Preventing Healthcare-associated Infections in Resource-limited Settings
Challenges for Infection Prevention

• Infrastructure
• Resources and Maintenance
• Personnel
  • Training and retention
• National priorities
  • Crisis response vs capacity building
Challenges for Infection Prevention

- Infrastructure
- Resources and Maintenance
- Personnel
  - Training and retention
- National priorities
  - Crisis response vs capacity building
- Sustainability
Resource-limited settings

• Matching capacity to care

• Levels of capacity:
  • Basic safety: water, shelter, light
  • Sanitation, protective equipment, and disinfection
  • Microbiology laboratory capacity, sterilization, reliable water and electricity

• Limited vs lost capacities
Translational Challenges

- Importation of technology without
  - maintenance capability
  - accompanying infection control capacity

- US infection control guidelines do not translate directly to resource-limited settings
New Invasive Procedures

- Tissue and organ transplants
- Surgical cosmetic procedures
  - Infections by non-TB mycobacteria after cosmetic abdominal procedures (Dominican Republic) and breast prostheses (Brasil)
- Medical Tourism
HIV Transmission in Dialysis Centers

- 11 patients in Corrientes, Argentina, 1989
- 30 patients in Cordoba, Argentina, 1991
- 26 patients in La Plata, Argentina, 1993
- 13 patients in Colombia, 1993
- 39 patients in Egypt, 1999

(J Infect Dis 2000;181:91-97)
Injections Are Overused

Number of injections per person and per year, by region, year 2000

- South America
- Central Europe
- West Africa
- China and Pacific
- South East Asia
- East and Southern Africa
- Eastern Europe and Central Asia
- South Asia
- Middle East Crescent

Global burden of disease study, 2000

Number of injections per person and per year
Injections Are Unsafe

Proportion of injections given with reused equipment, by region, year 2000

- South America
- Central Europe
- West Africa
- China and Pacific
- South East Asia
- East and Southern Africa
- Eastern Europe and Central Asia
- South Asia
- Middle East Crescent

Global burden of disease study, 2000

Number of injections per person and per year

Injections given with equipment reused in the absence of sterilization
Injections given with sterile equipment
Trends and Magnitude?

Limited capacities for:

- Microbiology and antimicrobial susceptibility testing
- Specific diagnoses

Curtails accurate surveillance.

- Tendency to focus on numerators and “outbreaks”.
Emerging diseases follow a consistent pattern:

1) Disturbance of, or intrusion into, an ecologic system
2) Primary insertion into human host(s)
3) Secondary spread among humans
4) **Amplification in healthcare settings**
Chain of transmission among guests at hotel M—Hong Kong, 2003

Guangdong Province, China

Hotel M—Hong Kong

Hospital 1—HK

Hospital 2—Hong Kong

Hospital 3—Hong Kong

Hospital 4—Hong Kong

Hospital 2 Hong Kong

Hospital 3 Hong Kong

Hospital 4 Hong Kong

4 family members

4 HCWs*

2 close contacts

10 HCWs

2 family members

3 HCWs

3 HCWs

0 HCWs

99 HCWs (includes 17 medical students)

156 close contacts of HCWs and patients

4 other Hong Kong Hospitals

10 HCWs

34 HCWs

37 HCWs

Unknown number close contacts

28 HCWs

37 close contacts

99 HCWs (includes 17 medical students)

2 HCWs

3 HCWs

2 family members

4 HCWs

10 HCWs

2 family members

4 HCWs

3 HCWs

2 family members

2 HCWs

4 family members

2 close contacts

Data as of 3/28/03
Other examples:

- Monkeypox
- Nipah-virus encephalitis
- Ebola hemorrhagic fever
Outbreak Response vs Routine Practices

- Short term interventions for outbreak control
  - Brief urgent effect
  - Importation of resources and personnel
  - Cohort and Isolate
  - Limited residual

- Establishment of new capacities
  - Ongoing effect
  - Regional resources and personnel
  - Extensive training, commitment of leadership
  - Retention of capacity
Outbreak Control: Nipah virus

- Related to Hendra Virus in Australia
- Malaysia and Singapore, 1998-99
- Zoonotic transmission
- Primary reservoir suspected to be *Pteropus* bats
Hendra and Nipah Virus Transmission

Hendra, Australia

A possible transmission cycle for Hendra virus during the Australian outbreak in 1994

Nipah, Malaysia

A possible transmission cycle for Nipah virus during the Malaysian Singapore outbreak in 1998-1999
14 (15%) of 92 *P. giganteus* (flying foxes) were Ab +
Possible transmission pattern for Nipah virus outbreak in Bangladesh, 2004

MEGACHIROPTERA:
- reservoir
- amplification
- dissemination

ZOONOSIS

Nosocomial?
Nipah virus outbreak, Bangladesh 2004

- Report of possible Nipah virus outbreak
- Total of 36 cases identified
  - 7 different villages
  - median age: 35 yrs (range: 5-60)
  - Male -19 (53%)
  - case fatality: 27/36 (75%)
  - 23/27 were laboratory confirmed (4 died before phlebotomy)
Nipah virus encephalitis – Bangladesh 2004
Epidemic curve by village and date of onset

Date of Onset

Total Cases

Malikpur
Kumrahati
Korbipur Char
Guholaxmipur
C and B Ghat
Alipur


0 1 2 3 4 5 6 7 8 9 10

CDC
## Cohort study preliminary results:
### Faridpur, Bangladesh 2004

<table>
<thead>
<tr>
<th>Exposure</th>
<th>RR</th>
<th>95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Travel to previously affected areas</td>
<td>2.2</td>
<td>0.3-11.8</td>
</tr>
<tr>
<td>Visited hospital or clinic</td>
<td>1.6</td>
<td>0.7-3.2</td>
</tr>
<tr>
<td>Fruit</td>
<td>0.8</td>
<td>0.4-1.6</td>
</tr>
<tr>
<td>Bats</td>
<td>0.9</td>
<td>0.5-1.6</td>
</tr>
<tr>
<td>Drinking palm juice</td>
<td>1.4</td>
<td>0.5-3.4</td>
</tr>
<tr>
<td>Handling palm juice bowls</td>
<td>2.1</td>
<td>0.7-6.2</td>
</tr>
</tbody>
</table>
Cohort study preliminary results: Faridpur, Bangladesh 2004

<table>
<thead>
<tr>
<th>Exposure</th>
<th>RR</th>
<th>95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Touch unconscious</td>
<td>4.5</td>
<td>1.7-12.0</td>
</tr>
<tr>
<td>Share room with unconscious</td>
<td>2.7</td>
<td>0.9-7.8</td>
</tr>
<tr>
<td>Touch later dead</td>
<td>15.0</td>
<td>4.0-65.0</td>
</tr>
<tr>
<td>Share room with later dead</td>
<td>6.9</td>
<td>1.9-29.0</td>
</tr>
<tr>
<td>Touch respiratory</td>
<td>5.0</td>
<td>2.0-13.0</td>
</tr>
<tr>
<td>Share room with respiratory</td>
<td>1.9</td>
<td>0.8-4.4</td>
</tr>
</tbody>
</table>
Person-to-person transmission of Nipah virus
Probable mechanisms:

• Respiratory secretions
• Hand contamination → self inoculation
• Shared utensils?
• No evidence to support airborne transmission
Isolation Ward

Staff and Patient Entrance
Contaminated area

Office

Nursing Station

Break room
New, guarded entrance for **patients only**

Proposed plan:

Locked entrance for **Staff Only**

Traffic-flow recommendations
Proposed plan: Barrier between clean and contaminated areas
Handwashing Basins

Contaminated Waste

Contaminated area

Soiled supplies and equipment

Nursing Station

Office

Clean supplies & Staff dressing room

Break room

Handwashing Basins

Contaminated Waste

Contaminated area

Soiled supplies and equipment

Nursing Station

Office

Clean supplies & Staff dressing room

Break room

Handwashing Basins

Contaminated Waste

Contaminated area

Soiled supplies and equipment

Nursing Station

Office

Clean supplies & Staff dressing room

Break room
Observation rooms: Single patient

Isolation rooms: 2 patients

Proposed use for cohorting and triage
Improving the status quo

• Short term interventions for outbreak control
  • Brief urgent effect
  • Importation of resources and personnel
  • Cohort and Isolate
  • Limited residual

• Establishment of new capacities
  • Ongoing effect
  • Regional resources and personnel
  • Extensive training, commitment of leadership
  • Retention of capacity
Basic capacity for infection prevention

Human resources must be created and supported:

- Training, accountability and authority for
  - Infection control personnel
  - Nursing staff
  - Physicians
  - Cleaners
Example intervention: Respiratory Cohort}

Intervention includes:

- Prompt recognition and cohorting for ARI symptoms
- Systematic daily monitoring by ICP
  - Prioritized IC precautions for cohorted patients
- Education for staff, patients, & families/visitors
  - Hand hygiene and respiratory etiquette
  - Visitation policy
- Monitoring and feedback
# Module H: OUTPATIENT Daily Monitoring of Respiratory Cohorting

**Infection Control Nurse:** ____________________________  **Outpatient Cohorting Area Observed:** ____________________________

**Week Of (Mon Date):** ____________________________  **Size of Cohorting Area:** _______ metres²

<table>
<thead>
<tr>
<th>Day/Time</th>
<th>Observations of RC Area</th>
<th>Other Observations and Notations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Monday:</strong></td>
<td>A. # in RC Area ______</td>
<td></td>
</tr>
<tr>
<td>___ AM/PM</td>
<td>B. # in RC Area who received respiratory etiquette briefing ______</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C. Crowding? Y N</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D. Triage attendant directing people correctly? Y N</td>
<td></td>
</tr>
</tbody>
</table>

| **Tuesday:** | A. # in RC Area ______ |                                  |
| ___ AM/PM | B. # in RC Area who received respiratory etiquette briefing ______ |                                  |
|          | C. Crowding? Y N |                                  |
|          | D. Triage attendant directing people correctly? Y N |                                  |

**Wednesday:** A. # in RC Area ______
Module E: HAND HYGIENE AUDIT TOOL
HAND HYGIENE ADHERENCE DURING HIGH RISK PATIENT CONTACTS

Monitor each clinical area for approximately 30 MINUTES

Hospital __________________ Date ______________ Start time ________ AM / PM (circle)
Section of Hospital (e.g. casualty, adult inpatient, pediatric) ________________________________
Observer name __________ Ward ID ______________ Number of patients in ward ______
Total number of sinks or basins in the clinical care area
   Of these, number that are working at time of audit (i.e. provide water) ______
   Of these, number used primarily by patients (not including toilet) ______

Hand Hygiene Opportunities
Use tick marks to indicate what behaviour was observed for each hand hygiene opportunity

<table>
<thead>
<tr>
<th>Discipline (see below)</th>
<th>No Attempt</th>
<th>Unsuccessful Attempt</th>
<th>Successful Attempt</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MONDAY</td>
<td>TUESDAY</td>
<td>WEDNESDAY</td>
<td>THURSDAY</td>
<td>FRIDAY</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>----------------------------------------------</td>
<td>------------------------------------------------</td>
<td>-----------------------------------------------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>7:00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INPATIENT WARDS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Participate in morning medical rounds in selected respiratory cohorting inpatient wards to evaluate ongoing measures and required revisions to patient placement plans</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Address questions or concerns by staff regarding hand hygiene or respiratory cohorting</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8:30</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CASUALTY AREA</td>
<td>CASUALTY AREA (and modify as needed) respiratory cohorting measures in casualty areas</td>
<td>CASUALTY AREA (and modify as needed) respiratory cohorting measures in casualty areas</td>
<td>CASUALTY AREA (and modify as needed) respiratory cohorting measures in casualty areas</td>
<td></td>
</tr>
<tr>
<td>• Evaluate and modify as needed respiratory cohorting measures in casualty areas</td>
<td>• Evaluate casualty visits over the past 24 hrs for patients presenting with acute respiratory illness. Identify where these patients were admitted, and (if necessary) follow to assigned ward to evaluate or modify current respiratory status and continued cohorting requirements</td>
<td>• Evaluate casualty visits over the past 72 hrs for patients presenting with acute respiratory illness. Identify where these patients were admitted, and (if necessary) follow to assigned ward to evaluate or modify current respiratory status and continued cohorting requirements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9:30</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tea Break</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10:00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALL SELECTED CLINICAL AREAS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Evaluate availability of soap, water supplies (or hand sanitizer if available) for hand hygiene for the next 24 hrs in casualty and on all targeted wards and request additional resources to address these shortages (i.e., procuring bars of soap, additional water basins or containers, sufficient Waterguard treatment, etc.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Monitor general adherence to respiratory cohorting measures in the casualty and inpatient clinical areas</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Troubleshoot in clinical areas with difficulties adhering to respiratory cohorting measures and suggest modifications in these areas if necessary. Document the issues arising in these areas.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11:00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Choose one or more of the following activities:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Preparation and development of new training or educational material for staff; OR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Prepare or conduct formally organized staff education sessions; OR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• KAP surveys (periodic); OR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Modules B - E (as required); OR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Prioritizing infection prevention capacity

Capacity should be appropriately linked to activities, e.g.:

- Oral therapy → Security, record keeping
- Wound care → + gloves, suture, sharps management etc.
- Obstetrics (uncomplicated) → + PPE, placenta management
- Surgical therapy → + Sterilization, surgical PPE
- ICU, hemodialysis, etc → + Environmental control, water safety, microbiology
Core Components for Infection Prevention and Control (IPC) Programmes

Report of the second meeting of the IPC in Health Care informal network

Geneva, Switzerland
26th - 27th June 2008

World Health Organization

CONTENTS

EXECUTIVE SUMMARY
Acronyms

I. INTRODUCTION
Purpose of the meeting
Background
WHO's Infection Prevention and Control in Health Care Initiative

II. SCOPE AND GENERAL CONSIDERATIONS
Scope
Definition of core components of IPC programmes
Considerations

III. CORE COMPONENTS

III. A. Description of the core components
1. Organizational structure
2. Technical guidelines
3. Human resources
   3.1. Human resources: Training
   3.2. Human resources: Staffing for programmes
   3.3. Human resources: Health care worker's health issues
4. Surveillance and monitoring of IPC practices
   4.1. Surveillance of infections
   4.2. Monitoring IPC practices
5. Microbiology laboratory support
6. Built environment
7. Evaluation of IPC programmes
8. Links with Public Health and other services/societal bodies

III. B. A road map for the development of IPC core components in health care facilities

Epidemic and Pandemic Alert and Response
Biohazard Reduction for Dangerous Pathogens
Infection Prevention and Control in Health Care
<table>
<thead>
<tr>
<th>Core component and the essential elements</th>
<th>Type of care</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Basic</td>
</tr>
<tr>
<td><strong>Microbiology laboratory</strong></td>
<td></td>
</tr>
<tr>
<td>Access to microbiology services</td>
<td></td>
</tr>
<tr>
<td>Permanent microbiology laboratory support</td>
<td></td>
</tr>
<tr>
<td>with an established system of quality</td>
<td></td>
</tr>
<tr>
<td>control</td>
<td></td>
</tr>
<tr>
<td><strong>Built environment</strong></td>
<td></td>
</tr>
<tr>
<td>Provision of water, waste management,</td>
<td>•</td>
</tr>
<tr>
<td>and clean premises</td>
<td></td>
</tr>
<tr>
<td>Running clean water</td>
<td>•</td>
</tr>
<tr>
<td>Electricity if using steam or other</td>
<td></td>
</tr>
<tr>
<td>physical sterilization methods</td>
<td></td>
</tr>
<tr>
<td>Availability to establish cohort isolation</td>
<td>•</td>
</tr>
<tr>
<td>Controlled environment and ventilation</td>
<td></td>
</tr>
<tr>
<td>for sterile supply and Operating Rooms</td>
<td></td>
</tr>
<tr>
<td>Capacity to maintain separation of</td>
<td></td>
</tr>
<tr>
<td>patients and availability of single</td>
<td></td>
</tr>
<tr>
<td>rooms for isolation</td>
<td></td>
</tr>
<tr>
<td><strong>Evaluation of programmes</strong></td>
<td></td>
</tr>
<tr>
<td>Audits to evaluate programme activities</td>
<td></td>
</tr>
<tr>
<td>and results according to the planned</td>
<td></td>
</tr>
<tr>
<td>goals</td>
<td></td>
</tr>
</tbody>
</table>
Thank you!

Photo: Ivan Kuzmin