

General Article

The Study of Hospital Waste Recycling Process

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Abstract

The main objective of the study was to analyze the hospital waste recycling process, their consequences, benefits, related problems etc. For completing the study 15 hospitals of Sirsa city was taken under consideration and analysis was done from April 2015 to Oct. 2015. In India like country where there is an extensive need for improving the health care facilities, there hospital waste recycling will be boon for the country. The benefits of a successful hospital recycling program can be across the board, providing a means to reduce operational costs, enhance community relations, increase worker safety and on some occasions, generate revenue. Health care facilities are the biggest and largest institutions/organizations in many communities, minimizing the amount of waste that is rerouted for beneficial use can have a significant and measurable impact. The study shows that instead of disposing of waste if they are recycled then it will be more beneficial as hospitals generate a lot of solid waste.

Keywords: Hospital waste recycling process, benefits, related problems

1. Introduction

Bio-Medical wastes or more specifically written as hospital waste are defined as waste that is generated during the analyses, treatment, diagnosis or immunization of human beings (patients) or animals, or in research activities pertaining there to, or in the production of biological. During these actions unavoidable waste is generated. This waste is generated from different sources such as dispensaries, small-clinics, and hospitals. These waste generated can be simply categorized as:

1. Biodegradable Waste
2. Non biodegradable wastes

Biodegradable wastes are organic waste which goes aerobic decomposition and broken into methane, water, carbon dioxide etc. Such biodegradable wastes are food waste, garden waste, paper and paperboard. It also includes waste from households, which because of its nature and composition is similar to biodegradable waste from households.

Non biodegradable wastes are the wastes that cannot be decomposed by bacteria e.g. plastics, bottles and tins. Dangerous chemicals and toxins are also non-biodegradable. Non- biodegradable debris has been a growing concern to environmentalists, but now is becoming a concern to anyone wanting to embrace a more eco-friendly lifestyle.

2. Materials and methods

The various materials, objects are used in the hospital for analyzing, treatment, diagnosis, dressing, some of which are recyclable and these are as follows:

1. Glass after cleaning and disinfection/ sterilization
2. Paper Corrugated cardboard
3. X ray film
4. Reclaimed silver from X ray film
5. Plastics: non infectious component only

The below table 1. shows the use of materials in the hospital which are re- usable and recyclable:

Table 1 Use of materials in the hospital which can be reused

Sr. No.	General use items	Disinfection
1.	Bed pans	Wash with hot water and dry Disinfect with phenol after use by infected patients Autoclave
2	Ventilator circuits, respiratory equipment in Neonatal/Pediatric unit	Heat disinfection for 800 F for 30 min Autoclave Ethylene oxide sterilization
3	Oxygen delivery face mask	Wash and dry Use 70% isopropyl alcohol to remove mucus
4	Suction drainage bottles	Ideally autoclave
5	Humidifiers	Empty daily refill with sterile water Disinfect when contaminated with 1% Na hypochlorite

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		Autoclave
6	Urinary Catheter	Should be disposable
7	Endotracheal tubes	Recycled after cleaning and autoclaving
8	Bath water	Add savlon when necessary
9	Bed pans	Wash with hot water and dry Disinfect with phenol after use by infected patients Autoclave
10	Bowls	Wash with hot water and keep dry Autoclave
11	Crockery, Cutlery	Wash with hot water/detergent and keep dry
12	Floors	Vacuum clean; No use of broom
13	Furniture	Damp dust with detergent/phenol/2% Lysol
14	Trolley tops	Wipe with warm water and detergent to remove dust and keep dry
15	Endotracheal suction catheter	Should be disposable
16	Thermometers	Wash with warm water/detergent and keep dry
17	Endoscopes/ Arthroscopes/ Laparoscopes/ Fiber optic Endoscopes	Immerse in 2% Cidex solution Use latex gloves, eye protection plastic covering mask while handling Alternatively, use ethylene oxide sterilization
18	Mattresses/ Pillows	Use water impermeable cover Wash cover with detergent and keep dry Disinfect with phenol/2% lysol
19	Incubators	Clean thoroughly with warm water / soap Use 70% isopropyl alcohol

3. Necessary steps for creating a health care recycling program

The initial challenge of recycling in the health care setting is the diversity of waste. The goal should be to manage all waste at a high level and reclassify materials from one category to another as needed.

If health care workers fail to segregate waste properly, they create a larger flow of materials into the regulated stream than is needed, resulting in more negative employee events, more cost and more compliance documentation.

A brief overview of the necessary steps for creating a health care recycling program includes the following:

Perform an audit:- This should be as comprehensive as the organization can afford, and must answer as many basic questions as possible. What is the state of the facility's current disposal practices? Where are all the facility's disposal locations? Where are different types of waste most often handled?

Additionally, an estimate of the quantity of materials that will be directed to recycling facilities

should be developed. Local and state authorities should be contacted for additional guidelines, resources and explanations of any regulations that will impact the scope of the recycling program.

Identify local resources:- What facilities and brokers are in the area to handle the facility's recycled waste stream? How will materials need to be sorted? What quantities are required and what are the prices? Commodity prices for such materials as cardboard and plastic are often volatile, which can have a negative impact on a program that has based projections on stable prices. Partnering with a resources provider who can navigate these fast-changing and inherently local markets is one way to deal with price fluctuations.

Establish goals:- If we talk about the goals it includes determining the number, type and placement of receptacles where staff generate the most recycling waste to maximize participation. The objective should be to consider ways of simplifying the process of discarding materials in the correct recycling bin rather than in the waste bin.

Educate staff:- Educating all hospital staff about proper segregation is the key to successful recycling. Creating the culture to make the recycling program successful takes a sustained commitment by leadership from the top down and funds for staff education. Quarterly flyers, e-mails or announcements to hospital staff are important tools to keep everyone focused on the program. State agencies can help facilities educate staff, patients and visitors on recycling. These often include samples of educational literature, links to resources, trained speakers and additional presentation materials.

Monitor and measure:- Projections that were established at the beginning of the program should not be filed away in a spreadsheet. People at all levels of the process should know they are responsible for hitting specific goals. Publicizing select targets to the entire organization can be an excellent incentive. Initially, as the processes are refined and goals are fine-tuned, targets should be confined to the core organizing team so unrealistic goals will not hurt enthusiasm. As realistic targets are confirmed, however, metrics can be shared with all participants. Examples include weight of waste diverted from landfills or cost savings.

4. Goals of waste reduction and recycling

1. Comprehensive Recycling (bottles & cans, paper)
2. Food Waste Composting
3. Disposable Dishware and Tray elimination
4. Enhanced Cardboard Recycling
5. Recycle Construction/Renovation Waste
6. Durable Goods Reuse, Donation
7. Medical Device Reprocessing
8. Reusable Sharps Containers

9. Reusable Products (gowns, sterilization containers)

5. Need and various reasons to recycle hospital waste

The largest waste stream in hospitals is solid waste, which covers several types of specialty waste, including regulated medical waste, confidential waste and hazardous materials, among others.

Some of the waste, such as pharmaceuticals, must be disposed permanently, but much of the material, if properly handled, is completely recyclable.

To get an idea of the general composition of hospital waste, a survey of hospitals in the Sirsa city was done from April 2015 to October 2015. The below table shows the solid-waste components by weight:

Table 2 Solid-waste components by weight

Sr. No.	Type of waste	Percentage
1	Paper and cardboard	49%
2	Plastic	21%
3	Organic(includes food and landscaping waste)	19%
4	Glass	5%
5	Metal	4%

The above table 2 clearly shows that maximum percentage of solid waste generated by the hospitals are paper and cardboard which was near about fifty percent.

The Hospitals under study are

Hospital Code	Name of Hospital	Bed Capacity	Indoor (I) /Outdoor (O)
A.1	Sanjivani Hospital	108	(I-O)
B.2	JCD Super Specialty Hospital & Trauma Centre	110	(I-O)
C.3	Shah Satnam Ji Specialty Hospital	300+ 100	(I-O)
D.4	Shree Hospital	30	(I-O)
E.5	Astha Hospital	30	(I-O)
F.6	Civil Hospital	300	(I-O)
G.7	Dr.Mohr Singh Surgical & Maternity Hospital	100	(I-O)
H.8	Dr. Pankaj Dental Hospital	1	(O)
I.9	Neeraj Choudhary Hospital	15	(I-O)
J.10	Dr.Shoyran skin care Hospital	1	
K.11	Patiala Nursing Home	10	(I-O)
L.12	Lalgarhia Hospital	20	(I-O)
M.13	Janta Hospital	100	(I-O)
N.14	Life Line Hospital	45	(I-O)
O.15	Sihag Children Hospital	18	(I-O)

I have given 15 different codes to the hospitals From A.1 to O.15 for easy study. Symbol (I-O) shows the hospital having both indoor and outdoor patient facility.

6. Special considerations

While organizing this type of program, health care organizations must pay particular attention to a number of special considerations that are peculiar to hospitals. They include the following:

HIPAA Compliance:- Health Insurance Portability and Accountability Act (HIPAA) standards for the handling and disposal of documents containing patient information. The most sustainable options for recycling documents regulated by HIPAA include the following:

1. Contracting with a provider who can take material directly to bonded shredding facilities or bonded paper mills that also offer recycling
2. Installing on-site shredding equipment to destroy documents properly and then recycling the material.

Universal waste:- Most health care facilities already are compliant with the proper disposal of regulated universal waste. This includes such items as batteries, cell phones, computers, computer monitors, electronic devices, fluorescent lamps, mercury waste, partially full aerosol cans and televisions.

This category poses health and environmental risk if put in the standard waste stream, but does not require the same level of special handling needed by more hazardous materials such as medical waste or industrial chemicals.

It is mandatory that everyone involved in the waste handling chain be aware of the procedures to deal with this waste separate from the hazardous materials stream, the regular waste stream and the recycling streams. For instance, fluorescent tubes are made of glass and can be included accidentally in glass recycling receptacles by uninformed staff. Similarly, partially full aerosol cans may end up in metal recycling receptacles.

Reprocessing medical devices:- The practice of recycling medical tools and equipment has been somewhat contentious, but is monitored by the Food and Drug Administration and increasingly is adopted by hospitals nationwide. The practice can reduce waste and operating costs.

The benefits of reducing this figure include economic rewards, environmental improvements, employee satisfaction gains and improved community relations. By starting small and building on simple successes, all health care facilities easily can make this a part of their daily operations.

7. Results & discussion

By knowing and segregating the type of waste (hospital waste) generation one can be able to do their proper management. The above studies show that a lot of material can be recycled if segregated properly. The **Table 1** shows the different types of material which are reusable. The proper knowledge of techniques such

as disinfection, sterilization, chemical utilization is required so that a lot of funds can be saved by reusing the hospital tools and materials such as bed pans, oxygen delivery face mask, suction drainage bottles, trolley tops, crockery, cutlery, gloves etc.

Table 2 shows that a lot of solid waste components are generated from the hospitals, dispensaries and clinics. The study of 15 hospitals of the Sirsa city shows that waste components by weight of paper and cardboard is 49%. The least percentage of that waste component by weight is of metal i.e. 4%. The other major solid waste is organic waste (includes food and landscaping waste) i.e. having percentage of 19%. All these items under table A.2 are solid waste and are recyclable.

8. Recommendations

1. The practice of recycling medical tools and equipment has been somewhat contentious, but is monitored by the Food and Drug Administration and increasingly is adopted by hospitals nationwide.
2. It is mandatory that everyone involved in the waste handling chain be aware of the procedures to deal with this waste separate from the hazardous materials stream, the regular waste stream and the recycling streams
3. The internal team should work with external partners and brokers to maximize the value of the new recycling streams. By closely examining the product and monitoring the market value of different materials, program organizers can make decisions.
4. A well-designed waste program incorporating recycling is required that will keep the staff safe, improve compliance, reduce environmental impact, and help the facility manage community and regulatory affairs.

Conclusions

1. On an average, medical waste is five times more expensive to discard than solid waste, and solid waste is more expensive to dispose than to recycle.
2. Recycling process can be properly achieved if the waste generated by the hospitals, medical cares, dispensaries will be controlled by powerful controlling management system, which keep an eye on waste generation, their proper segregation, so that only the material to be incinerate or required for other process go for disposal and rest of the material remained to be recycled.
3. Recycling process is required to be essentially adopted as it is the major or revolutionary technique to minimize and reducing the waste disposal generated. Further this will be fruitful in revenue generation.

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