

Dear Colleagues,

We write to provide a summary of the presentation at IDWeek by Dr. Bruce Ribner on caring for Ebola patients in the US<sup>1</sup>. Dr. Ribner led the team at Emory University that cared for two patients with Ebola virus disease (EVD) in August. In light of the recent Ebola cases in Dallas and Spain he agreed that a summary could be provided to assist ID specialists in their ongoing preparedness efforts.

### **Planning for the care of patients**

This involves the entire institution, and needs many sections to coordinate their work. EMS services were an important coordination point for the transport of the 2 patients to Emory. On the medical staff, many types of expertise were needed for clinical management: ID, critical care, anaesthesiology and several other subspecialties. Nursing, environmental management, facilities, security and media relations were all intensively involved ahead of time so that expected roles were defined. Even so, there were times when questions arose after the patients arrived.

### **Clinical Care**

Ebola patients in Africa have only limited clinical evaluations and essentially no laboratory testing due to the lack of any infrastructure to support this. The Emory team was able to make careful clinical evaluations over time in their 2 patients and Dr. Ribner summarized the main points as follows:

1. Despite weight gains of 15-20 kg, the patients were profoundly hypovolemic due to their low serum albumin and vascular leak with third spacing. Fluid losses in their patients were 5-10 L/day.
2. Electrolyte losses were significant and included profound hyponatremia, hypokalemia and hypocalcemia. At initial assessment at Emory the patients were one week into illness yet these were their first laboratory determinations. Arrhythmias were noted, and both intravenous and oral electrolyte repletion was necessary.
3. Nutritional depletion was evident as well.
4. Ebola virus RNA was detected in blood, urine, vomitus, stool, endotracheal suctioning and semen and on skin. It was not detected in dialysate. Environmental testing in the patient rooms had no detection of viral RNA and included many high touch surfaces such as bed rails and surfaces in the bathroom.
5. Intensive 1:1 nursing care was necessary around the clock. Patients were monitored continuously and this level of nursing care allowed for rapid response to clinical changes. Nursing and other team members provided emotional support, and as the patients improved, help with self-care and physical therapy.

### **Experimental Interventions**

While there are no approved vaccines or treatments for EVD, the WHO has noted that it is ethically acceptable to consider use of experimental agents. Categories of agents under study include candidate vaccines, whole blood and immune serum, and novel therapeutic agents (monoclonal antibodies, antivirals and RNA-based drugs). Most have not been evaluated in phase 1 human studies and are in limited supply. The Emory team engaged the FDA, CDC and pharmaceutical manufacturers in active discussions as they weighed additional interventions.

### **Laboratory Testing and Diagnostics**

Differences in guidance for laboratory testing were noted between CDC and ASM. The CDC guidance indicates that testing can be performed in a main lab with attendant infection control and analyzer safeguards that are specified by the instrument's manufacturer, while the ASM guidance specified that point of care (POC) instruments located very close to the patient should be used. The reality the Emory team noted was that if a specimen from one of their EVD patients

spilled in the main lab, it would be closed for hours to accomplish decontamination, thus impacting function of the entire hospital. There was realistic concern that technologists would not perform testing on EVD blood. These considerations prompted the Emory team to set up a POC testing area adjacent to the patient care unit<sup>2</sup>. Lab testing was kept to a minimum.

### **Surprises in Shipping**

Ebola virus is considered a category A agent which requires special packaging and shipping arrangements for clinical specimens. Despite meeting these requirements, the Emory team learned that commercial carriers refused to transport the specimens even when the carriers were licensed for Category A agents.

### **Staff and Environmental Safety**

The hospital safety officer needed to navigate multiple regulatory requirements at the federal, state and local level. Familiarity with the regulatory documents and jurisdiction was necessary.

### **Personal Protective Equipment**

Their staff was trained in the use of PPE that included impermeable body protection (gown, leg and shoe covers), face mask or N95, eye and face protection (goggles and face shield) and gloves. Practical considerations led them to use full body suits and PAPRs. Their decision was based on the need to work for extended periods of time using PPE, the aim of decreasing physical discomfort working in multi-component PPE and the avoidance of difficulties like fogged faceshields. The donning and doffing of PPE was always observed by another staff member, and the importance of adhering to safe removal of PPE was emphasized.

### **Unexpected Adventures in Waste Management**

Although the CDC guidance indicates that sanitary sewers are acceptable for patient waste, the local water authority disagreed. The Emory team had to disinfect all patient liquid waste with bleach or quaternary detergents for 5 minutes before it could be flushed. The hospital's waste disposal contractor would only pick up materials that were certified as free of Ebola virus. As a consequence, the hospital had to dedicate an autoclave and move it to process all materials used in clinical care in order for it to be accepted for disposal as regulated medical waste. By the end of the patients' stay the autoclaved and boxed materials filled several trailers.

### **Media and Communications**

Three key messages were used to manage the tsunami of media attention: first, that the Emory team had expertise in treating serious infectious diseases; second, that the staff and hospital were trained and prepared to care for the patients; and third, that the preparations included protection of Emory patients, staff and the community. Patient confidentiality was also underscored. For the hospital staff, multiple communications were done, using town hall meetings, email and other modes. For inpatients and all new admissions, letters were given that explained the situation and reiterated the key messages, and senior administrative leaders delivered the messages as well answered questions. No decrease in admissions or elective surgeries at the hospital was noted.

### **Lessons Learned**

Patients with EVD can be safely cared for in developed countries with appropriate safeguards. This opportunity affords close clinical observation and experience in clinical management that could be relayed to facilities with lesser infrastructure. Communication, both internal and external, is critical to manage the situation surrounding a hospitalized EVD patient.

The Society thanks Dr. Ribner and his team for their astute observations, their compassion and their willingness to share what they have learned.

Sincerely,

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## References

1. Ribner BS. Treating patients with Ebola virus infections in the US: lessons learned. Presented at IDWeek, October 8, 2014. Philadelphia PA
2. Hill CE, Burd EM, Kraft CS, et al. Laboratory test support for Ebola patients within a high-containment facility. Lab Medicine 2014;45(3):e109-111.

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