SINGLE USE WASTAGE GENERATED IN HOSPITALS AND RELATED INDUSTRIES

MD. Nafeza Fathima[1], V. Poornima[2], MD. Ashabee[3], V. Vyshnavi[4], Dr.P. Aparna[*]

* Professor, Dept. of Pharmaceutics, NRI college of pharmacy

4th Year B. Pharmacy students (1-4)

NRI COLLEGE OF PHARMACY, Pothavarappadu, Eluru District, Andhra Pradesh, India.

ABSTRACT:

Biomedical waste is a global concern. It is a waste generated in the process of diagnosis, treatment, immunisation, and research related to human beings and animals. A huge risk is posed to human health due to improper or poor waste management. Many countries world wide are taking steps and implementing strict laws to curb this problem, but due to lack of awareness and mishandling and loop holes in implementing laws to problem is still continuing if not increasing This work aim to highlights the various categories, of biomedical waste and some treating procedures to decreases the impact on the society.

KEY WORDS:

Plastic blisters, Gauze, Drapes, Purulent exudate, Catheter, Multi hazardous

INTRODUCTION:

1 HOSPITAL WASTE

Hospital waste is defined as the waste produced in the course of health care activities during Treating, Diagnosing, and Immunizing Human being or animals or while doing study or Research activities.

WASTE:

Waste is defined as almost anything that has served its original intended purpose and is being discarded or stored prior to being discarded

- The waste produced in the course of Health-care Activities carriers a higher potential for infection and injury than any other types of waste.
- Therefore, it is essential to have safe or reliable method for its Handing.
- Inadequate and inappropriate handing of health care waste may have serious public health consequences and a significant impact on the environment [1].

RECYCLING:

Recycling of waste is defined in the waste framework Directive as any recovery operation by which waste materials are reprocessed into products, materials or substances.

NON-RECYCLIG:

Means solid waste that may be reclaimed and or processed and used in the production of raw materials or products [2].

SINGLE USE DEVICES:

The term single use device means a device that is intended for one use or on a single patient during a single procedure.

PROBLEMS WITH HOSPITAL WASTE:

- Between 75% and 90% of the waste produced by health care providers as non-risk or general health care waste comparable to domestic waste.
- And 10-25% of health care waste is regarded as hazardous and may create a variety of health risks.
- Hospital waste is the second most hazardous waste after radioactive waste.
- The improper management of hospital wastes causes serious environmental problems in terms of air, water and land pollution.
- The nature of pollutants can be classified as biological, chemical, and radioactive [3].

SOURCES OF HOSPITAL WASTE:

The sources of health-care waste can be classified as Major or Minor.

1)Major sources of Hospital Waste:

Hospitals:

- University hospital
- General hospital
- District hospital.

Other – Health care establishments:

- Emergency medical care services
- Health care centres and Dispensaries
- Obstetric and maternity clinics
- Outpatient clinics
- Dialysis centres
- First aid posts
- Transfusion centres
- Military medical services.

TYPES OF WASTES:

- Related laboratories and Research Centres:
  - Medical and Bio medical Laboratories
  - Biotechnology laboratories and institutions
  - medical research centres.
- Mortuary and autopsy centres.
- Animal research and testing.
- Nursing homes for the elderly.

2)Minor sources of Hospital Waste:

Medical Wards:

Mainly infectious, waste such as dressing, bandages, sticking plaster, gloves, disposable medical items, used hypodermic needles and intravenous sets, body fluids and excrete, contaminated packaging and meal scraps [4].

Operating Theatres and Surgical Wards:

Mainly anatomical waste are classified as tissues, organs and body parts and other infectious waste. While minor and scattered sources may produce some health care wastes in categories similar to hospital waste, there composition will be different.

2 BIOMEDICAL WASTE:

Biomedical waste or hospital waste is any kind of waste containing infectious materials generated during the treatment of humans or animals as well as during research involving biologics.

- Biomedical waste may be solid or liquid.
- Examples of infectious waste include discarded blood, sharps, unwanted microbiological cultures and stocks, identifiable body parts other human or animal tissue.
- Biomedical waste is generated from biological and medical sources and activities, such as the diagnosis, prevention, or treatment of diseases.
- Biomedical waste include hospitals, health clinics, nursing homes, emergency medical services, medical research laboratories, offices of physicians, dentists, veterinarians.
- Biomedical waste is distinct from normal trash or general waste, and differs from other types of hazardous waste, such as chemical, radioactive, universal or industrial waste.
- Medical facilities generate waste hazardous chemicals and radioactive materials.
- While such wastes are normally not infectious, they require proper disposal. Some wastes are considered Multi hazardous, such as tissue samples preserved in formalin[5].

BIOMEDICAL / HOSPITAL WASTE:

Hospital waste is generated during the diagnosis, treatment, or immunization of human beings or animals or in research activities in these fields or in the production or testing of biologicals. It may include wastes like sharps, soiled waste, disposables, anatomical waste, cultures, discarded medicines, chemical wastes, etc. These are in the form of disposable syringes, swaps, bandages, body fluids, human excreta, etc. This waste is highly infectious and can be a serious threat to human health if not managed in a scientific and discriminate manner. It has been roughly estimated that of the 4 kg of waste generated in a hospital at least 1 kg would be infected[6].

These wastes are categorized into 10 different categories as:

- Human anatomical waste (tissues, organs, body parts etc.)
- Animal waste
- Microbiology and biotechnology waste, such as, laboratories cultures, microorganisms, human and animal cell cultures, toxins etc.
- Waste sharps such as, hypodermic needles, syringes, scalpels, broken glass etc
- Discarded medicines and cyto-toxic drugs
- Soiled waste, such as dressings, bandages, plaster casts, material contaminated with blood etc
- Solid waste (Disposal items like tubes, catheters etc., excluding sharps)
- Liquid waste generated from any of the infected areas
- Incineration ash
- Chemical waste

Surveys carried out by various agencies show that the health care establishments in India are not giving due attention to their waste management. After the notification of the Bio-medical Waste (Handling and management) Rules, 1998, these establishments are slowly streamlining the process of waste segregation, collection, treatment, and disposal. Many of the larger hospitals have either installed the treatment facilities or are in the process of doing so[7].

1. HOSPITALS: Medical Waste (also known as biomedical waste)

This includes anything from used needles and syringes, to bandages, dressings, discarded gloves, discarded surgical instruments, culture, stocks, swabs used to inoculate cultures, removed body organs, and more. These are potentially infectious materials and therefore must be treated with utmost care to prevent disease transmission.

2. INDUSTRIES: Industrial waste

The specific of this waste vary depending on their industry. For instance, the textile industry might produce dye waste, whereas a metal manufacturing plant might produce hazardous wastes that could be toxic, reactive, or corrosive [8].

Both types of waste require specific disposal methods to ensure they don't harm the environment or public health.

The pharmaceutical industry plays a critical role in producing medications and therapies that improve human health and well-being. However, like many industries, it also generates a significant amount of waste that can have environmental and public health implications. Here are some key waste-related issues associated with the pharmaceutical industry:

Chemical Waste: The manufacturing process for pharmaceuticals involves the synthesis of various chemical compounds, many of which generate waste byproducts. These chemicals can be hazardous and may require proper disposal to prevent soil and water contamination[9].

Hazardous Materials: Pharmaceuticals often contain active ingredients that can be harmful to human health and the environment. Improper disposal of expired or unused medications can lead to these substances entering the water supply, potentially affecting aquatic ecosystems and even human health .

Packaging Waste: The packaging of pharmaceutical products, including bottles, blister packs, and inserts, contributes to significant amounts of waste. Much of this packaging is single-use and may not be easily recyclable due to its complex nature.

Regulatory Challenges: The pharmaceutical industry is heavily regulated due to the potential risks associated with its products. This can sometimes lead to complex waste management processes to ensure compliance with environmental regulations[10].

Sterile Waste: Manufacturing pharmaceuticals often requires aseptic and sterile environments. The waste generated in such environments, including contaminated equipment and materials, needs careful handling to avoid potential contamination.

Unused Medications: Pharmaceuticals that are unused or expired are frequently discarded. Flushing them down the toilet or throwing them in the trash can lead to the presence of pharmaceutical compounds in water bodies or soil.

Research and Development Waste: The research and development phase of pharmaceuticals can generate various waste materials, including failed experimental drugs and research equipment. Proper disposal of these materials is essential to prevent potential environmental impacts[11].

Resource Intensity: The production of pharmaceuticals can be resource-intensive, requiring significant amounts of water, energy, and raw materials. This intensifies the environmental footprint of the industry

Emissions and Air Quality: Pharmaceutical manufacturing processes can release pollutants and emissions into the air. These emissions may include volatile organic compounds (VOCs) and other harmful chemicals that can contribute to air pollution and have negative health effects.

Need for Sustainable Practices: There is an increasing need for the pharmaceutical industry to adopt more sustainable practices, such as green chemistry, waste reduction strategies, recycling, and responsible disposal of hazardous materials [12].

Efforts are being made within the industry to address these waste-related issues. This includes developing greener manufacturing processes, improving packaging sustainability, promoting proper disposal of medications through take-back programs, and complying with stringent waste management regulations. Additionally, increased awareness among healthcare professionals and the general public about proper disposal methods for medications can help mitigate some of these challenges.

Single-use pharmaceutical waste refers to waste generated from the use of disposable or single-use medical and pharmaceutical products. These products are designed for one-time use and are discarded after use, contributing to waste generation in the healthcare and pharmaceutical sectors [13]. Here are some aspects and examples of single-use pharmaceutical waste:

Aspects of Single-Use Pharmaceutical Waste:

Disposable Medical Supplies: Single-use pharmaceutical waste includes various disposable medical supplies such as syringes, needles, IV tubing, gloves, masks, gowns, and other protective equipment .

Packaging: Packaging materials for single-dose medications, syringes, and other medical products also contribute to waste. These materials are often used to ensure sterility and safety during administration.

Lab Consumables: Single-use items used in laboratories for research, testing, and quality control also generate waste. Examples include pipettes, petri dishes, culture flasks, and disposable plasticware[14].

Surgical Items: Single-use items used in surgical procedures, such as drapes, gauze, and sponges, contribute to waste generated in healthcare facilities.

Examples of Single-Use Pharmaceutical Waste:

Syringes and Needles: These are commonly used for administering medications and vaccines. While necessary for preventing infections, they contribute to plastic waste when disposed of.

IV Bags and Tubing: Intravenous fluids and medications are often delivered through single-use IV bags and tubing, generating plastic waste [15].

Medication Packaging: Many pharmaceutical products come in single-dose packaging, which includes plastic blisters and packaging materials.

Personal Protective Equipment (PPE): Disposable gloves, masks, gowns, and face shields have been widely used during the COVID-19 pandemic to protect healthcare workers and patients, but they also contribute to waste.

Testing Supplies: Single-use testing kits and devices, including diagnostic test strips and collection swabs, generate waste in both clinical and research settings [16].

Figure 1: CATEGORIES OF HEALTH-CARE WASTES[17]

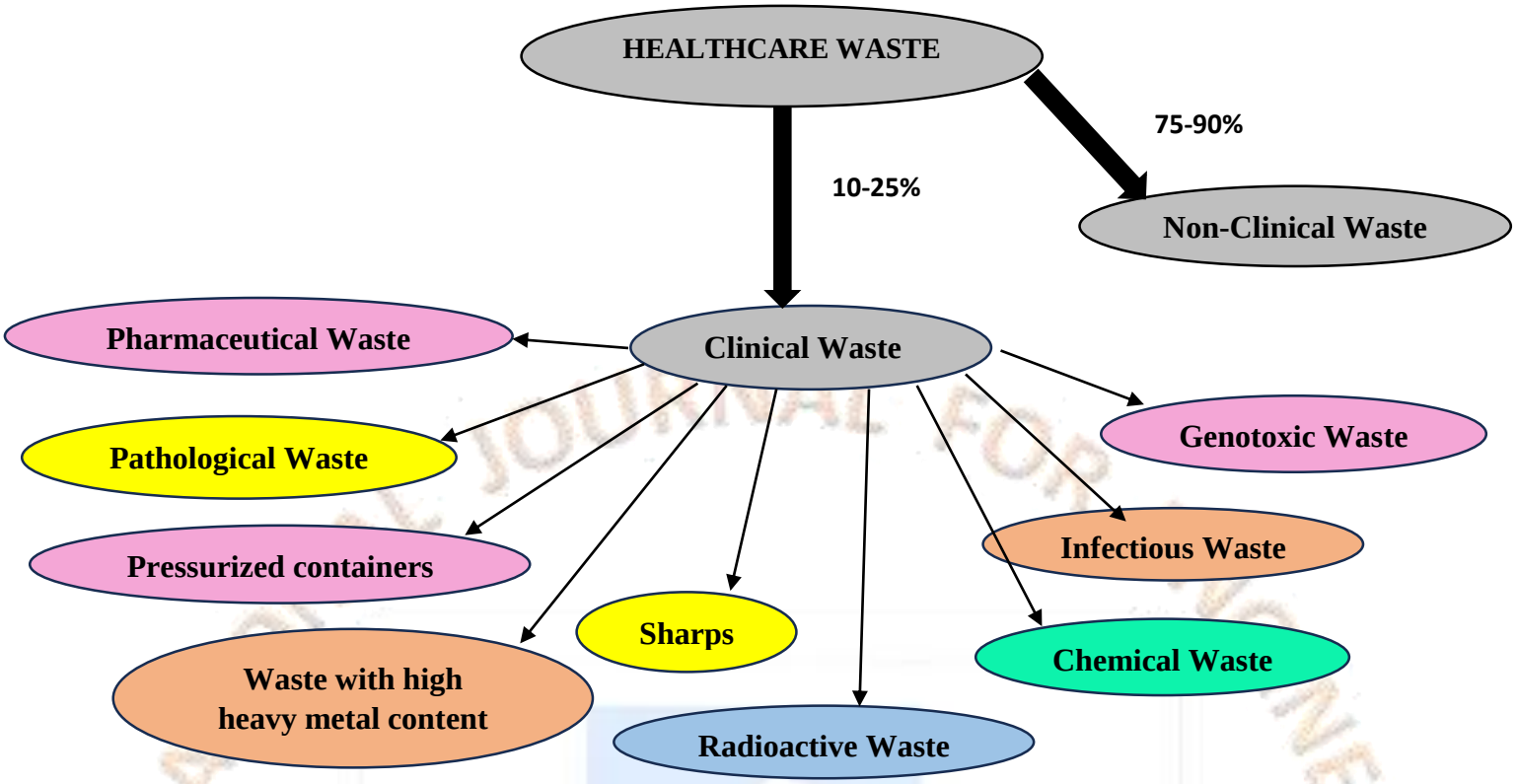
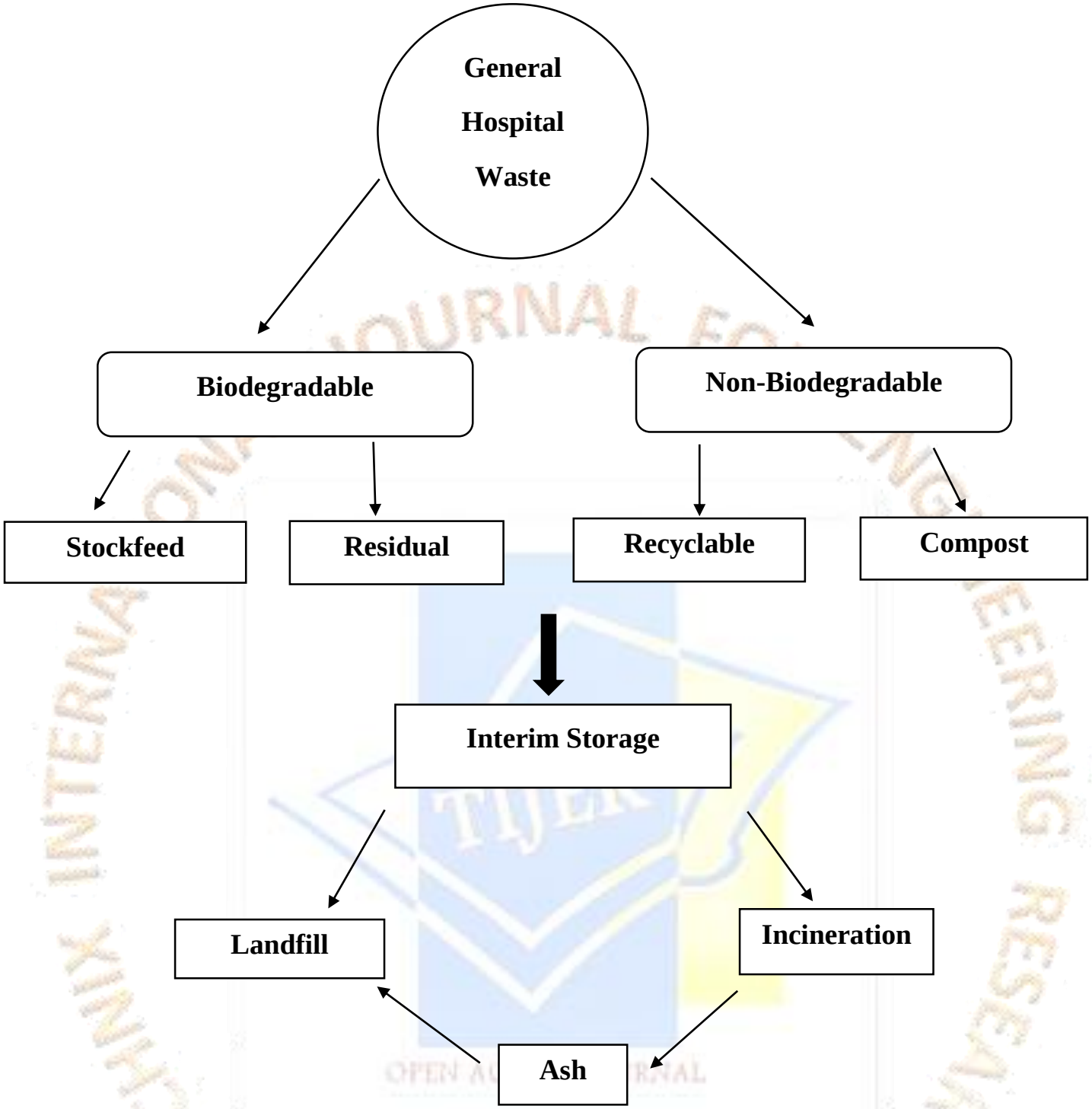


Figure 2: GENERAL HOSPITAL WASTE[18]



SEGREGATION [19]

Separation of healthcare wastes according to their category and labelling waste containers. It is the most important step to reduce the risk and amount of hazardous waste. Adequate waste management receptacles and proper personal protective device supply is determinant factors.

COLLECTION

Proper protective equipment and waste transporting utility supply such as waste bins, trolley, and wheelbarrow.

STORAGE

Secured and adequate temporary waste storage space allocation is vital. Waste storage time should be limited to 24 – 48 hours.

TRANSPORTATION

Proper personal protective equipment supplies and easily cleanable sealed containers such as plastic buckets or trolleys can be used to transport wastes from their temporary storage site to their treatment and permanent disposal.

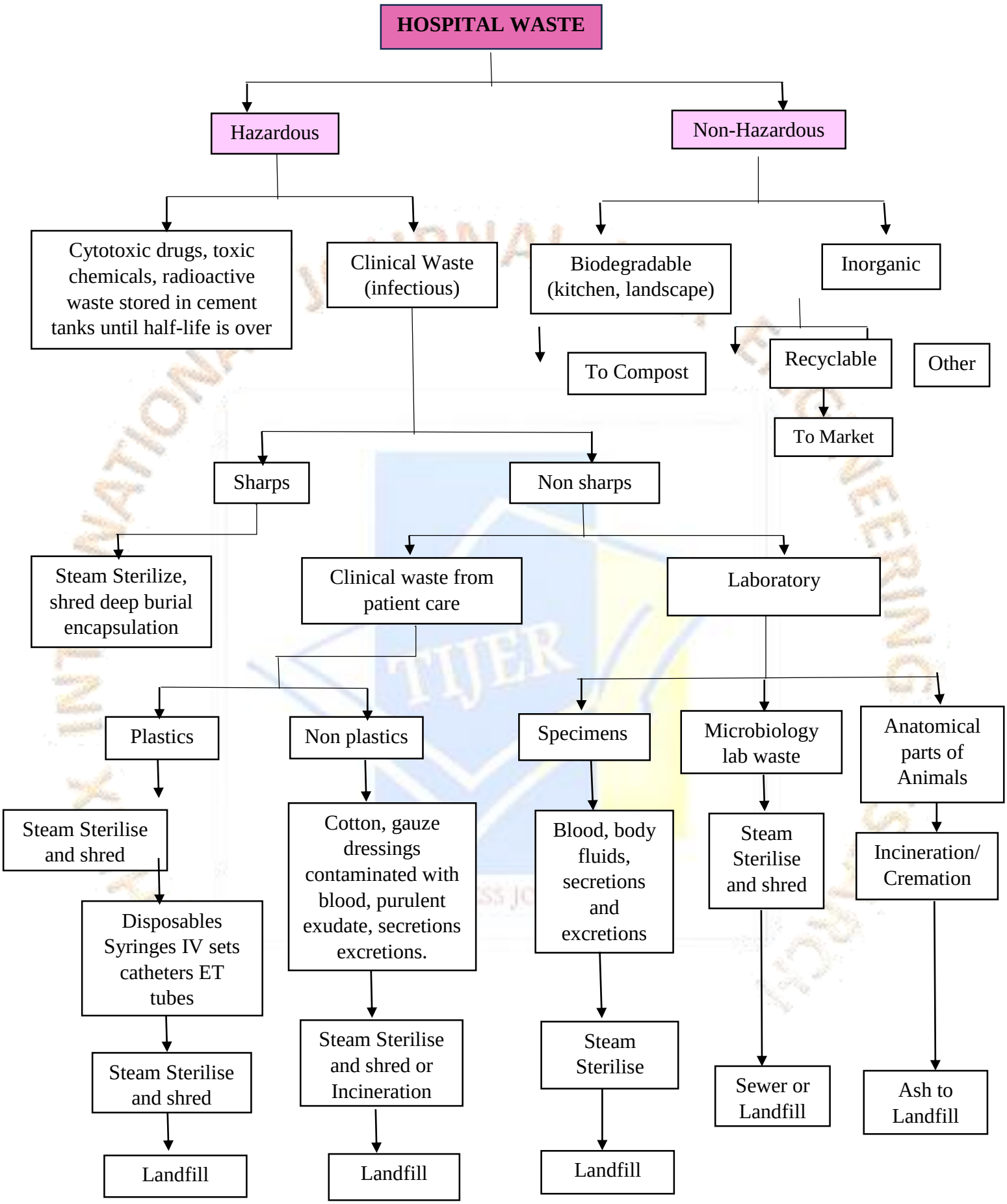
TREATMENT

Use of suitable treatment technology and proper protective device allocation is vital. the best and cost – effective treatment option should be selected based on the national environmental protection regulation.

DISPOSAL

Dispose wastes in accordance with the requirements of applicable national / international regulations. Establish a system of separate disposal of the different types of waste.

Figure 3: HOSPITAL WASTE[20]



CONCLUSION:

Biomedical Waste management is a social responsibility and has a legal importance utmost care should be taken during disposal of biomedical waste, which not only helps to protects the environment from contamination but also ensures the safety of workers who will come into direct contact with the same technical and non-technical personnel should stick on to the strict measure of handling and disposal of medical waste without any negligence

REFERENCES

1. M. Anji r eddy, Textbook of Environmental science and Technology, BS Publication Year: 2007 Pg No.131
2. Y. Anjaneyulu, Textbook of Introduction to Environmental Science, BS Publication year: 2004 Pg no.478
3. http://www.slideshare.net/hashu12/hospital-waste-55055785?from_m_app=android
4. WHO/UNICEF,2015. Water, sanitation and hygiene in health care facilities: status in low- and middle-income countries. World Health Organization, Geneva.
5. WHO. Review of Health Impacts from Microbiological Hazards in Health-Care Wastes. Geneva: World Health Organization; 2004.
6. Bio-Medical Waste (Management and Handling, 1998) Rules. New Delhi: Government of India Publications; 1998. Ministry of Environment and Forests Notification; pp. 276–84.
7. Bio-Medical Waste Management Rules. 2016 Published in the Gazette of India, Extraordinary, Part II, Section 3, Sub-Section (i), Government of India Ministry of Environment, Forest and Climate Change. Notification; New Delhi, the 28th March, 2016.
8. Organization, World Health (2000). The World Health Report 2000: Health Systems : Improving Performance. World Health Organization. ISBN 9789241561983.
9. Magriotis, Zuy; Saczk, Adelir; Salgado, Hélvia; Rosa, Isael (2021-07-30). "Chemical Waste Management in Educational Institutions". Journal of Environmental Science and Sustainable Development. **4** (1): 160–176
10. Hall, Dave (2017-03-13). "Waste packaging". the Guardian. Retrieved 2019-02-20.
11. "Medical & Bio-Hazard". Terragon Environmental Technologies Inc. Retrieved 2019-06-20
12. Secure Waste Disposal - Document Shredding & Medical Waste Disposal. 2017-01-27.
13. Singh, Z.; Bhalwar, R.; Jayaram, J.; Tilak, V. W. (April 2001). "An Introduction to Essentials of Bio-Medical Waste Management". Medical Journal, Armed Forces India. **57** (2): 144–147.
14. "Medical Waste: Turn Your Problem Into Opportunity". Terragon Environmental Technologies Inc. 2019-06-19. Retrieved 2019-06-20.
15. "Biomedical Waste: Its Effects and Safe Disposal", Environmental Waste Management, CRC Press, pp. 95–108, 2016-04-19,
16. "Unused Pharmaceuticals in the Health Care Industry: Interim Report" (PDF). United States Environmental Protection Agency. November 2011
17. Emergency Sanitation: Assessment and Programme Design (WEDC, 2002, 358 p.)
18. europepmc.org published in 23May 2019
19. http;//www.MedicoFem.com by Doctormel
20. researchgate.net published in December 2014