

Hospital Waste Management System

Amna A. Elsayed¹, Manal M. Ibrahim² and Gehan M. Diab³

¹B.Sc. Nursing Science, ²Professor of Nursing Administration, ³Assistant Professor of Nursing

Administration, Faculty of Nursing, Menoufia University, Egypt.

Abstract: The term of health-care waste includes the waste generated within health-care facilities, research centers and laboratories related to medical procedures. Medical waste poses an important global challenge because of potential hazards to the environment and public health. The lack of awareness of proper health care waste management HCWM, disposal and treatment procedures by healthcare providers has resulted in “hospitals becoming epicenters of spreading disease rather than working toward eradicating them. **Purpose** of this study was to clarify hospital waste management system. **Conclusion:** There is hospital waste management policy adapted from the National Infection Control Guidelines this policy has been distributed to all hospitals, but it is not applied in a correct way by health care personnel Policies adapted from the National Infection Control Index national guidelines of infection.

Key words: nurses awareness, waste management.

INTRODUCTION

Lack of awareness about the health hazards related to health-care waste, inadequate training in proper waste management, absence of waste management and disposal systems, insufficient financial and human resources, and the low priority given to the topic are the most common problems connected with health-care waste. Many countries either do not have appropriate regulations, or do not enforce them. The management of health-care waste requires increased attention and diligence to avoid adverse health outcomes associated with poor practice, including exposure to infectious agents and toxic substances (WHO, 2018).

Waste can be defined as anything which isn't intended further use (Zulfiquer 2018 & Amin shah, 2017). Hospital waste is the term used to describe waste produced from healthcare and similar activities that may pose a risk of infection, for example, swabs, bandages, dressings etc., or may prove hazardous, for example medicines. Medical waste as any waste is generated as a by-product of healthcare work at doctor's surgeries, dentists, hospitals, and laboratories (Secure Med, 2019).

Medical waste includes any material that could come into contact with the body during diagnosis, research, drug administration or any type of treatment. It's likely to be infectious, or potentially infectious, and is often contaminated with bodily fluids in some way but the term can also be used to refer to general waste from any medical practice, as well as specific waste streams typically found in the medical industry (Billingsely, 2020).

Bio-medical waste (BMW) collection and proper disposal has become a significant concern for both the medical and the general community. Since the implementation of the Bio-medical Waste Management and Handling Rules in the National Guideline of Infection Control from the Egyptian Ministry of Health every concerned health personnel is expected to have proper knowledge, practice, and capacity to guide others for waste collection and management, and proper handling techniques (Kumar, Somrongthong & Ahmed, 2016).

Purpose

The purpose of this study was to assess hospital waste management system through assessing health care providers'

level of knowledge, performance and awareness.

Hospital waste:

Hospital waste includes any material that could come into contact with the body during diagnosis, research, drug administration or any type of treatment. It's likely to be infectious, or potentially infectious, and is often contaminated with bodily fluids in some way but the term can also be used to refer to general waste from any medical practice, as well as specific waste streams typically found in the medical industry (Billingsely, 2020).

Hospital waste is very different from the ordinary waste that is produced in our homes on a daily basis that is why we need to adopt certain different methods for disposing off the hospital waste materials (Singh 2020).

Types of hospital waste:

Hospital waste divided to two groups risk waste and non-risk waste (Amin Shah, 2017).

Hospital risk waste: Hospital risk waste is further subdivided in seven groups. 1- Infectious waste, 2-Pathological waste, 3- Sharps, 4-Pharmaceutical waste, 5- Genotoxic waste,6-Chemical waste,7- Radioactive waste (Amin Shah, 2017).

Non-Risk Waste: Non-risk waste is that which is comparable to normal domestic garbage and presents no greater risk, therefore, than waste from a normal home. This general waste is generated by almost everybody in the hospital, i.e., administration, patient's risk, cafeterias rooms, cafeterias, and nursing station. Such waste may include: Paper and cardboard, packaging, food waste, i. e., left-over food, fruit and vegetable peelings and aerosols (spray) (WHO, 2018).

Hospital waste management

Hospital waste management or medical waste management is a system that handles the segregation, containment, and disposal of hazardous, hospital-generated infectious waste. Efficient waste management is critical for healthcare

institutions because medical waste can be pathogenic and environmentally hazardous (Andales, 2020).

Non-compliance with proper hospital waste management can lead to serious health risks, fines, and damage to a healthcare institution's reputation (Andales, 2020). Hospital Waste management refers to the processes involved from the point of generation to disposal or reuse of generated waste (Nwachukwu, Chuks, Orji & Ugbogu, 2017).

Hospital waste management stages:

The management of waste must be consistent from the point of generation («cradle») to the point of final disposal («grave»). The path between these two points can be segmented schematically into eight steps (WHO, 2018).

- 1) **Waste minimization:** Waste minimization means the reduction, to the extent feasible, in the amount of hazardous waste generated prior to any treatment, storage, or disposal of the waste.
- 2) **Waste generation:** Waste generation is the point at which waste is produced. Medical activities generate waste that should always be discarded at the point of use by the person who used the item to be disposed of.
- 3) **Segregation and containerization:** The best practice for medical waste segregation is at the point of generation.
- 4) **Collection and in Intermediate storage in the health care facility:** Includes time of collection, packing and labeling. During this stage each type of healthcare waste is collected separately.
- 5) **Internal transport in the health care facility:** Transport to the central storage area is usually performed using a wheelie bin or trolley.
- 6) **Centralized storage in the health care facility:** The central storage area should be sized according to the

volume of waste generated as well as the frequency of collection.

- 7) **External transport:** External transport should be done using dedicated vehicle.
- 8) **Treatment and final disposal:** The primary methods of treatment and disposal of medical waste are: 1- Incineration, 2-Autoclaves. 3-Mechanical/Chemical Disinfection. 4-Microwave.5-Irradiation. 6-Vitrification 7- Electric Arc Plasma (Daniels Health, 2020).
 - 1- **Incineration:** Incineration is the controlled burning of the medical waste in a dedicated incinerator. Incineration is an old technology and was widely used in the past for all sorts of waste. Individual buildings had their own waste incinerators in many cases. Incinerators got a bad reputation because of the air pollution they created and because the bottom ash, or clinker, was hard to keep under control (Meleko, Tesfaye &Henok, 2018).
 - 2- **Autoclaves** are closed chambers that apply heat and sometimes pressure and steam, over a period of time to sterilize medical equipment .For medical waste that will be disposed of, autoclaves can be used as heat treatment processing units to destroy microorganisms before disposal in a traditional landfill or further treatment (Food and Agriculture Organization (FAO), 2017).
 - 3- **Mechanical Processing:** Mechanical treatment to tear waste apart goes by verbs: granulate, pulverizes, shreds, grinds, mixes, agitation, and crushing. This can reduce the bulk volume of the waste by 60 percent or more. (Norwegian University of Science and Technology (NTNU), 2020).
 - 4- **Microwaves:** The processing usually includes front-end

shredding of the waste, both to increase the efficacy of the microwave treatment and to reduce the volume of the end waste for disposal. If the waste is dry, water is introduced, and the wet waste is introduced to the microwave chamber (Environmental Health and Safety, 2020).

- 5- **Irradiation:** Irradiation disinfects waste by exposing it to gamma rays that are fatal to bacteria. A radioactive isotope of cobalt is employed. This is basically the same radiation source used for radiation treatment of cancer. In cancer treatment, radiation is intended to kill the malignant cells. In irradiation for sterilization of equipment or treatment of waste, the radiation is intended to kill pathogens. By contrast, you may hear about ultraviolet (UV) radiation treatment of wastewater (Daniels Health, 2020).
- 6- **Vitrification:** Vitrification means production of glass. The high temperatures kill pathogens, and some combustible material may burn or pyrolyze, resulting in an off-gas. Remaining material is encapsulated in glass, which has a very low diffusivity. There is little danger of hazardous materials leaching out of glass in significant quantities. The vitrified waste can therefore be put in a landfill with confidence (FAO, 2017).
- 7- **Electric Arc Plasma:** Plasma treatment has been developed and proposed as an alternative to incineration. However, despite some interest in using it for medical waste, it has not found widespread use (FAO, 2017).

Waste Disposal:

Disposal refers to the long-term placement of waste or treated waste. It is almost always off-site, away from where the waste is generated, and usually

involves burial underground. Healthcare providers do not classify putting waste in storage containers on site as a form of disposal (Oyekale & Oyekale, 2017).

- 1- **Sanitary landfills:** Sanitary landfills are a staple of the waste disposal system in the United States and many countries. The idea is that the waste will stay in the landfill and hence not harm the environment until it has degraded to a sufficient level that it is safe. The engineering of these landfills is pretty well worked out now. A plastic liner or liners underlies the waste (Daniels Health, 2020).
- 2- **Recycling medical waste into compost or fertilizer:** Municipalities across the country have embraced recycling programs and some even have city-run composting services, which pick up compostable material from residences. Regulated medical waste (e.g. infectious or bio-hazardous waste) is not recycled or composted and there is no movement to start doing so.

The five Benefits of Proper Hospital Waste Disposal

Proper hospital waste disposal is important for many reasons from protecting public health and the environment to keeping hospital's patients and coworkers safe. It also protects healthcare facility from fines and a bad reputation. The World Health Organization (WHO) has made a huge effort to encourage proper hospital waste disposal around the world (WHO, 2020). Here are the five major benefits of proper hospital waste disposal:

- 1- **Compliance:** The most basic benefit of proper hospital waste disposal is compliance with state and federal regulations. The Center for Disease Control, the United States Environmental Protection Agency, and Federal and State

legislature all impose certain laws and regulations on the treatment of hospital waste. Compliance with all of these regulations is necessary for medical facilities to stay above board). Unfortunately, all too often, the temptation to save time and money leads to healthcare facilities skimping on proper hospital waste disposal. The penalties for non-compliance are no joke (Secure Med, 2019).

- 2- **Environmental impact:** Poor management of hospital waste can lead to contamination of water and wildlife habitats. National Geographic explains that, "Runoff is a major source of water pollution. As the water runs along a surface, it picks up litter, petroleum, chemicals, fertilizers, and other toxic substances. From California to New Jersey, beaches in the U.S. are regularly closed after heavy rainfall because of runoff that includes sewage and medical waste." Toxic hospital waste can cause harm to humans, animals and plants if not disposed of properly (Environmental Protection Department 2018).

National Geographic describes how this happens, "The waste can harm humans, animals, and plants if they encounter these toxins buried in the ground, in stream runoff, in groundwater that supplies drinking water, or in floodwaters, as happened after Hurricane Katrina. Some toxins, such as mercury, persist in the environment and accumulate. Humans or animals often absorb them when they eat fish" (Daniels Health, 2020).

- 3- **Reduced Risk to Patients and Employees:**

Hospital waste management is something that can often be taken for granted, but the benefits of a good hospital waste system are

numerous, including peace of mind and trust for both patients and employees. Exposure to infectious materials, needle sticks and other dangerous conditions is the result of poor hospital waste management. The World Bank lists advantages of proper hospital waste disposal including that it:

Helps control nosocomial diseases (hospital acquired infections), complementing the protective effect of proper hand washing. Cuts cycles of infection; and easily and cost-effectively addresses health care worker safety issues, including reducing risk of needle sticks (WHO, 2020).

4- Positive Impact on Public Health:

Hospital waste accumulates in huge quantities every day. If it is not disposed of properly, the public health impact could be disastrous. According to the World Bank, good healthcare waste management practices can:

Control zoonosis (diseases passed to humans through insects, birds, rats and other animals), avoid negative long-term health effects; eg, cancer, from the environmental release of toxic substances such as dioxin, mercury and others, prevent illegal repackaging and resale of contaminated needles and dramatically reduce HIV/AIDS, sepsis, and Hepatitis transmission from dirty needles and other improperly cleaned/disposed medical items (Secure Med, 2019).

5- Efficiency: “Healthcare waste management (HCWM) is most effective when proper methods are employed at each step, from planning and procurement through disposal. The first step should be determining realistic options for HCWM given the budget, technology, and local community preferences. Different aspects of

health care waste must be considered when choosing the appropriate treatment technology (such as volume, temperature, whether the waste is liquid or solid, hazardous or infectious),” explains the World Bank (Daniels Health, 2020).

In the United States government fortunate to have many resources and choices when it comes to hospital waste management and disposal. Secure Med is the best choice in the greater Birmingham and Huntsville areas for complete, compliant, reliable medical waste disposal. Contact us today for a free quote and see how we can help you take advantage of these benefits (Secure Med, 2019).

Negative Effects of Dumping Medical Waste:

Improperly disposed of medical waste not only endangers the general public, but the environment. It costs lots of money too in fines and penalties. (Daniels Health, 2020).

1- Healthcare dangers of medical improper medical waste disposal

The negative impact of improper medical waste disposal on human health is staggering. The potential transmission of infectious diseases from needle stick injury or contamination is a primary concern due to medical illnesses and diseases that may be caused by improper disposal of medical waste: (Daniels Health, 2020).

Respiratory infections such as tuberculosis, Streptococcus pneumonia, and viruses like the measles, all of which can be transmitted through improper disposal or outright illegal dumping of infectious waste. HIV and AIDS are both transmitted through items contaminated with blood or body fluids. Gastrointestinal infections such as

salmonella, helminths (parasitic worms), cholera, and Shigella are transmitted through materials contaminated with infectious vomitus or feces.

Viral hepatitis A (transmitted through feces), B, or C, which, like HIV and AIDS, are transmitted via items contaminated with blood or bodily fluids. Septicemia, bacterial infections, and Candida albicans are also transmitted through items contaminated with tainted blood (Daniels Health, 2020).

2- Environmental Impact:

Treatment and disposal of healthcare waste may pose health risks indirectly through the release of pathogens and toxic pollutants into the environment the disposal of untreated health care wastes in landfills can lead to the contamination of drinking, surface, and ground waters if those landfills are not properly constructed. The treatment of health care wastes with chemical disinfectants can result in the release of chemical substances into the environment if those substances are not handled, stored, and disposed in an environmentally sound manner (FAO, 2017).

Incineration of waste has been widely practiced, but inadequate incineration or the incineration of unsuitable materials results in the release of pollutants into the air and in the generation of ash residue. Incinerated materials containing or treated with chlorine can generate dioxins and furans, which are human carcinogens and have been associated with a range of adverse health effects. Incineration of heavy metals or materials with high metal content (in particular lead, mercury, and cadmium) can lead to the spread of

toxic metals in the environment (Daniels Health, 2020).

Only modern incinerators operating at 850-1100 °C and fitted with special gas-cleaning equipment are able to comply with the international emission standards for dioxins and furans. Alternatives to incineration such as autoclaving, microwaving, steam treatment integrated with internal mixing, which minimize the formation and release of chemicals or hazardous emissions should be given consideration in settings where there are sufficient resources to operate and maintain such systems and dispose of the treated waste (WHO, 2020).

3- Even so, proper medical waste disposal practices are hospital's responsibility – it's the law!

An alarming amount of water is discharged by hospitals into sewer systems, to be then managed by wastewater treatment plants. It's estimated that one hospital bed per year generates approximately 145,000 gallons of wastewater. Improper treatment of sanitary waste increases the risk of dangerous particles, toxins, or other contaminants into the environment (FAO, 2017).

Even the most effective water treatment plants or sewage collection treatments are unable to remove all contaminants such as microbes or pharmaceuticals from wastewater, leaving traces levels of chemicals behind with the potential to be released into the environment (Daniels Health, 2020).

4- Financial consequences of illegal medical waste disposal

The financial consequences of improper or illegal medical waste dumping are huge. In 2018, the Environmental Protection Agency increased penalties that now

average \$20,000 to \$93,000 per violation, per day. Other agencies, government and state also have the option of impose their own penalties on top of that (Daniels Health, 2020).

Ethical dilemmas regarding medical waste:

The moral and legal concerns of waste management are diverse; they range from breach of privacy and confidentiality, through duty of care to matters concerned with negligence, compensation, and restorative justice. Several legislations are in force in most countries that are enacted for the purpose of ensuring environmental integrity, proper waste handling, and human health and well-being. These include acts of parliament and other legal instruments (Meleko, Tesfaye and Henok, 2018).

Furthermore, international ethical instruments, such as the UNESCO Universal Declaration on Bioethics and Human Rights, have identified fifteen core principles of bioethics, which include “protecting future generations” and “protection of the environment, the biosphere, and biodiversity.” Therefore, doctors and other healthcare professionals have a moral and ethical obligation to act in a value- and duty-based manner to assist in the proper disposal of medical waste as part of virtue ethics and duty-based ethical obligations (Bourguignon, 2017).

CONCLUSION

There is hospital waste management policy adapted from the National Infection Control Guidelines, this policy has been distributed to all hospitals, but it is not applied in a correct way by health care personnel.

RECOMMENDATIONS

Forming a hospital waste management team to make continuous training

courses for health care personnel regarding hospital waste management and supervise on the application of hospital waste management policy in correct way.

REFERENCES

Amin Shah SA. (2017). Types of Hospital Waste | Risk Waste, Non- Risk Waste. Available at <https://www.aboutcivil.org/hospital-waste-types.html>

Andales J. (2020). Hospital Waste Management; Effectively manage medical waste by implementing best practices in your healthcare institution. Available at <https://safetyculture.com/checklists/hospital-waste-management/>

Billingsely A. (2020). DIFFERENT TYPES OF MEDICAL WASTE. Copyright © 2020 | MH Purity lite WordPress Theme by MH Themes. Available at <https://www.inciner8.com/blog/medical-incineration/different-types-of-medical-waste>

Bourguignon D. (2017). Understanding waste management, (2017): Policy challenges and opportunities. European Parliament Briefing. Brussels: European Parliamentary Research Service (EPRS); June 2015. Available from: http://www.europarl.europa.eu/RegData/etudes/BRIE/2015/559493/EPRS_BRI%282015%29559493_EN.pdf. [Last accessed on 2017 Jul 30].

Daniels Health. (2020). Importance of Hospital Waste Management Available at: <https://www.danielshealth.com/>

- [knowledge-center/hospital-waste-management](#)
- Environmental Health and Safety. (2020). HOW TO DISPOSE OF CHEMICAL WASTE. 2020 Case Western Reserve University 10900 Euclid Ave. Cleveland, Ohio 44106216.368.2000.
- Environmental Protection Department. (2018). Chemical Waste Control. Available at: https://www.epd.gov.hk/epd/english/environmentinhk/waste/guide_ref/guide_cwc.html.
- Food and Agriculture Organization of the United Nations (FAO). (2017). AQUASTAT website, Country Fact Sheet: Burundi [Internet]. Rome: FAO; Available from: <http://www.fao.org/nr/aquastat/>
- Kumar R, Somrongthong R& Ahmed J. (2016). Impact of waste management training intervention on knowledge, attitude, and practices of teaching hospital workers in Pakistan. Original Article, Pak J Med Sci. 2016;32(3):705-710
- Meleko A, Tesfaye T& Henok A. (2018). Assessment of Healthcare Waste Generation Rate and Its Management System in Health Centers of Bench Maji Zone
- Norwegian University of Science and Technology NTNU. (2020). Disposal of infectious waste. Available at <https://innsida.ntnu.no/wiki/wiki/English/Disposal+of+infectious+waste>
- Nwachukwu NC, Chuks N, Orji FA& Ugbogu OC. (2017). Health Care Waste Management–Public Health Benefits and the Need for Effective Environmental Regulatory Surveillance in Federal Republic of Nigeria; Available from: <http://www.intechopen.com/books/current-topics-in-public-health>. [Last accessed on 2017 May 31].
- Oyekale AS& Oyekale T O. (2017). Healthcare waste management practices and safety indicators in Nigeria
- Secure Med. (2019). 5 Benefits of Proper Hospital Waste Disposal. Available at: <https://securemedllc.com/2018/08/03/hospital-waste>
- Singh RD, Jurel SK, Tripathi S, Agrawal KK& Kumari R. (2020). Mercury and Other Biomedical Waste Management Practices among Dental Practitioners in India.
- World Health Organization (WHO). (2020). Health-care waste. Available at <https://www.who.int/news-room/fact-sheets/detail/health-care-waste>
- World Health Organization (WHO). (2018). medical waste classifications. Available at: <https://www.who.int/news-room/fact-sheets/detail/health-care-waste>
- Zulfiquer A A. (2018). Hospital Waste Management. Available at <https://www.slideshare.net/zulfiquer732/hospital-waste-management-93579083>.