Magnitude of the Ebola outbreak 2014-15
Combination of determining factors

• **Geographical:** ease of cross border movements, outbreak in urban areas leading to high transmission

• **Cultural:** religious practices and customs facilitating transmission, care-seeking behavior

• **Structural:** poor roads, infrastructure, lack of access to clean water and basic sanitation, weak health systems with limited capacity to detect and control infectious disease outbreaks in the affected countries,

• **Socioeconomic:** high poverty levels, low literacy rates, post conflict environments),

• **Governance issues:** lack of linkages between central and peripheral levels

• Poor implementation of International Health Regulations
Key lessons learned for infection prevention and control (IPC) from the Ebola outbreak

1. Absence of IPC basic measures and infrastructures both in the community and in healthcare settings led to the unprecedented situation of this outbreak.

Newly issued on 17 March 2015

- 54 countries (LMIC)
- 66,101 facilities
- 38% no improved water source
- 19% no improved sanitation
- 35% no water and soap for handwashing

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Provision of water, sanitation and hygiene services in healthcare facilities

<table>
<thead>
<tr>
<th>WHO Regions</th>
<th>Access to an improved water source within 500m</th>
<th>Access to improved sanitation facilities</th>
<th>Access to soap for handwashing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of facilities</td>
<td>Number of countries</td>
<td>Coverage (mean)</td>
<td>Number of facilities</td>
</tr>
<tr>
<td>AFR</td>
<td>66,101</td>
<td>54</td>
<td>62%</td>
</tr>
<tr>
<td>AMRO</td>
<td>52,674</td>
<td>23</td>
<td>58%</td>
</tr>
<tr>
<td>EMRO</td>
<td>3,026</td>
<td>16</td>
<td>70%</td>
</tr>
<tr>
<td>EURO</td>
<td>5,778</td>
<td>3</td>
<td>—</td>
</tr>
<tr>
<td>SEARO</td>
<td>3,596</td>
<td>6</td>
<td>78%</td>
</tr>
<tr>
<td>WPRO</td>
<td>500</td>
<td>3</td>
<td>—</td>
</tr>
</tbody>
</table>

Country          | N°of healthcare facilities (HCFs) | Water coverage in HCFs | Sanitation coverage in HCFs | Soap for HW availability |
Guinea           | 1401                             | 13%                     |                             |                           |
Liberia (2013)  | 328                              | 50%                     | 91%                         | 54%                       |
Sierra Leone     | 1264                             | 62%                     | 78%                         | 95%                       |

IPC assessments in 113 healthcare facilities in Liberia (February 2015)

<table>
<thead>
<tr>
<th>Service</th>
<th>Public</th>
<th>Private</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training</td>
<td>68%</td>
<td>32%</td>
</tr>
<tr>
<td>IPC FP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incinerator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WMS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 month supplies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isolation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Triage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latrines</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electricity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clean water</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

FP: focal point; IS: injection safety; WMS: waste management system

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Key lessons learned for infection prevention and control (IPC) from the Ebola outbreak

1. Absence of IPC basic measures and infrastructures both in the community and in healthcare settings led to the unprecedented situation of this outbreak
2. Importance of consistency and coordination within & among agencies

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Key Measures for Prevention and Control of Ebola Virus Disease

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Lack of clarity about transmission

The PPE Obsession!

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Other key elements for IPC...

1. Standard precautions for all patients at all times
2. Patient triage and isolation
3. Hand hygiene
4. Environmental cleaning and disinfection
5. Cleaning and disinfection of patient care equipment
6. Waste disposal
7. Injection safety and prevention of sharps injuries
8. Laboratory safety
9. Safe post-mortem examination
10. Safe management of dead bodies
11. Management of exposure risk and accidents

New WHO Guidelines on Personal Protective Equipment (PPE)

Guideline development process
- Development of key research questions
- Systematic literature reviews
- Literature review and an online survey on values and preferences of health workers
- Evidence-to-recommendations exercise using the GRADE framework
- Expert consultation
- WHO Guideline Review Committee

Issued on 31 October 2014

What are the benefits and harms of double gloves, full face protection, head cover, impermeable coveralls, particulate respirators, and rubber boots as PPE when compared with alternative less robust PPE for HCWs caring for patients with filovirus disease?
How you use PPE is crucial:

- **Essential:** for putting on and removing PPE, supervision by a trained member of the team
- Avoid touching or adjusting PPE
- Perform hand hygiene before donning new gloves
- Avoid touching your eyes, mouth, or face with gloved or ungloved hands
- Leave the red zone and remove PPE if you have to urinate or touch your PPE or eyes, mouth, or face

**For removal:**
- Remove the most contaminated PPE items first and PPE protecting eye, nose and mouth mucosae at last
- Be careful to avoid any contact between the soiled items (e.g. gloves, gowns) and any area of the face (i.e. eyes, nose or mouth) or non-intact skin
- Discard disposable items in a waste container

It’s all about spraying everywhere!
**Spraying**

- **Spraying chlorine solutions should not be routinely encouraged** (WHO Interim IPC Guidance 2014) because:
  - it is not an evidence-based practice, and
  - it can cause virus spread through aerosolization,
  - it gives a false sense of safety (insufficient contact time), and
  - if extensively used, can lead to adverse events among staff and patients

- “*Avoid* cleaning techniques, such as using pressurized air or water *sprays*, that may result in the generation of bioaerosols” (OSHA Fact Sheet)

- If spraying chlorine solutions is utilized, **staff should still maintain maximum attention** while manipulating organic material, touching contaminated surfaces, and removing PPE because these may still be contaminated by the Ebola virus

**Cleaning and decontamination process**

**WARNING:** chlorine is inactivated when it gets in contact with organic material; therefore, directly pouring chlorine over spills or liquid waste containing blood or body fluids will NOT lead to appropriate decontamination of this waste and of the soiled surfaces

Key principles for environmental cleaning and decontamination:

1. Remove the soiled with a rag or towel or wipe
2. Clean with soap/detergent
3. Disinfect with chlorine solution 0.5%

- *Guideline for Disinfection and Sterilization in Healthcare Facilities, 2008*
- *WHO IPC Interim Guidance. December 2014*
- *CDC Interim Guidance for Environmental Infection Control in Hospitals for Ebola Virus*
Ebola outbreak - What are the main lessons learned for infection control? Prof. Benedetta Allegranzi, Dr. Anthony Twyman, and Dr. Joyce Hightower, World Health Organization
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What was wrong about hand hygiene?

- Use of chlorine solutions?
- Soaking hands in bowls containing chlorine solutions
- Inappropriate technique
- Insufficient contact time
- Inadequate hand hygiene facilities at the point of care
- No hand hygiene between patients
- Not freshly prepared chlorine solutions
- Lack of quality control (adequate concentrations)
New WHO Guidelines on Hand Hygiene in Health Care in the Context of Filovirus Disease Outbreak Response

Guideline development process
- Development of key research questions
- Systematic literature reviews
- Evidence-to-recommendations exercise using the GRADE framework
- Expert consultation
- WHO Guideline Review Committee

Issued in December 2014


206 WHO/MOH IPC assessments in Ebola facilities – Sierra Leone

IMPROVEMENT ACTIONS

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3. Fear factors, especially in emergency situations can lead to misplaced focus in IPC and/or to wrong IPC practices
4. Healthcare workers have been the frontline victims of these vicious circles

EVD in healthcare workers

- HCWs are 21 to 32 times more likely to be infected by EVD than the general population
- Total N°EVD in HCWs (3 countries): 815 (3.9% of conf. & probable cases), with 65.5% CFR (418/635)

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Professional categories

<table>
<thead>
<tr>
<th>Health worker position category\a</th>
<th>Non-health workers 21%</th>
<th>Health workers</th>
<th>Guinea</th>
<th>Liberia</th>
<th>Sierra Leone</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% [95% CI]</td>
<td>% [95% CI]</td>
<td>% [95% CI]</td>
<td>% [95% CI]</td>
<td>% [95% CI]</td>
</tr>
<tr>
<td>Medical workers</td>
<td>Not applicable</td>
<td>12% [9.3-14.1] (63)</td>
<td>30% [23.5-36.9] (57)</td>
<td>7% [4.1-11.1] (10)</td>
<td>3% [1.7-6.2] (10)</td>
</tr>
<tr>
<td>Nursing workers\a</td>
<td>82% [48.2-55.7] (375)</td>
<td>45% [37.8-52.4] (86)</td>
<td>53% [45.9-59.3] (120)</td>
<td>57% [51.3-62.9] (187)</td>
<td></td>
</tr>
<tr>
<td>Midwifery workers</td>
<td>3% [2.0-4.8] (23)</td>
<td>4% [1.5-7.4] (7)</td>
<td>2% [0.7-5.0] (5)</td>
<td>4% [1.9-6.6] (11)</td>
<td></td>
</tr>
<tr>
<td>Ambulance workers</td>
<td>3% [1.9-4.6] (22)</td>
<td>6% [2.9-10.1] (11)</td>
<td>1% [0.1-3.1] (2)</td>
<td>3% [1.4-5.8] (9)</td>
<td></td>
</tr>
<tr>
<td>Laboratory workers</td>
<td>7% [5.0-8.8] (40)</td>
<td>5% [2.2-8.8] (9)</td>
<td>7% [2.7-10.6] (15)</td>
<td>8% [5.3-12.6] (24)</td>
<td></td>
</tr>
<tr>
<td>Pharmacy workers</td>
<td>3% [1.6-4.4] (21)</td>
<td>1% [0.0-3.7] (2)</td>
<td>5% [2.7-9.6] (13)</td>
<td>2% [0.6-4.2] (7)</td>
<td></td>
</tr>
<tr>
<td>Community health workers</td>
<td>3% [2.2-4.3] (24)</td>
<td>6% [0.0-2.9] (3)</td>
<td>1% [0.3-3.8] (3)</td>
<td>7% [4.2-10.4] (20)</td>
<td></td>
</tr>
<tr>
<td>Trade and elementary workers</td>
<td>7% [4.8-8.6] (47)</td>
<td>5% [2.2-8.8] (9)</td>
<td>8% [4.7-12.2] (18)</td>
<td>7% [4.2-10.4] (20)</td>
<td></td>
</tr>
<tr>
<td>All others</td>
<td>11% [8.6-13.2] (77)</td>
<td>6% [2.2-8.8] (9)</td>
<td>16% [11.7-21.7] (87)</td>
<td>13% [7.3-14.7] (121)</td>
<td></td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Circumstances leading to Exposure</th>
<th>Total Citations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Insufficient / Inadequate PPE / Inconsistent use of PPE</td>
<td>17</td>
</tr>
<tr>
<td>2 Unrecognized Ebola patients</td>
<td>7</td>
</tr>
<tr>
<td>3 No soap, chlorine/beach/cleaning supplies, running water, electricity, working waste disposal system</td>
<td>7</td>
</tr>
<tr>
<td>4 Isolation Areas/Setup - Improper / Inadequate</td>
<td>4</td>
</tr>
<tr>
<td>5 Barrier Nursing - Improper / Inadequate / Absent</td>
<td>3</td>
</tr>
<tr>
<td>6 Hygiene / Contaminated Equipment - Surfaces</td>
<td>3</td>
</tr>
<tr>
<td>7 Washing hands inconsistencies/inadequacies or no hand washing stations</td>
<td>3</td>
</tr>
<tr>
<td>8 Rubbed eyes with soiled glove</td>
<td>3</td>
</tr>
<tr>
<td>9 HCW providing nursing care at home</td>
<td>2</td>
</tr>
<tr>
<td>10 Cadaver exposure in hospital and public</td>
<td>2</td>
</tr>
</tbody>
</table>

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1. Absence of infection prevention and control basic measures and infrastructures both in the community and in healthcare settings led to the unprecedented situation of this outbreak

2. Lack of consistency and coordination within & among agencies

3. Fear factors, especially in emergency situations can lead to misplaced focus in IPC and/or to wrong IPC practices

4. Healthcare workers have been the frontline victims of these vicious circles

5. At least, the Ebola outbreak has given the opportunity to get IPC on the top of the national and international agendas

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Liberia: Background

- At the beginning of the EVD outbreak, there was no organizational unit in MOH dedicated to IPC
- However, multiple structures were established to respond:
  - MOH IPC focal point
  - County IPC focal points
  - IPC task force
  - IPC steering committees
- To sustain a culture of IPC, these structures need to be institutionalized in the Liberian healthcare system in the post-EVD era
- In addition, IPC policy, SOPs, and guidelines must be integrated into the MOH strategy for building a resilient health system
Libera: Top 3 Lessons Learned

1. **Accountability** needs to be enforced. Health facilities need to comply with standards as was done during the response
   - Establishing (or empowering) accreditation bodies (i.e. LMDC, embedded TAs)
   - Patients deserve the right to access SAFE care

2. A better **understanding of risk assessment**
   - Knowing how to identify and categorize risk
   - Applying risk assessment across all essential health services will better integrate IPC across all essential health services

3. There is a need to ensure **realistic expectations** now that these countries are transitioning back to their normal system
   - During the response, there was a great impetus for immediate progress
   - Goal is to create a safety culture, both for patients and HCWs
   - This cannot be done without time and dedication
Guinea: Planning Gaps

• Country Level
  – No national department responsible for effective IPC activity
  – No comprehensive national IPC plan or strategy
  – No national or sub-national continuum to rapidly implement IPC response activity
  – No clear IPC direction for the country
  – Country NGO defined their own activities
  – NGOs found back doors and non direct ways of overriding agreed upon standards and activities

Guinea: Planning Gap (2)

• International Ebola Response Level
  – No framework for international humanitarian organizations to work within (governance, regulations, standards for engagement, responsibilities or reports)
  – No coherent plan, indicators, tools, documentation or goals
  – Lack of direction and accountability
  – Lack of standardization for quality and harmonization of implementation
Guinea: Implementation Gaps

- Decisions for implementation sites for activity
  - Based on sites getting international attention after problems developed
  - Little preventative activity was attempted with the exception of IPC training which was often seen as non effective despite the evidence of reduction of HCW transmissions where training was done

Guinea: Evaluation Gaps

- Inconsistent evaluation information
  - Many assessments and evaluations were done with unclear methods and tools
  - Emphasis placed only on the number of lives touched and not on the quality or efficacy of the activity in the short or long run
  - Many reports were published for the world's consumption without being given to national leaders to use in making decisions
Guinea: Solutions

• Clear Progress was made in IPC:
  – Framework for activities and overall goals was established
  – NGO implementing partners agreed on a gap analysis approach for intervention by health districts
  – Tools were harmonized and validated by the MOH
  – Standardization of training materials and criteria of trainers

Ebola Lessons Learned: conclusions

1. IPC/WASH in healthcare settings is a cornerstone of the Ebola response
2. Need for building upon the current situation of increased attention on IPC to improve basic structures and standards
3. Patient safety and healthcare workers safety are equally important during EVD care
4. Need for including social mobilization and taking culture into account in IPC messages
5. Need for adequate preparedness, i.e. meeting minimum requirements for IPC/WASH both in the community and in healthcare
6. MOH leadership, partners coordination, and consistent reference to and implementation of correct IPC standards are paramount
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February 17, 2016

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PREVENTION OF SURGICAL SITE INFECTIONS

Prof. Sean Berenholtz
Departments of Anesthesiology/Critical Care
Medicine and Surgery
Johns Hopkins University School of Medicine
Baltimore, MD

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