EBOLA AND PREPAREDNESS AT DENVER HEALTH

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Denver Health and Hospital
September 18, 2015
Agenda

• Background on Ebola

• Overview of preparedness at Denver Health

• Lessons learned from 1st patient

• Grant funding and future planning
BACKGROUND ON EBOLA
The Ebola Virus

- Ebola hemorrhagic fever or EVD
  - Viral Hemorrhagic Fever
  - Rare and deadly disease
  - Caused by infection with one of the Ebola virus strains.
- Named after the Ebola River in the Democratic Republic of the Congo (formerly Zaire)
- First outbreak (Zaire 1976)
  - 318 human cases
  - 88% mortality
  - Spread has been due to healthcare sites, burial rituals and close family contact with ill patient's
- Five types
  - Zaire, Sudan, Tai Forrest, Bundibugyo and Reston
Comparison to Past Ebola Outbreaks

Ebola cases and deaths by year, and countries affected

1976 (virus discovered)

2nd-worst year
Sudan, Democratic Republic of Congo

602 cases (dark orange)
431 deaths (light orange)

1995
5th
Democratic Republic of Congo

315 cases
254 deaths

2000
3rd
Uganda

425 cases
224 deaths

2007
4th
Uganda, Democratic Republic of Congo

413 cases
224 deaths

2014
1st
Sierra Leone, Liberia, Guinea, Nigeria

13 cases deaths as of Sept. 26

Africa is the 2\textsuperscript{nd} Largest Continent

It is at least 4 times bigger than the continental US

The current Ebola activity is focused in a very small part of Western Africa

2014/15 Ebola Outbreak
Cumulative Case Counts

Total suspected, probable, and confirmed cases of Ebola virus disease in Guinea, Liberia, and Sierra Leone, March 25, 2014 – September 6, 2015, by date of WHO Situation Report, n= 28,147
Where is the Outbreak Now?
Why Was this Outbreak So Hard to Contain?

- Lack of **knowledge** amongst the population about Ebola
- **High mobility** of people in this area of the world
- Wide **geographic spread** of cases
- **Distrust** of medical personnel
- **Fear**
- Incomplete **contact tracing**
- Burial **rituals**- deceased people are usually washed and then clothed
- **Culinary practices**– bats, bushmeat
- Lack of adequate **public sanitation**
- **Access to healthcare**
- Emergence in several **highly populated areas** in West Africa
Ebola Patient left to die outside Liberian hospital because there is no more room
Ebola Ranks Relatively Low On The Contagiousness Scale

$R_0$ (“R-nought”)

$R_0$ | Maximum number of people (on average) that could be infected by one sick person

|   | 2 | 4 | 10 | 18 |

Hepatitis C  
Ebola  
HIV  
SARS  
Mumps  
Measles

Although HIV and Ebola have similar $R_0$s, but Ebola’s infections per unit of time is much higher than HIV.

When everyone is vaccinated, the $R_0 \downarrow$ to ~zero for measles.

Because people with Ebola aren't contagious until they show symptoms, $R_0$ is certain to be way less than two in this country.
Where Does Ebola Come From?
Transmission

- Highly infectious but not highly transmissible
- Index case likely becomes infected through contact with an infected animal
- Once an infection occurs in humans, the virus spreads through direct contact (through broken skin or mucous membranes) with
  - A sick person's blood or body fluids (urine, saliva, feces, vomit, and semen)
  - Objects (such as gloves, needles) that have been contaminated with infected body fluids (virus can survive in environment many days)
  - Infected animals

http://www.cdc.gov/vhf/ebola/transmission/index.html
Virus Survival

- Ebola virus RNA from Emory patient:
  - Blood, urine, vomitus, stool, endotracheal suctioning, semen, skin
  - It was not detected in dialysate
- Although Ebola virus can survive for several hours on surfaces, environmental testing of high touch surfaces in the patient rooms negative
- May survive up to 6 days in moist environment
- Enveloped virus: standard disinfectants (detergent, 70% ethanol, bleach) are effective

Ribner B., IDWeek 2014
Specific hemorrhagic symptoms were rarely reported (in <1% to 5.7% of patients).

(n=467-1151)

Time between Exposure and Disease Onset, West Africa, 2014

The mean incubation period was 11.4 days. Approximately 95% of the case patients had symptom onset within 21 days after exposure.

**Diagnosis**

- Laboratory findings may include low white blood cell and platelet counts and elevated liver enzymes.
- Virus detectable by real-time RT-PCR from 3-10 days after symptoms appear
  - Collect a minimum volume of 4mL whole blood (preserved with EDTA) in plastic collection tubes
  - All suspect cases should be immediately reported to the CDPHE Disease Control and Environmental Epidemiology Branch for approval for diagnostic testing
- Testing should encompass evaluation for other sources of febrile illness in the returned traveler
Clinical Experience from Emory

- Despite weight gains of 15-20 kg, the patients were profoundly hypovolemic due to low serum albumin and vascular leak with third spacing.
- Fluid losses in their patients were 5-10 L/day.
- Electrolyte losses were significant and included profound hyponatremia, hypokalemia and hypocalcemia.
- Arrhythmias were noted, and both IV and PO electrolyte repletion was necessary.
- Nutritional depletion was evident as well.

Ribner B., IDWeek 2014
Treatment

• Severely ill patients require intensive supportive care.
• Patients are frequently dehydrated and require oral rehydration with solutions containing electrolytes or intravenous fluids.
• New drug therapies are being evaluated. Emergency investigational new drug application and IRB needed
  • Mapp Biopharmaceutical and contact information at
    • http://www.mappbio.com/
  • ZMapp information at
    • http://www.mappbio.com/zmapinfo.pdf
  • Chimerix brincidofovir information at
    • http://ir.chimerix.com/releasedetail.cfm?releaseid=874647
OVERVIEW OF PREPAREDNESS AT DENVER HEALTH
Who is Denver Health

Denver Health
An innovative healthcare system that is a model of success for the nation.

- Clinical Care
  Highest quality, low cost provider

- Education
  Academic center teaches the next generation of healthcare workers.

- Research
  Ongoing, leading-edge research

- Rocky Mountain Regional Trauma Center
  Region’s top Level I Trauma Center for adults and Level II Center for children = whole family care

- Community Health Centers
  Offering total family care in 8 neighborhood centers where families need it the most

- Public Health
  Keeps the public safe through tracking communicable disease and promoting healthy behaviors

- School-Based Health Centers
  Keeping kids in school by providing vital health care to DPS students through 16 in-school clinics, free of charge

- Rocky Mountain Center for Medical Response to Terrorism
  Working every day to plan for the “what if” for 5 states

- Regional Poison Control Center
  Trusted experts for multiple states and over 100 national and international brands

- Denver Health Medical Plan, Inc.
  Keeping our community healthy by providing comprehensive insurance to 77,000+

- Denver Health Foundation
  Provides additional resources that bridge the gap financially to fund special projects and specific needs

- 911 Response
  Operates Denver’s emergency medical response system, the busiest in the state

- NurseLine
  Registered nurses advising on medical information, home treatment, and when to seek additional care, giving patients peace of mind 24/7

- Denver Care
  Provides a safe haven and detox for public intoxicants

- Correctional Care
  Providing medical care to prisoners in Denver’s jails and via telemedicine
Mission: keep the doors open and keep everyone safe!

- When the event is in the community…
  
  **I-25 Denver pileup: Vehicles, disparate lives collided in massive accident**

  By Kevin Simpson
  *The Denver Post*

- When WE are the event…
  
  Former employee's threat against Denver Health paramedics prompts brief 'modified' lockdown
Denver Health Ebola Preparedness

- “Ebola Task Force” created in September (weekly, bi-weekly, now monthly meetings)
  - Lead by Infectious Disease, Infections Prevention, and Emergency Management
  - Includes Nursing, EVS, Lab, PR, COSH, Critical Care, ED, Paramedics, DPH, Clinics
- Written Ebola Response Plan
- Supply purchases
Timeline: Ebola Arrival and Spread in a Dallas Hospital

- Boards flight from Liberia.
- Arrives in Dallas to visit family.
- Begins to develop symptoms.
- Seeks care at Dallas hospital but is sent home.
- Admitted to Dallas hospital and placed in “isolation.”
- Positive Ebola test confirmed.
- Patient dies.
- Nurse1 tests positive for Ebola.
- Nurse2 tests positive for Ebola.

* Nurse 1 and 2 were treating the patient during this time.
Assumptions for Planning

• Cases will be rare
• Cases will not involve multiple persons, likely just individuals
• Cases will likely present through Denver International Airport (DIA), the Emergency Department (ED), the Adult Urgent Care Clinic (AUCC), less likely on a routine clinic visit
• Based on the epidemiology to date in the US, these assumptions to be functional for planning at this time, adjustments will be made if warranted.
• **STAFF SAFETY IS #1 PRIORITY**
Screening

- **Screening of patients at all points of first access**
  - Clinics, AUCC, ED, Paramedics, Call Center

- **Patient waiting areas** shall have signs posted instructing patients to notify provider if they have traveled to West Africa in past 3 weeks

- **Providers** shall have screening tools in provider work areas and exam areas with screening questions
When to Suspect Ebola

Suspect Ebola in patients who have TRAVELED TO GUINEA, SIERRA LEONE, or LIBERIA WITHIN 21 DAYS of symptoms or contact with blood or body fluids of another person known to have or suspected to have Ebola

AND

One or more of the following SYMPTOMS:
Fever (subjective or measured greater than 38.0 °C or 100.4 °F) - Severe headache - Muscle Pain - Weakness - Abdominal (stomach) pain - Vomiting - Lack of Appetite - Diarrhea - Unexplained bleeding or bruising
ED/AUCC Triage

Travel link is KEY!

These patients should be exceedingly infrequent at this time - travel to an area at risk is very rare

Courtesy of Lisa Vogel, RN
Levels of Isolation

• **Level 1 (Possible Ebola):**
  - Airborne and Contact Isolation
  - Gown, gloves, N95

• **Level 2 (Probable Ebola):**
  - Impermeable gown, 2 layers of gloves, N95 or PAPR hood, Face shield, Head & neck cover, Boot covers
  - Strict donning/doffing protocol
  - Always work in pairs
  - Must document competency
  - Essential staff only
Possible Ebola

- Place a facemask on the patient
- Patient placed in private room for immediate medical evaluation by provider
- Level I Personal Protective Equipment (PPE) Implemented:
  - Provider entering room dons, gown, gloves, N95
- Only evaluating provider (no trainees) goes in room
- Minimize patient contact

STILL THINK THIS PATIENT MIGHT HAVE EBOLA?
If NO → D/C LEVEL 1 ISOLATION AND EVALUATE PER NORMAL
IF YES (THIS SHOULD BE RARE!) →
“Ask. Isolate. Call.”
Probable Ebola

- Notify Infection Control (on call 24/7)
- Patient will be transferred to ED R6* for further evaluation and management
  - Need a setting with appropriate environment, resources, and personnel to complete patient management
  - Call to notify ED at 303-436-8100
- ED prepares room- place “Ebola Isolation Cart” outside E19
- Level II PPE implemented
- No staff allowed in room who are not willing, trained, and competent with Level II PPE

* If already in ED, may already be in room
Ebola Isolation Cart

- Impermeable gown
- 2 layers of gloves—regular hospital gloves, 1 nitrile going to elbows
- N95 mask
- Face shield
- Head & neck cover
- PAPR
- Boot covers
- Duct Tape
- Log book to record room entry/exit
- Isolation signs
- Lab kit for blood draw for PCR and malaria
- Donning/Doffing posters
- Checklist
- Floor tape for hot/cold/warm zones
- Facility Ebola Plan
- Call down sequence and phone numbers
Emergency Department Setup

ED BIOCONTAINMENT SETUP

ED Room 6

Elevator to SICU
“Biocontainment Pod”
Inpatient Room Placement

- Room is large
- Critical care capability, including staging of ultrasound machine, ventilator (if required), hemodialysis machine, (if required)
- Easy access from ED
- Proximity to lab, or ability to stage lab equipment contiguous to patient care area
- Easily secured and separated from public areas
- Negative airflow capability
- Ability to utilize adjacent rooms
- No carpeting
- No upholstery
- Easy to clean
- Access to staff shower
- Can accommodate an autoclave for waste management
- Secluded from other patients and staff
Intrafacility Patient Transport from ED

Team 1: ED staff in the patient room
- Prepare the patient
- Staff must wear all required PPE
- Put the patient in a surgical mask and drape with a clean sheet
- Disinfect the bed rails and equipment with 10% bleach wipes

Team 2: Receiving ICU staff and security
- Staff members must wear all required PPE
- Additional team member will accompany to push elevator buttons and open doors.
- Security will be utilized for traffic control during transport
- Non-public elevator to limit exposure to public

Transfer the patient Team 1→Team 2
Patient Care Team

- Volunteers- no one will be forced
- Core team: ED, MICU physicians, ICU nursing
- Only primary provider allowed in room
- RN and MD assume responsibility for ventilator, CRRT, lines
- No one works alone. Buddy verifies PPE donning doffing protocols followed. Use checklist
- Must demonstrate competency in PPE use- show that PPE can be doffed without contamination x 3
- 2:1 nursing or greater if need arises
Employee Health

- If caring for an Ebola patient WITHOUT exposure: 2x/day symptom monitoring, NO furlough
- If contact with Ebola patient WITH exposure: 2x/day symptom monitoring, 21-day paid furlough
- If any symptoms of Ebola develop, with or without exposure:
  - Rule out in hospital
  - Paid furlough until ruled out
- Returned humanitarian worker: 21 day unpaid furlough
Laboratory

- The utilization of available point-of-care testing is required to decrease potential lab exposure
- All technologists processing the sample will wear Level II PPE
- Remove lids of blood tubes to assure safe handling
  - Utilize BioSafety cabinet
  - Remove blood caps with gauze to contain any potential spray and remove behind a shield
Specimen Transport

- Clearly label specimen at the bedside with a sharpie
- All specimens requiring centrifugation will be spun in biocontainment unit prior to transport
- Outside of specimen will be disinfected with 10% bleach wipe and then placed in a clean plastic biohazard bag
- Biohazard bag will be placed in an impervious plastic container
- All specimens will be *walked and hand delivered* to the lab for receiving and processing
Daily Room Cleaning for Provider Team

- EVS **will not** do routine cleanings
- Daily wipe down by Provider team
- Use 10% bleach or Virex
  - Keep all surfaces wet for appropriate contact time!
- Clean all horizontal surfaces
- Clean all high touch areas
- Put any soiled linens in hazardous waste bins
Discharge Cleaning for EVS

- Only enter after approval by Infection Prevention
  - Room will sit unoccupied for 24 hours
  - All PPE will be worn for cleaning
  - Supervised by Infection Prevention
- Only use 10% bleach or Virex
- Keep all surfaces wet for appropriate contact time!
- Remove the privacy curtain and discard
- Perform standard discharge terminal clean
- UV light after cleaning
Waste Removal

- All waste will be handled as Category A waste treated with bleach or other approved disinfectant or autoclaved before leaving unit.
- The exterior surface of the primary container will be disinfected with bleach or other approved disinfectant.
- Category A waste containers will be stored in a secure area within the biocontainment pod.
- All body fluids will be disinfected before flushing/pouring.
Postmortem

• Only personnel trained in handling infected human remains, and wearing PPE, should touch, or move, any Ebola-infected remains.

• Handling of human remains should be kept to a minimum.

• Autopsies on patients who die of Ebola should be avoided.
Recovery from Event

- Demobilization of HICS
- Staff and Supply Recovery
- Financial Recovery
- Business Recovery
Denver Health Ebola Preparedness

- Ebola Grand Rounds
- PPE Training sessions (weekly, monthly and quarterly sessions)
- Exercises and Drills (6 tabletops, 5 drills in 3 months, now quarterly)
- Discussions with Healthcare Coalition
- CDC and CDPHE visits
Training, Training, Training
And More Training……..
Denver Health’s Dr. Cohn on the front line

- Activation of our Ebola Response Plan (at 0130)
  - Denver Paramedics response
  - Setup and Staffing of Biocontainment Unit
  - Activation of HICS (first DH briefing at 0430; briefings 2-3 times a day)
  - Patient arrived at 0630
  - Healthcare Worker Monitoring
- Communications sent internally to staff and externally to our partners/media
- DPH (ESF-8 lead) as a Liaison to outside agencies and for supply requests
- Clinically stable
- Discharged quietly
Ebola Recovery (After Action Items)

- Used the Biocontainment Unit for an “Open House” – invited staff and key partners to come see the Unit
- DH Ebola Task Force Debriefs – 2
- DH PR Debrief – 1
- CDPHE Debrief – 1 (with JeffCo, DPH, and DH)
- After Action Report and Improvement Plans – Identified
- Changes to Ebola Response Plan
Learning from those that endured

American doctor declared free of Ebola finds the virus in his eye months later

By Faith Karimi and Joshua Berlinger, CNN

Video Source: CNN
Ebola Plan Now

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Ebola Subsite of the PULSE
GRANT FUNDING
Ebola Funding Opportunity Announcement (FOA)

- Federal funding distributed through State Health Departments as the primary awardee
- Certain percentage from the state funds must be dedicated to hospitals by subcontract
- Part A – Compensation for preparedness and designated Regional Assessment Centers
- Part B- Regional Treatment Center Funding
  - Colorado, Montana, North Dakota, South Dakota, Utah and Wyoming (Region 8)
- 9 Centers in the US
  - Funding of $3.25 million over 5 years
Expectations for the Grant Funding

- Take up to 2 patients, adult and pediatric
- Must be used for patient care when there are no high risk patients
- Update our CONOPs plan for responding to Ebola or other highly infectious disease to contain
  - Regional agreements
  - Transportation, Ground and Air, including verbiage addressing weather and ground transport over 4 hours
  - Patient movement within facility, including evacuations
- Training and Competencies
- Lab capacity
Grant Exercises

- Unannounced first encounter
- System and state wide
- Regional
- EMS Capability, transport or transfer
- Treatment
- Lab Capability
- Quarterly training for the staff
Goals for DH

• Dedicated support for education and training
• Additional patient care equipment
• Additional lab equipment
• Simulation lab
• Construction to enhance the BCU
• Web-based outreach training
Questions