Infection Control Principles & Strategies
Focus on the Outbreak Context

Short Course on Infectious Diseases in Humanitarian Emergencies
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IC Module Plan

• Basic IC Principles & Strategies

• Basics of HH, PPE, & Isolation Precautions

• The outbreak context

• Scenarios
Basic Principles of Infection Control
Chain of Infection

In order to control or prevent infection it is essential to understand that transmission of a pathogen resulting in colonisation or infection requires the following 5 vital links:

- **Agent**
- **Source**
- **Mode of transmission**
- **Portal of entry into the host**
- **Susceptible host**
Agent

Types of potential pathogens include:

i. Bacteria
ii. Viruses
iii. Fungi
iv. Protozoa
v. Arthropods
vi. Prions
**Source**

- **Health care setting**
  - Health care can be at home, community centres, hospitals, etc.
  - Primary source = patient (secretions, excretions, body fluids, respiratory aerosols)

- **Non-health care setting**
  - Farms, etc
  - Primary source = animals, plantation
Risk of Infection

*Never forget the environment...*

- Contaminated manikin’s head and neck
- Contaminated intubation equipment
Main Modes of Transmission

• Contact
  – Direct contact
  – Common vehicle

• Droplet (large aerosols)

• Airborne
  – tiny aerosols (droplet nuclei) over long distance

• Vector
Modes of Transmission

Respiratory Aerosols

• Respiratory aerosols comprise
  – Droplets = large aerosols, size ≥ 5µm
  – Droplet nuclei = tiny aerosols, size < 5µm
Predicted Infection Risk as a Function of the Ventilation Rate and the Quanta Generation

The quality of ventilation has been pointed as a major factor in determining the risk of exposure.


Exposure period: 0.5 h

*Courtesy Prof. Y. Li, Univ Hong Kong*
Portals of Entry into the Host

To cause disease, the infectious agent must first gain entry into the human body. Common portals of entry include:

- Respiratory tract
- Gastrointestinal tract
- Mucosa (e.g., conjunctiva, nose, mouth)
- Genitourinary tract
- Breach of skin integrity
- Mosquito bite
Basic Infection Control Strategies
Infection Control Strategies

AIM: BREAK LINKS

Agent
Source
Mode of transmission
Portal of entry into the host
Susceptible host

Epidemic and Pandemic Alert and Response
Breaking the Chain of Infection

**Actions targeting the links**

- **Source control measures**
  - E.g., cough etiquette, elimination of hazardous materials, cleaning, disinfection
- **Modes of transmission**
  - Contact: hand hygiene
  - Droplet: distance from the source >1 m
  - Airborne: ventilation of the space
  - Vector: nets
- **Portal of entry into the host**
  - Adding barriers, e.g., PPE
- **Host**
  - Enhancing defence, e.g., vaccination
# IC Precautions: Health Care vs Non-health Care Settings

*Issues that impact on type of precaution*

<table>
<thead>
<tr>
<th>Issue</th>
<th>Non-HC setting</th>
<th>HC setting</th>
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<tbody>
<tr>
<td>Source</td>
<td>Animals, plantation, etc.</td>
<td>Patient</td>
</tr>
<tr>
<td>Mode of transmission</td>
<td>Greater importance of the environment (dust, risk of injuries, etc.)</td>
<td>Mainly through direct and close contact with patient</td>
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<tr>
<td>Task</td>
<td>Frequently heavy duty</td>
<td>Involves fine and precise acts with patients</td>
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<tr>
<td>Controllability over the setting</td>
<td>Unpredictable</td>
<td>Better control through policies &amp; structures</td>
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Epidemic and Pandemic Alert and Response

World Health Organization
IC Precautions in Non-health Care Settings

• Frequent need to
  – Cover the whole body: e.g., environment heavily soiled with contaminated dust
  – Protect the feet against injuries with resistant shoes (e.g., boots)
  – Perform heavy duties that may disrupt the protective barrier, resulting in need for additional resistant barriers (e.g., rubber gloves and apron).
Infection Control Strategies

**Conclusion**

- **Administrative Controls**
  - Programmes, policies, procedures – Triage, organization of work

- **Engineering Controls**
  - Environmental ventilation (air exchanges)

- **Personal Protective Equipment**
  - based on the isolation precaution indicated for the situation

**Strength of measure**

**Outbreak settings: Frequent problems**

- NO IC structure
- NO IC Policy
- Infrastructure
  - NO electricity, NO running water
  - Overall bad maintenance
Questions?
Hand Hygiene and Personal Protective Equipment (PPE)
Isolation Precautions in HC

• Standard Precautions
  ➔ Routine precautions to be applied in all situations for all patients

• Additional Precautions
  ➔ For specific patients/diseases
  – Contact Precautions
  – Droplet Precautions
  – Airborne Precautions
Standard Precautions in HC

*Providing the Foundation*

- To limit/prevent contact with all secretions or biological fluids, skin lesions, mucous membranes, and blood or body fluids.
  - Includes direct or indirect contact
  - Dealing with individuals
  - Dealing with the environment

- Main foundations
  - Clean/safe environment
  - Hand hygiene
  - Use of PPE based on risk assessment
The Role of Hands in Disease Transmission

1. Organisms on patient’s (pts) skin or environmental objects.

2. Organisms transferred to hands

3. Organisms survive for several minutes

4. Hand hygiene inadequate or omitted or agent inappropriate

5. Hand has contact with another patient or the environment

Epidemic and Pandemic Alert and Response

World Health Organization
Hand Hygiene

All settings: If hands are soiled with dirt or secretions = WASH HANDS WITH SOAP & WATER.

Health care settings: unless hands are visibly soiled, alcohol based hand rubs should be used, if available.

Epidemic and Pandemic Alert and Response
Hand Hygiene

Typical parts missed

- Wearing gloves does not remove the need to perform hand hygiene after glove removal.
Hand Hygiene Technique

**How to handrub?**
**WITH ALCOHOL-BASED FORMULATION**

1a. Apply a palm of the product in a spread hand, covering all surfaces.
1b. Rub hands palm to palm.
2. Rub backs of fingers to opposing palms with fingers interlocked.
3. Rub palms over left dorsum with interlaced fingers and side area.
4. Pals to palms with fingers interlaced.
5. External rubbing, thumbs and forefingers with closed fingers of right hand in left palm and vice versa.

**20-30 sec**

6. External rubbing, thumbs and forefingers with closed fingers of right hand in left palm and vice versa.
7. Rinse hands with water.
8. Once dry, your hands are safe.

**How to handwash?**
**WITH SOAP AND WATER**

1. Apply enough soap to cover all hand surfaces.
2. Wet hands with water.
3. Rub hands palm to palm.
4. Rub palms over left dorsum with interlaced fingers and side area.
5. Rub palms over left dorsum with interlaced fingers and side area.
6. Rinse hands with water.
7. Dry hands thoroughly with a single use towel.
8. Use towel to turn off faucet.
9. Your hands are now safe.
PPE for Standard Precautions

- BASED ON RISK ASSESSMENT
- IF direct contact with blood & body fluids, secretions, excretions, mucous membranes, non-intact skin
  - Gloves PLUS gown
PPE for Standard Precautions

- BASED ON RISK ASSESSMENT
- IF there is the risk of spills onto the body and face:
  - Gloves PLUS gown PLUS
  - Face protection (mask plus eye protection goggle or visor; face shield)
PPE for Specific Precautions

- Directed to specific diseases
- Some disease may require a combination of specific precautions

- **Contact Precautions**
  - Gloves PLUS gown

- **Droplet Precaution**
  - Medical mask

- **Airborne Precaution**
  - Particulate respirator
How to use PPE
Preparation

• Hazard identification and risk assessment

• Guarantee hand hygiene conditions
  – Access to hand rub or
  – Access to sink + soap + single use towel

• Guarantee necessary PPE items
  – Well placed
  – When needed
Few Issues BEFORE Putting on PPE

- Where are you going to put on PPE?
- Do you need assistance?
- Where and how are you going to take PPE off?
- What will you do with the waste generated?
Key points for safe practice

• PPE BREACHES may occur
  – Try to work with another person, a “buddy”. This can provide informal feedback on performance.

• PPE may
  – Restrict the wearer by limiting movement or visibility
  – Cause discomfort and thus facilitate breaches
    • Additional layers do NOT ADD protection, but discomfort

• Try to ensure cleanliness and orderliness of the worksite

• Remove PPE immediately after use
Gloves

• Intended to prevent skin contact with hazardous substances, e.g. body fluids

• Do you have an allergy to latex?
  – Alert the team leader / whoever in charge of PPE

• Do not reuse disposable gloves
  – Change gloves between patients, perform hand hygiene & put a clean pair on
  – Don’t apply HH products on latex gloves
Gown

• Protects skin and prevents soiling of clothing during procedures that are likely to generate splashes or sprays of blood, body fluids, secretions, or excretions.

• Select a gown that is appropriate for the activity and amount of fluid likely to be encountered.

• Remove a soiled gown as promptly as possible and wash hands to avoid transfer of microorganisms to other patients or environments.
Coverall

Use for non-health care settings
Apron

Apron may be worn if there is concern over splash with infectious body fluids

AND

- The coverall/gown is not impermeable

OR

- Heavy duty with risk of disrupting the coverall/gown
Protection of Facial Mucosa

• Protect mucosa of mouth, nose AND eyes

• Protection of mucosa of mouth and nose
  – Mask OR
  – Face shield

• Eye protection
  – Visor OR
  – Goggle OR
  – Face shield

➢ If face is splashed, wash it immediately!
ERROR: stackunderflow
OFFENDING COMMAND: ~
ERROR: stackunderflow