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***Solid medical waste management.
The case of Parirenyatwa
Hospital, Zimbabwe.***

Original Article

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SUMMARY.

Introduction. This research investigates flow of solid medical waste. Qualitative and quantitative data collection techniques were used.

Material and methods. The researchers made frequent visits to the hospital to find out how solid medical waste is generated, stored, collected, and disposed of. Interviews were carried out with key personal such as the incinerator operator, infection control sister, and matron. Waste collection workers were also interviewed to establish how they collect and store solid material waste.

Results. The study established that solid waste is largely collected and stored together with other refuse such as plastics, organics, and food leftovers. Of the interviewed workers 98% reported that solid medical waste is not separated from other refuse. This implies that medical waste ultimately finds its way to the municipal dumpsite.

Discussion. It is recommended that medical waste be stored and collected separately from other refuse. Taking an integrated approach to solid medical

management may reduce the volume of waste that has to be stored, collected, and incinerated, thus, reducing cost. Besides, environmental health and waste management experts must be included in the infection control team. This may increase the effectiveness and ability of the infection control team to manage solid medical waste so that it does not find its way to the municipal dumpsite. (*Rev Biomed 2005; 16:153-158*)

Key words: solid medical waste, environmental health, infection control.

RESUMEN.

Manejo de los desechos sólidos médicos. El caso del Hospital de Parirenyatwa, Zimbabwe.

Introducción. Esta investigación aborda los movimientos de los desechos médicos sólidos. Técnicas cualitativas y cuantitativas fueron usadas para la recolección de datos.

Material y métodos. Los investigadores realizaron visitas frecuentes al hospital para observar cómo se

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generaban, almacenaban, colectaban y disponían los desechos sólidos. Se entrevistó a personal clave como el operador del incinerador y la enfermera jefe del control de infecciones. Los trabajadores encargados de los desechos también fueron entrevistados para establecer cómo los colectaban y almacenaban.

Resultados. El estudio estableció que los desechos médicos sólidos eran colectados y almacenados junto con otros desechos plásticos, orgánicos y alimenticios. De los trabajadores entrevistados 98% reportó que los desechos médicos sólidos no eran separados de los otros. Esto implica que los desechos médicos finalmente terminarán en el basurero municipal.

Discusión. Es recomendable que los desechos médicos sólidos sean colectados y almacenados de manera separada del resto de la basura. Tomando esto en consideración, se puede reducir el volumen de basura que es colectada, almacenada e incinerada reduciendo así los costos. La salud ambiental y el manejo experto de los desechos deben de ser incluidos en el equipo del control de infecciones. Esto puede incrementar la efectividad y habilidad del equipo de control de infecciones en el manejo de los desechos médicos sólidos y que no terminen en el basurero municipal. (*Rev Biomed 2005; 16:153-158*)

Palabras clave: residuos medicos sólidos, salud ambiental, control de infecciones.

INTRODUCTION.

Medical waste is potentially hazardous, infectious, and toxic. It therefore requires special handling and disposal practices. The United Nations Environment Programme (UNEP) argues that medical waste represents one of the most problematic genres of special waste (1). Most countries, both developed and developing, face serious challenges in the storage, collection, and disposal of medical waste, as its nature and composition render it difficult to handle.

The waste generated in hospitals contains pathogens that pose serious threats to the environment and those who come in contact with it (The World Health Organization (WHO), 1993) (2). Medical

waste has physical and chemical characteristics that are dangerous to both human health and the environment (3). It is notable that in Zimbabwe, as in many other developing nations, no regulations or systems are specifically designed to manage potentially hazardous medical waste. This led to the sprouting of severe environmental health impacts that focus on those aspects of human health and disease determined by factors in the environment (2, 4).

Medical waste must be separated from other refuse, but in many parts of Africa it tends to be collected along with the rest of the waste stream (5). Most hazardous and toxic waste is placed on land sites with few safeguards to protect those living nearby and water sources from contamination. This is usually the case in developing nations (6). Taking into account the above information, a research study was undertaken to investigate the storage, collection, and disposal of hazardous medical waste at Parirenyatwa Hospital in Harare, Zimbabwe.

Research methodology.

Parirenyatwa Hospital is located in the northern part of Harare City. The researchers made frequent visits to the hospital, taking note of how solid medical waste is managed. Regular visits were made to general medical wards, maternity wards, surgical and critical care wards, operating theatres, and orthopedic sections. It was observed that the majority of solid medical waste is generated in general medical wards. Careful observations were also made at the disposal site, the hospital incinerator.

In addition, key informant interviews were conducted. An interview guide was prepared for each of them. The informants included the infection control sister and matron, as well as the incinerator operator. The infection control matron is the head of the Infection Control Department, which is mandated to observe the storage, collection, and disposal of generated medical waste. The interviews were focused on how medical waste management operations are executed at Parirenyatwa Hospital, while establishing the technicalities and modalities involved.

The incinerator operator revealed how medical

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waste is disposed of by incineration. The composition of the waste material brought for incineration was established, as well as that of the residue and its disposal. Information regarding the efficiency of the incinerator and operational problems was also obtained from the incinerator operator.

Questionnaire survey.

A questionnaire was prepared and administered to Anabas Cleaning Company workers. These workers are responsible for collecting and storing medical waste that is generated in various sections of Parirenyatwa Hospital. The questionnaire was aimed at soliciting information on how solid medical waste is collected from the time it is generated through to storage.

Sampling procedure.

Anabas Cleaning Company has a wide scope of workers. Some have spent a considerable time in the field of medical waste collection at the Hospital, while others have only worked for a few months. The sampling was purposively done to ensure that those workers with experience were selected. This comprised personnel with between one month and two years medical waste collection and storage experience. A total of 87 people out of the 290 workers met the survey requirements, forming a 30% purposive sample.

RESULTS.**Solid medical waste storage.**

As soon as medical waste is generated, it is put into small bins at the bedside of each patient for temporary storage. At times, the bins are filled to capacity, and the waste is strewn over the bedside of each patient, as evidenced mainly in Ward C3.

The small bins are then emptied into large plastic refuse sacks, which are tied at the top and placed in the corridors for collection. The plastic refuse sacks usually contain a variety of solid medical waste and other types of solid waste, such as food and flowers. This means that medical waste is not stored separately

from other refuse. Only two percent of the interviewed workers separated medical waste from other refuse, due to their experience of the dangers of sharp objects.

As reported by 44% of the interviewed Anabas Cleaning Company workers, waste storage facilities at the hospital are inadequate. The small patient bins are sometimes emptied into large plastic bins outside the hospital, which are meant for domestic waste. In fact, medical waste including syringes, needles, and dirty gloves, is often seen in domestic bins located at the entrance of the accidents and emergencies section. The domestic bins (often containing solid medical waste) are taken to Teviotdale municipal dumpsite for disposal. This means that solid medical waste is disposed together with the rest of the waste stream.

Solid medical waste collection.

The plastic refuse sacks are placed in the hospital corridors for collection. A small collection vehicle (tag) monitors the hospital corridors, collecting refuse sacks to be taken to a storage site. The tag carries between ten and 14 bins (totaling about 15 kilograms in mass) simultaneously, most of which are three-quarters full. A physical counting of the plastic refuse sacks at the temporary storage site indicated that an estimated 124 bins are collected on a daily basis.

Waste placed in corridors is due for timely collection. However, the infection control sister indicated that there is only one collection vehicle that also transports items to and from the Central Steam Sterilising Department (CSSD). This means that the plastic refuse sacks are left uncollected for longer periods than desirable.

The temporary storage site is about 950 metres from the incinerator. A government vehicle normally ferries the waste to the nearby incinerator on a daily basis. However, the waste can go for a number of days without being taken to the incinerator. The infection control sister reported that this is compounded by the problem of fuel. There are flies and rats at the storage site, which is normally referred to as the waste storage bay. Cats and dogs sometimes tear open the bins. When loading the refuse sacks into the lorry, the

workers are sometimes careless and medical waste is spread on the ground. Some of the workers would search for expired drugs and recyclable paper for resale, as reported by the infection control matron.

It is the responsibility of Anabas Cleaning Company workers to collect waste from the point of generation and put it in storage refuse sacks. However, the workers have no formal training with regards to solid medical waste collection and storage. Only 53% of the interviewed workers attended a one-day induction workshop as part of job training. The rest either missed the workshop or simply failed to attend. This means that the personnel carry out their operations without proper understanding of the risks and hazards involved.

Disposal by incineration.

As there are no storage facilities at the site of the incinerator, the material brought for incineration is scattered all over the incinerator location. There is only one person who operates the incinerator and he reported that people who bring the waste for incineration tear open the bins as they scavenge for usable items. He also argued that unnecessary waste, such as food, is found in bins brought for incineration. He pointed out that degradable material should be separated from solid medical waste. However, he cannot separate the waste as he is already overloaded with operating the incinerator.

The incinerator, as reported by the operator, has become very inefficient following the collapse of its furnace lining. The diesel-spraying pump is not working, so waste is ignited using paper. In addition, the incinerator is overloaded with waste from unauthorised external parties. Rats and flies are a nuisance since, due to its delayed incineration, some waste decomposes.

Residue from the incinerator is off-loaded and put into skip containers, which are ferried to Teviotdale municipal dumpsite by ENCO Private Limited Company. The residue is not complete ash, as it contains glass bottles and organic material.

DISCUSSION.

The results of the study revealed that solid medical waste is largely stored and collected with other refuse, including paper, plastics, and food. This results in mixed waste ultimately finding its way to landfill sites (7). The municipal dumpsite at Teviotdale does not have suitable measures in place for managing potentially hazardous waste. The State of the Environment in Southern Africa (2002) reported that the municipal rubbish dumps are infrequently covered with soil (8). This attracts vermin, leading to the spread of disease.

Failure to separate solid medical waste from other refuse means that waste not destined for incineration is also burnt. This puts unnecessary pressure on the already inefficient incinerator. On the other hand, solid medical waste that finds its way to the dumpsites poses significant health hazards to people who scavenge for usable and recyclable items. The incinerator has been reported to be inefficient, with low temperatures being applied (9). It has reported that simple and low temperature burning of solid waste does not destroy all hazardous components of the waste stream, but merely facilitates their dispersion in the atmosphere (9, 10). In cases of high concentration, these pollutants can be inhaled by humans, leading to several respiratory ailments. Research by Schirding shows that carbon monoxide, one of the most common by-products of incomplete combustion, reacts with haemoglobin to form carboxy-haemoglobin (4). This reduces the oxygen-carrying capacity of blood. In cases of extreme exposure, this causes mental fatigue and cardiac malfunction. On the other hand, the propensity for the formation of dioxin formatting can occur in this conditions (11, 12).

As there are no proper storage facilities at the incinerator site, rats and flies constitute a prolific epidemic. Rats have the potential of spreading plague and rat-bite fever (13), while flies may transmit bacillary dysentery and diarrhoeal diseases when they come in contact with food (14).

The survey established that people live nearby the incinerator. These are persons most likely to be affected if the problem of proper storage facilities is

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not addressed. Past research has shown that waste heaps support large populations of synanthropic flies, which are well known vectors of diseases, including diarrhoea, dysentery, and cholera (15, 16).

It is important to emphasise that the infection control team comprised two people, the infection control matron and sister. These two people oversee all the waste management operations ranging from domestic to clinical waste. They are registered general nurses who bear the burden of managing medical waste as well as domestic waste. There are no environmental health or waste management experts in the infection control team. This compromises the ability of the team to carry out its operations, as medical waste requires special handling by those who come into contact with it. In addition, a large percentage of Anabas Cleaning Company workers did not receive any formal training with regards to medical waste management and are consequently unaware of the environmental health impacts of medical waste.

Recommendations.

- Solid medical waste must be stored and collected separately from other refuse. As soon as it is generated, it must be put in separate refuse sacks containing no other waste.
- All sharp materials must be strictly put in separate boxes. These boxes must be placed near an area where sharps are used and should only be filled to three-quarters of their capacity, enabling them to be closed.
- The incinerator should be refurbished. The furnace lining must be repaired as well as the diesel-spraying pump. This will increase incinerator efficiency.
- Waste storage facilities should be built at the incinerator site.
- The incidence of rats and flies at the incinerator site must be frequently controlled by spraying chemicals or by other methods.
- Scavenging for usable items at the incinerator must be regulated. This can be done by enlisting registered people to search for usable items. These people will then be held accountable for any litter around the site.
- Residue from the incinerator must be put in

separate containers and transported to specific dumpsites.

- The personnel number at the incinerator must be increased. Two people can load and unload the incinerator, while one person can ensure that waste not destined for incineration is separated from waste to be burnt.
- There must be a collection tag specifically for collecting waste in the corridors and another for transporting materials to and from the CSSD.
- Environmental health experts must be included in the infection control team, as well as some waste management experts. This will improve the ability and effectiveness of the Infection Control team to carry out its operations.
- There must be a separate department for dealing with medical waste and another for domestic waste. This may increase the efficiency of medical waste management.
- Monthly training workshops must be frequently held for Anabas Cleaning Company workers. Environmental health and waste management experts should be called to discuss best practice.
- The government must allocate foreign currency for medical waste management operations.
- Waste, such as plastics, should be recycled and food should be composted. These must not be incinerated at all.
- The pathology waste from external parties should not be incinerated at the expense of Parirenyatwa Hospital. This would reduce stress on the already overloaded incinerator.
- Handling and management of medical waste should be done using two systems; one based on the rack and bag system situated in the sluice rooms of the wards. The bags are sealed and collected in wheeled bins which are transported off site to be emptied, washed, and disinfected before returning to the hospital. The second system is the use of returnable leak proof and puncture proof containers. The use of these systems does not only protect workers from injury but also improves the efficiency of collection and movement of solid medical waste.
- A medical waste management policy should be

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formulated separately from a hospital waste management policy. This can be done by a multidisciplinary team including Environmental Health experts and waste management experts.

CONCLUSION.

Medical waste is hazardous and infectious and must be disposed of separately. The personnel handling medical waste should be properly acquainted with the dangers that it poses, as mismanagement of medical waste can result in the sprouting of irreversible environmental health impacts. Due to the toxic nature of medical wastes, improper handling may destroy the natural environment and disturb the balance of ecosystems. Investments in medical waste management operations should not be seen as a cost. Rather, they should be viewed as a benefit.

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