

Development of a New Classification and Colour Code for Medical Waste Segregation

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Abstract: - Medical waste poses a serious threat to the environmental health without comprehensive guidelines and efficient management as it contains highly toxic chemicals, pathogenic viruses and bacteria. Therefore, proper handling of medical waste with specialised treatment from its source to final disposal has been a primary concern among medical institute, public and private agencies. The existing medical waste classification in many countries did not contain clear and appropriate segregation, which has created confusion among the medical staff to handle the medical waste. It is persistent to mention that, WHO guidance recommends different countries to conduct assessments prior to any decision-making process and improve their own guidelines incorporated with the recent technologies. In view of the challenge in managing the medical waste, there is an urgent need in developing and adopting comprehensive medical waste segregation guidelines to separate the medical waste at the source itself, as it is the key element for the following processes such as handling, transportation, storage and disposal. Therefore, the objectives of this research are: 1) To develop a new classification of medical waste by merging Malaysia's Scheduled Waste Regulations together with European Waste Code 2) To suggest colour code that is recommended for this project which is adopted from the colour code that is recommended by WHO with few amendments.

Key-Words: - Medical Waste Segregation, Medical Waste Classification, Colour Code, WHO guidance, European Waste Code, Malaysia's Scheduled Waste Regulations.

1 Introduction

Medical and healthcare institutional can be the source of the life saving medical interventions but it also plays a significant role as a vital energy hogs. At the same time, healthcare and medical institutional, conduct different kinds of therapeutic activities, which result in the production of infectious waste, sharp objects, radioactive wastes and chemical materials [1]. In order to this, the medical waste management has become a blooming issues among public all over the countries after few medical institutional reported on ecological footprint that 384 times greater than the plot of land on which medical institutional located. In 2002, the assessment conducted by a WHO among 22 developing countries showed that from 18% to

64% proportion of healthcare facilities do not use waste disposal method according to the regulations and guidelines [2]. A research conducted by Yoan-Kagoma the medical director and co-authors from University of Western Ontario's medical school have been concluded that the proper waste segregation is the single most effective cost saving measure that all the hospital should compulsory adopt into practise [3]. The article published in Canadian Medical Association Journal emphasize that a hospital should reduce their ecological footprints by having comprehensive medical waste segregation and adopt "reduce, reuse, recycle" concept into medical waste management system [4]. Moreover, without designated medical waste segregation,

enormous waste from medical institutional especially operation room is being classified as 'biohazard waste'. Thus, 'biohazard waste' is a category of waste that required expensive handling, packaging and incineration which has been estimated to cost eight times more per tonne compare to solid wastes for the disposal process. According to the literature studies, a single method of biomedical waste treatment or disposal could not completely eliminates all risks to environment or to humans [5, 6]. Thus, being aware of this environmental health risk issues associated with medical waste management, WHO is providing support tools to particular countries. Since each and every health care establishment could not have own treatment and disposal system, a common treatment and disposal facilities under the coordination of medical head and guidance of the civic authority are required [7]. The WHO's available tools facilitate the respective countries with the analysis and decision-making process in developing comprehensive guidelines and policies. This effort will be a foundation that will have access to medical-waste management that are safer to the environment and health.

2 Problem Formulation

The key elements, which are lack in existing classification system in many countries are, medical waste did not be segregated separately according to their characteristics at the point of generation. For an example, sharp wastes have been sort apart from the infectious waste group while it should be assigned under infectious category. Despite that, there are three different type for the same infectious waste product which are blood and body fluid waste, infectious waste and other infectious wastes. According to WHO's guidelines all this three categories should be assigned under the same type called 'bio-hazardous waste'. Besides that, pharmaceutical and cytotoxic pharmaceutical waste did not be classified as a hazardous waste as the handling and disposal for the hazardous class pharmaceutical waste is different from the general category pharmaceutical waste. Furthermore, waste types such as chemical and radioactive have been omitted from the classification which are the threaten substances

to the environmental health. Another significant waste that has been left out from the classification is recyclable waste, which is the crucial aspect, in reducing the waste management cost.

3 Problem Solution

Therefore, to overcome all the mention weaknesses in the existing classification, a new classification of medical waste by merging Malaysia's Scheduled Waste Regulations together with European Waste Code has been developed. Improper medical waste management will lead to a negative impact onto environmental health. The detailed classification is presented in Figure 1. Starting from first class, named as Scheduled Wastes other classes and subclasses are presented in the following sections.

- 1) Scheduled Wastes under the Environmental Quality (Scheduled Wastes) Regulations, 2005 defined as waste which may contain either inorganic or organic constituents.
- 2) Under Scheduled Wastes, medical waste has been separated into bio-hazardous waste (SW404), which inclusive of all infectious waste and hazardous waste (SW403).
 - i) Bio-hazardous waste (SW404): Pathogenic and clinical wastes and quarantined materials.
 - ii) Hazardous waste (SW403): Discarded drugs containing psychotropic substances or containing substances that are toxic, harmful, carcinogenic, mutagenic or tetragonic.
- 3) Bio-hazardous waste has been divided into three subdivisions as follow:-
 - i) Microbiological wastes:- specimens from medical and pathological laboratories, live or attenuated vaccines, wastes from biological testing, cultures and stocks of infectious agents from clinical laboratories, disposable culture dishes and devices used to transfer, inject and mix cultures, tissues from infected patients.
 - ii) Pathological wastes:- human tissues, organs, body parts removed during surgery, blood, serum, plasma and other blood components, human fetuses, body fluids, cloth containing blood stains,

blood coated cotton balls, plasters, bandages, surgical dressings

iii) Sharps

needles, syringes, scalpels, blades, intravenous needles, lances, capillary tubes, pasteur pipettes, specimen slides, cover slips, glass petri plates, infusion sets, knives, saws, nails and broken glass.

4) Hazardous waste has been divided into three subdivisions as follow:-

i) Pharmaceutical waste:-

Expired pharmaceuticals, unused pharmaceuticals, bottles or boxes containing pharmaceuticals, drugs, vaccines, sera, gloves with pharmaceutical residues, masks, drugs connecting tubes and drug vials

ii) Chemical waste:-

Chloroform, trichloroethylene, film developer, xylene, methanol, acetone, isopropanol, formaldehyde, photographic chemicals, methylene chloride, toluene, ethyl acetate and acetonitrile

iii) Radioactive waste:-

Unused liquids from radiotherapy, radioactive substances contaminated glassware or packages, urine and excreta from patients treated or tested with unsealed radionuclide, sealed sources.

5) Non-infectious waste has been divided into two categories as followed:-

i) Non-recyclable waste

Food waste, used paper towels, napkins, tissues, aerosol spray cans, styrofoam (cups, plates, packing materials), light, bulbs, mirrors

ii) Recyclable waste

Paper, paperboard, glass, metal, cardboard, aluminium can, plastic soda, juice bottles, milk jugs and detergent bottles.

the existing colour coding system for the medical waste segregation is, unavailable of different containers for the subdivisions of medical waste. The subdivision waste includes microbiological waste, pathological waste, sharps, pharmaceutical waste, chemical waste, radioactive waste, non-recyclable waste and recyclable waste. Therefore, different colour coding has to be assigned to different waste for effective segregation. Thus, suggested colour code that is recommended for this project which is adopted from the colour code that is recommended by WHO with few amendments is as followed [8]:-

Red: Microbiological Waste

Yellow: Pathological Waste

Blue: Sharp Waste

(In a leak-proof and puncture-resistant container)

Brown: Pharmaceutical Waste

Orange: Chemical Waste

Silver: Radioactive Waste

Black: Non-recyclable Waste

Green: Recyclable Waste

All the waste must be collected at the point of generation and all the containers must bear international symbols with appropriate wording. The containers should never be filled, nor filled above the full line indicated on the box.

3.2 Colour Coding for Effective Medical Waste Segregation

Surveys have showed that an appropriate method of identifying and segregating the waste is by sorting the waste into different colour code. However, there is no standard colour code to follow by all countries for the medical segregation. The element that is a deficiency in

Classification of Medical Waste

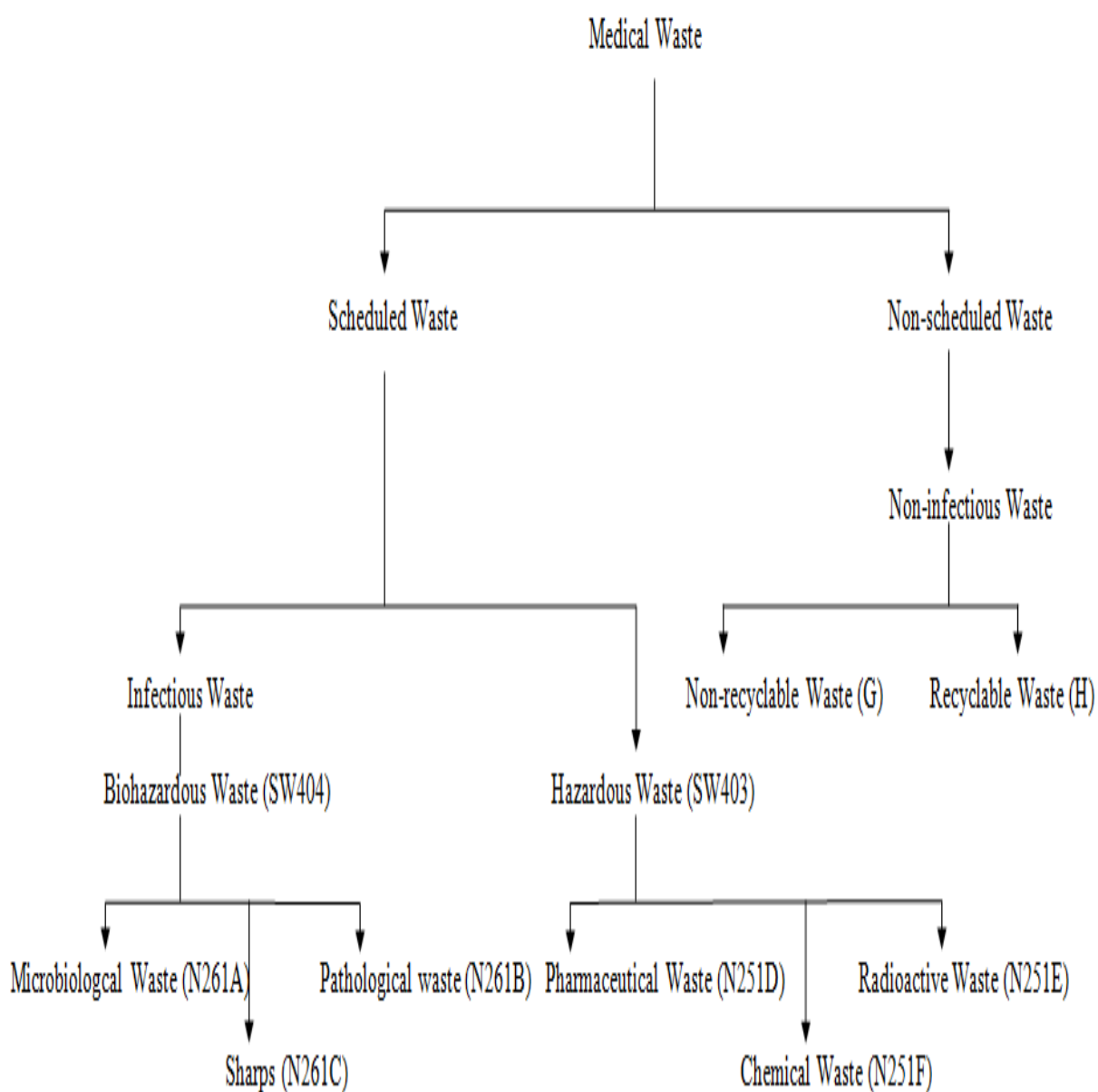


Figure 1 Proposed new medical waste classification

4 Conclusion

Medical waste management system is indeed needs an urgent attention and comprehensive action plan to protect the environment from the growing environmental problems. In order to achieve this, the medical waste segregation section need to be drastically changed and develop based on the comprehensive guidelines. Therefore, it is a critical initiative to develop comprehensive guidelines based on the literature reviews and surveys on the other countries guidelines. Following the medical waste segregation, a standard colour coding system should be developed to facilitate the handling process without further complication among the medical staff. One more factor that requires an observation is recyclable waste that can minimise one third of the disposal cost. For that, more attention should be given on 3R procedure, which inclusive of reduce, reuse and recycle the medical waste as much as possible under safety measure.

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