health-care waste collection and transportation were made (Zeren [7]). Incineration was the major type of technology used for waste treatment, which is true for most health facilities in Kenya [8]. However, according to WHO 2016 recommendations, health facilities were advised to adopt cleaner technologies of treating and disposing waste such as microwaving, autoclaving and shredding.

The facility used incineration as the major treatment method with all the different classes of wastes being incinerated together. The incinerator had no panel for controlling the temperatures. Incineration was done every day at dawn and stopped by around 8.00am. It was

reported that the smoke from the incinerator interfered with the patients in the wards, staff and people leaving nearby. The incineration and open-air burning was done by casuals. They reported on having been trained by the public health officer on how to operate the incinerator but not much on HCWM. Hence, they lacked knowledge on proper incineration of medical waste, the recommended temperatures and the relevant SOPs. They also lacked proper PPEs for proper handling of waste in that they used clean gloves and theatre masks as opposed to the proper gloves and masks. The facility also had a dumpster operated by the County government where it disposed some of its waste mostly the general, non-hazardous waste. However, there was no regular schedule of emptying it. Thus, it overflowed and given that it was not in a secure location waste piled out posing a threat to the hospital environment.

### Policies on Healthcare Waste Management

**Hospital Policy/Plan on Waste Management:** None of the respondents was aware if the hospital had a waste management policy or plan. This disagrees with (Tudor, et al. [9]), whereby health workers in USA were fully aware of the waste management policy and plan. This can be accredited to the fact that in Iten level 5 county referral hospital, budgeting and financing for HCWM had no vote head in the hospital's expenditure and it was lumped up with other operational costs while in USA health facilities had it.

**Hospital Waste Management Team:** Waste management in this study was under the Public Health Officer (PHO). However, staff were not aware of their roles in HCWM. In the laboratory, which was unique compared to other places, there was a waste management team headed by a waste management officer and the effect of this was clearly seen in that it was the only place that practiced strict waste segregation. The WHO Blue Book and the Kenya National Guidelines for Safe Management of Healthcare Waste 2011 both require every hospital to have a designated person responsible for waste management in the hospital, a committee to oversee waste management activities (Infection Prevention Committee or a healthcare waste committee) together with all staff in hospital understanding their roles in waste management.

Further, the National Guidelines on HCW require each facility to have a healthcare waste management plan detailing the procedures of management of different waste streams in accordance to the national laws and safe guarding the environment. The plans should detail the facility's commitment, roles and responsibilities for each cadre, estimation of key HCWM commodities and Personal Protective Equipment (PPE), waste quantification and budgeting. This was not present at Iten level 5 county referral hospital as budgeting for HCWM was lumped with the other operational costs. Waste quantification was being done by the waste handlers at the incinerator where they kept a ledger of daily waste generated by each department. However, as they reported, the data was never viewed by the hospital management and was not used in planning. This is contrast to a study performed in

Chittagong Metropolitan Area, Bangladesh, whereby, HCW quantification was important in order to assess the potential risks associated with HCW handling and management besides guiding the policy makers in developing HCW management guidelines (Alaml [10]).

## Conclusion

This study was meant to find out: knowledge of staff about waste management, the practices of staff in terms of waste segregation, transportation, treatment and disposal as well as whether the hospital had policies in terms of training and waste disposal operating procedures. Similar to the general trends in developing countries, in Iten county referral hospital, there were no continuing medical education (CME) or refresher courses offered to staff on HCWM. They relied solely on knowledge received during their training while those who were not trained remained ignorant. Hence, there were gaps as far as proper waste management is concerned with segregation being a major area of inadequacy. For waste segregation, there was lack of adherence to colour coding in most places as well as absence of waste segregation charts to act as reminders. Storage of waste bins and sharps boxes in the areas was largely in open places where traffic and patient activity was much instead of the recommended areas of less traffic and patient activity [11-14]. On the other hand, transportation of waste at the facility was wanting in that at the time of study the study, it was majorly transported by hand carrying through a route that had much patient activity and traffic. Incineration was the major method of waste treatment with all waste being incinerated at the same time, releasing a lot of smoke into the air. On policies on healthcare waste management, none of the respondents was aware if the hospital had a waste management policy or plan and most of the staff members were not aware of a committee on waste management or its composition.

## Recommendations

- Hospital management should organize for (CME) or refresher courses to all staff at regular intervals.
- The procurement department should ensure there are adequate coloured bins and liners as well as waste segregation charts at all stations.
- Hospital management to ensure that storage of waste bins and sharps boxes should be in areas of less traffic and patient activity.
- The incinerator should be installed with a panel for controlling the temperatures in addition to workers being provided with the correct PPEs. Also, the institution should adopt cleaner technologies of treating and disposing waste such as microwaving, autoclaving and shredding.
- Hospital management should ensure of colour coded trolleys to maintain segregation during waste transportation as well as specific transportation routes avoiding where possible, areas where food is transported and prepared and places heavily used by people.
- Hospital, budgeting and financing for HCWM should be budgeted for and financed and should not be lumped up with other operational costs. In addition, members to be sensitized on the waste management committee and its composition.

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