Management of Ebola Virus Disease in Children

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KEYWORDS

• Children • Clinical management • Critical care • Diagnosis • Ebola • Pediatrics • Screening • Therapy

KEY POINTS

- The care of children with Ebola should be standardized and include a reproducible, regimented treatment protocol.
- The major domains of care include fluid resuscitation, electrolyte repletion, empiric antimicrobial prophylaxis, and nutritional supplementation.
- Comprehensive care for children with Ebola is extremely challenging in resource-constrained tropical environments, especially when appropriate attention to infection prevention and the safety of health care providers limits patient contact.

INTRODUCTION

Long considered a disease with limited ability to spread across borders in epidemic fashion, Ebola virus grabbed the world's attention in an outbreak that stretched across the West African nations of Guinea, Sierra Leone, and Liberia in 2013 to 2016.[1] More than 11,300 people were confirmed to have died during this outbreak, although this quite likely underestimates the true burden of illness. In addition to reframing the medical community's understanding of this viral hemorrhagic fever,[2] the epidemic contributed to a massive disruption of health care services in already impoverished countries recovering from years of civil wars superimposed on pervasive, abject poverty.[3] It was only in the midst of the recent West African outbreak that the medical community remembered that some 6% to 14% of asymptomatic Liberians harbored Ebola antibodies in serosurveys dating back to 1970s.[4–6]

Given the size of this outbreak, the large number of reservoir mammals,[7,8] and the high rate of asymptomatic infection,[9] it is inevitable that future outbreaks, or at least sporadic cases, will emerge again, as has already been the case in the Democratic Republic of

No conflicts of interest.

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Infect Dis Clin N Am ■ (2017) ■–■

https://doi.org/10.1016/j.idc.2017.10.010 **id.theclinics.com**

Congo.[10] As with most illnesses, it is also unfortunately likely that children will suffer disproportionately, especially in areas where specialized pediatric care is relatively limited. Given the massive size of the recent West African outbreak, with thousands of health care workers involved in caring for Ebola suspects and cases in hundreds of centers, much was learned about how to deliver optimal care in austere settings under extremely harsh conditions.[11–13] In anticipation of future outbreaks, this article reviews the clinical management of children with, or suspected to have, Ebola virus disease.

Children usually constitute a disproportionately small number of cases in Ebola outbreaks.[14–17] Nevertheless, the large absolute number of cases seen and the specialized care required to optimally care for children infected (or suspected to be infected) with Ebola led to disproportionately high mortality rates ranging from 50% to 80%.[16,18–22] Beyond the individual cases of Ebola, an outbreak such as this devastates the entire system of pediatric health care for a generation to come,[23,24] leading to the disruption of immunization services,[25–27] measles epidemics,[28,29] breakdown of obstetric services,[30] and increased rates of acute malnutrition.[31]

ROUTES OF INFECTION

Infants born to mothers with Ebola rarely survive,[32] although novel experimental therapies may fortunately be challenging this dogma.[33] Thus, this article focuses on children infected via direct (horizontal) contact with infected body fluids, predominantly sweat, saliva, urine, stool, and blood. Children may also be infected via breast milk, including from asymptomatic survivors.[34,35]

PRINCIPLES OF CARE

Aggressive and comprehensive critical care, initiated early in the course of illness, has significant potential to decrease mortality for all Ebola patients.[13] This is especially worth emphasizing in children, in whom fluid shifts, electrolyte disturbances, underlying malnutrition,[36,37] and secondary infection can contribute to rapid and fatal decompensation.[38–41] The effectiveness of this aggressive approach was most prominently demonstrated at the Hastings Ebola treatment unit (ETU) in Sierra Leone, where the case-fatality rate approached 30% at a time when mortality rates in excess of 50% were the norm,[42] and in the very low mortality among evacuated infected expatriates. Nevertheless, such critical care is significantly hampered by the inability to fully examine patients and the need to adhere to strict infection prevention requirements for this extraordinarily contagious virus in resource-constrained, environmentally challenging settings.[43]

DIAGNOSIS AND ISOLATION CRITERIA

During an Ebola outbreak, clear criteria for ETU or holding center admission need to be established, based on the predominant manifestation of the particular Ebola strain responsible for that outbreak. For example, the Zaire strain responsible for the recent West African outbreak manifested primarily as a gastrointestinal illness, with profuse vomiting and diarrhea, rather than the prototypical hemorrhagic fever.

These criteria need to be highly sensitive to keep infected individuals isolated from the community, but this will inevitably make any suspect case definition less specific and contribute to a fair number of ETU admissions among those with other illness, such as malaria and viral gastroenteritis, that mimic Ebola. **Box 1** provides an overview of the clinical criteria used for ETU admission during the recent West African outbreak.[44]

The biggest challenge in tropical settings is the high degree of overlap that these criteria have to mimic many other acute childhood illnesses endemic in these settings,