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Healthcare Waste Management in India: A Study

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Abstract

Management of medical waste in India has been given more attention because of the latest rules (Management & Handling of Biomedical Waste Regulations 1998). The current situation is discussed in several medical units, includingthe quantity and percentage of various waste components, processing, treatment, and disposal methods (HCUs). The rate of waste production ranges from 0 5 to 2 kg of bed – one day – one day. The anticipated trash generation in India is approximately 0 33 million tons per year. Solid wastes are bandages, sheets and other infectious wastes (30%-35%), plastics (7%-10%), disposable needles (03%-5%), glass (3%-5%) and other general garbage, even foods (40%-45%). The garbage is generally collected in mixed form with municipal solid waste, transported and wasted. In many regions, authorities fail to implement acceptable systems for a number of reasons, such as lack of suitable technology, limited financial resources and a lack of professional waste management training. Health hazards and weaknesses in the current system are noted with regard to healthcare waste management. The guidelines on biomedical waste management and processing have been summarised, which include several categories of waste, recommended storage containers with colour-coding and treatment alternatives. Existing and prospective waste management methods for healthcare are described. A waste management plan for healthcare facilities, including institutional structures, appropriate technology, operational planning, financial management, and relevant staff training programmes, is also proposed.

Keywords: biomedical wastes, disinfection, healthcare establishment, infectious waste, regulations, waste-management plan, waste disposal, India.

Introduction

Creating health care for all civilised societies is a fundamental requirement. For the treatment of outpatient and hospital-admitted patients, food, medicines, chemicals, equipment and instruments, a variety of waste is produced. Wastes from the treatment of people with infectious disorders might spread the infection either directly or indirectly via the environment. Overall, this issue has been taken seriously and properly devel- and installing waste management systems. In India, the relevant agencies have recognised this problem and government policies have been set up to apply systematic temperatures. Accordingly, health authorities (HCUs) aim to install systems to comply with the law. There are a lot of challenges to apply these standards in practice in various regions. The report analyses the difficulties and identifies current weaknesses to help overcome these concerns. It also proposes a plan for improving the development of adequate waste management systems.

Existing healthcare waste management

In India, both the public and the private industries have a significant network of HCUs. There are vast numbers of minor clinics or clinics that only offer ambulatory care. The cen- tres community health service provides rural health facilities. The next level includes subdivision and regional hospitals, medical schools, and public- and private-sector hospitals. Furthermore, the latest trend of the creation of MSCs in urban centres is fast rising. In all these institutions, the normal bed strength ranges between 30 to 1000 or more beds. These hospitals generate large volumes of garbage, which the hospitals themselves have to manage. The amount of waste produced is, however, substantially smaller in rural hospitals. The health data show that 20% of all beds are in rural hospitals, and 80% are in metropolitan hospitals (Ministry of Health and Family Welfare, India, 1998). It is predicted that around 0 33million tons a year—1 of the total hospital garbage is generated, extrapolating from previous numbers the number of beds and average waste generated at the rate of a 1 kg bed—1 day—1.

Hazards of healthcare waste management

There is currently no specific system that ensures that the infected and non-infectious waste is separated at the source. As a result, infectious trash is mixed with others regularly disposed of alongside municipal waste, leading to different risk types (Kelkar, 1998).

Quantities

The quantity of garbage created at the plant needs to be known in order to prepare a well-planned waste management system. Therefore, by talks, interviews and physical tests, the quantities of different waste types have to be calculated. The amounts generated depend on the type of hospital and the local economic situation from hospital to hospital. The hospitals normally do not preserve the data on the quantity of garbage. The trash amount was physically weighed in various hospitals with specialised equipment in one of the research carried out in Indore City. Table 1 shows the average values (Malviya, 1999). Many hospitals in India are overcrowded, and so the amount of waste is estimated at 100%.

Category of HCU	Quantity (kg bed^{-1} day^{-1})[a]
Paediatric unit	0·53
Eye unit	0·66
Orthopaedic unit	2·15
Gynaecology unit	1·43
Medicine unit	1·80
Surgery unit	1·04
OPD, burns, X-ray and canteen	2·64
General hospital	1·95
Multi-speciality hospital	2·23
Average	1·60

Table 1. Quantity of solid waste from healthcare units (HCUs)

Composition

Health waste is classified as infectious and non-infectious (Saini and Dadhwal, 1995). Infectious waste contains enough or large pathogens that may be transmitted by exposure to infectious diseases. These waste products include cultures and spatuli from laboratory tests for infectious agents as well as garbage following surgery and autopsy for infected patients. Wastes in touch with animals or those with infectious diseases, including human tissues, tissues or organs, portions of the body, bodily fluid-contaminated objects, cotton dressings, other contaminated materials with blood, etc. From packaging and the preparation of meals and guests' activities non-infectious wastes are generated. Compared to infectious waste, this waste is large.

A high proportion of these products are possibly recyclable but can be contagious. Before submitting for recycling, these must be stored separately and sterilised. A study carried out in Indore City shows the proportion of solid wastes generated at different hospitals in Table 2. The composition of different components depends on the type of equipment supplied by HCUs. A detailed field investigation has been carried out in Calcutta, where eight large hospitals have been examined with solid waste composition encompassing three seasons of the year; the average deviation values are shown in Table 3.

Handling methods

In India, trash is usually collected without disinfection in open containers. Plastic or other unspecified containers are collared on bandages, cotton and other materials that are used to absorb human fluids. Mixed form wastes are collected. Some national hospitals have their own color coding scheme designed (CPHEEO, 1998). Without disinfection or mutilation, waste sharks are abandoned, which may lead to their being reused and so an infection spreading. The garbage collection and transport personnel segregate the recyclable material for sale in the hospital. Likewise, the garbage pickers will separate all disposable plastic goods, who store the waste inside the hospital or outside the community basin for onward transport and disposal together with municipal rubbish (Rao, 1995).

Type of waste	Range (%)	Average (%)
General	50·46–88·31	71·37
Infectious	10·00–36·23	18·83
Pathological	4·06–19·71	8·11
Chemical	0·22–2·77	0·91
Sharps	0·41–1·42	0·78

Table 2. Proportion of solid waste from HCUs

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Table 3. Composition of hospital waste in Calcutta

Treatment and disposal

The garbage was sterilised and disposed away with regular waste at large hospitals. Similar treatment of waste generated in ambulatory departments (OPD). Discharge is made without disinfections/sterilisation of wastes from operating theatres, stationary and pathology labs. The rest is torched in some corners of the hospital, typically in open pits and in the area of the body where amputations, anatomical waste, or other highly infective wastes are present.

Health waste is generally buried in the on-site pits in smaller municipalities or shipped to municipal trash disposal sites.

Smaller private nursing homes and clinics do not take safeguards and typically dispose of waste from communal waste storage bins.

Therefore, the disposal of medical waste together with municipal garbage is a widespread practice. For its disposal, open burning is also usually observed.

Waste picking

Many waste collectors collect recyclable products from their waste, such as plasticware, needles and glass. Recyclables such as plastics, glass and metals have been picked up from and sold by cleaning personnel in HCUs several times. This is a risky practice because it is linked to a significant risk of infection and grave sickness.

Shortcomings in the existing system

In the country, increased urbanisation has led to faster urban health facilities than in rural areas. Waste management systems are already overloaded in metropolitan areas. The situation is, therefore, further compounded by the mixture of HCU infectious waste. Only a few facilities have separate systems for the disposal of HCU waste. The weaknesses in the current system are:

- mixed collection of wastes increases the quantity of infectious waste;
- absence of colour-coded storage containers for different categories of waste;
- non-availability of treatment and processing devices compatible with waste generation;
- lack of common treatment and processing facilities;
- unplanned waste-management systems; inadequate provision of budget allocation;
- lack of awareness of better waste management; lack of waste management training for HCU staff.

In the past, numerous reform agencies have undertaken efforts in this field in view of these deficiencies. The Indian Standards Bureau (1989) has drawn out standards for the management of hospital waste. Another group of experts has produced a working manual (Pruthvish et al., 1998). In this manual, the handling, disinfection, housekeeping and disposal of practical topics are discussed in detail in safe hospital waste management.

Shrishti, a non-governmental organisation, created a roadmap for building a system for managing the trash of hospitals. It was intended to encourage both management and worker participation and to ensure that resources are provided. A two-step planning process addresses topics such as organisation, assessment of existing practices, collection, processing, equipment, training, and reporting. Their separated collection, processing and treatment is explained in detail in simple approaches for waste categorisation, mainly as infective and non-infectious. Waste collection is discussed in more detail at the hospital, the operating theatres, etc. The document contains the technique for training various staff levels. Finally, casestudies covering the technical aspects of the guide are presented (Kela et al., 2000).

SKAT has collated case studies from many developed countries such as Ghana, India, Nepal, the Palestinian Territories, Senegal and Tanzania and is provided in a question and in the response form. The conclusions are drawn on the agencies' position on the spot in line with the responses to each question. The learned lessons are summarised in the preceding studies. The authors underline that health waste management is not just about data collection and technology; training, engagement, management, leadership and effective lawmaking are needed (Code and Christen, 1999).

The World Health Organisation has published a detailed booklet describing in-depth definitions, characterisation, health effects, laws, policies and waste management plans (Pruss et al., 1999). The related expenses and safety practices, hygiene and infection control, are also highlighted for both employees and trash workers. In India, a comparable extensive report was prepared (Mehta, 1998).

Biomedical wastes (management and handling) rules

In 1998, the Ministry of the Environment & Forestry produced a report on the rules governing the management of biological waste (management and management) (The Gazette of India, 1998). The Minister introduced the term biomedical waste for all kinds of trash from HCUs and veterinary facilities while defining the regulatory framework. Biomedical waste is included in table 4 in 10 categories.

The Rules also make the waste generator responsible for segregation, packaging, storage, transport and disposal of the waste in order to ensure that it does not endanger public health. Table 5 provides the color coding, type of container and appropriate treatment and disposal choices for distinct forms of biological waste. The categories are placed together to help unqualified employees handle garbage.

A suitable biological hazard or cytotoxic sign should be labelled for the containers used to store biomedical waste.
For HCUs (linked occupants) delivering services to more than 1,000 patients a month, permission from specified authorities such as the National Pollution Control Boards is mandatory. This is awarded for a 1 year trial term.
The guidelines specify the treatment and disposal duties of employees for biological waste. The disposal alternatives listed include incineration, deep funeral, autoclaving, microwave, disinfection, mutilation and disposal in municipal sites. As the waste management system in India is at its earliest stage, the technologies laid down in the guidelines are generic and should be created under certain conditions.

No.	Category	Type of waste
1	Human anatomical waste	Human tissues, organs, body parts
2	Animal wastes	Animal tissues, organs, body parts, carcasses, fluid, blood; experimental animals used in research, waste generated by veterinary hospitals
3	Microbiology and biotechnology wastes	Waste from laboratory cultures, stocks or specimens of micro-organisms, live or attenuated vaccines, human and animal cell cultures used in research, infectious agents from research and industrial laboratories, wastes from production of biologicals, toxins, dishes and devices used to transfer of cultures
4	Waste sharps	Needles, syringes, scalpels, blades, glass, etc., capable of causing punctures and cuts. This includes both used and unused sharps
5	Discarded medicines and cytotoxic drugs	Waste comprising outdated, contaminated and discarded drugs and medicines
6	Soiled wastes	Items contaminated with blood fluids including cotton, dressings, soiled plaster casts, linens, bedding
7	Solid wastes	Disposable items other than the waste sharps, such as tubing, catheters, IV sets etc.
8	Liquid wastes	Waste generated from laboratories, washing, cleaning, house-keeping and disinfection activities
9	Incineration ash	Ash from incineration of any medical wastes
10	Chemical wastes	Chemicals used in production of biologicals, disinfection, insecticides, etc.

Source: *The Gazette of India* (1998).

Table 4. Categories of biomedical waste

Depending on the treatment option chosen, colour coding shall be selected for waste categories with numerous treatment options as mentioned above. Waste collection bags shall not be made of chlorinated plastics for forms of waste that require burning, namely, PVC; other chlorinated rubbish shall not be burnt. Collected waste shall not be incinerated. Liquid garbage and liquid waste do not require bags or containers. If disinfected locally, it is not necessary to place microbiology and biotechnology trash in containers/sacks. Only in towns with a population of fewer than five lakhs and rural areas should deep funerals be used.
The authority to be established by each State Government/Union Territory is the agency responsible for the execution of this rule. Sharps and disposable equipment were barred from recycling and reusing. Before disposal, they must be disinfected/sterilised and mutilated.
A consultative group should be formed that includes health and animal husbandry experts, veterinary sciences, environmental management, municipal administration and any associated HCUs department. The Advisory Committee shall also include representatives of the State Pollution Control Board/Pollution Control Committee. Where necessary, the committee must advise the State/Union Government on questions relating to the application of the Rules of Procedure.
An annual report shall be presented to the prescribed authorities by all employees in a defined format. The report will provide information on biological waste classifications and volumes processed throughout the previous year. By 31 March each year, the author shall transmit this information to the Central Pollution Control Board.

Implementation of the regulations

The various HCUs should apply the rules. By the end of 2002, waste treatment plant such as incinerators, autoclaves, microwaves etc. must be phased in. Storage, collection, processing and disposal facilities must be provided. Nevertheless, efforts have been limited to ensure adequate technologies.

As much as required, the Rules of Procedure have not been publicised. Thus, it may not be completely aware of tiny HCUs. A variety of problems such as collecting and storage standard, equipment, etc. have not been addressed in detail. However, it is difficult for them to manage their wastes according to the regulations, given that the proper equipment is not available.

Need for additional provisions in the regulations

A critical evaluation of the Rules shows that the following difficulties must be tackled if they are to be effective: (1) responsibility for the carriage and disposal after disinfection on the part of local authorisation, such as a municipal government; (2) provisions on workplace health and safety for waste handlers; (3) provisions on waste picking and waste scavenging; (4) awareness programmers;

Waste management plan for HCUs

Members of the Waste Management Team (WMT) should be appointed for an examination in their area of responsibility of the existing waste management. In the light of provisions established in the Rules and the development of an appropriate system, existing practices should be examined.

Institutional arrangements

The administration and active involvement of the trained personnel in the segregation, storage, collection, transportation, treatment and disposal rely on the management. Health care waste management. Staff members and other support people primarily carry out these activities. Therefore, the establishment head, all departures, hospital superintendent, nursing superintendent and hospital engineer is desired to organise a committee. Consequently, it is expected. An Environmental Control Consultant and an Infection Control Consultant could select a waste management officer to advise the committee. According to the HCU facilities and staff, the committee might be formed.

Appropriate technologies

Waste management technology, affordable and in line with operational and maintenance circumstances and legal regulations, should be consistent with waste characteristics. As the systems have evolved in India, the scope for developing suitable technology for storing, transferring, collecting, transporting, processing and disposing of health waste is widespread. (2) handcarts closed; (3) disposable mutilation devices like nets, syringes and plastic items,;(4) appropriate sterilisation devices, such as incinerators and microwave ovens, including dry and wet-thermal technologies; (3) the use of disinfectants and sterilisation devices, of appropriate sizes. These include:

To help HCUs select devices that are suitable for their use, a selection of storage containers, disinfectants, and processing equipment might be made available. For tiny, space-insufficient establishments, a centrally placed common waste treatment system could be developed. However, such a system will require safe and frequent trash transfer, which entails extra costs.

At present, even large hospitals, since the system is not entirely formed in the country, are concerned about constructing their facilities and finding a shared treatment facility. But awareness of the need for action gains speed due to the implementation of regulations.

Operational plans

The operational plan shall include (1) storage container location and capacity; (2) collection frequency for various waste types; (3) schedule of activities. Operational plans shall include:

Infectious waste should be stored in colour-coded containers that are stiff to be safe to handle and can be disinfected/sterilised by the healthcare facility available.

Waste should be transported to a disinfection or treatment facility within a hospital on closed handboards. After disinfection/sterilisation, the garbage is transferred to a shared processing facility, such as an incinerator or controlled site, after disinfection/sterilisation. General waste from food, packaging and other HCUs, together with municipal solid garbage, shall be maintained separately and disposed of. The trash is disposed of away in the sewage system following proper treatment.

Financial management

Financial provision is important for capital and recurring expenses when specialised systems have been implemented in many HCUs. There should also be a long-term resource recovery plan. A separate distribution of waste management funding is usually not provided. But appropriate personnel, disinfectants, equipment and devices must be provided with funding. Rs. 3000–4000 (USD 70–93) is expected to be required per ton of hospitals trash. This could be identified by private HCUs when loading patients. Government hospitals should, nevertheless, make enough provision of waste management money and satisfy budgetary expenses.

Awareness and participation

Awareness that healthcare waste is being properly handled and disposed of between health staff is a priority; it is necessary that everyone knows the possible health risks. Regular programs avoid health waste and related risks from being exposed. Effective methods are displayed in posters, correct labelling and staff explanation. It is also vital to have workshops and seminars and to participate in training courses. WHO has supported regional seminars on this topic in India (WHO, 1999). These workshops focused mainly on: (1) trash reduction, recycling and separation; and (2) handling, storage and transport.

Waste minimisation

The following reduction tactics can achieve waste reduction: (1) reusable glass and metal elements that can be disinfected and reused as far as possible, as far as possible (Raghupathi, 1998). (2) Reusable products, increase sterilisation processes and quality assurance, adequate monitoring and cleaning validation, patient disinfection and decrease the amount of single-use pre-sterilised products. (3) Adopt waste management methods and policies. (3) (4) Develop, in collaboration with an approved plastic manufacturer, an effective plastic recycling policy. (5) In order to avoid the formation of hazardous chemical waste, use steam sterilisation procedures in alternative to chemical disinfection.

Conclusion

The management of healthcare waste is likewise heavily influenced not only by technical problems but also by economic conditions. Legislation alone will not make it more effective. Sustainable solutions can be implemented through the involvement of local waste management agencies and through the observance of efficient management principles. Before reuse, recycling, or disposal, healthcare waste should be disinfected and mutilated. Precautions must be taken to prevent the reuse of disposable devices such as needles or syringes. Efforts must be taken to minimise waste: a suitable plan must evolve in accordance with the current situation. Lastly, there need to be proper financial arrangements.

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