Acute Specialized Care of Patients with Ebola Virus Disease: Gaps and Opportunities

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The World Health Organization received the first notification of an outbreak of Ebola virus disease in Guinea on March 23, 2014.[1] By June 18, the outbreak was considered the largest outbreak of Ebola virus disease.[2] On August 8, the epidemic was categorized as a "public health emergency of international concern."[1] There were 3343 confirmed and 667 probable Ebola cases in Guinea, Liberia, Nigeria, and Sierra Leone identified until September 14. Considerable attention has been focused on prevention of spread of Ebola virus within and outside the countries predominantly involved in the epidemic. There appears to be a lack of understanding of steps required and effort placed on reducing case fatality estimated at 70.8% among patients with known Ebola infection through specialized care.[1]

Our perspective on the current state of specialized care is based on observation made during in person visit to Donka National hospital, Conakry, Guinea (Figure 1), which serves as the country's designated hospital for treatment of Ebola virus infected patients. We conducted detailed interviews with several healthcare personnel to understand the capabilities of Donka National hospital and acute care provided to Ebola virus infected patients. Of note were our communications with the physician leaders in the hospital, including Drs. Elhadj Ibrahima Bah, Moumier Barry, Sidiki Diakité, L. Béavogui Kézély, and Tokpagnan Oscar Loua.

The acute care of Ebola virus disease patients is conducted within an isolation unit that comprises a single-level building structure and an open area delineated by temporary fencing and encampment in front of the building serving as entry and exit points (Figure 1). The isolation unit comprises small (two beds) and large rooms (three beds), and there is no severity-based allocation. Patients are located and shifted based on several criteria but mainly availability. Protective gear up prior to entry and gear down upon exit from the building is undertaken at the encampment. The open area has a section for Ebola virus disease confirmed patients to come out and meet visitors. The visitor seatings are separated by 10 feet of temporary fences. There is an adjacent open location where a fully geared member of the treating team comes out and loudly reads the notes regarding each patient, including vitals, medication administered, and any new development. The notes are being dictated by two health care personnel who are sitting 10 feet away and recording the notes.

All patients within the isolation unit have confirmed Ebola virus infection by means of polymerase chain reaction test. There were 46 Ebola virus infected patients in the acute care unit at the time of our visit, which included two medical students, two physicians, and two nurses. Acute care is provided in three shifts starting from 7 a.m. to 2 p.m., from 2 p.m. to 8 p.m., and from 8 p.m. to 7 a.m. There are five teams within each shift, which rotate across the isolation unit in a sequential manner resulting in one team within the unit at a given time. The team members are doctors, nurses, psychologists, and hygienists. Each team member wears protective gear that includes overall clothing, including head gear, gloves, goggles, boots, and apron. The team members wash hands at several locations prior to entry with chlorine solution (0.05%). The protective gear is decontaminated by spray of chlorine solution (0.50%) upon exiting the isolation unit. Any item that that enters the isolation unit is considered contaminated and cannot be brought back out. The patient excreta and clothes are burned.

The patients' symptoms are broadly grouped into three categories: 1) fever and headaches, 2) vomiting and diarrhea, and 3) hemorrhagic symptoms. There are occasional end-stage encephalopathic symptoms characterized by restlessness and agitation. Blood pressure and pulse rate are measured four times daily using cuff measurements and manual palpation, respectively. There is no antiviral medication, vaccine, and exchange transfusion (from survivors) in use. Each patient is treated with antimalarial agents, which are a combination of

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Figure 1. A view of the Ebola treatment unit at Donka National hospital, Conakry, Guinea.

Artemether and Lumefantrine. The treatment is focused on symptom relief, which includes oral acetominophen for fever, headache, arthralgia, and myalgias. Tramadol is second-line agent for pain control, and intravenous or intramuscular morphine sulfate is infrequently used as third-line agent. Oral hydration formulation is preferred route for maintaining adequate hydration. Intravenous hydration using lactated ringers, dextrose containing fluids, and rarely normal saline is next line for treatment of volume depletion, hypotension, and malnutrition. Nutritional care for Ebola infected patients is based on food provided by families, inspected at the Ebola treatment center and subsequently administered to patients. Patient who are not able to tolerate oral intake rely on caloric intake from intravenous dextrose containing fluids. There are no other parenteral nutrition formulations in use. There is no mechanical ventilator available, and supplemental oxygen via face mask is the only option for respiratory distress. Blood transfusions are very rarely used, and no intravenous vasopressors are available. Laboratory tests, such as complete blood count and basic metabolic panel, are not performed, because samples have to be sent out to routine laboratories in other parts of the hospital where the risk of contamination and infection spread cannot be contained. The average stay within the isolation unit is two weeks. If a patient is afebrile or asymptomatic for three days, a polymerase chain reaction test is performed and if negative, the patient is discharged. The survival of confirmed Ebola infected patients is 60%, with most survivors being discharged home. The discharge symptoms include fatigue, anorexia, and arthralgias. Infrequently, patients are transferred to other units in the hospital after being infection-free because of other acquired infections such as pneumonia. The most common cause of death in Ebola-infected patients is hemodynamic shock.

The societal burden of the Ebola virus disease maybe much smaller if fatality is reduced to 20% by improvement in several areas of acute specialized care. Early resuscitation to achieve optimal hemodynamic goals in patients with acute critical illness before the development of organ failure in severely ill patients can result in a 23% fatality reduction.[3] Several items included in the guidelines for management of severe sepsis and septic shock,[4] such as early goal-directed resuscitation during

the first six hours after recognition using crystalloid or colloid fluid resuscitation, vasopressors, and targeted hemoglobin levels, can be instituted in appropriate patients at Donka National hospital. A monitoring setup based on automated blood pressure, electrocardiographic monitoring, and electronic displays within the isolation unit, and secondary distant stations can allow early detection of hypotension and institution of corrective measures. Availability of point-of-care laboratory testing for hemoglobin, coagulation parameters, and electrolytes within the isolation unit can guide treatment, including blood product transfusions and electrolyte replacements. Availability of blood products with appropriate processing and storage capabilities within the unit and provision for intravenous vasopressors administration and mechanical ventilator support can reduce the associated fatality.

The value of supportive care measures, such as provision of enteral nutrition and prevention of nosocomial infections, stress ulcers, skin breakdown, and deep venous thrombosis, has been previously recognized in reducing fatality in patients with severe sepsis.[5] General steps such as institution of glycemic control, deep vein thrombosis, and stress ulcer prophylaxis maybe possible for a larger group of patients within the isolation unit. Availability of enteral and parenteral formulations will greatly enhance the nutritional supplementation of unmet patient metabolic needs.

Our hope is that by identifying the current gaps in acute specialized care, international medical community can focus on enhancing the capabilities of the isolation units in designated hospitals, such as Donka National hospital through collaborations, financial assistance, and provision of supplies and expertise. The fiscal resources generated through financial pledges by African Development Bank, World Health Organization, United Nations, Gates Foundation, and World Bank have the potential to institute a high-impact therapeutic intervention to reduce the case fatality rates associated with Ebola virus disease. The dedication and courage demonstrated by health care teams working tirelessly in the isolation unit at Donka National hospital serve as the guarantee for the success of such efforts.

References

1. WHO. Ebola Response Team Ebola Virus Disease in West Africa — the First 9 Months of the Epidemic and Forward Projections. *N Engl J Med* 201410.1056/NEJMoa1411100

2. Dixon MG, Schafer IJ. Ebola viral disease outbreak—West Africa 2014. *MMWR Morb Mortal Wkly Rep* 2014;63(25):548–51.

3. Kern JW, Shoemaker WC. Meta-analysis of hemodynamic optimization in high-risk patients. *Crit Care Med* 2002;30(8):1686–92.

4. Dellinger RP, Levy MM, Carlet JM, et al. Surviving Sepsis Campaign: international guidelines for management of severe sepsis and septic shock: 2008. *Crit Care Med* 2008;36(1):296–327.

5. Wheeler AP, Bernard GR. Treating patients with severe sepsis. *N Engl J Med* 1999;340(3):207–14.