BIOMEDICAL WASTE MANAGEMENT IN GHANA: THE NEED FOR URGENT ATTENTION AND LEGISLATION

MARCH 4, 2016
IMANI CENTER FOR POLICY AND EDUCATION
EAST LEGON, ACCRA, GHANA

Imani Centre for Policy and Education
Contents

Introduction

Methods of Disposal of Biomedical Waste

Health Risk of Current Disposal Methods

- Impacts of sharps and infectious waste
- Impact of chemical and pharmaceutical wastes
- Impacts of radioactive waste

Recommendations

- Policy and Legislative instrument on medical waste management in Ghana
- Centralized Healthcare Waste Collection, Transportation, Storage, Treatment, and Disposal facilities (CHWTSDF)
- Increase Awareness on medical waste and its management

REFERENCES
Introduction

It is widely understood that municipal solid waste, if not managed correctly, can be an environmental and health hazard. However, medical waste, by its very nature poses a significantly higher risk to both the environment and especially to the community. In addition, it is estimated that 15% of waste created by health-care activities are classified as hazardous waste, which includes biomedical waste.¹

Biomedical waste is waste generated from biological and medical sources including medical laboratories, hospitals and clinics. This classification of waste includes discarded blood, tissue from surgery or birth, gloves, used bandages, and sharps such as syringes, needles, and blades. An estimated 16 billion injections are administered worldwide annually. In Africa, and specifically Ghana, a large proportion of the needles and syringes are discarded as general solid waste and not treated as medical waste.

Biomedical waste has a higher risk of injury or infection compared to ordinary waste, therefore, safe and reliable methods for its management are crucial. Inadequate and inappropriate handling of biomedical waste is likely to have serious public health ramifications through direct contact or indirectly through the environment. An example of the indirect impact is observed when farmers irrigate their crops with the same source of water from drains that are used to dispose of the biomedical waste. In 2012, this allegedly occurred in Accra, when liquid medical waste from the 37 Military Hospital flowed freely into the main gutters of the capital city for over a year, affecting the health especially of those living close to the hospital.²

According to the World Health Organization (WHO), "National legislation is the basis for improving medical waste practices in any country. It establishes legal controls and permits the national agency responsible for the disposal of medical waste, usually the ministry of health, to apply pressure for their implementation. The law should be complemented by a policy document, and by technical guidelines developed for implementation of the law."³ National legislation combined with rigorous enforcement, is thus one of the major prerequisites for effective management of biomedical waste in Ghana.

Despite a detailed Ministry of Health Policy guideline on medical waste handling published in March 2006, the purported need for complementarity between the law and the policy paper does not exist in Ghana because national legislation on handling biomedical waste does not exist. It is against this backdrop that this report aims to expatiate on the advantages of such legislation and the potential health risks of not having it.

Methods of Disposal of Biomedical Waste

Biomedical waste disposal varies widely across the world ranging from low risk disposal that includes incineration, autoclaving waste, microwaving waste to render it inert to high-risk disposal by disposing it untreated directly into landfills. The health risk implications and the environmental impact should be taken into consideration when deciding which method to ultimately use.

**Biomedical Waste Disposal in Ghana**

Currently in Ghana, there is no medical waste legislation that provides guidance and enforcement for health facilities in the management and disposal of biomedical waste. Consequently, each facility decides independently how to manage and dispose their medical waste resulting in widely different risk profiles to both public health and the environment.

As far back as 2002, The Ghana Environmental Protection Agency (EPA) in collaboration with the Ministry of Local Government and Rural Development, published guidelines on how institutions should manage the disposal of biomedical waste. The EPA recommends using different coloured bags and containers to segregate waste and to dispose of the waste according to that system, where black would be used for general waste, yellow for infectious waste, and brown for hazardous waste. To manage the waste in an efficient manner, it recommends disposal in the following manner, illustrated in the diagram below:

---

However, despite these guidelines, the evidence from research and from studies of selected facilities in Ghana shows that not every medical facility follows these guidelines.

A study conducted by ESO-Consult in 2014, looked primarily at how medical waste disposal was managed in two of the largest hospitals in Accra, the Korle Bu Teaching Hospital and the Ridge Regional Hospital.

---

5 ESO-Consult. (August 2014). Study on: Scoping opportunities for commercial waste handling in Ghana – Greater Accra, study performed for Delft Imaging Systems and Universal Health
In Korle Bu hospital, the findings included the discovery of blocked sewage systems, resulting in liquid waste being disposed of in the nearby lagoon. Only one out of the three brick incinerators and one of two of the mechanical incinerators were operational. At the same hospital, only 20% of solid waste was separated, using the coloured disposable bags to keep track of the different waste types. Though there were paraphernalia promoting segregation into different coloured containers, they actually were not in use. Despite even this small effort to differentiate waste, all types ended up in the same disposal site, where bags were left open after being exposed to wildlife, and the overseeing staff forewent protective gear.

Meanwhile, at the Ridge hospital, which was in the process of an expansion project, liquid waste was drained directly into the municipal communal sewage system. Waste was segregated with the use of different coloured bags and containers according to its type. However, despite the effort inside the hospital and the fact that they pay for the services of a waste collection company, once the waste left the hospital, it was all ultimately disposed of in the same place, the landfill. In the final designs for the expansion of the hospital, it is anticipated that the new hospital will include a shredder and autoclave for the disposal of waste, which would offer a more environmentally friendly alternative to waste disposal.

Findings of another study conducted on four health facilities out of the twelve within the Offinso Municipality of the Ashanti Region paints a poor picture of the extent of the poor biomedical waste management challenges across the country. The study asserts that the total health waste generated in the four reviewed hospitals was 2,626.5.8 kg, which consisted of 420.0 kg of infectious waste and 2,206.5 kg of non-infectious waste. Segregation of the waste into coloured containers as described in EPA guidelines was rarely done, with the exception of a few sharps. Containers for storing the waste were not covered (83.0% of containers observed by researcher in all the four health facilities). The healthcare waste was eventually dumped at unfenced landfills or pits, which were then burned openly. The table below summarizes the existing waste management practice in the study areas.

---

6 Yawson P. Assessment of Solid Waste Management in Healthcare Facilities in the Offinso Municipality. (Master’s Thesis, KNUST IDL, Department of Environmental Science. November 2014

Imani Centre for Policy and Education
<table>
<thead>
<tr>
<th>Name of health institution</th>
<th>Segregation of waste</th>
<th>Record on quantity of waste</th>
<th>Knowledge Of Hospital Waste Management Policy/Legislation</th>
<th>Labeling On Containers/Colours Code</th>
<th>Training On Waste Handling</th>
<th>Incidence/Reported Case Of Injury/Needle-stick</th>
<th>Handler(s) of Waste</th>
<th>Type of Containers Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>St. Patrick Hospital</td>
<td>2.2 Kg (0.14%)</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Waste handlers and Orderlies</td>
<td>Paper boxes/Polythene bags</td>
</tr>
<tr>
<td>SDA Hospital</td>
<td>1.7kg (0.40%)</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Orderlies</td>
<td>Paper boxes/Polythene bags</td>
</tr>
<tr>
<td>Offinso Health care</td>
<td>1.1 kg (0.33%)</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td></td>
<td>Yes</td>
<td>Any health worker on duty</td>
<td>Paper boxes/Polythene bags</td>
</tr>
<tr>
<td>Quality Care Clinic</td>
<td>1.3 kg (1.3%)</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td></td>
<td>Yes</td>
<td>Orderly and any health workers on duty</td>
<td>Paper boxes/Polythene bags</td>
</tr>
</tbody>
</table>

Since the largest health facilities in Ghana are having issues implementing the recommended disposal methods, it is likely that the smaller facilities will also struggle to enforce standards.

In a Universal Health Group study (2013), 200 randomly selected health officials in Ghana were questioned on the waste disposal methods used in their facilities. The study found that the most common biomedical waste disposal method was open burning or incineration. According to the officials surveyed, 8% claimed that they burn or incinerate pathological waste. This was also the case for sharps, which 27% stated they burned/incinerated, 3% claimed to do so with chemical waste, 19% with general waste, as well as infectious and radioactive wastes.

### Table 2: other methods of disposal apart from incineration (% of a sample of 200 randomly sampled health officials)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Burying (6%)</td>
<td>Collected by Zoomlion (3%)</td>
<td>Dustbin or litter boxes/ pedal dustbins (3%)</td>
<td>Decontaminated (1%)</td>
<td>Put in septic tanks (2%)</td>
</tr>
<tr>
<td>Placing them in separate/ special containers (6%)</td>
<td>Disinfected and concealed for collection company (3%)</td>
<td>Incinerated/ steam sterilized and disposed (4%)</td>
<td>Dark room (1%)</td>
<td>Placed in separate bins (2%)</td>
</tr>
<tr>
<td>Broken and buried/ Needles broken off (6%)</td>
<td>Kept in containers with cover and given to patients (3%)</td>
<td>Separated from other waste (5%)</td>
<td>Disposed through the sewage system (1%)</td>
<td>Buried (2%)</td>
</tr>
<tr>
<td>Separated into a recycle bin and sent to Korle Bu hospital/ Recycle bin (10%)</td>
<td>Recycle bin (3%)</td>
<td>Disinfected and concealed for collection (5%)</td>
<td>Put in yellow plastic bags (2%)</td>
<td>Bleached (3%)</td>
</tr>
<tr>
<td>Safety boxes/ yellow box (10%)</td>
<td>Taken to Korle Bu (4%)</td>
<td>Buried (5%)</td>
<td>Placed in separate rooms (2%)</td>
<td>Connected to the manhole (3%)</td>
</tr>
<tr>
<td></td>
<td>Buried (8%)</td>
<td>Decontaminated (6%)</td>
<td>Putting them in separate containers (2%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flushed into the sewage system (9%)</td>
<td>Added to general waste (2%)</td>
<td>Flushed/Washed away through sewage system (8%)</td>
<td></td>
</tr>
</tbody>
</table>

Source: Pre-Feasibility Study: Scoping opportunities for commercial waste handling in Ghana – Greater Accra by ESO-Consult, August 2014.
Health Risk of Current Disposal Methods

Exposure to hazardous biomedical waste can result in disease and/or injury. Medical waste has a risk profile for those who work in medical facilities (doctors, nurses, pharmacists, etc.), those in support services (laundry, waste handling, waste transportation staff), scavengers, and the general public if the waste is not disposed of properly. Exposure can range from foul odour, toxic emissions, contaminated ground water, vector transmission (rats and mice), and inadvertent direct contact by the general public with the waste if it is not disposed properly.

Impacts of sharps and infectious waste

Infectious waste includes waste that is contaminated with blood and other bodily fluids (e.g. from discarded diagnostic samples), cultures and stocks of infectious agents from laboratory work (e.g. waste from autopsies and infected animals from laboratories), or waste from patients in isolation wards and equipment (e.g. swabs, bandages and disposable medical devices). Approximately 15 to 20% of biomedical waste analysed in Greater Accra region has been found to include infectious wastes and sharps, which contain a variety of pathogens. Infections, which can be caused by exposure to infectious biomedical waste include, but are not limited to:

- Gastro enteric infections,
- Respiratory infections,
- Ocular infection, Genital infections,
- Skin infections,
- Meningitis,
- Acquired immunodeficiency syndrome,
- Haemorrhagic fevers, Septicaemia, Bacteraemia, Candidaemia,
- Viral hepatitis A, B and C.

Abrasions, cuts in the skin, inhalation, and ingestion are the common ways that pathogenic organisms enter the human body.

Research has firmly established the link between the transmission of the Acquired immunodeficiency syndrome (AIDS), viral hepatitis A, B, and C to contaminated syringes found in biomedical waste. Health workers, especially nurses, cleaners, waste management personnel, and scavengers on disposal sites are at the highest risk to cuts and abrasions from sharps. Due to the unregulated disposal of these infectious wastes by health facilities, the general public is equally at risk. Children playing in neighbourhoods where health facilities are located for instance are likely to be exposed to discarded syringes, needles, and other sharps.

A report by the US Environmental Protection Agency to Congress on medical waste estimated the annual numbers of viral hepatitis B (HBV) infections resulting from injuries caused by sharps among medical personnel and waste-management workers.

---

The annual number of HBV infections in the USA resulting from exposure to healthcare waste was between 162 and 321, out of an overall yearly total of 300,000 cases.\textsuperscript{10} Infections can also spread through other media (sewage systems) or resilient agents such as rats, which feed on them and may cause risk to the general public. In some Latin American countries for instance, the uncontrolled discharge of sewage from hospitals treating juvenile patients have been strongly linked to a cholera epidemic experienced in the early 1990s.\textsuperscript{11}

**Impact of chemical and pharmaceutical wastes**

Chemical wastes consists of solvents used for laboratory preparations, disinfectants, and heavy metals contained in medical devices (e.g. mercury in broken thermometers) and batteries while pharmaceuticals wastes are made up of expired, unused and contaminated drugs and vaccines.\textsuperscript{12}

Chemical and pharmaceutical wastes are hazardous because most are toxic, corrosive, inflammable, reactive, and explosive. Though in small quantities in biomedical waste, they may cause intoxication, injuries, and burns when they come in contact with the skin or are inhaled. Expired chemicals or pharmaceutical products make up the largest proportion of this type of medical waste. Chemical waste is mostly washed into the public sewage system through drains or manholes. These toxic chemicals find their way into the soil and contaminate surface water bodies and the ground water- resulting in a significant health hazard to people who depend on wells for drinking, washing, and agricultural activities. Both plants and animals in the natural ecosystem can potentially be affected. Burning or unregulated incinerating of such toxic chemicals can result in risk, in that the emissions may be toxic air pollutants such as Nitrogen Oxides (NO\textsubscript{x}), particulates, dioxins, and heavy metals, which can be spread over a wide area. Dioxins have been confirmed as a potent cancer-causing agent, do not biodegrade, and accumulate in progressively higher concentrations as they move up the food chain.\textsuperscript{13} Heavy metals, such as mercury and cadmium are toxic, cause birth defects in small quantities, and can also concentrate in the food chain. In 2013 for instance, as a means of destroying expired and substandard medicines, the food and drugs authority openly burned them. This type of action can result in a grave public health risk and long-term effects on people living in the affected community.\textsuperscript{14} Another hazard is the potential explosion of pressurized containers during open burning or crude incineration.

**Impacts of radioactive waste**

Radioactive waste is genotoxic and consists of products contaminated by radionuclides including radioactive diagnostic material or radiotherapeutics

\textsuperscript{10} Ibid. 16
\textsuperscript{12} Ibid 16
materials. Though generated in small quantities in Ghana, its handling and disposal pose a significant risk to the public as currently managed. In the 2013 study by the Universal Hospital Group on medical waste disposal in health facilities in Greater Accra region revealed radioactive waste is mostly handled internally by burning or adding it to general waste. The type of disease caused by radioactive waste is determined by the type and extent of exposure and can range from headaches, dizziness, and vomiting to death. Health-care workers, waste-handling or cleaning personnel exposed to this radioactive waste are at highest risk.

Several accidents resulting from improper disposal of nuclear therapeutic materials have been reported, with a large number of persons suffering from the results of exposure.

In Brazil, one case of carcinogenic impact on the general population linked to exposure to radioactive hospital waste has been analyzed and fully documented. While moving, a radiotherapy institute left a sealed radiotherapy radioactive source in its old premises. An individual who gained access to these premises removed the source and took it home. As a consequence, 249 people were exposed, of whom several either died or suffered severe health problems (IAEA, 1988).

In most developing countries, including Ghana, cases of exposure to radioactive health-care waste, and its associated health problems are usually not reported or recorded. This explains the unavailability of scientific data on the impacts of radioactive waste incidents.

**Recommendations**

**Policy and Legislative instrument on medical waste management in Ghana**

The management of medical waste is the responsibility of the health facility that generates it. In 2006, the Ghana Health service, working with the World Health Organization published the ‘Health Care Waste Management in Ghana; MOH Policy & Guidelines for Health Institutions’ as the overarching policy document for the management of biomedical waste. It contained technical guidelines for classification of health care waste; steps in health care waste management: segregation, colour coding, storage, requirement for collection containers, record keeping, and implementation strategies. The policy has not been reviewed or amended in the 10 years it has been in effect. Though some existing laws assign functions to some institutions such as the Environmental Protection Agency (EPA) (Act 490) and National Sanitation Policy (1999), there is no existing specific law that addresses biomedical waste or enforces the adherence to the guidelines in the existing policy. Consequently, this has not only led to non-adherence to the policy guidelines, reluctance by health facilities to spend on proper medical waste collection and treatment processes, but also limited investment by the private sector in improving existing medical waste management infrastructure.

15 Ibid.16
The policy on the management of medical waste in Ghana needs to be reviewed to reflect current trends and technology. Considering the enormous health risk the public faces as a result of the current medical waste management practices, Parliament must enact a legislation that would give backing to the reviewed policy as soon as practical. This would ensure strict compliance and enforcement of the policy guidelines, enforced by the Ministry of Health. Also, the legislative instrument should propose a licensing regime for private firms solely responsible for managing biomedical waste. The legislative instrument should spell out clearly financing vehicles for handling the cost of implementing a centralized Healthcare Waste Collection, Transportation, Storage, Treatment, and Disposal facility (CHWTSDF).

In the United Kingdom for instance, under the Environmental Protection Act 1990 it is unlawful to deposit, recover or dispose of controlled (including clinical) waste without a waste management license, contrary to the conditions of a license or the terms of an exemption, or in a way which causes pollution of the environment or harm to human health. Contravention of waste controls is a criminal offence. Section 34 of the Act, places people concerned with controlled (including clinical) waste under a duty of care to ensure that the waste is managed properly, recovered or disposed of safely and is only transferred to someone who is authorized to keep it. Hazardous medical waste is subject to the requirements of the Hazardous Waste Regulations 2005. The Environment Agency is responsible for administering the hazardous waste regime.17

Centralized Healthcare Waste Collection, Transportation, Storage, Treatment, and Disposal facilities (CHWTSDF)

In most health facilities in Ghana, generators of medical waste do not have effective waste management systems or qualified personnel to handle their waste.18 The larger hospitals have incinerators on their premises, which are operated under capacity or simply non-functional. Incinerating medical waste on-site also has its implication as fumes emitted contain toxic chemicals, which are harmful to the environment and people living close to the health facilities. A study by the Ghana Health Service and the Ghana Atomic Energy Commission in 2004 recommended a limit to the expansion of the number of incinerators by various health facilities. The existing medical waste incinerators in Ghana were found to emit at higher levels, which cause substantial environmental contaminations.19 Since Ghana is a signatory to several climate change conventions, it is necessary to reduce emission of greenhouse gases from several on-site incinerators. Nonetheless, incinerating process is still a very potent treatment methodology. Current advanced incinerator technologies available have higher efficiencies and produce less emission. Also, a significant number of officials of health facilities (45%) surveyed in a study by Universal Hospital Group revealed that their medical waste is collected by a local waste company. The problem with this is that the biomedical waste collected by the waste collection companies are not transported, processed, and disposed of

appropriately according to international standards. There is therefore a need for off-site specialty medical waste disposal facilities for managing biomedical waste in Ghana, specifically several centralized Healthcare Waste Collection, Transportation, Storage, Treatment, and Disposal facilities, CHWTSDF operated by a private sector player.

**Collection, storage and transportation**

The CHWTSDFs will be licensed to systematically collect sorted medical waste from all hospitals, health facilities, pharmaceutical firms, and laboratories within a defined area. Specific regulations must be stated in the revised policy and legislative instrument on biomedical waste management to regulate the collection, transportation, personnel safety, treatment, destruction, and final disposal. For instance, biomedical waste must be transported only in specially designed vehicles equipped with modern spill collecting kits; separate compartments for keeping different colour coded bags. The vehicle for transporting these wastes needs to be tested periodically against leaks. These safety actions, among many other strict regulations, would help prevent the direct contact and access by the public, the transport operators and scavengers to the waste. The private facilities would be responsible, as for accurate record keeping of biomedical well waste in the country.

**Treatment, Destruction and Final Disposal**

Due to the infectious nature of biomedical waste, its treatment and disposal requires special processes and technologies which most medical facilities in Ghana lack. The table below explores the treatment options available for the central biomedical waste management facilities.

<table>
<thead>
<tr>
<th>Waste Category</th>
<th>Treatment options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infectious waste (e.g sharps, patient waste, human/animal tissue and cultures/specimens) with the biohazard label</td>
<td>Autoclaving/ Incineration/ Shredding/specialized landfill</td>
</tr>
<tr>
<td>Hazardous waste (e.g. expiry drugs, vaccines, chemicals etc). Where only small amounts of chemical wastes are generated, these may be added to the infectious waste.</td>
<td>Advanced Incineration/Chemical treatment/</td>
</tr>
</tbody>
</table>

Source: Author's compilation

The concept of a Centralized Healthcare Waste Collection, Transportation, Storage, Treatment, and Disposal facility (CHWTSDF) has already been implemented in several countries. The case of the successful private Centralized Healthcare Waste Collection, Transportation, Storage, Treatment, and Disposal facility in India, for example is a good model for Ghana to review.

The Management of biomedical waste at a CHWTSDF has recently become an integral part of a state medical waste management strategy in some states in India. In the Twin Cities (Hyderabad and Secunderabad), area of Andhra Pradesh for instance, GJ Multiclave Pvt. owns and operates a CHWTSDF, which manages biomedical waste generated from 125 health care facilities including private, semi-private, and government hospitals as well as nursing homes, with a total of 10,000 beds. The CHWTSDF, established in 2000, is located about 55 km from the city of Hyderabad on a 12-acre parcel of land. The equipment at the CHWTSDF consists of two autoclaves, a microwave, and an incinerator. In addition, an effluent treatment
plant and a secured landfill are part of the CHWTSDF. GJ Multiclave, engaged an environmental consultant that analysed for HCl particulate matter and SO$_2$ samples from the CHWTSDF effluent treatment plant.$^{20}$

To reduce the environmental and public health risks from on-site poor management practices being used for treatment and disposal of medical waste in Ghana, it is recommended that an efficient private company invest and develop an off-site facility.

**Increase Awareness on medical waste and its management**

The health and environmental risks associated with the biomedical waste management affects everyone. The Ministry of Health and the EPA should engage in an intense public awareness campaign to educate Ghanaians on the dangers of improperly managed biomedical waste. Health facilities across the country should consistently educate all health workers as well as auxiliary support service providers, such as cleaners, on the operation guidelines of biomedical waste management. Waste segregation using colour codes as described in the Ministry of Health’s policy guidelines should be enforced strictly. This would greatly reduce risks associated with biomedical waste to the immediate health workers and the general public at large.

---

REFERENCES


