

BIOMEDICAL WASTE MANAGEMENT PRACTICES IN PUNE

A look at how biomedical waste is collected and disposed by hospitals in Pune, and the implications of these practices on the society and environment



Healthcare is a never dying industry in any country. Hospitals, which are at the center of this industry, have immense scope for continual expansion, in terms of their infrastructure and services. As in any other industry, hospitals also generate waste. However, this waste is different in terms of content.

Hospitals generate biomedical waste, the handling of which is one of the major concerns of hospitals across the globe, in particular, those of the developing countries.

Let us look at how biomedical waste is handled, segregated and disposed of by private hospitals in Pune. Popular as a well-planned and progressive city, an examination of the waste management practices in this city will give us a fair idea of how this issue is handled in other hospitals across India, and the implications on the society and the environment. We will also examine the method of collecting and disposing waste, as practiced by the Common Biomedical Waste Treatment Facility.

What is waste?

The term 'waste' refers to 'all the materials arising from human and animal activities that are discarded as useless or unwanted.'¹

Waste is produced in every household or industry where human beings reside or work. This waste is an inherent part of our lives. Overproduction of waste or its careless disposal can have long-term effects on human lives, and indirectly on the environment too.

1. wgbis.ces.iisc.ernet

Waste in the society can be classified into the following categories:

- i) Municipal solid waste
- ii) Bio-medical waste
- iii) Hazardous waste
- iv) Electronic waste
- v) Construction waste

Let us now understand what biomedical waste is.

Biomedical waste: A life-threatening issue

The waste produced by hospitals is known as 'biomedical waste'. This waste is different from all other waste, mainly because of its hazardous nature. Since this waste is directly generated from the human body and animals, it is the content more than the quantity which makes it dangerous and risky.

Hospitals are institutions that form a part of the category of emergency services. They are frequented by people from every layer of the society. Despite technological advancement, and the progress made in terms of knowledge, there has been no reduction in the amount or form of waste produced by hospitals. Strict prohibition of reuse of medical equipment only adds to the problem. Naturally, this has led to an increase in the use of disposable medical supplies, causing an increase in the quantity of biomedical waste.

The hazardous nature of biomedical waste came to the limelight in the 1980s and the 1990s. Till then, it was not considered a life-threatening issue. In the 1980s and 1990s, the exposure to HIV and Hepatitis B virus increased the awareness of biomedical waste. It also brought forth the potential risks involved in bio-medical waste.²

Not only is biomedical waste a risk to the society and the environment, but people who collect, segregate and dispose it are at potential risk from this waste too. Needles, blades and other sharp instruments that are not disposed of properly or not disinfected can infect them or harm them. Also, the high temperatures and toxic gases released during waste disposal pose a health hazard to the workers.

Surprisingly, 80% out of the total quantity of biomedical waste, is non-hazardous. Only 15% is harmful or infectious. If bio-medical waste is allowed to mix with municipal solid waste and dumped in the garbage bins meant for other waste, then the entire mass becomes infectious and can pose a potential risk to the nearby residents. Since this will be disposed of at landfills, the environment will

also be harmed. If incinerators are not operated properly, environmental degradation is inevitable. Considering the hazardous nature of biomedical waste and the risks associated with it, the Ministry of Environment and Forests formed the Biomedical Waste (Management and Handling) Rules in 1998.

The Biomedical Waste (Management and Handling) Rules, clearly define various terms including 'biomedical waste', 'occupier' and biomedical waste treatment facility. They cover important areas like treatment and disposal, segregation, packaging, transportation and storage of biomedical waste. They clearly state that the government of every state will establish a prescribed authority.

Data reveals that 15.69% of the Health Care Establishments (HCE)

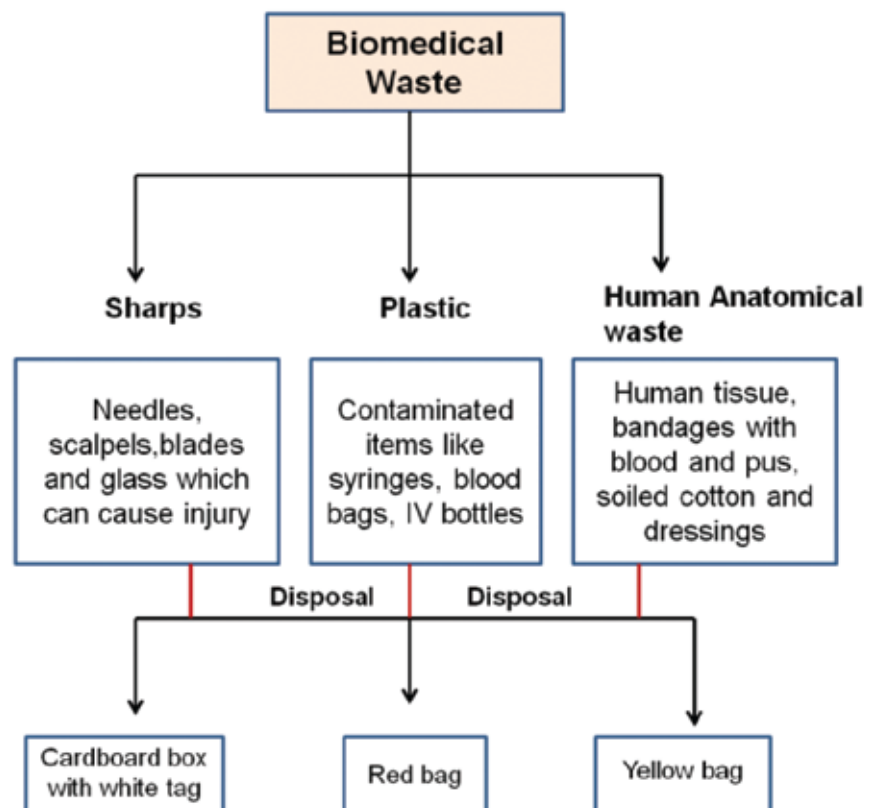


Figure 1. Types of biomedical waste and disposal bag color code 3

2. www.jomfp.in/article.asp

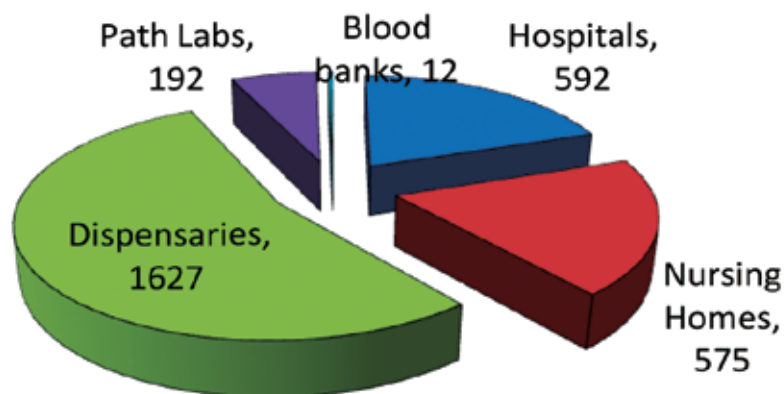


Figure 2. Sources of biomedical waste

in Maharashtra are found in Pune, which contributes to about 19.58% of the total biomedical waste load of Maharashtra state. The total number of bedded HCE in Pune are 2764 and the non-bedded HCE are about 4421. The bedded HCE generate 4158 kgs whereas the non-bedded HCE generate 4337 kgs of biomedical waste.³ The Rules also categorize the waste into ten categories and lay down the method of treatment and disposal. (Refer fig. 1) The Rules also clearly state the colour coding to be followed and the type of container to be used for the storage of each category of biomedical waste.

Biomedical waste management scenario in Pune city

Pune is becoming a sought after destination for healthcare. Many healthcare companies are looking at Pune and major hospitals are planning large-scale expansion.⁴

Currently, the city generates about 1750 kgs of biomedical waste everyday. This quantity comes from 592 hospitals, 575 nursing homes, 1627 dispensaries, 192 path labs and 12

blood banks, which are registered with the Pune Municipal Corporation.⁵

Methodology

In order to understand biomedical waste management in Pune, case studies of three hospitals and the common biomedical treatment facility were carried out. The data obtained was tabulated and an attempt was made to understand the biomedical waste storage, segregation, handling and disposal in the hospitals of Pune. The study involved hospitals within the Pune Municipal Corporation (PMC) limits only.

The two old and well established hospitals that were studied had different number of beds. The study attempted to understand, how much waste is generated and how it is managed in hospitals with varying capacity (in terms of beds). The third hospital, which was identified for study was a very recent establishment, where examinations were done to see whether any special provisions with regard to biomedical waste management existed. The staff members who handled the biomedical waste were interviewed to find out the details of the processes followed.

According to the rules prescribed, the duty of the occupier is segregation, packing and daily handing over of the waste. The occupier of any healthcare facility is required to register with the following three bodies:

- The local authority, which is PMC in Pune
- Common Biomedical Waste Treatment Facility (CBWTF), which is Passco in Pune
- Maharashtra Pollution Control Board (MPCB)

Table 1: Data from the case studies

Hospital	Location	No. of Beds	Private/ Govt.	Method of disposal	Main Storage area
1.	Pune	411	Private	Given to CBWTF - Pascco	Near the main entry
2.	Kamla Nehru park, Pune	100	Private/ Trust	Given to CBWTF - Pascco	On the side of the hospital
3.	Aundh, Pune	75	Private	Given to CBWTF - Pascco	On the rear side of the hospital

Table 2: Hospital and quantity of biomedical waste

Hospital	No. of Beds	Quantity of Bio-medical waste generated/ month
1.	411	5,150 kg
2.	100	900 kg
3.	75	20 kg (note: since the hospital was opened 15 days back, the waste generated was very less)

3. Environment Management Centre. "Status of Biomedical Waste Management in the State of Maharashtra, 2010. Maharashtra Pollution Control Board, Mumbai, June 2011. www.emcentre.com

4. www.expresshealthcare.in

5. Dasgupta, Amitabh. "Biomedical Waste Disposal-is the city coping?". Sakaal Times, 28 November, 2010. Print

The number of beds, the location, the technique of disposing waste and the main storage area are mentioned in Table 1.

BIOMEDICAL WASTE MANAGEMENT IN HOSPITAL 1

This is a huge hospital with nine floors and a capacity of 411 beds. It generates almost 6000 kgs of biomedical waste every month. This waste is segregated at the source itself. Before disposal into garbage bins, the waste, such as plastic is disinfected using 1% sodium hypochlorite. This waste is shifted to the garbage room located on the same floor. All the segregated biomedical waste from the same floor is collected in this garbage room. The waste from each floor is then brought to the common storage area located near the main hospital gate within the premises. This shifting is done at night, when there is less crowd, using the common lift. Once in the common storage area, the colour coded waste bags are kept in a closed container. These are later picked up by the Central Biomedical Waste Treatment Facility (CBWTF).

BIOMEDICAL WASTE MANAGEMENT IN HOSPITAL 2

This is a multi-speciality private hospital with 100 beds. Each department that generates biomedical waste has colour-coded waste bins. The waste from each floor, after being disinfected, is collected in the colour coded bins placed in the area on the rear side of the building. This shifting of waste is done using the patient lift only. The waste is then collected by CBWTF.

BIOMEDICAL WASTE MANAGEMENT IN HOSPITAL 3

This is a newly opened 75 bed private



Figure 3. Biomedical waste in yellow bags

hospital, in Pune. Being fairly new, the biomedical waste generated is not very significant as compared to the old and established hospitals. In this hospital also the waste is segregated and disinfected at the source itself. An electric needle cutter is used to break the needle portion of each used syringe, to prevent needle injuries. The waste collected from all the floors is brought down using the common lift. It is then stored in colour-coded bins, in the area behind the hospital, from where it is picked by the CBWTF vehicle every morning at 10 am.

AREAS OF CONCERN

The study of these three hospitals brought to light certain problem areas as follows:

- The absence of a separate, designated area for storage of biomedical waste.
- No separate lift that could be used to collect waste from each floor and bring to the main storage area.
- No proper planning for the transportation of the waste from each floor to the main storage area.

COMMON BIOMEDICAL TREATMENT FACILITY(CBWTF): A CASE STUDY

A Common Biomedical Waste Treatment Facility or CBWTF is a place where the biomedical waste generated from various healthcare

establishments is treated and disposed of properly. This ensures that the adverse effects on the society and environment is reduced. There are many reasons that make it impossible for hospitals to have their own biomedical waste disposal facility:

- High capital investment required to set up an individual biomedical waste treatment facility.
- Separate manpower and expert staff required to operate the facility.
- Since hospitals are majorly located in areas surrounded by residential and commercial establishments, location of a CBWTF in such an area will pose a health hazard to its residents due to the emission of toxic gases during the disposal process.

Keeping all these factors in mind, the concept of CBWTF has been introduced to cover up for all the issues related to biomedical waste disposal. It is a proven concept, which many developed countries have adopted. The Central Pollution Control Board (CPCB) has prescribed guidelines for CBWTF.

Founded in 1995, Passco Environmental Solutions Private Limited is a leading environmental and waste management organization in Pune associated with biomedical waste disposal. It operates on Build-Own-Operate (BOO) and Build-Operate-Transfer (BOT) basis. Everyday Passco collects approximately 3000 kgs of biomedical waste from 370 locations in Pune. It owns seven collection vehicles and two vans, which are equipped with weighing scales and bar code scanning facilities. Each vehicle has a 24x7 GPS tracking system to check foul play.

The final disposal site is located in the premises of the Kailas crema-

torium in Pune, which is equipped with incinerators, a waste autoclave, waste shredder and an Effluent Treatment Plant (ETP). There is a separate place for storing the waste generated from the disposal of biomedical waste. Also, there is a separate area for washing the vehicles after the waste has been unloaded.

The rates charged by Passco are based on the Nursing Homes Act.

Table 3: Disposal method followed by Passco

Waste category	Disposal method followed by Passco
Plastic waste (autoclaved, shredded and treated)	Recycling
Incineration ash	Sent to a company in Ranjangaon which disposes it to secured landfill
Waste sharps (disinfected)	Secured landfill

They have prescribed rates for different categories of healthcare facilities.

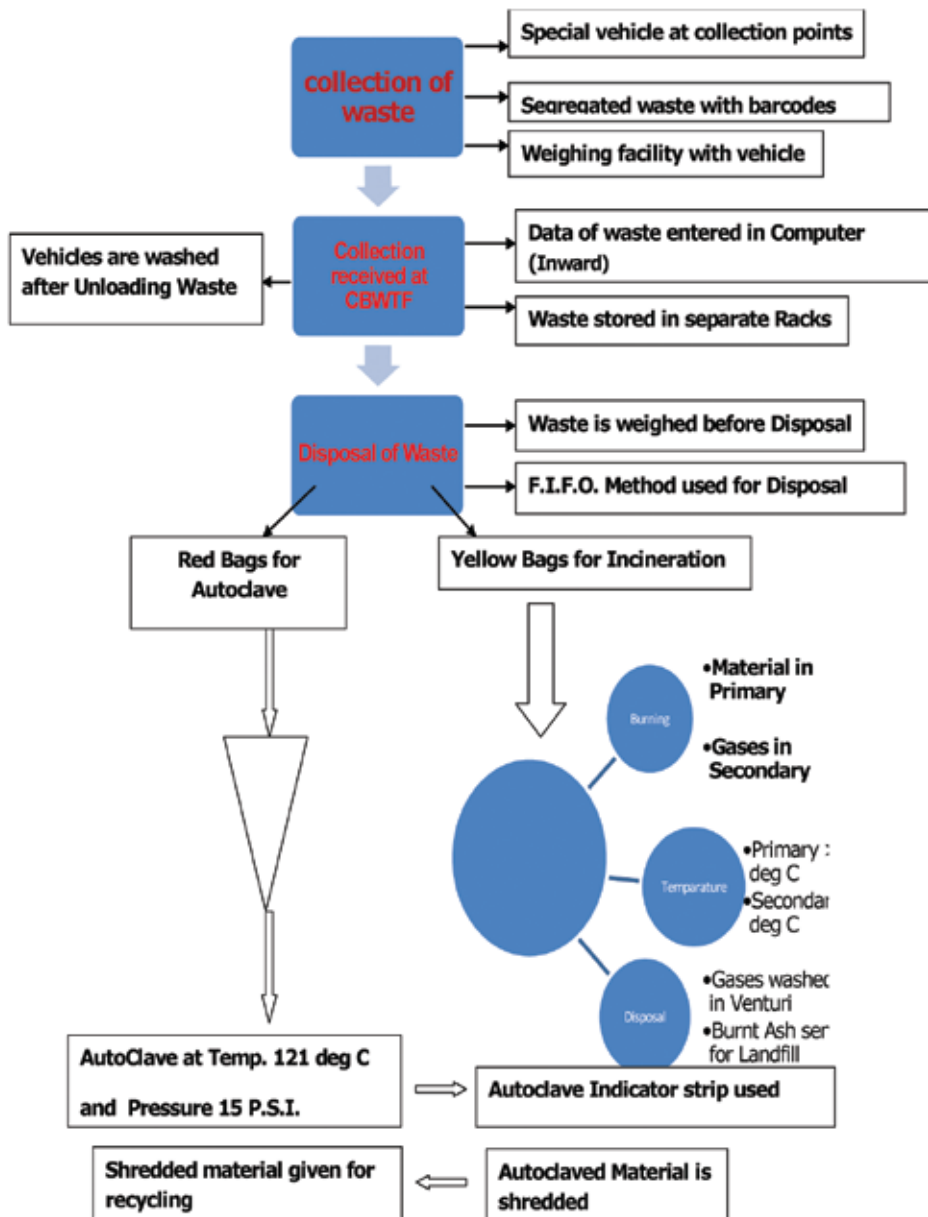


Figure 4. Flow chart showing the process followed by Passco (Source: Passco)



Figure 5. Passco vehicles equipped with weighing machine. (Photo Courtesy: Passco)



Figure 6. Shredder and autoclave (Photo Courtesy: Passco)



Figure 7. Incinerator and incineration ash
(Photo Courtesy: Passco)

CO-ORDINATION BETWEEN THE HOSPITALS, CBWTF AND MAHARASHTRA POLLUTION CONTROL BOARD (MPCB)

All hospitals are required to register themselves before they start operating. The registration is done with the local authority, CBWTF and MPCB. The Common Biomedical Waste Treatment Facility is appointed by the local authority, that is, the Pune Municipal Corporation (PMC) in Pune, for collection and appropriate disposal of waste. The entire process of waste management in hospitals, right from segregation to storage, handing over of the waste to the CBWTF and the disposal procedure followed by the CBWTF, is monitored closely by the MPCB. Hence, all the three are dependent on each other. With co-ordination from each other, they are bound to function well.

Observations

- The area for storage of biomedical waste, for collection by the CBWTF vehicle, is not situated away from

- the main hospital building.
- The area for storage is neither fenced properly nor has any covering (on the top).
- In many hospitals, the biomedical waste storage area is not defined.
- There is lack of knowledge about the categories of waste, as per the rules leading to mixing of one waste with another.
- The people who actually handle, segregate and store the waste are not educated about the hazardous nature of biomedical waste.
- Heavy charges required to be paid prevent many small healthcare facilities from registering for biomedical waste disposal.
- There is no separate lift for transferring biomedical waste from all floors to the area of storage.
- The CBWTF vehicles collect and transport the waste to the disposal site during the morning hours, which poses a threat to the areas in which they operate.
- There is a difference in biomedical practices prescribed as per rule and actually followed in private hospitals.

Recommendations

EFFECTIVE BIOMEDICAL WASTE MANAGEMENT AT HOSPITALS CAN BE ENSURED BY:

- Educating the people who actually handle the waste, in the local language using simple terms.
- Monitoring segregation of waste at the source, to avoid contamination.
- Standardizing the infrastructural requirement.
- Providing a designated and properly fenced area with a separate lift to be used only for transfer of biomedical waste.

- Bringing waste from all areas of the hospital to the main storage area during the night, to avoid infection and injury.
- Ensuring that the distance between the storage area and the collection point is minimal to avoid spilling waste and interfering with visitors to the hospital.
- Providing for easy-to-clean finishes for the biomedical waste storage area.
- Ensuring that plastic waste is not sold to scrap dealers, but sent for autoclaving.

EFFECTIVE BIOMEDICAL WASTE DISPOSAL AT CBWTF CAN BE ENSURED BY:

- Training the hospital staff on safe biomedical waste handling practices
- Segregating and storing on a regular basis and not as and when needed.
- Making it mandatory for all healthcare facilities to register with the CBWTF for effective biomedical waste management and disposal.
- Ensuring that biomedical waste is not mixed with other waste as it damages the equipment used for its disposal.
- Transporting biomedical waste to the disposal plant during the night to avoid heavy traffic and crowded places.
- Monitoring hospitals and also CBWTF periodically (by PMC and MPCB) to ensure proper biomedical waste handling and disposal.

Conclusion

The first step in biomedical waste management is to understand the categories of wastes, the potential risks they possess, and the best practices for effective disposal. Though

the Biomedical Waste (Management and Handling) Rules of 1998 have laid out norms for safe and effective biomedical waste handling and disposal, it is clear that there are still many loop holes in the entire process. Though discrepancies are evident and solutions have been suggested, it is difficult to pin point a single cause or factor. However, it is clear that only a joint venture between the local government, CBWTF, HCEs and MPCB can effectively and successfully ensure proper biomedical waste management practices in the city.

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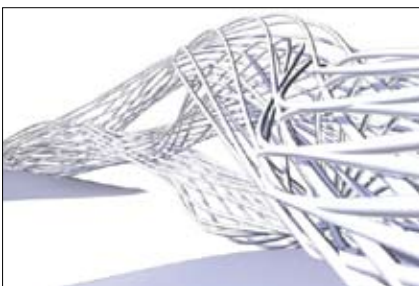
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