



Need of Biomedical Waste Management in Rural Hospitals in India

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ABSTRACT

Biomedical waste management in India is receiving greater attention due to stringent regulations made by the Ministry of health. Biomedical waste may be disposed using different methods which many countries have adopted. However, the disposal of medical waste needs to be carried out in a way that neither the environment nor the health conditions of people are put at risk as they are hazardous. Observations have been made on how they manage their medical waste through visits in those hospitals. Several survey works carried out by various research organizations have been discussed and reviewed in this paper. The research is a cross-sectional comparative study carried out to determine the variations and similarities in the activities of clinical waste management practices in Hospitals of Rural Area in India. The results showed similarities in many areas, confirming that similar activities take place within the hospitals and variations in other areas confirming that many factors both external and internal affect the clinical waste management and other activities within the hospitals. Studies revealed many deficiencies in the management mostly weaknesses in segregation process. The management as well as the associated Environmental and health risks of medical waste are of global concern. There exist critical steps for safe and scientific management of medical waste which healthcare establishment can adopt.

Keywords: biomedical wastes, hazardous waste, waste-management plan, waste disposal.

INTRODUCTION

Biomedical waste means any waste generated during diagnosis of body parts, immunization of human beings or other living beings. Management of biomedical waste is an integral part of infection control and hygiene programs in healthcare industry¹. Biomedical waste can be categorized based on the risk of causing injury and/or infection during handling and disposal.

Wastes targeted for precautions during handling and disposal include sharps, pathological wastes and infectious wastes². Other wastes generated in healthcare settings include radioactive wastes, mercury containing instruments and polyvinyl chloride plastics. Other reasons for raising of biomedical waste is due to medical tourism flourished in India, which is also considered as boon for Indian economy and it will pave the way for more funds allotted to biomedical waste management³. These are among the most environmentally sensitive by-products of healthcare. WHO stated that 85% of hospital wastes are actually non-hazardous, around 10% are infectious and around 5% are non-infectious but hazardous wastes. In the USA, about 15% of hospital waste is regulated as infectious waste. In India this could range from 15% to 35% depending on the total amount of waste generated. The management of bio-medical waste is still in its infancy all over the world. There is a lot of confusion with the problems among the generators, operators, decision-makers and the general community about the safe management of bio-medical waste. The reason may be a lack of awareness. Hence resource material on the environment for hospital administrators, surgeons,

doctors, nurses, paramedical staff and waste retrievers, is the need of the hour.

Sources of Biomedical Wastes

While rural solid waste has attracted the attention of planners, environmental activists and civic administrators, there is yet lack of concern for some special sources of waste and its management for making green environment. One such waste is bio-medical waste generated primarily from health care establishments, including hospitals, nursing homes, veterinary hospitals, clinics and general practitioners, dispensaries, blood banks, animal houses and research institutes. The waste generation rate for the day ranges between 0.5- 2.0 kg/bed. The amount of waste generated depends on factors such as waste management techniques, the type of health care institution, health care specializations, and the quantities of reusable equipment available in the hospital/clinic and the number of patients treated daily. This section provides an overview of the research on clinical waste management. According to the Department of Environment, healthcare establishments include hospitals, clinics, outpatient surgery centres, pharmacies and nursing homes that create and generate hazardous waste that should be handled properly as to prevent its effect on the human health and the environment⁴. The study is conducted in order to determine and assess the clinical waste management in India that focuses on clinical waste management in district hospitals. As there were many studies focuses on general and bigger hospitals, district hospitals that has been more neglected were chosen as assumptions that there were greater



problems in the clinical waste management. The clinical waste management study covers the critical aspects in the process of clinical waste generation, separation, collection, transportation, storage, treatment and final disposal. It also examines the level of knowledge and awareness of the hospital personnel towards the clinical waste management in the hospitals. Biomedical waste in India comprises of the general waste, clinical waste, pharmaceutical waste, hazardous chemicals, and radioactive waste where clinical waste is reported together with pharmaceutical waste. Although 75 percent to 90 percent of hospital waste is a non-hazardous waste which is general waste, the remaining 10 percent to 25 percent of the waste is regarded as hazardous and may create a variety of health risks. Hospital waste is a potential reservoir of pathogenic micro-organisms that requires appropriate, safe and reliable handling⁵. There are recognised hazards associated with clinical waste where exposure to it can result in disease or injury. This is because clinical waste may contain infectious disease, contains hazardous chemicals or pharmaceutical, radioactive and it may contains sharps. Improper management of clinical waste management can create many problems especially threats to the health, safety and environment. The Ministry of Health stated that other most common issues faced by clinical waste management are the improper waste segregation at source. Poor healthcare waste management results in adverse effects on the environment and the public health where the most common issues in proper healthcare waste management are in terms of safe disposal of infectious and sharp waste and occupational safety for workers handling the waste. Persons who are most exposed to the hazards of improper clinical waste management include medical and nonmedical staff at hospitals and waste handlers as well as patients and visitors.

RESEARCH METHODOLOGY

The survey research is used to examine and evaluate clinical waste management and to identify the level of knowledge and awareness among the hospitals personnel. Besides using interview and physical observations, the study also used questionnaire as a tool to collect data and information from the hospitals personnel. The hospitals selected were from Shirpur, Dhule Dist, and Maharashtra, India. Instead of selecting general hospitals where much attention were given by the government and management as well as researchers, district hospitals were selected as to identify the problems in the clinical waste management system. Three hospitals were selected to reflect the clinical waste management managed at three different locations. Site surveys were carried out at the study locations as to observe and examine the current practices of clinical waste management. An observational checklist was used to record the findings from the surveys. Besides that, the research was administered using survey questionnaires to identify the level of knowledge and awareness on clinical

waste management among respondents. A non-probability stratified sampling techniques were applied for each hospital with the number of questionnaires distributed for each hospital was 20. Before distributing the questionnaires, a stratified sampling was used where only hospital personnel who are handling and managing clinical waste at the hospitals are the sample of the study⁶. Therefore, several departments and units generating and handling clinical waste such as wards, laboratories were selected. Simple random sampling at the locations was done where only ten to fifteen hospital personnel in each unit and department answered the questionnaire. There were 60 questionnaires equally distributed to medical practitioners at the three studied hospitals. Questionnaire covers the questions regarding the knowledge and awareness on clinical waste management in the hospitals. Face to face interviews were conducted with the concession companies and hospitals representatives regarding clinical waste management at the hospitals. Structured interviews were conducted to obtain information on the clinical waste management at the study locations. Frequencies and percentages were used to summarise information from the respondents about clinical waste management practices in the hospitals. There are some limitations towards the study. The hospitals chosen are to reflect the clinical waste management in the regions is in the same district. There are only three district hospitals selected for the study because of time and financial constraint. It is hoped that future studies on clinical waste management in healthcare facilities to be conducted at bigger sample populations as to accurately present the current practices and scenarios in rural India healthcare facilities⁷. The study focuses on district hospitals where the number of beds were not a determine factors for the hospitals. Questionnaires survey, interviews, observations and site visits were carried out as to obtain information regarding the clinical and their awareness towards clinical waste handling. Full cooperation by hospital personnel cannot be achieved through the study. Longer time was required by the respondents for many reasons such as lack of time to answer and the questionnaires are too long.

Biomedical waste generation & segregation

Clinical waste generated in the hospitals came from various activities performed in the hospitals. The amount of clinical waste generated in hospitals depends upon various factors such as size of establishments, number of beds, types of health services provided, available waste segregation options, economic, social and cultural status of the patients and general condition of the area where the hospitals are situated. However, the exact amount of clinical waste generated in the Hospital from the required years could not be provided by RCB as a result from poor record keeping. Only estimation amount of waste generation were provided. This amounts reflects that bigger hospital generate more amount of wastes than smaller hospital⁸. The segregation of clinical wastes from general waste was practiced by the hospitals. Sharps



were deposited into puncture-proof sharp bin, and infectious waste was first deposited into light blue bags for autoclave treatment before deposited into yellow bags for final disposal. Colour coded waste bins and high density polyethylene bags are available in the facilities to segregate clinical wastes. However, it was revealed that segregation of clinical waste was not conducted according to the definite rules and standards. At Hospital it was found that clinical waste deposited into yellow bins exceeds the specific limit of less than $\frac{3}{4}$ full. Besides incubation plates were found pressed into sharp bins, it was also revealed the risk of needle prick to waste handlers and staffs by the improper disposal of sharps into the container. Misusing of clinical waste bags and a yellow bag hung at the blood pressure machine were observed. Some of the nurses also mistakenly provided the clinical waste bags to patients to contain their clothes during discharge from wards. Besides clinical waste were thrown exceed $\frac{3}{4}$ full in the container, there were yellow bags hung at a trolley in ward. Some of the hospital staffs misused the yellow bags by depositing sharp objects. Intruding sharps from the bags might also affect the staffs and patients with infectious disease or risk of injury. As the clinical waste management in India hospitals should follow the guidelines provided by the Ministry of Health, much of the findings during observation were similar at the hospitals. A fundamental issue that was highlighted through interviewed with personnel at the hospitals was that there are frequently insufficient waste containers to handle the volume of clinical waste generated. The clinical waste containers and bags were provided by the concession companies to all required departments and wards in the hospitals.

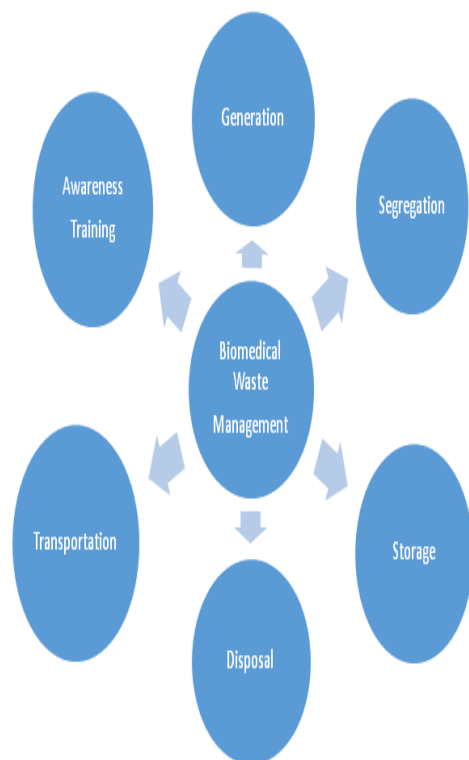


Figure 1: Components of Biomedical Waste Management

Central storage of biomedical waste

In all studied hospitals, there are central storages sites for biomedical waste temporary storage. Biomedical wastes were collected daily and stored temporarily in the waste storage area before final disposal. The storage of biomedical waste in the three hospitals was separated with general waste storage areas and was locked when not in access. Biomedical wastes are stored at twelve to twenty four hours and not more than forty eight hours at the facilities following the guidelines by the Ministry of Health⁹. There were facilities for washing down and disinfection of biomedical waste containers and bins. In Hospital hundreds of yellow plastic bags filled with biomedical waste including amputated body parts, placenta, used syringes, blood-stained materials and other infectious waste were left biomedical waste store. The cold storage should play its role in keeping the biomedical waste. However, observation identified that the cold storage for biomedical waste in Hospital was not in used besides it was made a rest room by the waste handlers. This situation should not happen as the abandoned biomedical waste had to be given priority to be stored safely.

Transportation of biomedical waste

Biomedical wastes generated in the hospitals were collected on a daily basis and transported to the temporary storage area in the hospitals. The findings are corresponding with the requirement by the DOE and WHO for daily and frequent collection and transportation of biomedical waste. During collection, new biomedical waste bags and containers marked with international infectious substance symbol are used replacing the collected ones. At the end of each shift, biomedical wastes were collected and transported to a temporary storage area by waste handlers¹⁰. There were two waste handlers at every shift where each of them was assigned to do collection at different collection points. The waste handler have to carry all the containers and trolley, collect the biomedical waste at generation points and change the yellow bags and containers at every location by their own. Wheeled trolleys were used in collection process to the temporary storage area. During observation, it was found that in Hospital, wheeled bins were left standing at corridors by the waste handlers.

Wheeled bins should not be left standing in corridors, special locations near patients and visitors traffic. This is important as clinical waste is a hazardous waste and can cause significant risk to people.

These vehicles were then cleaned and disinfected at the washing down facilities located at the central storage in lined with the legal requirement by the DOE¹¹.

The waste handlers were equipped with personal protective equipment during clinical waste collections and transportation including gloves, safety boots, face mask and apron as required by the DOE.

Disposal of biomedical waste

The external transportation process and procedures from the hospitals were observed similar in practice¹². The vehicles used for biomedical waste transportation were observed to have licenses from the DOE. During survey, it was found that the off-site transportation of clinical waste in Hospital to the incinerator is made on Monday, Tuesday, Friday and Saturday. The clinical waste collected on Sunday and Thursday will be kept in the cold storage until next collection on Monday. The transportation of clinical wastes from the central storage from the hospitals to the incinerators was made using a truck. Only one truck was used by all hospitals as it was capable of transporting the amount of clinical waste generated by the hospitals daily. A driver and an attendant were appointed by the concession companies to load and transport clinical wastes from the storage areas to the incinerators. Hospital personnel were involved in the verification process of collection at the hospitals as required by the Ministry of Health. Incineration is the final step in clinical waste management. All clinical waste collected and been transported to the incinerator plant were burned into ashes. The distance of Hospital to the incinerator is about 120 km which takes about 2 hours transportation time. Clinical waste collected at Hospital by RSB was sent to the incinerator. Only about 1 hour is taken to transport the clinical waste for final disposal. The hospitals during this time did not have a subcommittee to monitor how the final disposal of clinical waste is done where it is fully handled by the concession company.

Awareness and knowledge of biomedical waste management

Results show that majority of the respondents from the Hospital have high knowledge about the clinical waste management processes in the hospitals. 20 percent from Hospital did not know the correct method of clinical waste handling based on their categories¹³. Some respondents that did not know the colour coding system that separate clinical and general waste with Hospital. The result also shows that most of the respondents knew that the hospital has a set of transport schedule for hospital infectious waste within the organization and were collected and transported to the designated central storage site daily. Majority of the respondents knew that the clinical waste storage room should have good lighting and ventilation and that clinical waste storage time is from 24 hours to 48 hours. 34.7 percent from Hospital did not received training in the clinical waste handling and management in hospitals.

Majority of the respondents from Hospital were aware that clinical waste can cause risks and health hazards to health if not properly handled¹⁴. They were also aware that clinical waste can cause risks and adverse effects to the environment when not handling properly with Hospital. There were a number of respondents stated that they were injured with needle stick or sharp injury during waste handling

CONCLUSION

From the results of the study, it shows that clinical waste management in the hospitals studied is following the required standards and regulations. However, a continuous proper management of clinical waste in the hospitals cannot be practiced as there are some deficiencies and weaknesses in the management. Controlling waste is an important part of public health where improperly managed waste can create conditions that may have severe adverse effects on public health and the environment. Proper storage, collection, transportation, and disposal are key elements to controlling biologic and infectious wastes. Based on the Guidelines, to manage clinical wastes effectively, consideration needs to be given to the generation and minimization, source separation and segregation, identification and labelling, handling and storage, safe transportation and treatment. The occupational safety and health, public and environmental health as well as research and development into improved technologies and environmentally friendly practices should also be considered as accordance to the guideline¹⁵. From the findings, the problems confronting the hospitals include lack of instructions on the aspects of clinical waste segregation and practices by nurses and intermingling of clinical waste with general waste. It is no doubt that problem in improper segregation of clinical waste and general waste is a common problem in clinical waste management worldwide. However, it is still important to keep the segregation process according to the standard and guidelines as to ensure the safety and health of the people and environment. Besides that, improper use of clinical waste bags and containers including sharps containers are also common. Moreover, there are also failure to keep good record keeping on clinical waste generation, failure to ensure proper temporary central storage for clinical waste and low education and training on clinical waste management among the hospital staffs. It can be concluded that there are other hospitals in Malaysia probably having similar problems. Future research is encouraged to be conducted as to oversee and further assess the current status of clinical waste management and the problems exist. Broader aspects on clinical waste management such as risk assessment of the practices of clinical waste in hospitals should be conducted as to analyse the risks associated at every steps of the management. It is suggested that study should be conducted at all hospitals in India.

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