Isolation Precautions and Workflow
Objectives

• Describe use of transmission-based isolation precautions recommended for EVD
• Determine how workflow can prevent transmission

Handouts/Materials:
- Floor plan from your clinic
- Flipchart or Large Pieces of Paper (1 piece of paper per group)
- Markers
Principles of Transmission-based Isolation Precautions

• Based on the way that the disease is transmitted

• Disease specific but divided into 3 categories
  – Contact
  – Droplet
  – Airborne

• Diseases can have more than one means of transmission
Transmission of Ebola

• What is known about Ebola virus transmission
  – Based on data from investigations of >20 African outbreaks since 1976

• Ebola virus in the blood increases logarithmically during the acute phase of illness

• Ebola virus present in other body fluids

• Opportunities for EVD transmission
  – Patient with vomiting (67.6% of patients)
  – Patient with diarrhea (65.6% of patients)
  – Patient with unexplained bleeding (18% of patients generally late in the course of disease)

  – Patients who died have 2 \log_{10} higher blood levels than levels in patients who survived

Source: http://www.cdc.gov/vhf/ebola/transmission/human-transmission.html
## Ebola virus in body fluids (RT-PCR) in Uganda (2000)

<table>
<thead>
<tr>
<th>Body Fluid</th>
<th>Acute phase of illness*</th>
<th>Convalescent phase of illness*</th>
<th>Last day detected after symptom onset**</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin</td>
<td>1/8 (13%)</td>
<td>0/4 (0%)</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Saliva</td>
<td>8/12 (67%)</td>
<td>0/4 (0%)</td>
<td>8</td>
<td>Ebola virus antigen has been detected in the urine in other studies</td>
</tr>
<tr>
<td>Urine</td>
<td>0/7 (0%)</td>
<td>0/4 (0%)</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Stool / Feces</td>
<td>2/4 (50%)</td>
<td>n/d</td>
<td>29</td>
<td>Ebola infects circulating macrophages which are present in breast milk</td>
</tr>
<tr>
<td>Breast milk</td>
<td>1/1 (100%)</td>
<td>1/1 (100%)</td>
<td>15</td>
<td>Sexual transmission of Marburg virus (but not Ebola virus) has been described</td>
</tr>
<tr>
<td>Semen</td>
<td>n/d</td>
<td>1/2 (50%)</td>
<td>101</td>
<td></td>
</tr>
<tr>
<td>Vaginal fluid</td>
<td>n/d</td>
<td>n/d</td>
<td>33</td>
<td></td>
</tr>
</tbody>
</table>

* number detected/number tested (percent)

** maximum described persistence after symptom onset described in the literature

Transmission of Ebola

Through **direct contact**:

- Blood or body fluids of an infected symptomatic person
- Splashes of body fluids
- Exposure to objects contaminated with infected secretions
  - needles
  - contaminated surfaces or equipment

Source: WHO, 2014
Evidence for Direct Contact

• In studies of previous outbreaks all or the large majority of secondary transmissions involved direct physical contact with known EVD patients

• Example in Ebola outbreak, 1995, Kikwit, DRC
  – 16% of household contacts of 27 primary Ebola cases developed EVD
  – All 28 secondary cases involved direct physical contact with a known EVD patient
  – Family members with direct contact infected: 28 of 95
  – Family members with NO direct contact infected: 0 of 78

Persons Most at Risk

• Those who have direct contact with infected individuals or their blood and body fluids
  – Healthcare personnel without access to PPE
  – Other caregivers in hospitals or homes
  – Persons handling bodies of deceased EVD patients
Isolation and Workflow

ISOLATION
Transmission-based precautions

For Ebola in healthcare setting:

- **Principles of Contact and Droplet Precautions**
  - NOT Airborne except during Aerosol generating procedures

- **Include strict and meticulous adherence:**
  - Single room or cohort
  - PPE to prevent skin/mucous membrane contact with patient or environment
  - Standard precautions
Transmission-based precautions

Standard precautions always apply

Contact precautions: To prevent contact with potentially infectious body fluids
- **Direct**: contact with potentially infectious body fluids
- **Indirect**: transfer of an infectious agent through a contaminated intermediate object or person

Droplet precautions: To protect the mucous membranes of the nose, mouth, or eyes from splashes and respiratory droplets. In general, droplet particles travel only short distances (3-6 feet) from the infectious individual.

For aerosol-generating procedures:
- **Examples**: sputum induction, bronchoscopy, airway suctioning, endotracheal intubation, nebulized medication administration, positive pressure ventilation via face mask
Isolation and Workflow
An Ebola Management Center

https://www.youtube.com/watch?v=4jakGYoR-Jk&feature=share
Isolation in Health Facility

- EVD patients do not need to be managed in an Ebola Management Unit
  - Necessary in outbreak setting to cope with large numbers of patients and get people out of homes
  - Purpose built to manage patient flow
- Existing structure can be used/modified
  - Good if occasional or small number of patients
  - May take some planning/reconstruction to create safe workflow
  - Advantage: has utilities and supply chains in place
  - Disadvantage: disruption of normal function, loss of business
Ideal Placement for Ebola Patients

In health facilities patients should be placed in a single isolation room inside a ward which has:

• Adjoining dedicated toilet/latrine
• A sink equipped with running water, soap, and single-use towels
• Adjoining dedicated showers
• Alcohol-based hand rub dispensers
• Stocks of PPE
• Stocks of medications
• Good ventilation
• Screened windows
• Doors should be kept closed
• Restricted access

Reference: WHO, 2014
No Isolation Rooms Available?

- If there are no isolation rooms available, patients can be confined together (cohort) to a designated area that is kept separate from other patients.

- Ensure the other elements for isolation are available.

Reference: WHO, 2014
Cohorting Ebola Patients

- Keep suspected and confirmed cases separate
- Ensure at least 1 meter (3 feet) distance between patient beds
Staffing

• Clinical and non-clinical staff should be assigned exclusively to Ebola patient care areas and should not move freely between the different clinical areas

• Keep a log of all staff entering high-risk area

• All non-essential staff should be restricted (consider staff doing more than one job)

Reference: WHO, 2014
Visitors

- Visitors should be limited to include only those necessary for the patient’s well-being and care (i.e. a child’s parent)
- Visitors should not enter the isolation area and should be kept approximately 15 meters (50 feet) from the isolation area
- Visitors should be screened for Ebola before entering the clinic each day

Reference: WHO, 2014
Precautions

• PPE should be put on and off in dedicated changing zones
• Workflow is in one direction only
• Clear designation of low-risk and high-risk areas
• Nothing should leave the high-risk area without being appropriately decontaminated

Reference: WHO, 2014
Barriers

• Keep high-risk separate from low-risk
Isolation and Workflow

FACILITY DESIGN
Six Things To Consider

1. New patients/suspect cases
2. Probable/confirmed cases
3. Waste (of all kinds)
4. Staff
5. Materials
6. Dead bodies
Risk Workflow

- Staff
  - Low risk entry (scrubs)
  - Doctor's/Nurses station
  - Rest area
  - Chlorine preparation
  - Laundry
  - Supplies (including PPEs)
  - CR/shower
- Suspect cases
  - CRs/showers
- Probable/confirmed cases
  - CRs/showers
- Waste handling
- Morgue
- High risk entry/Don
  - High risk exit/Doff
  - Chlorine bath
- Patients
  - Screening
  - Admission
  - Triage
  - Triage exit
- Patient exit(s)
- Transportable waste exit
- Dead body exit

Low risk exit
Screening vs. Triage

• **Screening:**
  – Preferably at the entrance to the hospital or health facility
  – Quick and without a thorough physical exam
  – Can be done with *minimal PPE* (gloves and mask)
  – Determines whether or not a person should be treated as a PUI

• **Triage:**
  – Must be done with *full PPE*
  – Determines whether or not a PUI must be admitted as a *suspect* or *confirmed* case
Entering and exiting the treatment area:

**LOW RISK AREA**
- 
- How to undress:
  - How to dress up:
- Waste bin for gloves, etc.
- Washable items:
- Chlorine foot bath:
- Changing cubicle male:
- Street clothes:
- Street shoes:
- Changing cubicle female:
- Dirty scrub suits:
- New scrub suits:
- Bare hand washing:
- Outside Treatment Unit:

**HIGH RISK AREA**
- 
- How to dress down:
- Washable items:
  - Apron, goggles, mask:
- Waste bin:
- Chlorine foot bath:
- Changing cubicle male:
- Street clothes:
- Street shoes:
- Changing cubicle female:
- Bare hand washing:
- New gloves:
- Outside Treatment Unit:

**INNER FENCE**
- Guard entrance:
- Guard exit:
- Staff entrance:
- Staff exit:
- Boots spraying:
- Bare hand washing:
- Gloves hand washing:
Examples of Transferring Material

• Buckets, bed covers, blankets, sheets, etc.
  – All belong in high-risk area unless disinfected

• Food and food containers
  – Disposable containers or use ‘tipping’ - can also be used for certain types of waste

• Personal items
  – Only items that can be reliably disinfected

• PPEs
  – Heavy rubber gloves, boots, goggles, etc. can be disinfected with 0.5% chlorine solution
Modifying a Facility

Initial Setup Yambio, South Sudan, 2004.
In the beginning, patients were already accommodated in the rooms. A basic setup was done to allow safe entry and exit from the rooms.

The initial suspect and probable rooms shown were the only permanent buildings; all other facilities were installed using tents, or plastic sheeting structures.
Final Setup Yambio, South Sudan, 2004.
The facility was subsequently enlarged and improved. Low and High-risk areas were arranged; separated latrines and bathing areas were installed, along with a morgue, and changing areas. No lab was present so four separate suspect patient areas were installed.
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Other Considerations

• How and where will you provide psychosocial support to patients, their families, and your staff?
• Is there a way to provide a viewing area where families can speak to or see their relatives?
• Is there a way to triage or isolate patients without stigmatizing them?
• If necessary, how will waste be transported away?
• If necessary, how will patients be transferred safely?
WHAT WILL YOUR ISOLATION AREA AND PATIENT FLOW LOOK LIKE?
Clean: Staff area, medical records, break room etc.

Supplies (clinical and PPE), put on PPE

Confirmed patient room

Suspected patient room

Staff Entry

Patient Entry

Staff Exit

Confined patient room

Waste Disposal

Laundry

Morgue

Human Remains Exit

Waste Linen Exit

Doff PPE

after PPE removed

Water
Activity

- Where is high-risk and low-risk zone?
- Where will staff enter?
- Where will patients enter?
- Where will staff don and doff PPE?
- Where will staff leave?
- Where will patients leave?
- Where will waste leave?
- Where will human remains leave?
- Where will high-risk items have to travel before disposal?
Resources

- WHO 2014 Interim Infection Prevention and Control Guidance for Care of Patients with Suspected or Confirmed Filovirus Haemorrhagic Fever in Health-Care Settings, with Focus on Ebola
  http://apps.who.int/iris/bitstream/10665/130596/1/WHO_HIS_SDS_2014.4_eng.pdf?ua=1&ua=1

  http://www.cdc.gov/vhf/ebola/transmission/human-transmission.html