

Patient Safety Monitor Journal

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Ebola waste disposal emerges as key safety issue following outbreak

Infection control concerns arise after hospitals struggle to dispose of Category A waste in the wake of CDC and DOT discrepancies

Hospitals around the country that cared for Ebola patients were met with numerous challenges, from proper screening protocols to protecting healthcare workers with appropriate PPE. But one particular logistical problem, involving waste disposal, emerged as one of the biggest obstacles.

The problem was two-fold: One, a single Ebola patient generated a tremendous amount of waste. Linens, curtains, mattresses, and healthcare worker PPE generated eight 55-gallon barrels of waste each day, according to the *Los Angeles Times*. Two federal agencies, along with vendors and local municipalities, had varying guidelines regarding how to dispose of that waste.

Most notably, confusion between the CDC and the Department of Transportation (DOT) about how to properly dispose of Ebola waste put hospitals in a predicament at a time when many were already on high alert about preventing transmission.

The discrepancy arose because CDC recommendations instructed hospitals to dispose of Ebola waste in leak-proof containers and discard it as regular waste. The DOT, on the other hand, classifies Ebola waste as Category A as a "material known or reasonably expected to contain a pathogen ... that is capable of causing permanent disability or life threatening or fatal disease in otherwise healthy humans." Transporting Category A waste requires special packaging and hazmat training.

The discrepancy initially caused problems for at least two hospitals. Emory University Hospital in Atlanta treated the first two Ebola patients in the United States in August. The hospital's waste hauler at first refused to dispose of the waste because of DOT regulations, according to Reuters. Emory was forced to keep the waste in 32-gallon rubber drums purchased at Home Depot in the facility's biocontainment unit.

Texas Health Presbyterian Hospital in Dallas ran into similar issues in September when an Ebola patient presented at the hospital. They stored gallons of waste in the isolation area where the patient was being kept.

Ultimately, the CDC and DOT released joint guidelines that required a special permit to transport waste. On October 3, the DOT approved a special permit that covered all of Texas, allowing Stericycle two alternative options for packaging waste.

The joint guidance offered a workaround, says **Amesh Adalja, MD, FACP**, a member of the public health committee at the Infectious Disease Society of America (IDSA) and a senior associate at the University of Pittsburgh Medical Center's Center for Health Security. However, it did not offer a blanket solution for Ebola waste disposal. He says most hospitals do not handle Category A waste, so this is new territory.

"This special permit has been granted several times already, but it is something that could be cumbersome for the hospital," he says. "Now that we have hospitals identified as

Ebola care centers, this may be something they are working on ahead of time in the event they get an Ebola patient."

Adalja adds that the buildup of Ebola waste creates additional infection control, worker safety, and patient safety risks. Hospitals that were already dealing with a very acute concern regarding the spread of the disease, now had to manage an additional problem with waste storage.

"When hospitals are so busy making sure they have the appropriate facilities and infection control procedures, it just added to workload of the hospital emergency management personnel who were then dealing with this whole other problem," he says.

Autoclaving waste

Aside from obtaining a special permit to transport waste through vendors, hospitals have two other options for appropriately disposing of Ebola waste through on-site inactivation, according to the CDC:

- Ebola-associated waste may be inactivated through appropriate autoclaves

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- Ebola waste may be incinerated and transported according to state and local regulations

The Los Angeles Times points out that burning infectious waste is “effectively prohibited” in California and seven other states. Additionally, many hospitals do not have large-scale autoclaves to sterilize waste.

One medical facility that was able to successfully autoclave and properly dispose of Ebola waste was the Nebraska Medical Center, which houses a Nebraska Biocontainment Unit. In commentary published in the December issue of the *American Journal of Infection Control*, members of the unit describe the hospital’s strategy to convert Category A waste into Category B waste. The Nebraska Biocontainment Unit treated three patients with Ebola from September through November.

All solid waste and doffed PPE was placed inside a clear plastic bag and transported through a pass-through autoclave by healthcare workers in full contact precaution PPE. The autoclaved waste was placed in a biohazard bag lining a watertight receptacle and disposed of as Category B waste. Autoclaved linens were placed into a hospital soiled linen receptacle for special processing, according to the commentary.

Liquid waste, on the other hand, was disposed of in a toilet along with hospital-grade disinfectant and held for 2.5 times the recommended contact time.

A single Ebola patient generated approximately 1,000 pounds of waste, or 430 cubic feet, says **Shawn G. Gibbs, PhD, MBA, CIH**, associate dean for student affairs and professor of environmental, agricultural, and occupational health at the University of Nebraska Medical Center College of Public Health, research director of the Nebraska Biocontainment Unit in Omaha, and one of the authors of the commentary.

Gibbs admits the same resources are not available to most hospitals. The autoclave itself is approximately \$75,000.

“We had the luxury of designing a new facility so we were able to implement that into the design of the facility,” he says. “Literally, from our patient care area to the warm side of the autoclave is maybe about 50-60 feet and it’s all contained within our unit.”

Gibbs says the unit is built to manage high-level infectious diseases, but preparing for Ebola still required some coordination and planning on their part. In the

summer, when it became apparent that the unit could receive an Ebola patient, administrators began working with vendors and local municipalities to iron out their waste disposal process.

He adds that the staff had a level of confidence in the process because they had undergone thorough training prior to the first Ebola patient. Healthcare workers that take care of patients in the biocontainment unit volunteer for that position, so they are acutely aware of the risks of managing an infectious patient.

Gibbs recommends that hospitals preparing for an Ebola patient communicate with their vendors and municipalities and work through some of the unique issues they might face in the future.

“More importantly, start working with the healthcare workers and your staff that are going to be dealing with this waste on a daily basis so they understand the risks, and they understand the hazards, and they understand how you’re working with them to mitigate it,” he says.

Coordinating with local authorities and vendors

The DOT and CDC regulations weren’t the only thing tripping up hospitals, Adalja says. In some cases, vendors did not want to take autoclaved Ebola waste, even though it was a process approved by the CDC. In other instances, local sewer authorities restricted hospitals from flushing Ebola waste down the toilet.

“We had the best solution we could with these special permits, but it didn’t stop other entities from continuing to panic and make life much more difficult for hospitals, where they had completely noninfectious waste that had been autoclaved or incinerated and they were being told, ‘Don’t send it to us,’” Adalja says.

Gibbs says the Nebraska Biocontainment Unit reviewed their waste plan, including their intention to autoclave solid waste and flush liquid waste with disinfectant, prior to admitting an Ebola patient.

“We communicated that with our local authorities, including the state and local health department and they were very happy with that,” he says.

Adalja says that what is approved in one municipality may not work in another, particularly when you have a high level of panic surrounding an outbreak like Ebola.

“It might not work in two different municipalities in the same state,” he says. “That’s something we need to think about for future outbreaks.” ■

UV robots take center stage in the fight against pathogens

In the wake of the Ebola outbreak, some hospitals are looking at their environmental cleaning practices in a whole new light. Ultraviolet light, to be specific.

Companies that manufacture UVC robots saw a spike in interest—and in some cases, a spike in sales—in the wake of the Ebola cases in the United States. The devices do not replace traditional terminal cleaning, but rather act as a supplement to more effectively kill dangerous pathogens.

With a stronger focus on terminal cleaning procedures, suddenly the machines went from a “nice-to-have” item to a “must-have” device.

Patient Safety Monitor Journal spoke with three UV robot manufacturers about the increased interest in their product and how that might impact future interest.

Spectra254

The Danbury, Connecticut-based company sold two pieces of equipment to the World Health Organization and shipped units to five hospitals in the United States free of charge for 30–60 days. According to Sanford Greene, president of Spectra254, three of the five have made purchases following the trial run.

“We did see an increased interest,” he says. “Also, some healthcare facilities that were thinking about it and had it in the pipeline, but had not made a decision to go forward, accelerated their decision to purchase.”

Green adds that the robots typically have a long sale cycle, but the Ebola outbreak added an extra incentive for some hospitals to make room in the budget.

The company says the Spectra254 system—which costs \$40,000—is 99.9% effective on pathogens, including Ebola, on areas within 15 feet following a five minute cycle.

“In a typical hospital environment where you have one or two beds, you might use two or three cycles of five minutes depending on how the room is shaped,” Green says. “You just want to make sure the room is totally saturated with UVC light.”

Xenex

Once Ebola arrived in the U.S., Xenex, based in San Antonio, rolled out Ebola-specific protocols for their germ-zapping robot. The Xenex robot uses xenon, an inert gas, rather than mercury, to circulate UV light into a hospital room.

Xenex CEO Morris Miller says that the company saw

markedly increased interest from hospitals following the Ebola outbreak.

“In the fourth quarter we’ll sell just as many robots as we sold in the rest of the year,” he says. “It’s a dramatic effect.”

The Xenex robot costs \$100,000 and it takes approximately 15 minutes, or three, five-minute cycles, to clean an entire hospital room.

Morris says that outbreaks like Ebola often get hospitals thinking about environmental cleaning, which leads to a discussion about other dangerous pathogens.

“As the world becomes more interconnected and people travel back and forth, they are invariably going to spread these things all over and hospitals need a solution in place to cut back a sudden outbreak,” he says.

TRU-D SmartUVC

Based in Memphis, Tennessee, TRU-D SmartUVC began fighting the Ebola outbreak before it reached the U.S. In early August, Dr. Jeffrey Deal, the inventor of the system, took two machines to JFK Hospital and ELWA Hospital in Monrovia, Republic of Liberia. Both hospitals used the machines to disinfect rooms before treating a suspected Ebola patient.

Once the virus hit the U.S., many hospitals that had budgeted to purchase the device in 2015, “accelerated that for immediate purchase,” says **Chuck Dunn**, president of TRU-D SmartUVC LLC. Dunn says that sales have increased 50% in September, October, and November compared to what the company forecasted.

Currently, the TRU-D device is being utilized at three of the 35 designated Ebola hospitals across the country.

“It seems to have settled a bit now, but from a business perspective it did increase our sales considerably,” he says.

The device costs \$100,000 and Dunn says a complete cycle averages around 20 minutes. Healthcare workers are trained to prepare the room by moving furniture away from the walls and raising bed rails in order to get a thorough cleaning. During the outbreak, TRU-D adjusted its standard operating procedures so that the machine would run one cycle prior to manual cleaning, then environmental services would do a terminal cleaning, and then the machine would run a second cycle.

All three representatives agreed that although Ebola boosted interest in these devices, the true driver is Medicare reimbursement tied to HAIs. As that percentage of money tied to HAIs increases, they believe these devices will become much more pervasive in healthcare facilities.