Hazardous Waste Management in Healthcare Centers

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There are different types of healthcare waste as specified in Decree 13389 of 2004 and the health effects of the mismanagement of hazardous health care waste are many. Among those are Hepatitis A, B and C, Aids, gastro enteric infections, respiratory infections, skin infections, meningitis, anthrax, etc.

The proper management of hazardous waste from health care centers consists of several steps starting with minimization, segregation, handling, storage and ending with treatment and disposal. Minimization of hazardous waste can be done by proper segregation of the different categories of waste since improper segregation would lead to an increase in the volume of the hazardous and infectious waste. Once segregated, proper handling and storage in appropriate storage locations should be properly selected. There are several technologies for the treatment of the different types of healthcare wastes. For instance, infectious waste can be treated by autoclaves, microwaves, dry heat treatment, high temperature incineration, and chemical treatment. Pathological waste can be treated through burial in cemeteries or special burial sites, burning in crematoria or high temperature incinerators and alkaline hydrolysis. Pharmaceutical waste can be returned to the original supplier, encapsulated and buried in a sanitary landfill, and treated by chemical decomposition or high temperature incineration. Chemical waste can be treated through chemical decomposition and high temperature incineration. Cytotoxic waste can be returned to the original supplier, treated by chemical decomposition and high temperature incineration.

The criteria for the selection of the appropriate treatment method for each type of waste must consider waste characteristics, types and quantities, technology capabilities and requirements, volume and mass reduction, regulatory requirements, available space, location and surroundings, public acceptability, infrastructure requirements, operation and maintenance requirements, skills needed for operating the technology, environmental and occupational health and safety considerations, and cost considerations (capital, O&M, testing, environmental monitoring and decommissioning).

In Lebanon, the management of infectious waste is relatively advanced as compared to other hazardous waste such as cytotoxic, expired drugs and chemicals. The quantity of infectious waste produced out of the 180 hospitals in Lebanon (Private and Public) that offer around 17,700 beds is around 7,500 t/yr. This makes the quantity of infectious waste generated per bed per day to be 1.5 to 1.75 kg. Around 70 % of the infectious healthcare waste generated in hospitals is treated at arc- en- ciel autoclaving and shredding facilities while sterilized waste are disposed in a sanitary landfill. Few hospitals treat their infectious waste on their own premises. Treatment cost of infectious healthcare waste varies between 0.5 and 1.0 USD/Kg.

Cytotoxic and chemical waste management, on the other hand, is a much more complicated process. These were estimated at 122 t/yr based on a recent questionnaire sent to hospitals by the Syndicate. The sources of cytotoxic waste in healthcare centers are mainly contaminated materials from drug preparation & administration (includes syringes & needles, vials & packaging, contaminated PPEs, dressings, bandages, nappies, incontinence aids, heavily contaminated bedding, etc.), expired drugs, excess solutions, or drugs returned from wards, urine, feces, vomit from patients, and contaminated specimens from the Laboratory.

Due to the lack of national infrastructure for the disposal of cytotoxic, chemical and pharmaceutical waste, the only available option would be to export them under Basel Convention for proper treatment and disposal. The syndicate of Hospitals signed in 2019 two MOUs with 2 companies (Solutions and Treveria) to facilitate the export of chemical waste (including pharmaceuticals and part of cytotoxic wastes) for disposal in Europe. The process of export is complicated and bears lots of challenges. These include being a very costly and lengthy process, contaminated cytotoxic waste with biohazardous infectious waste cannot be shipped abroad, waste containing mercury are not accepted in all destination countries, transit countries may reject accepting the shipment to pass through, and not all exporters can secure the environmental Insurance.

AUBMC was one of the leaders in the country in the chemical and cytotoxic drug export. Since 1997 to date, AUBMC has successfully exported 7 shipments of mixed hazardous chemical wastes (including pharmaceuticals and cytotoxic drugs) amounting to around 67 tons under the Basel convention with the coordination of the Lebanese Ministry of Environment. Currently, AUBMC is exporting around 12 tons of hazardous chemical waste to United Kingdom through a contract with a UK company – Pegasus Waste Management.

In specialized oncological hospitals, cytotoxic waste may constitute as much as 1 to 2 % of the total healthcare wastes. Some hospitals incinerate their cytotoxic waste in onsite waste incinerators, others are storing them pending their export for proper disposal, while other hospitals dispose of cytotoxic waste by mixing them with other wastes. Cytotoxic waste is highly hazardous and should never be autoclaved, landfilled or discharged into the sewerage system. High temperature incineration in double combustion chamber incinerators to temperature exceeding 1,100 degrees Celsius and state of the art flue gas treatment is the only solution to treat cytotoxic waste. When neither high-temperature incineration nor exportation of cytotoxic waste for adequate treatment to a country with the necessary facilities and expertise is possible, encapsulation or inertization may be considered as a last resort.

In addition to the above, healthcare centers generate radioactive waste which in turn are hazardous and require special arrangements. Radioactive waste generated in healthcare centers are classified according to the level of activity being high, medium or low; half-life being short or long; and form being solid, liquid or gas. In hospitals, most of the waste is of low activity and occasionally medium activity. Particular attention shall be made to ensure proper collection, segregation and storage of radioactive waste.

Radioactive waste in healthcare centers is managed in one

or a combination of the listed methods: delay and decay of solid and liquid radioactive waste of short half-lives (Tc-99m and I-131 waste); dilution and dispersion- applicable only when the concentrations in the solid, liquid, or gaseous waste is within the regulatory limits; incineration of insoluble liquids and combustible solids; return to the supplier for used generators and iridium sources; long-term on-site storage till transport to final disposal facility for calibration sealed sources, orphan sources, brachytherapy and blood irradiation.

As indicated above, the management of healthcare waste bears a lot of challenges. These include the lack of national strategies and plans for proper management, lack of infrastructure & treatment technologies for treatment & disposal of hazardous healthcare waste, lack of national expertise in hazardous waste management, export of chemical and pharmaceutical waste under Basel Convention necessitates extensive paper work and is very costly, mixed cytotoxic waste is hard to treat locally and to export abroad, low level of legal enforcement (though improving) and the lack of national capacity for the testing and laboratory analysis of certain pollutants.

Despite all these challenges, there are some opportunities which shed some light at the end of the tunnel. Among those are the initiatives that are taking place to export chemicals, expired pharmaceuticals and cytotoxic drugs under Basel Convention, the signed MOU between the syndicate of hospitals and two companies for the export of waste, possibility for hospitals to join forces to cooperate and export hazardous waste under Basel Convention creating economies of scale, initiatives by the private sector to establish hazardous waste storage and treatment facilities and the enactment of the decree on the management of hazardous waste that was prepared by MOE and enacted by the Council of Ministers in August 2019.