Infection prevention implications for healthcare facilities in the wake of the West Virginia water contamination crisis.

BY VICKY UHLAND

When a January chemical spill shut down the water supply in nine West Virginia counties for nearly a week, the state’s largest hospital system was ready. But many local long-term care facilities needed help managing the crisis, and county and state health departments were forced to learn some valuable lessons in disaster preparedness.

Charleston, West Virginia, residents began noticing a licorice smell in their water shortly before it was discovered that a toxic chemical was leaking into the city’s water supply. Freedom Industries, which produces chemicals for the mining, steel, and cement industries, stored the chemical 4-methylcyclohexane methanol (MCHM) in a tank along the Elk River. The tank sprang a leak, and about 10,000 gallons of the chemical spilled into the river—upstream from the local water department’s intake, treatment, and distribution center.

The spill was discovered January 9, and early that evening, the state health department issued a do-not-use order for all Elk River water. As a result, roughly 300,000 people in the Charleston area were unable to drink, cook with, or bathe in tap water, although they were allowed to flush their toilets.

The stop-use order also affected about 1,300 restaurants, food suppliers, day-care facilities, hospitals, ambulatory centers, and long-term care facilities.

The order remained in effect until January 15, when the Centers for Disease Control and Prevention announced that main water pipe flushing in the Charleston area was finished and that MCHM levels were below the 1 part per million level that is associated with adverse health effects.

Here is a look at how some Charleston health facilities, along with the county health department, dealt with that weeklong dry spell.
Lillian Morris, RN, MS, CHSP, had just finished her workday on Thursday, January 9, and was at home cooking dinner when she heard on the 5:30 p.m. news about the do-not-use order. As the corporate director for safety at the state’s largest hospital system—Charleston Area Medical Center (CAMC)—Morris immediately knew her dinner would have to be postponed.

Morris rushed back to CAMC General, which, along with CAMC Memorial and CAMC Women and Children’s, was in the do-not-use water zone. CAMC’s smaller Teays Valley Hospital is about 25 miles away in Hurricane, West Virginia, and was unaffected by the water crisis.

Morris and CAMC administrative staff activated the hospital’s disaster preparedness protocol and set up a command center. Throughout the crisis, the command center communicated with various local, state, and national health entities and held twice-daily briefings for CAMC personnel. CAMC’s marketing team also used social media to alert staff and the community.

Morris then paged Joe Tucker, CAMC’s corporate director for housekeeping and waste management, who was 30 miles away picking up his car from a repair shop when the do-not-use order was issued.

“I was saying to my wife, ‘My goodness, what is that licorice smell in the air?’ and 10 minutes later I got Lillian’s page,” Tucker said.
Tucker drove to the hospital and began directing the facilities staff to shut off water pipes; cover up faucets; and disconnect ice machines, water fountains, and coffee makers.

Meanwhile, the state health department, which began calling each area hospital after the media reports went out, told Morris and other CAMC officials that they should plan for at least a couple of days without water. CAMC was among the first of the local homes and businesses to have its pipes flushed when operations began on Monday, January 13, to remove the chemical MCHM from the water. In the end, the hospital was waterless for four days.

**A 72-HOUR DISASTER SUPPLY**

Per its emergency management protocol, CAMC already had what it thought was a 72-hour supply of bottled water stored in a nearby warehouse. The storeroom also contained a 72-hour supply of disinfectant cloths and bleach wipes that the environmental services staff could use for cleaning and on flat mops.

CAMC personnel immediately switched patients to bottled water, and each employee was given one bottle of water per shift. Bottled water was also delivered to each handwashing station, along with extra alcohol gel. Infection preventionists made rounds to explain that it now took two people for handwashing—one to pour the water and the other to lather up.

CAMC also elected to continue food service operations. “Not all hospitals kept their cafeterias open, but we thought it was important not only for our patients but also our staff,” Morris said. The dietary services department used bottled water for cooking and minimized washing by using disposable containers and serving items.

But even though toilet flushing was still allowed and nonclinical/nonemergency staff was told not to report to work the first day of the water crisis, hospital officials soon realized they had underestimated their water needs. “We had planned for 5,000 gallons per day,” said CAMC Infection Preventionist Deana Samms, BS, MA, CIC. “But we actually found we used 7,000 gallons a day that weekend and 11,000 gallons on Monday.”

Fortunately, Morris was able to reach out to a county contact, and late Thursday night, county officials delivered two water buffaloes—small tanks of potable water that can be pulled by a truck. And Friday morning, a 7,000-gallon water tanker pulled up to the CAMC General loading dock. Meanwhile, local water manufacturers donated as much bottled water as they could, and another vendor sent a truck filled with 4,000 bags of ice.

But just because water had arrived didn’t mean that it was readily usable. Staff had to figure out how to get it out of the tanks and into the five-story hospital. “We have a guy in our facilities department, Dan Brown, who we call a mechanical savant,” Tucker said. “He designed a pump system to get the water to the higher floors, and a connection that could fill up five five-gallon jugs all at once by hitting one button.”

Staff then dispersed the water throughout CAMC General and loaded water from the tanker into the water buffaloes to transport to the other CAMC hospitals. Everyone hauled water at some point, including the CEO, Tucker said.

**VENDOR CONTRACTS COVER EMERGENCIES**

Suppliers handled many of the hospital’s other needs during the water crisis. As part of its vendor contracts, CAMC requires all suppliers to provide support in times of emergency.

A cleaning wipes company opened its warehouse after hours and offered its entire stock of wipes to CAMC. Facilities staff also made a late-night trip to another vendor to pick up disposable cooking and serving products for Friday’s breakfast service. “We’ve made sure we now stock those things in the disaster prep room,” Tucker said.

Another vendor sent 100 five-gallon containers—enough so that one container could be put at each nursing station, along with ice coolers that staff purchased at a local store. Throughout the do-not-use period, facilities staff filled up each container on its “water runs” every two hours, and the dietary services department stocked the ice. Each patient got a bottle of water during
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those runs as well. Tucker took a water inventory twice a day and reported it to the command center.

Linen supply was another issue. Not only did CAMC have its own linen to wash, but it also handles laundry for other healthcare facilities. CAMC shipped mountains of dirty laundry as far as 60 miles to hospitals that weren’t affected by the water crisis.

“One of the things that really struck us was all the cooperation from other hospitals,” Morris said. “CAMC is the largest hospital in the state, so we don’t often have people calling us and offering assistance. It was really special.”

CREATIVE INSTRUMENT-STERILIZING SOLUTIONS

CAMC General rescheduled all of its Friday surgeries, but because it’s a level 1 trauma center, it still needed surgical trays for emergencies.

Staff solved that problem by transporting all of the trays in wrapped containers to CAMC’s Teays Valley Hospital outside of Charleston. “They typically process about 20 trays a day, but over two-and-a-half days they processed more than 460 trays,” Morris said. “We sent staff over to help them, but they still worked 24-hour days in a small room. I can’t say enough about how amazing they were.”

Late Saturday night, authorities began allowing Charleston hospitals to clean equipment and trays with tap water, as long as it could be steamed. However, endoscopy and other departments that use scopes were still a problem.

“We didn’t want to transport the scopes to the other hospitals for cleaning because we would run a huge risk of breakage,” Samms said. “So the maintenance guys carried up water and poured it into a portable water tank they had connected by a hose to the sterilization equipment. As a result, by Monday morning, we were able to do all of our scheduled procedures.”

CAMC General also has a dialysis center on its second floor. For the first 24 hours after the stop-water order was issued it was shut down, but then the dialysis company sent in a tanker truck. Still, the facilities staff had to figure out how to pump the water up two stories, which it quickly accomplished.
THE AFTERMATH

Even though the main water lines to the CAMC facilities were flushed on Monday, the hospitals still had to flush their internal lines, clean ice machines, and replace filters on all equipment that uses water. It was an arduous process, Morris said. And that didn’t even include water testing.

A task force consisting of state health, water company, National Guard, and city emergency management representatives developed a plan for MCHM testing in the water that was flowing into the hospital post-spill. Overall, the testing took three days, Morris said.

Even though authorities cleared all CAMC facilities to use tap water after that, the Women and Children’s Hospital continued using bottled water for cooking and patient supply several weeks longer. “Patients were concerned so we used an abundance of caution,” Morris said.

Overall, during the entire waterless week, there was not one patient complaint, Morris said. “In fact, patient satisfaction scores for January and February were higher than they had ever been,” she said. “There was such a sense of community.” Morris said CAMC also didn’t see a big uptick in patient illnesses or infections post-crisis.

After the crisis was over, CAMC conducted audits to assess how much water each department really needs. Radiology, for instance, requires extra drinking water for its patients. Certain departments also need sterile or distilled water. Tucker said he’s learned that not only does CAMC need to keep 33,000 gallons of bottled water on hand (11,000 gallons a day for 72 hours), but the bottles must to be in a variety of sizes, including one and five gallons.

While they agree that communication between individual hospitals could improve, the CAMC staff is pleased at how well their disaster preparedness operations worked. “The command center was calm—I never saw anyone get panicked,” Tucker said.

“I think our training with leadership and staff and our rapid set-up of incident command structure really served us well,” Morris added. “Overall, I’m very proud of the fact that no hospital in the region had to close or lose services for an extended period of time.”

Long-term care facilities and the Kanawha-Charleston Health Department

CAMC may have weathered its drought successfully, but things didn’t flow as smoothly at nearby long-term care facilities and in the health department that serves Charleston and the surrounding Kanawha County.

Even though the Kanawha-Charleston Health Department’s environmental health staff was the first to alert the local water department about the MCHM chemical spill, the health department obtained most of its information during the water shutdown from press conferences and media reports, said Janet Briscoe, RN, BSN, MBA, director of epidemiology and emergency preparedness.

As a result, health department staff found themselves in a reactive rather than proactive position. During the initial two weeks after the do-not-use water order was issued, Briscoe said the health department fielded hundreds of phone calls a day from concerned citizens.

“People were asking what to do about what they saw on TV,” she said. “We had staff diverted away from their regular jobs to handle all the calls.”

One of those regular jobs was making sure long-term care (LTC) facilities were aware of the water crisis and had plans in place. “We made personal calls to large nursing homes, and our emergency management team volunteered to review their emergency plans,” Briscoe said.

Because many of the Charleston LTC facilities are owned by national corporations that haven’t developed disaster plans at local levels, Briscoe said the health department staff needed to walk LTC personnel through infection prevention, kitchen water usage, and other disaster measures.

Charleston also has a variety of apartment buildings that serve seniors. The water crisis taught health department employees that in the future, county disaster preparedness discussions need to include representatives from these apartment buildings.

From a community standpoint, “the biggest saving grace for us was that the schools were closed during the water crisis, because there was a lot of concern about GI [gastrointestinal] disease transmission,” Briscoe said.

That may be one reason why the health department’s initial data shows no outbreak of infectious disease in the community in January, Briscoe said. “The numbers for outbreaks of GI illness are the same or a little lower than they were the same time last year,” she said.

The information on handwashing that the Kanawha health department dispersed via news conferences, social media, and its website also helped, she said. “At the community level, there was so much apprehension, parents were careful about good handwashing practices with their kids.”

Complicating the issue is that there is very limited data about exposure symptoms for MCHM, Briscoe said, including no data on what happens if the chemical is consumed.

Consequently, the Kanawha health department planned to collect follow-up data through May from community healthcare providers. “We found that after the water systems were flushed, providers got an increase in health complaints,” Briscoe said.

That may be partially due to the fact that more than two months after the CDC announced that the MCHM in Charleston tap water was below the 1 part per million associated with adverse health effects, some water still had the telltale MCHM licorice smell.

“People have a lot of mistrust and fear now, which makes it important to provide accurate information at the community level,” Briscoe said.

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