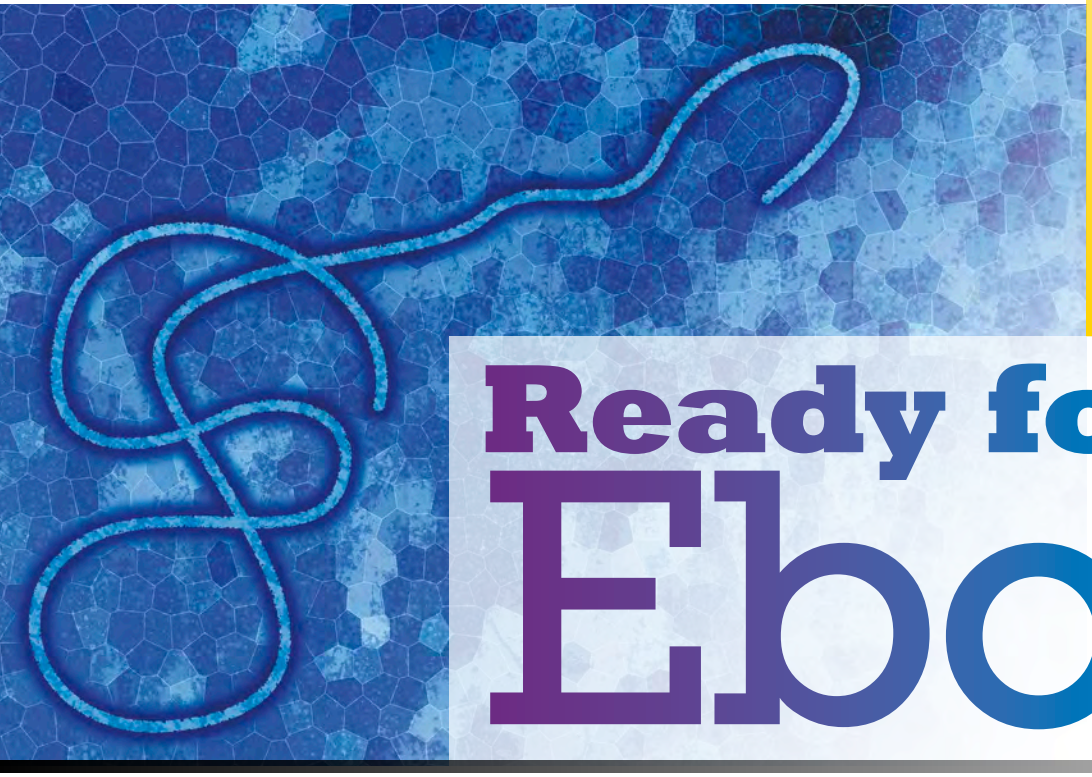

Ready for Ebola

BY TANYA CUSTER, M.S., R.T.(R)(T), AND CHRISTINA GREGG, B.S., C.N.M.T., R.T.(R)(N)(CT)

In September, Jolene Horihan, R.T.(R)(M), as a member of Nebraska Medicine's Biocontainment Patient Care Unit team, became one of the first technologists in the U.S. to take a radiograph of a patient infected with Ebola.

PHOTO: COURTESY OF FRAN HIGGINS

Jolene Horihan serves as the main radiologic technologist on Nebraska Medicine's biocontainment team.

In response to the terror attacks of Sept. 11, 2001, and a SARS (severe acute respiratory syndrome) outbreak in 2003, the U.S. Centers for Disease Control and Prevention commissioned the construction of a biocontainment patient care unit in 2005 on the campus of Nebraska Medicine's University of Nebraska Medical Center in Omaha.

Of the four high-level biocontainment units in the country, Nebraska Medicine's is the largest. The unit is separate from the university's general hospital and has its own air circulation system. The 10-bed unit is equipped to treat patients affected by bioterrorism attacks and extremely infectious naturally occurring diseases, such as SARS, plague, smallpox, drug-resistant tuberculosis and the Ebola virus.

Nebraska Medicine's biocontainment unit sat unused for nearly 10 years, but the biocontainment team continually trained and prepared for the day when the unit would be needed. In July 2014, the U.S. State Department visited the Nebraska Medicine Biocontainment Unit to assess its readiness to receive a patient infected with Ebola.

R.T.s Lend a Hand

In early September, the unit received word that it would be caring for American physician Dr. Richard Sacra, who had become infected with the virus while treating patients in Liberia. Jolene Horihan,

R.T.(R)(M), a lead radiologic technologist at Nebraska Medicine, was asked to serve on the medical team that would treat Dr. Sacra.

Even before Jolene was invited to join the biocontainment team, she knew her answer would be yes. "I wasn't anxious about being a part of the team," she said. "I fully believe in the system at Nebraska Medicine."

Ebola is a rare, highly infectious and deadly disease caused by a viral infection from the family Filoviridae, of the genus Ebolavirus. The virus was first discovered in the mid-1970s near the Ebola River in Africa. According to the CDC, the recent Ebola outbreak in West Africa is the largest Ebola outbreak in history and the first Ebola epidemic in the world.

Treatment of the Ebola virus is experimental. At this time, the U.S. Food and Drug Administration hasn't approved a vaccine or medicine for its treatment, but the CDC reports that experimental vaccines and treatments are under development. Successful treatment of patients infected with the virus requires supportive care, such as providing intravenous fluids, balancing electrolyte levels, maintaining oxygen and blood pressure status, and treating any secondary infections.

Nebraska Medicine's biocontainment team is composed of infectious disease specialists, registered nurses, respiratory therapists, patient care technicians and radiologic technologists. The role of the R.T. in the treatment of Ebola patients is still being defined, but physicians at Nebraska Medicine opted to train technologists to be a part of the team.

"We found that obtaining portable x-rays was an important part of providing care to patients with Ebola virus disease," said Angela Hewlett, M.D., M.S., associate medical director of the Nebraska Biocontainment Patient Care Unit. "Adding a

Members of Nebraska Medicine's biocontainment team demonstrate the donning process for applying personal protective equipment.

IMAGE: COURTESY OF NEBRASKA MEDICINE.

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Each member of Nebraska Medicine's biocontainment team works with a donning partner to ensure that all equipment is properly applied and fastened.

radiologic technologist to our team allowed us to obtain these studies in an appropriate and timely manner."

Medical imaging exams, such as chest and abdominal radiography, are useful in the care of an Ebola patient. Indications for chest x-rays might involve the evaluation of the respiratory and cardiac systems or help rule out infections such as pneumonia. Abdominal radiography helps physicians evaluate the gastrointestinal system or rule out obstructions.

Even though Jolene serves as the biocontainment unit's main radiologic technologist, other R.T.s were also trained to assist the team so that Jolene wouldn't need to be on call 24 hours a day, seven days a week.

Ebola Protocol

All members of Nebraska Medicine's biocontainment team must follow strict personal protective equipment procedures outlined in its "Donning and Doffing Guidelines." Jolene and the other technologists designated to work in the biocontainment unit learned how to properly enter and exit Dr. Sacra's room, and how to don and doff protective equipment, although the practice wasn't new to them.

"Handling 'dirty' and protective equipment are put into practice on a daily basis when imaging other patients in contact, droplet or airborne isolation," Jolene said. "We're used to implementing these practices while obtaining radiographs in the operating room, and during other procedures where you must avoid contaminating a sterile field."

Jolene estimates that it takes about six minutes to suit up in the protective equipment. "That doesn't include the time it takes the technologist to change out of her standard scrubs and shoes and into the scrubs and washable shoes provided by the biocontainment unit when she enters the unit locker room," she added. "That process can take anywhere from five to 10 minutes."

All radiography exams within the biocontainment unit are performed using a portable digital radiography machine. Nebraska Medicine currently prohibits radiologic technologists from having any direct contact with Ebola patients. "Obtaining a simple chest x-ray becomes a meticulous process when the patient is infected with Ebola," Jolene said.

Under the guidance of a technologist, a nurse or physician places and positions the wireless image receptor behind the patient. The receptor is secured in a single-layer Kapak pouch. Originally, it was heat-sealed in two plastic covers, but its battery frequently needed to be removed for charging.

"Removing the heat-sealed coverings was cumbersome and posed a risk for contamination," Jolene said. Using a Kapak cover, commonly used as a sterile cover for the imaging receptors in the OR, proved to be a better solution. The Kapak cover has an adhesive strip at the opening, Jolene explained, making it easier to remove to access the receptor's battery with less risk of contamination.

Prior to an exposure, all nonessential personnel move to an adjoining area, called the anteroom, to avoid radiation. The R.T. then positions the tube/central ray to take the radiograph. "It takes anywhere from 30 minutes to an hour to perform a basic imaging exam on an Ebola patient," Jolene said, "depending on the number of images taken and whether there is anyone in front of you for the donning and doffing procedure."

Although not part of a radiologic technologist's duties as a member of the biocontainment team, the portable radiography machine and image receptor must undergo 48 hours of decontamination before they can be used again.

Jolene and others on the biocontainment team were allowed to go home and continue normal activities outside of the medical unit, on and off duty, she said. "No one on the team was quarantined, and none of the team members has ever displayed any signs or symptoms of the virus."

Always Ready

In early October, not long after Nebraska Medicine's biocontainment team successfully treated and released Dr. Sacra, a second Ebola patient was admitted to its unit.

Freelance journalist Ashoka Mukpo was infected while working in Liberia as a cameraman for NBC News.

During his treatment, news emerged that two nurses in Dallas, Amber Vinson and Nina Pham, had been infected with the Ebola virus while treating patient Thomas Eric Duncan at Texas Health Presbyterian Hospital. The nurses had been wearing personal protective equipment while treating Duncan, who contracted Ebola in Liberia shortly before traveling to the U.S.

The news didn't daunt Jolene. "The nurses in Nebraska Medicine's biocontainment unit instructed me on the protocols and procedures of the unit, which assured me that I could fully protect myself while caring for the sickest of patients."

Under the care of the biocontainment team, Ashoka soon recovered, and Nebraska Medicine released him from the unit in late October.

On Nov. 15, a third Ebola patient arrived for treatment in the biocontainment unit. Dr. Martin Salia, a surgeon who practiced in Sierra Leone, Africa, treated patients at medical facilities throughout Freetown, Sierra Leone's capital and largest city. It isn't known where and how Dr. Salia contracted the virus, but he was in very critical condition when he arrived at the University of Nebraska Medical Center.

"We used every possible treatment available to give Dr. Salia every possible opportunity for survival," said Dr. Phil Smith, the medical director of the Nebraska Medicine Biocontainment Unit, in a news release. "As we have learned, early treatment with these patients is essential. In Dr. Salia's case, his disease was already extremely advanced by the time he came here for treatment." Dr. Salia suffered advanced symptoms associated with the virus, including kidney and respiratory failure. He died on Nov. 17.

Over a three-month period, Jolene and several other radiologic technologists assisted the team at some point to image one or more of the unit's Ebola patients.

"Caring for patients in the biocontainment unit at Nebraska Medicine has been a rare and exciting opportunity," Jolene said. "The unit staff was very well prepared and had thought of nearly every detail prior to using radiography in the unit. It's been a great learning experience for me."

Nebraska Medicine's radiology department has access to Nebraska Medicine's "Biocontainment Unit Policies and Procedures" and protocol updates, and is ready to receive and care for a patient in the biocontainment unit at any time, Jolene noted.

"We are actively sharing our protocols with members of the medical community across the U.S. and the world," Dr. Hewlett said. "We hope that other centers will be able to use our experiences to increase their preparedness, so they can provide quality care to patients with Ebola virus disease while keeping their health care workers safe." S

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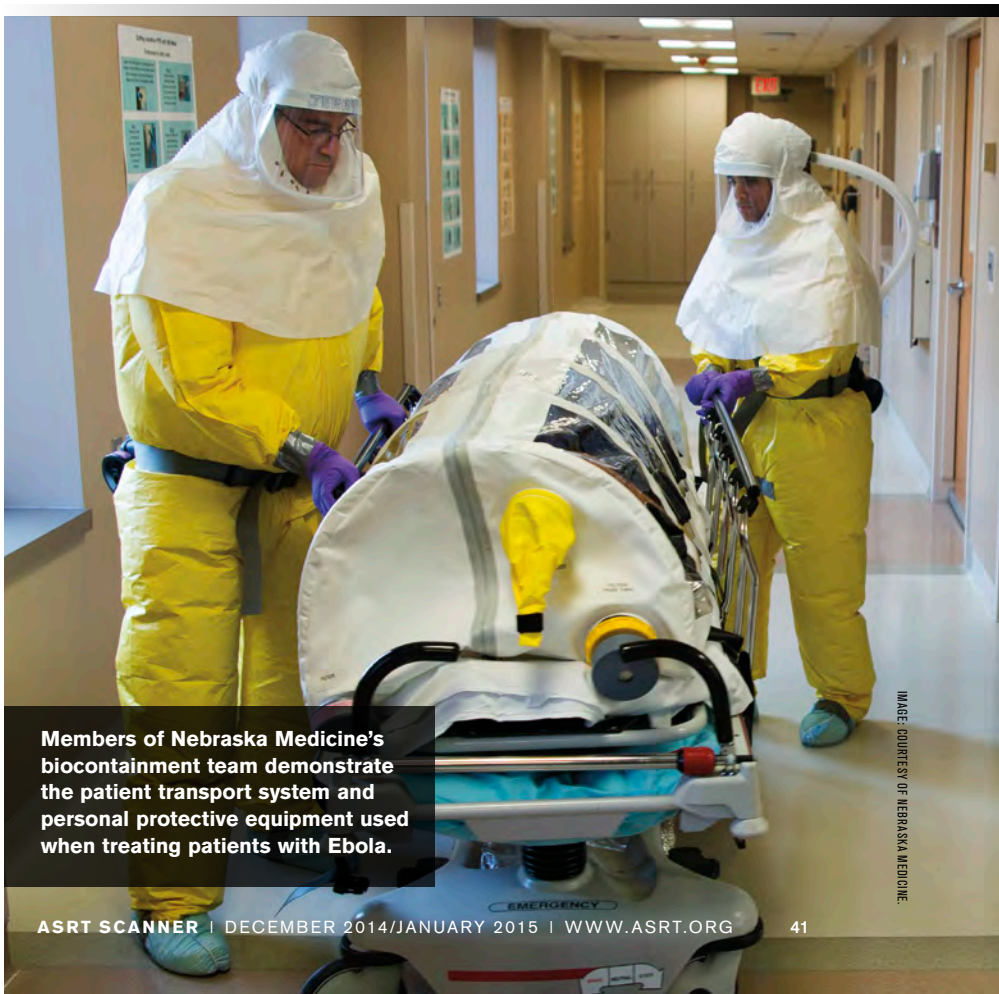

Members of Nebraska Medicine's biocontainment team demonstrate the patient transport system and personal protective equipment used when treating patients with Ebola.

IMAGE: COURTESY OF NEBRASKA MEDICINE.