Medical Waste Disposal: Safety Challenges and Solutions

Hazardous medical waste has a peculiar life cycle. Administrative and non-hazardous health care waste tends to follow the same pattern as trash generated in any industry; uncontaminated paper, glass, and metals should be recycled. Food waste, ideally, would be composted. Mundane garbage will end up in a landfill.

But when we talk about “medical waste disposal,” the real question is how to handle the dangerous byproducts of life-saving medical interventions. And that life cycle looks very different than that of conventional garbage.

In this article, we will study the flow of hazardous medical waste from generation to treatment for safe disposal, or, alternately, on-site incineration.

The moments from generation to treatment of medical waste present the greatest risk to health care workers, and must be carefully navigated. Ultimately, the industrial trend toward automation will emerge as the solution to the dangers of handling medical waste in its early stages. When workers don’t come into contact with potentially infectious materials, they will not become infected; it is that simple. Targeted technology, in the form of highly specialized material handling equipment, is the key to keeping medical workers safe while disposing of waste that carries a variety of risks.

In particular, we recommend a new type of Bin Tipper that isolates loads from operators during the most dangerous step in the waste-disposal procedure: emptying biohazard containers into treatment equipment.

Categories of Unsafe Medical Waste

The dangers of medical waste are multifold. While hazardous waste only makes up 15 percent of the total garbage created by health care activities, the World Health Organization lists seven separate categories of that waste, each with its own threat to human health. These are:

- **Sharps** - Across the globe, health care providers administer about 16 billion injections per year. Understandably, that floods the waste disposal systems of the world with countless syringes and needles, each of which might pose a unique biohazard.

  Disposable scalpels and other surgical implements carry similar dangers, and require similar treatment to protect workers from infection.

- **Infectious Materials** - Patients receive care because they are sick. Viruses, bacteria, and toxic substances can be transmitted via blood, cultures, and bodily fluids.

  In the course of caring for a patient, health care providers create a deluge of contaminated bandages, swabs, medical devices, diagnostic samples, and cultures for analysis. All of these can infect health care workers if the waste is not rigorously isolated from human contact.

- **Pharmaceutical Waste** - Expired drugs still contain active agents. Contaminated medicine cannot be used in treatment. Health care facilities are responsible for eliminating unused pharmaceuticals without exposing people to them, either during disposal or long after — as they can leach into the groundwater, for instance.

- **Chemical Waste** - Medical equipment is often packed with heavy metals and other toxic substances. Thermometers contain mercury. Batteries for life-saving devices might contain lithium, iodine, zinc, mercury, nickel, and/or cadmium.

  Meanwhile, health care workers depend on chemical disinfectants and laboratory solvents to treat their patients. Most of these chemicals are considered “hazardous waste” by the Environmental Protection Agency, which means they’re subject to far-reaching laws governing the handling and disposal of such substances.

- **Genotoxic Byproducts** - Some cancer treatments use cytotoxic drugs, which are highly damaging to human tissues without strict controls. Other health care activities create mutagenic and carcinogenic byproducts. Obviously, these must not end up in the groundwater, and staff must avoid direct contact with them.

- **Radioactive Substances** - Radioactive agents are used for diagnosis and treatment of a variety of conditions, including cancer. The disposal of radioactive waste is, to put it lightly, highly regulated — for obvious reasons.
- **Pathological Tissues** - In the course of healing the human body, health care professionals sometimes have to remove tissues. Body parts and organs and other human tissue can be highly infectious.

  Health care laboratories may have to dispose of contaminated animal carcasses. These carry similar risks to infected human tissues.

While each of these categories poses its own threat to human health, general treatment at the point of generation remains the same. Medical waste must be carefully separated by type, and kept far away from the conventional waste-disposal track.

Handling Dangerous Medical Waste at the Point of Generation

Safe handling of hazardous medical waste begins the instant it is generated. Treatment sites should be stocked with a variety of disposal containers, including FDA-cleared sharps containers. Labeled and color-coded waste receptacles provide a foolproof method for separating medical waste by category.

Depending on the type of waste and local regulations, you may be required to assign a code to each load. These rules vary by state. This wasn't always the case; for about three years in the late '80s, the EPA governed the treatment of medical waste through the Medical Waste Tracking Act (MWTA).

Since the MWTA expired in 1991, though, state governments have taken over the rules on medical waste handling. Your state's health department or environmental agency can tell you more about local requirements.

Note that some hazardous waste generated in the health care industry — heavy metals, for instance — falls under the EPA's legal definition of "hazardous waste," and is therefore subject to the rules of the Resource Conservation and Recovery Act. Learn more about that law here.

The Occupational Safety and Health Administration (OSHA), the Food and Drug Association (FDA), and the Centers for Disease Control (CDC) regulate medical waste, as well. The depth of the legal requirements surpasses the range of this article; consult your legal team when developing a by-the-numbers plan for disposing of medical waste.

That being said, once approved medical waste bins fill up, the next step is to transport them safely to treatment sites. A representative paper from the Journal of Family and Community Medicine states that "transportation of hazardous medical waste should be well mapped in the hospital and conveyed by special carts." Ensure that staff handling dangerous waste is fully trained on the subject, and provided with adequate personal protective equipment.

Assuming waste reaches the on- or off-site treatment facility safely, the next step is particularly risky for staff. They have to empty the biohazards into whatever treatment equipment in use. This step potentially exposes staff to contact with these dangerous substances, and this is where technological upgrades can substantially improve safety.

Protecting Health Care Workers from Hazards at the Disposal Site

There are many technologies available to render medical waste safe for final disposal, and, as the industry continues to innovate, the safest choice is always a moving target.

Until 1997, almost all the infectious medical waste generated by the American health care industry was simply incinerated. Incineration is the most flexible and dependable way to sanitize biohazards.

However, evidence of significant air pollution from medical incinerators piled up throughout the '90s. The EPA responded with a set of strict emission standards for infectious waste incinerators. These regulations continue to be updated, and were last revised in 2013.

In response to these changing standards, the waste disposal industry came up with a variety of effective alternatives to incineration. These include:

- Autoclaves, which destroy microorganisms with heat, pressure, and steam
- Thermal solutions, including microwave treatment
- Chemical treatments, such as shredding waste and mixing it thoroughly with bleach, peracetic acid, or chlorine dioxide
- Radiation treatment
- Shredding, grinding, and/or compression (in conjunction with sterilization)

To be sure, incineration remains a valid technique for destroying medical waste. A 2010 paper in the Journal of Renal Care suggests that incineration is actually the most environmentally friendly way to dispose of waste in dialysis facilities. Cutting-edge incinerators eliminate 99.8 percent of the emissions

produced in 1990, Ray James, author of the paper, wrote.

Regardless of the technology in use at a given medical facility, every machine designed to either destroy or sanitize medical waste for later disposal requires loading.

That is the real danger for staff. Medical wastes aren't entirely solid, and liquid can easily splash onto staff as they empty receptacles into disposal equipment. Any contact between infectious agents and bare skin can seriously threaten an employee's health.

Bin Tippers Safely Load Medical Waste into Treatment Equipment

In addition to providing personal protective equipment during this crucial, final step in the on-site treatment of medical waste, employers can reduce health risks for staff by stocking disposal rooms with a specially designed Bin Tipper.

The Dumpmaster Bin Tipper from Simpro can be outfitted for ideal use in medical waste-disposal applications. First of all, these devices safely lift and empty loads of up to 660 pounds (300 kg), with customizable cradles that firmly grasp virtually any container. They empty bins with a unique lift-and-tip motion that keeps the travel path of loads predictable, without sacrificing stability.

An auto-cycle allows operators to set the machine and leave the room, reducing the chances of contact with medical waste to zero. Even if the operator does monitor the whole process in person, a polycarbonate splash shield is available for dependable protection from splashes and drips.

When a load has been emptied, the Dumpmaster is easy to clean and sterilize — a crucial consideration in this application. Full stainless steel construction is available for easy cleaning. Even better, all components are fully covered, allowing staff to hose the machine down without fear of dowsing crucial electrical systems.

Medical waste disposal is a highly specialized field. The best way to protect staff from contact with dangerous substances is with highly specialized equipment. The Dumpmaster Bin Tipper is ideal for waste disposal sites in medical facilities, whether they use incinerators or the latest autoclave technology.

Figure 1. The Dumpmaster Bin Tipper is ideal for medical waste disposal, and can be customized with various options that protect operators from the bio-hazardous materials being handled.

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P.O. Box 28990 • St. Louis, MO 63132 USA • 1.800.BHS.9500 • Fax: 314.423.6444 • Email: sales@bhs1.com • Web: BHS1.com