PPE 201: Critically Thinking about PPE
Learning Objectives

• Learners will identify and select the PPE components needed in the care and management of wet patients with potentially hazardous and communicable diseases such as Ebola and other special pathogens.

• Learners will develop SOP for wet PPE donning and doffing, using appropriate equipment.

• Learners will assess strengths and weaknesses of PPE SOP.
1. Introductions
2. Review of PPE guidance and products
3. Donning and doffing
4. Debrief and case studies
5. Review and conclude
Considerations when selecting PPE

- Disease transmission characteristics
- Expert guidance
- Staff safety and comfort
- Supply chain and item availability
- Standardization of PPE for all staff
- Layout of patient care area
Clinical Severity

Dry versus Wet
## ANSI/AAMI Standards

<table>
<thead>
<tr>
<th>Level</th>
<th>Test Methods Used</th>
<th>Expected Barrier Effectiveness</th>
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<tr>
<td>1</td>
<td>Impact Penetration</td>
<td>Minimal water resistance</td>
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<td>Impact Penetration &amp; Hydrostatic Pressure</td>
<td>Low water resistance</td>
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<td>Impact Penetration &amp; Hydrostatic Pressure</td>
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<td>ASTM F1670 Synthetic Blood &amp; ASTM F1671 Viral Penetration Test</td>
<td>Blood and viral penetration resistance</td>
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</table>
Review of PPE Guidance and Products

Personal Protective Equipment

Head Covers
Masks
Respirators
Eye Protection
Gloves
Gowns
Coveralls
Disposable Boots
PPE Multiple Combinations
Facilities may and do differ in the types and brands of PPE used
Clinical presentation:
• En route she developed high fevers, profuse watery diarrhea, and respiratory distress requiring intubation
• Upon arrival she had a temperature of 100.9°F with a BP of 112/54 mmHg and a HR of 82 bpm
• She is on mechanical ventilation (A/C mode)

Clinical management:
• She is on a propofol drip at 30 mcg/hr
• A Foley catheter is in place, and she has had approximately 50ml/hr of urine output overnight
• She has a RIJ running LR at 150ml/hr
• She continues to have large volume stool of 6 liters over the last 24 hours and 2 liters of NGT secretions collected in the suction canister
• She is also receiving levofloxacin and doxycycline for empiric antibiotic coverage

Setting the scene:
• Ms. A is a 38-year-old nun who was working in a Catholic church in Baunchi, Nigeria, where she was exposed to patients with Lassa fever. She became ill and has been diagnosed with Lassa Fever and has been medically evacuated to your facility for treatment.
PPE 201

Wet Donning and Doffing
There are a variety of options available for personal protective equipment (PPE). The NETEC has developed the following PPE donning and doffing protocol based on CDC guidance for U.S. healthcare settings when managing patient with confirmed Ebola or evaluating persons under investigation (PUIs) for Ebola who are clinically unstable or have bleeding, vomiting, or diarrhea.

For additional information on CDC recommendation, please visit:

Donning location

• Should take place in a designated safe donning area

Before Donning, Healthcare workers donning PPE should:

• Wear surgical scrubs or comfortable clothing under the PPE
• Remove all personal items (e.g., jewelry, watches, cell phones, pagers, pens)
• Secure hair away from face
• Secure eye glasses, if worn
Engage Trained Observer

Gather and **Inspect** PPE Prior to Donning
- Single-use (disposable) impermeable coverall
- Powered-air purifying respirator (PAPR)
- A pair of single-use (disposable) gloves
- A pair of single-use (disposable) extended cuff gloves
- A pair of single-use (disposable) shoe covers
- Single-use (disposable) apron
Don inner gloves

- Perform hand hygiene prior to donning gloves

Don coverall

- Ensure the coverall is large enough to allow unrestricted movement
- Ensure cuffs of inner gloves are tucked under the sleeve of the coverall
- If a PAPR with a self-contained filter and blower unit that is integrated inside the helmet is used, the belt and battery unit must be put on before donning the impermeable gown or coverall so that the belt and battery unit are contained under the gown or coverall
- If a PAPR with external belt-mounted blower is used, then the blower and tubing must be on the outside of gown or coverall to ensure proper airflow
Don outer gloves
- Put on the second pair of gloves (with extended cuffs)
- Ensure the cuffs are pulled over the sleeves of the gown or coverall

Don shoe covers
Don PAPR

- If a single shroud PAPR hood is used, regardless of the type of PAPR, then a single-use hood that extends to the shoulders and fully covers the neck must also be used. Be sure that the hood covers all of the hair and the ears, and that it extends past the neck to the shoulders.
- If the PAPR hood has a double shroud, the inner shroud should be tucked into the gown or coverall.

Don apron
Verify

- After completing the donning process, the integrity of the ensemble should be verified (e.g., there should be no cuts or tears in the PPE)
- You should be able to perform range of movement without disturbing PPE
Perform hand hygiene

Enter the hot zone
Doffing location

- PPE should be doffed in the designated safe PPE doffing area. As with all PPE doffing (even during training), care should be taken to avoid self-contamination

Engage trained observer
Inspect PPE:
- Inspection is performed while still inside the hot zone.
- Inspect the PPE for visible contamination, cuts, or tears before beginning the doffing process.
- If any PPE is visibly contaminated, disinfect by using an *EPA-registered disinfectant wipe.

Exit the hot zone  Enter the warm zone
Disinfect Outer Gloves:

- Disinfect outer gloves with either an *EPA-registered disinfectant wipe or ABHR

Doff apron and disinfect outer gloves

- Dispose of apron into the designated waste container
- Disinfect outer gloves with either an *EPA-registered disinfectant wipe or ABHR
Wet PPE Doffing - PAPR

Doff shoe covers
- Dispose of shoe covers into the designated waste container

Disinfect and doff outer gloves:
- Disinfect outer gloves with either an *EPA-registered disinfectant wipe or ABHR
- Remove and discard outer gloves, taking care not to contaminate inner gloves
- Dispose of outer gloves into the designated waste container
Inspect and disinfect inner gloves:

- Inspect the inner gloves’ outer surfaces for visible contamination, cuts, or tears.
- If an inner glove is visibly soiled, disinfect the glove with either an *EPA-registered disinfectant wipe or ABHR, remove the inner gloves, perform hand hygiene with ABHR on bare hands, and don a new pair of gloves.
- If there is no visible contamination and no cuts or tears on the inner gloves, then disinfect the inner-gloves with either an *EPA-registered disinfectant wipe or ABHR.
Doff coverall:

- Avoid contact of scrubs with outer surface of gown or coverall during removal.
- If a PAPR with external belt-mounted blower unit is used, remove the belt-mounted blower unit and place all reusable PAPR components in an area or container designated for the collection of PAPR components for disinfection.
- Pull gown or coverall away from body, touching only the inside of it to roll it inside out.
- Dispose of gown or coverall into the designated waste container.
Disinfect inner gloves:
- Disinfect inner gloves with either an EPA-registered disinfectant wipe or ABHR

Doff respirator
- If a PAPR with a self-contained blower in the helmet is used:
  - Remove and discard disposable hood
  - Disinfect inner gloves with either an EPA-registered disinfectant wipe or ABHR
  - Remove helmet, belt, and battery unit. The healthcare worker may need help removing the PAPR
  - Place all reusable PAPR components in an area or container designated to collect PAPR components for disinfection
- If a PAPR with external-mounted blower is used, switch off the PAPR motor, and disconnect the tubing from the motor prior to removing the hood. The healthcare worker may need help removing the hood with the tubing connected
Disinfect and doff inner gloves:

- Disinfect inner gloves hands with either an *EPA-registered disinfectant wipe or ABHR
- Remove and discard gloves, taking care not to contaminate bare hands during removal process
- Dispose of gloves into the designated waste container

Perform hand hygiene
Inspect:

- The healthcare worker should inspect their clothing and skin for signs of contamination

Exit the warm zone  Enter the cold zone
Wet PPE Donning Checklist - PAPR

1. Engage trained observer
2. Gather and inspect PPE prior to donning
3. Don inner gloves
4. Don coverall
5. Don outer gloves
6. Don shoe covers
7. Don PAPR
8. Don apron
9. Verify
10. Perform hand hygiene
Wet PPE Doffing Checklist - PAPR

1. Engage trained observer
2. Inspect PPE
3. Disinfect Outer Gloves
4. Doff apron
5. Doff shoe covers
6. Disinfect and doff outer gloves
7. Inspect and disinfect inner gloves
8. Doff coverall
9. Disinfect inner gloves
10. Doff respirator
11. Disinfect and doff inner gloves
12. Perform hand hygiene
13. Inspect
Donning location

• Should take place in a designated safe donning area

Before Donning, Healthcare workers donning PPE should:

• Wear surgical scrubs or comfortable clothing under the PPE
• Remove all personal items (e.g., jewelry, watches, cell phones, pagers, pens)
• Secure hair away from face
• Secure eye glasses, if worn

Wet PPE Donning - N95
Engage Trained Observer

Gather and **Inspect** PPE Prior to Donning

- Single-use (disposable) impermeable gown or coverall
- NIOSH Certified N95 respirator
- Single-use (disposable) surgical hood extending to shoulders
- Single-use (disposable) face shield
- A pair of single-use (disposable) gloves
- A pair of single-use (disposable) extended cuff gloves
- A pair of single-use (disposable) boot covers
- Single-use (disposable) apron
Wet PPE Donning – N95

3. Don boot covers

4. Don inner gloves
   • Perform hand hygiene prior to donning gloves
Wet PPE Donning – N95

Don gown or coverall
- Ensure it is large enough to allow unrestricted movement
- Ensure the gloves are tucked under the sleeve of the gown or coverall

Don N95 Respirator
- Wear size indicated at fit test
- Perform a seal check
Don surgical hood
- The hood is worn over the N95 straps
- The hood should cover all hair and extend past the neck and shoulders
- Ensure the hood completely covers the ears and neck

Don apron
- This will provide an extra layer over the front of your PPE
Don outer gloves
- Ensure the cuffs are pulled over the sleeves of the gown or coverall
- If the coverall has a knitted cuff, ensure it is completely covered

Don face shield
- This goes over your N95 respirator and surgical hood
Verify

- After completing the donning process, the integrity of the ensemble should be verified (e.g., there should be no cuts or tears in the PPE)
- You should be able to perform range of movement without disturbing PPE
Perform hand hygiene

Enter the hot zone
Doffing location

- PPE should be doffed in the designated safe PPE doffing area. As with all PPE doffing (even during training), care should be taken to avoid self-contamination

Engage trained observer
Inspect PPE

• Inspection is performed while still inside the hot zone
• Inspect the PPE for visible contamination, cuts, or tears before beginning the doffing process
• If any PPE is visibly contaminated, disinfect by using an *EPA-registered disinfectant wipe

Exit the hot zone  Enter the warm zone
Disinfect Outer Gloves:

- Disinfect outer gloves with either an *EPA-registered disinfectant wipe or ABHR

Doff apron and disinfect outer gloves

- Dispose of apron into the designated waste container
- Disinfect outer gloves with either an *EPA-registered disinfectant wipe or ABHR
Wet PPE Doffing – N95

Re-inspect PPE:
- Inspect the PPE for visible contamination, cuts, or tears before beginning the doffing process.
- If any PPE is visibly contaminated, disinfect by using an *EPA-registered disinfectant wipe.

Disinfect and doff outer gloves:
- Disinfect outer gloves with either an *EPA-registered disinfectant wipe or ABHR.
- Remove and discard outer gloves, taking care not to contaminate inner gloves.
- Dispose of outer gloves into the designated waste container.
Inspect and disinfect inner gloves:

- Inspect the inner gloves’ outer surfaces for visible contamination, cuts, or tears.
- If an inner glove is visibly soiled, disinfect the glove with either an *EPA-registered disinfectant wipe or ABHR, remove the inner gloves, perform hand hygiene with ABHR on bare hands, and don a new pair of gloves.
- If there is no visible contamination and no cuts or tears on the inner gloves, then disinfect the inner-gloves with either an *EPA-registered disinfectant wipe or ABHR.
Doff face shield:

- Tilt head slightly forward and grasp the rear strap and pull the face shield gently over your head allowing it to fall forward, then discard.
- Care must be taken not to touch your face when removing the face shield.
- Avoid touching the front surface of the face shield.
Disinfect inner gloves:
  • Disinfect inner gloves with either an *EPA-registered disinfectant wipe or ABHR

Doff surgical hood:
  • Unfasten (if applicable) and gently remove, and discard.
Disinfect inner gloves:

• Disinfect inner gloves hands with either an *EPA-registered disinfectant wipe or ABHR
Remove gown or coverall:

- Depending on gown design and location of fasteners, the healthcare worker can untie fasteners, have the doffing assistant or “buddy” unfasten the gown, or gently break fasteners.
- Avoid contact with scrubs or disposable garments with outer surface of gown during removal. Pull gown away from body, rolling inside out and touching only the inside of the gown.

- To remove coverall, tilt head back to reach zipper or fasteners. Unzip or unfasten coverall completely before rolling down and turning inside out. Avoid contact of scrubs with outer surface of coverall during removal, touching only the inside of the coverall.
Disinfect inner gloves:
- Disinfect inner gloves hands with either an *EPA-registered disinfectant wipe or ABHR

Doff Boot Covers
Disinfect and change inner gloves

Remove N95 respirator:
- Remove the N95 respirator by tilting the head slightly forward, grasping first the bottom tie or elastic strap, then the top tie or elastic strap, and remove without touching the front of the N95 respirator.
- Discard N95 respirator
Disinfect inner gloves:
  • Disinfect with either an *EPA-registered disinfectant wipe or ABHR.

Disinfect washable shoes
  • Use an *EPA-registered disinfectant wipe to wipe down every external surface of the washable shoes.
Disinfect and remove inner gloves:
  - Take care not to contaminate bare hands during the process

Perform hand hygiene:
  - Perform hand hygiene with ABHR
Inspect:

- The healthcare worker should inspect their clothing and skin for signs of contamination
- If contamination is identified, the garments should be carefully removed and the wearer should shower immediately

Exit the warm zone

Enter the cold zone
1. Engage trained observer
2. Gather and inspect PPE prior to donning
3. Don boot covers
4. Don inner gloves
5. Don gown or coverall
6. Don 95 respirator
7. Don surgical hood
8. Don apron
9. Don outer gloves
10. Don face shield
11. Verify
12. Perform hand hygiene
## Doffing Wet PPE Checklist – N95

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<thead>
<tr>
<th>Step</th>
<th>Description</th>
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<tbody>
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<td>1.</td>
<td>Engage trained observer</td>
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<td>2.</td>
<td>Inspect PPE</td>
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<tr>
<td>3.</td>
<td>Disinfect Outer Gloves</td>
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<td>4.</td>
<td>Doff apron</td>
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<tr>
<td>5.</td>
<td>Re-inspect PPE</td>
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<td>6.</td>
<td>Disinfect and doff outer gloves</td>
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<td>7.</td>
<td>Inspect and disinfect inner gloves</td>
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<td>8.</td>
<td>Doff face shield</td>
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<td>14.</td>
<td>Doff boot covers</td>
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<td>15.</td>
<td>Disinfect and change inner gloves</td>
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<td>16.</td>
<td>Doff N95 respirator</td>
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<td>17.</td>
<td>Disinfect inner gloves</td>
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<tr>
<td>18.</td>
<td>Disinfect washable shoes</td>
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<tr>
<td>19.</td>
<td>Disinfect and remove inner gloves</td>
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<tr>
<td>20.</td>
<td>Perform hand hygiene</td>
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<tr>
<td>21.</td>
<td>Inspect</td>
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Let’s talk....
Virtual Toolbox

CDC
- PPE Guidance
  - *Wet* patients
  - *Dry* patients

WHO
- Donning & doffing posters
- PPE for use in filovirus disease outbreak – Rapid advice guideline
Setting the scene:
• Mr. B is a previously healthy 45-year-old man who returned from a humanitarian mission in the Democratic Republic of Congo 7 days ago.

Clinical presentation:
• He presents to the Emergency Department where he is diaphoretic and is noted to have a maculopapular rash that involves his neck, trunk, and upper arms.
• He is febrile to 102.8°F with a BP of 105/75 mmHg, HR 101 bpm, RR 18/min, and O2 saturation of 94% RA.
• The only medication he is taking is atovaquone/proguanil for malaria prophylaxis.
Setting the scene:
• Ms. C is a 28-year-old woman who works in an advertising firm in New York. She recently participated in an Umrah pilgrimage to Mecca and has returned 5 days ago.

Clinical presentation:
• She was feeling well during her travels, but last night developed a fever with muscle aches and a cough.
• She took ibuprofen for the fever, but the cough got worse overnight.
• She presents to Urgent Care, where she is noted to be calm but breathing at 22 respirations/minute.
• She has a temperature to 100.1F, BP 105/70 mmHg, HR 84 bpm, and O2 saturation of 96% on room air.
• A chest x-ray is performed which demonstrated patchy opacities in both lung bases.
### Setting the scene:

- Mr. D is a 52-year-old banker who was on a business trip in Hong Kong 3 days ago. While there, he participated in a tour of rural districts in Guangdong Province. He has a history of congestive heart failure that is controlled with captopril and carvedilol. His only other medication is aspirin.

### Clinical presentation:

- He develops a productive cough and fever, and presents to the Emergency Department, where he is febrile to 102.3°F.
- He is using accessory muscles to breath, and quickly deteriorates so that intubation is required in the ED to maintain respiratory protection.
- He has copious thick gray secretions from his oropharynx, and requires 70% FiO2 on the mechanical ventilator.