

ACR SUGGESTIONS FOR PREPAREDNESS AND IMPLEMENTATION OF IMAGING IN BIOCONTAINMENT SITUATIONS

An ACR Ebola Imaging Resource Center *(updated April 15, 2015)*

I. Introduction

In response to recent diagnoses of Ebola Virus Disease (EVD) in patients and health care workers in the US, a great deal has been written and published about diagnosis, incubation periods, methods of transmission, treatment and prognosis.

Inevitably, additional cases of EVD or other serious communicable diseases will be suspected or diagnosed on US soil. The American College of Radiology believes that it is the responsibility of radiologists and imaging technologists to help those in need, regardless of the severity of the patient's illness and potential risk to the provider. However, there are undoubtedly methods that can help assure safe and effective patient care while offering maximum protection to radiologists, technologists and other radiology personnel. The suggestions in this document are offered as a first step to that end. While this document focuses on medical imaging issues, it also provides links to other sites with information regarding the broader aspects of infection control of EVD and other serious communicable diseases. Recognizing that local conditions and circumstances vary, adjustments may be necessary to best utilize local environments and resources.

II. Preparedness

A. Radiology Department or Facility Point Person

Long before any patient arrives at your facility with a history of exposure or symptoms of EVD or similar conditions choose a responsible person to oversee coordination of the radiology response. This person may be a medical director, department chair or other appropriately trained individual who can monitor, discuss and advise regarding appropriateness of imaging that may be requested.

B. Personnel – Physician, Technical Staff, and Other Radiology Personnel

Training may be focused on the subset of individuals most likely to experience direct contact with patients suspected to be infected or those already diagnosed. Some facilities may ask for staff volunteers to participate in the care of patients with EVD.

C. Personal Protective Equipment (PPE)

Purchase and stock PPE in a safe place in your hospital or facility. One size does not fit all and a good fit is essential. All personnel who may be directly involved in patient contact should be trained and have demonstrated competency in the safe donning and doffing of PPE in accordance with the guidelines of the Center for Disease Control and Prevention (CDC).

D. Imaging Equipment

Use wireless transmitting equipment whenever possible. Portable radiographs will be the most used technique. Ultrasound may also be useful within the patient isolation unit. The use of advanced imaging procedures that require transport of the patient with active EVD out of the isolation unit should be avoided unless absolutely necessary.

III. Performing Imaging Procedures, and Use and Decontamination of Equipment

<p>ALL HOSPITAL and/or CDC GUIDELINES FOR ISOLATION AND PERSONAL PROTECTIVE EQUIPMENT (PPE) SHOULD BE FOLLOWED.</p>
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A. Decision to Image

- Only necessary imaging procedures should be performed (determined by discussion between the ordering physician and the radiology “Point person”).
- If a patient is in a “rule out “ isolation situation, the care team should determine if the imaging can be delayed until testing for the infectious disease is finalized.
- Routine or “daily” imaging orders should be avoided- studies must be ordered individually with clear communication of exam necessity and patient risk level.

B. General Imaging Procedures

- The number of technologists/radiology personnel involved should be limited.
 - Goal is 1-2 technologists per shift on a (preferably) voluntary basis.
 - Personnel **must** be trained and demonstrate competency in personal protective equipment (PPE) use, donning and doffing.
- No technologist/personnel should enter an isolation anteroom/room without proper guidance in donning and doffing PPE.
- No technologist/personnel should enter an isolation anteroom/room without someone to watch them don and doff their PPE.
- Technologists should avoid direct contact with patient; if possible the technologist should not enter the actual isolation room with patient (depending upon room layout and positioning of equipment).
- When possible, equipment should be covered and double-bagged to protect sensitive surfaces and electronics.
- Sterilization of imaging equipment may include wiping and/or misting with a disinfectant appropriate for the known or suspected infectious agent; note that some disinfectant solutions may damage electronic equipment. Manufacturer guidelines should be consulted.

C. Portable Radiography

- Use wireless transmitting capable units to avoid having to transport cassettes FROM patient isolation rooms and insert into processors.
- A designated unit should be kept in isolation area.
- Any portion of the portable unit which can be, will be covered prior to entering isolation room
 - cover x-ray unit's arm with plastic; if possible, cover the controls as those areas can be difficult to disinfect.
- **PRIOR to entering isolation room with X-ray unit:**
 - Cassette will be wiped down with appropriate agent.
 - Cassette will be double bagged, with openings facing opposite directions and inner bag taped or otherwise sealed.
- Ideally, technologists should direct the isolation room personnel in cassette or wireless portable detector and patient positioning (in some institutions the technologists will perform the examination, while in others, cassette/patient positioning will be performed by the infectious disease team under guidance of the radiologic technologist).
- **After making exposure and retrieving cassette from the patient:**
 - Outer bag wiped down and opened by isolation room personnel.
 - Cassette in the inner bag is removed from the opened outer bag by anteroom personnel.
 - Inner bag wiped down prior to opening by anteroom personnel.
 - Inner bag opened and held so that RT may remove cassette after they have disinfected their gloves.
 - Cassette itself wiped down and handed off to the technologist or other individual with clean/disinfected gloves.
- **Retrieving the portable unit from patient isolation room:**
 - If at any time, there is **visible soiling** on any piece of equipment, the visible soiling will be disinfected then wiped off while in the isolation room **prior** to final disinfectant wipe down of the equipment, with appropriate disposal of all soiled cleaning materials per hospital or facility protocol for disposal (for example, if body fluids are detected on the X-ray unit, wet the area with appropriate disinfectant, allow appropriate contact time and wipe off); then proceed to next step
 - At the door to the room, **wheels** must be disinfected; this may take the form of:
 - Misting or wiping down with appropriate agent, allowing contact time for effectiveness based upon the disinfectant.
 - Mopping the floor before and after the portable unit (mopping the path of the wheels).
 - Using disinfectant mats (just outside the isolation room) soaked in appropriate agent, and rolling the unit over the mats.
 - After wheels disinfected, portable unit may be pulled into anteroom of isolation room.
 - Remove any disposable, protective covers from the X-ray unit (in the doffing room); all exposed portions of the X-ray unit will be wiped down with appropriate disinfectant.
- At this point, the cassette should have been wiped down allowing appropriate disinfectant contact time, and may be inserted into the portable unit for transmittal of the image, or otherwise processed, if so required by that particular portable unit (i.e. if not an entirely wireless transmitting unit and cassette).

- Portable X-ray unit is stored in designated area of isolation unit.
- When no longer needed in an isolation situation, a final disinfection should be performed which may involve any or all of currently suggested procedures such as: wiping with an approved disinfectant, hydrogen peroxide vapor treatment, ultraviolet light treatment.

D. Ultrasound

- As per general guidelines, ultrasound should be used only as needed.
- Cover any portions of the ultrasound unit able to be covered; in particular the control panel, including keyboard if present.
- Sonographers MUST be appropriately trained in and observed during donning and doffing of PPE (as above).
- Process for retrieving the ultrasound unit from the room as per portable x-ray.
- The ultrasound unit should be kept in isolation in the event it is needed again: once determined it shall no longer be needed, a final decontamination should be performed as for the portable x-ray unit.

E. CT/MRI

- Generally avoid use of CT or MRI if possible.
- Must coordinate need for imaging, route for transportation of patient and ability to close off the room following the imaging for full decontamination.

F. Interventional Radiology (IR)

- Generally there should be limited if any need for IR for these patients.
- IR services are frequently involved in vascular access for many facilities, and may be called upon in biocontainment situations, when there is not a health care provider skilled in ultrasound guided vascular access already involved in the care of the patient.
- Procedures should be performed in the isolation room at patient's bedside whenever feasible.
- Limit the use of IR technologists when possible.
- IR physicians must be trained in and demonstrate competency in the use of PPE, and have available trained assistance for observing PPE donning and doffing.
- Use of portable imaging equipment as listed in relevant sections above.

IV. Screening, Isolation, Quarantine and Furloughs

A. CDC Guidelines

The CDC defines 4 risk states as 1) high risk, including direct exposure to an infected patient or dead body, 2) some risk (e.g. close contact with an infected patient such as health care workers tending to patients with EVD), 3) low (but not zero) risk, including travel or brief personal patient contact, and 4) No identifiable risk.

B. Screening

Where a radiology facility serves as health system patient intake, e.g. hospital based or freestanding outpatient centers, patients should be screened for recent (last 21 days) travel to endemic regions and known contact with a person with EVD. A written questionnaire or oral questioning of patients for recent travel history or symptoms may be appropriate.

C. Isolation

Patients screened and found to be at elevated risk for EVD should be separated from the waiting area, to avoid infection of others while waiting further guidance from the infectious disease service. Risk levels and guidelines for observation and/or quarantine are provided by the CDC. In all at risk individuals imaging should be avoided until disposition of the patient is clear.

D. Quarantine

Separation of a person (or persons) “reasonably believed to have been exposed, but not yet ill”. Used to separate and restrict the movement of persons. In regards to EVD the incubation period is considered up to 21 days. Quarantine may include up to 21 days of isolation, no movement beyond a single room, no travel, and monitoring of vitals including temperature twice daily.

E. Furloughs

Furloughs are a lesser degree of separation. Generally used to refer to individuals with some level of exposure to a quarantinable illness who are advised or told not to present to work or school until they are deemed no longer at risk for having that illness (i.e. after the incubation period for the illness). This may include paid leave from work, no public means of transportation and checking temperature twice daily.

F. Consequences

Example - an RT or sonographer may have been exposed to a contagious patient. He or she may be quarantined or furloughed. Sending a health care worker home may bring up new challenges. This worker may put family and friends at risk. Lodging away from home may be necessary. The hospital or facility should be prepared to house and feed such individuals for the entire quarantine or furlough period.

G. Active and Direct Active Monitoring

Active monitoring involves the assigned (state or local) public health authority communicating with an individual daily to inquire as to development of symptoms or fever; direct active monitoring involves the health authority directly observing the individual for this daily assessment.

V. Summary Points

- **Plan ahead and practice.**
- **Designate a “point person” – a radiology representative should play an active role in planning for the facility and guiding the performance of imaging in a biocontainment situation.**
- **Limit the amount of imaging to only what is truly necessary.**
Discussions should occur between ordering physician and radiologist prior to imaging.
- **Expose as few people as possible.**
Use only a few designated radiologists, technologists or other radiology personnel with training in isolation gear.

- **Radiologic technologists should not need to make contact with the patient.**
Whenever possible have imaging equipment operated by physicians in the isolation room with guidance from the radiology personnel.
- **Isolate equipment.**

VI. General Medical Resources for Ebola Virus Disease

- Center for Disease Control and Prevention Ebola (Ebola Virus Disease) - Information for Healthcare Workers and Settings. Available from: <http://www.cdc.gov/vhf/ebola/hcp/index.html>
- American Medical Association Ebola Resource Center. Available from: <http://www.ama-assn.org/ama/pub/physician-resources/public-health/ebola-resource-center.page>
- Emory Healthcare Ebola Preparedness Protocols. Available from: <https://www.emoryhealthcare.org/ebola-protocol/ehc-message.html>
- Nebraska Medicine Biocontainment Unit - Ebola Outbreak. Available from: <http://www.nebraskamed.com/biocontainment-unit/ebola>
- National Institutes of Health - Ebola Virus Disease: Information for U.S. Healthcare Workers. Available from: <http://www.nih.gov/health/ebola.htm>
- The Joint Commission Standards – Safely and Effectively Managing the Infectious Ebola Patient. Available from: <http://www.jointcommission.org/joint-commission-standards-safely-and-effectively-managing-the-infectious-ebola-patient/>

VII. Additional Radiology Resources for Ebola Virus Disease

- Auffermann WF, Kraft S, Vanairsdale S, Lyon GM, Tridandapani S. Clinical perspective. Radiographic imaging for patients with contagious infectious diseases: how to acquire chest radiographs of patients infected with the Ebola virus. AJR 2015; 204:44-48. <http://www.ajronline.org/doi/abs/10.2214/AJR.14.14041>. Accessed April 10, 2015.
- Bluemke DA, Meltzer CC. Ebola virus disease: radiology preparedness. Radiology 2015; 274(2): 527-531. <http://pubs.rsna.org/doi/full/10.1148/radiol.14142502>. Accessed April 10, 2015.
- Mollura DJ, Palmore TN, Folio LR, Bluemke DA. Radiology preparedness in Ebola virus disease: guidelines and challenges for disinfection of medical imaging equipment for the protection of staff and patients. Radiology 2015; Ahead of print. <http://pubs.rsna.org/doi/full/10.1148/radiol.15142670>. Accessed April 10, 2015.
- Moreno CC, Kraft CS, Vanairsdale S, Kandiah P, et al. Performance of bedside diagnostic ultrasound in an Ebola isolation unit: the Emory University Hospital experience. AJR 2015; Ahead of print. <http://www.ajronline.org/doi/abs/10.2214/AJR.15.14344>. Accessed April 10, 2015.