The Struggle to Contain Ebola: A Report from the Front Lines
2014 Ebola Epidemic, West Africa

- September 18, 2014
  - 5833 cases
  - 2833 Deaths
  - 50% in the last 3 weeks

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<th>Country</th>
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Ebola - Background

Courtesy Cynthia Goldsmith, CDC
History of Outbreaks
**Enzootic Cycle**

New evidence strongly implicates bats as the reservoir hosts for ebolaviruses, though the means of local enzootic maintenance and transmission of the virus within bat populations remain unknown.

**Ebolaviruses:**
- Ebola virus (formerly Zaire virus)
- Sudan virus
- Tai Forest virus
- Bundibugyo virus
- Reston virus (non-human)

**Epizootic Cycle**

Epizootics caused by ebolaviruses appear sporadically, producing high mortality among non-human primates and duikers and may precede human outbreaks. Epidemics caused by ebolaviruses produce acute disease among humans, with the exception of Reston virus which does not produce detectable disease in humans. Little is known about how the virus first passes to humans, triggering waves of human-to-human transmission, and an epidemic.

Human-to-human transmission is a predominant feature of epidemics.

Following initial human infection through contact with an infected bat or other wild animal, human-to-human transmission often occurs.
Clinical Presentation

• Acute onset, typically 4-10 days after exposure (2-21)
• Non-specific symptoms
  – Fever (98%), weakness
  – Diarrhea (74%), vomiting, abdominal pain
• Hemorrhagic complications (<50%)
• Blood loss is not typically sufficient to cause death

Personal Observation

Pattyn, S et al. Lancet 1977
Khan, S. et al. JID 1999 S76
Human-to-Human Transmission

• Ebola is spread through direct contact (through broken skin or unprotected mucous membranes) with:
  – A sick person’s blood or body fluids, including but not limited to urine, saliva, diarrhea, vomit, and semen
  – Contaminated objects (like needles and syringes)

• A person is infectious when they are symptomatic

• Transmission can be prevented with contact precaution
Treatment – Primarily Supportive

• There is no specific anti-viral therapy or vaccine approved for use

• Volume Repletion
  – Oral rehydration salts
  – Historically healthcare workers have been reluctant to use intravenous hydration
Outbreak Challenges
Outbreak Challenges – Inadequate Basic Healthcare Infrastructure

Courtesy of Tom Fletcher
Outbreak Challenges: Health Care Workers

Fischer, W. et al Annals 2014
Outbreak Challenges:
Distrust of Government, Local Resistance

Courtesy of Meredith Dixon
UNC Response
MSF Ebola Treatment Unit, Gueckedou
Evidence of Improved Outcomes with Aggressive Care

- Marburg hemorrhagic fever case fatality rate
  - 22% (7/31) in Germany and Yugoslavia 1967
  - 87% for all cases of Marburg in sub-Saharan Africa

- Kikwit 1995 Ebola case fatality rate
  - 250/315 (79%) died
  - Last 25 patients received IVF
    - Case fatality rate 14/25 (56%)

Roddy, P. et al JID 2011 S791
Clinical Management of Ebola is Supportive, But Aggressive

- **Hypovolemia +/- Sepsis Physiology**
  - IV Fluid resuscitation

- **Electrolyte abnormalities (from GI losses):**
  - K+, Mg, glucose, HCO₃⁻

- **Empiric Therapy**
  - **Antibiotics** for possible gut translocation
  - **Antimalarials**

Case Fatality Rate = 50%
Pre-deployment HCW Training

- Epidemiology of the current epidemic
- Principles of infection control
  - Identification and triage
  - Healthcare worker safety
  - Interruption of transmission
- Ebola treatment units
- Principles of Ebola therapy
UNC Hospital Preparedness

• Critical issues
  – Vigilance
  – Infection Control
  – Staffing
  – Staff training/safety
    • PPE
    • Process
  – Communication

Fischer, W. et al Annals 2014
UNC Preparedness – Treatment of Suspect Cases

• Rooms have been identified for suspect patients

• Designated healthcare workers are being trained

• HCW protection exceeds CDC and WHO recommendations
  — Equipment and process

Fischer, W. et al Annals 2014
Exponential Growth

Gomes, M. et al. Plos Currents Outbreaks 2014
There is HOPE