The future of infection control: challenges and opportunities

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President, Infection Control Association (Singapore)
President, Asia-Pacific Society of Infection Control

History of IC in Singapore

- 1974: Infection Control Program began with focus on surveillance
- 1985: MRSA
- 2003: SARS
- 2005: Launch of the National Infection Control Surveillance Program
- 2006: Signed pledge with WHO Hand Hygiene program
- 2009: 1st national conference in IC

Standards for quality healthcare system

- Safe
- Effective
- Patient-centered
- Timely
- Efficient
- Equitable

We are living in exciting times....

- The healthcare systems in world recognized need for change
- Singapore responded and made the change
  - Infection Control benefited from this
  - International accreditation became necessary - JCI

Changing landscape

Asia may not have been known for major discoveries..

- But we do have major issues of potential significance
- Pandemics
- MDROs
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Pandemics
- Nipah virus
- SARS
- Avian influenza
- Dengue

Factors
- lapses in infection control practices?
- 'the world is flat'?

NDM-1 at UK, India, Bangla Desh and Pakistan

Lancet Infect Dis 2010; 10: 597–602

More NDM-1 cases within a month in Singapore

Four more infected by new superbug

Prevalence of HA-MRSA: World-Wide

USA (84%) (
North America (39%) (n/a)
Latin America (25%) (n/a)
Europe (29%) (
Africa (27%) (n/a)
UK (96%) (n/a)

ESBL estimates


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MDRO and outbreaks
- MRSA clusters
- VRE outbreak

MRSA reduction programs
- Active surveillance
  - Risk stratification
  - Universal screening
  - Inpatients
  - Elective surgeries

The truth
- Looking at issue in perspective:
  - Not an iceberg but a ‘drift ice’

Challenge #1
- Reducing HA-MRSA to near zero
  - In all acute care hospitals and ILTCs
- What we can do
  - Work has begun and will continue
  - We do not give up

Other outbreaks
- *Bacillus* species and powdered gloves
  - Effective investigations by both clinical microbiologists and infection control professionals
- *B cepacia* and oral mouth wash, body wipes

Environmental contamination

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Reality
- Many high touch points in patient care area

<table>
<thead>
<tr>
<th>Summary of paper</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Heavy contamination of hospital surfaces—such as bed linens, bed rails, and tabletops—with MDROs such as MRSA, VRE, and C. difficile</td>
</tr>
<tr>
<td>• Many MDROs are able to live on inanimate surfaces for prolonged periods of time, and studies have shown that the hands of healthcare workers are just as likely to become contaminated with MDROs by touching surfaces in the rooms of colonized patients as they are touching the skin of those patients</td>
</tr>
<tr>
<td>• Patients who are admitted to rooms previously occupied by a patient colonized with an MDRO have a higher risk of acquiring an MDRO during their hospitalization</td>
</tr>
</tbody>
</table>

Table 1: Persistence of clinically relevant bacteria on dry inanimate surfaces

<table>
<thead>
<tr>
<th>Type of bacteria</th>
<th>Duration of persistence (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acinetobacter spp.</td>
<td>3 days to 3 months</td>
</tr>
<tr>
<td>Bacteroides species</td>
<td>3 to 6 days</td>
</tr>
<tr>
<td>Bacillus spp.</td>
<td>3 to 6 days</td>
</tr>
<tr>
<td>C. difficile</td>
<td>3 to 6 months</td>
</tr>
<tr>
<td>C. glutamicum</td>
<td>1 to 4 weeks</td>
</tr>
<tr>
<td>Enterococcus spp.</td>
<td>3 to 4 months</td>
</tr>
<tr>
<td>Flavobacterium</td>
<td>12 days</td>
</tr>
<tr>
<td>Helicobacter pylori</td>
<td>1 to 2 months</td>
</tr>
<tr>
<td>Klebsiella spp.</td>
<td>1 to 2 months</td>
</tr>
<tr>
<td>Listeria spp.</td>
<td>2 to 3 weeks</td>
</tr>
<tr>
<td>Methicillin-resistant Staphylococcus aureus (MRSA)</td>
<td>1 to 3 days</td>
</tr>
<tr>
<td>Methicillin-sensitive Staphylococcus aureus (MSSA)</td>
<td>1 to 3 days</td>
</tr>
<tr>
<td>Mycobacteria</td>
<td>1 to 4 weeks</td>
</tr>
<tr>
<td>Pseudomonas aeruginosa</td>
<td>1 to 4 weeks</td>
</tr>
<tr>
<td>Serratia marcescens</td>
<td>1 to 4 weeks</td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td>1 to 4 weeks</td>
</tr>
<tr>
<td>Staphylococcus epidermidis</td>
<td>1 to 4 weeks</td>
</tr>
<tr>
<td>Staphylococcus saprophyticus</td>
<td>1 to 4 weeks</td>
</tr>
<tr>
<td>Streptococcus spp.</td>
<td>1 to 4 weeks</td>
</tr>
<tr>
<td>Strep. pneumoniae</td>
<td>1 to 4 weeks</td>
</tr>
<tr>
<td>Strep. pyogenes</td>
<td>1 to 4 weeks</td>
</tr>
<tr>
<td>Strep. salivarius</td>
<td>1 to 4 weeks</td>
</tr>
<tr>
<td>Uropathogens</td>
<td>1 to 4 weeks</td>
</tr>
<tr>
<td>Viridans group streptococci</td>
<td>1 to 4 weeks</td>
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Contact and indirect contact

- Direct transmission
- Susceptible patient
- Compliance in hand hygiene: ~ 50%

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Evaluation of patient area cleaning

- 157 rooms and 1404 targets evaluated in 3 hospitals studied
- 45%, 42%, and 56% of targets were removed by routine terminal cleaning/disinfecting activities

Carling et al, AJIC 2006

We need to break the chain of infection

Challenge #2

- Clean and safe environment and equipment
- What we can do
  - Be involved in selection of products used by/on patients
  - Partnership with MMD, BME

Contact Precautions

- Purpose
  - To reduce the risk of transmission of epidemiologically important microorganisms by direct or indirect contact
- Organisms
  - MDRO, *C. difficile*, gastroenteritis

Components

- Patient placement
  - Single room or cohort
- Gown and gloves
- Hand hygiene
- Patient transport
- Cleaning
- Equipment
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Do we really need to apply Contact Precautions all the time?

- **YES!**

- **Objective**
  - To prevent transmission

- **NO!**

  - Adverse events associated
    - Less patient-health care worker (HCW) contact
    - Delays and more noninfectious adverse events
    - Increased symptoms of depression and anxiety
    - Decreased patient satisfaction with care

Less patient-HCW contact

- Less likely to visit ICU patients (Kirkland and Weinstein, 1999)
  - 2.1 vs 4.2 hourly patient contacts by HCW for CP patients vs non-CP (p= 0.03)
  - HCWs more likely to wash hands after seeing CP patients (83% vs 34%, respectively, p < 0.001)

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- Attending physicians less likely to examine patients on CP (Saint et al, 2003)
  - Senior residents examined CP and non-CP equally (83% vs. 87%, respectively, p = 5.58)
  - Attending physicians examined fewer patients on CP (35% vs. 73%, respectively; RR, 0.49, p<0.001)

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- All HCWs spend less time with patients on CP, which is not explained by severity of illness (Evans et al, 2003)
  - 5.3 CP vs 10.9 non-CP overall ICU/Floor HCW encounters (P ,.001)
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Patient placement

- Single rooms
- Availability

- Cohort
- Like patients
- Bed management issues

Knowledge, attitudes, and practices of contact precautions among Iranian nurses

Mehrdad Sabzevari, MD, MPH,† Rezae Amiri, MD, MPH,† and Mary Louisa McLean, MPh, RNCP* (†Sahand, Iran, and †Vermont, USA)

Background: Knowledge, attitudes, and contact precaution practices were surveyed in nurses at Sahand University of Medical Sciences. The research group assessed knowledge, attitude, and practice compliance, and compliance was correlated with infection control practices. The study was conducted in 2016.

Methods: A cross-sectional, comparative study was conducted in 2016. The sample was 200 nurses. The sample size was calculated using the Alirezaie formula. The Alirezaie formula was used to calculate the sample size for the study. A total of 200 nurses were selected. The study was conducted in 2016.

Results: The mean age of the nurses was 32 years. The mean age of the nurses was 32 years. The mean age of the nurses was 32 years. The mean age of the nurses was 32 years. The mean age of the nurses was 32 years.

Conclusions: Knowledge, attitudes, and practices of contact precautions among Iranian nurses were analyzed. The correlation of knowledge, attitudes, and practices with practice compliance was analyzed. The correlation of knowledge, attitudes, and practices with practice compliance was analyzed. The correlation of knowledge, attitudes, and practices with practice compliance was analyzed. The correlation of knowledge, attitudes, and practices with practice compliance was analyzed. The correlation of knowledge, attitudes, and practices with practice compliance was analyzed.

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Knowledge ≠ Compliance

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<th>Phase 1 (n = 1229)</th>
<th>Phase 2 (n = 1102)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand hygiene before patient contact</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>228</td>
<td>18.7</td>
<td>126</td>
</tr>
<tr>
<td>Hand hygiene after patient contact</td>
<td>704</td>
<td>57.7</td>
</tr>
<tr>
<td>Gowning</td>
<td>387</td>
<td>31.7</td>
</tr>
<tr>
<td>322</td>
<td>26.4</td>
<td>11.7</td>
</tr>
<tr>
<td>Total compliance*</td>
<td>250</td>
<td>67.7</td>
</tr>
<tr>
<td>Hours of observations</td>
<td>Phase 1</td>
<td>Phase 2</td>
</tr>
<tr>
<td>Early morning (6 am-6 am)</td>
<td>337</td>
<td>27.6</td>
</tr>
<tr>
<td>Morning (6 am-12 am)</td>
<td>280</td>
<td>23.0</td>
</tr>
<tr>
<td>Afternoon (12 pm-6 pm)</td>
<td>337</td>
<td>27.6</td>
</tr>
<tr>
<td>Night (6 pm-6 am)</td>
<td>266</td>
<td>21.8</td>
</tr>
</tbody>
</table>

*Total compliance for phase 1 = gloves and gowns; for phase 2 = only gloves.

Undesirable outcome: increased HAI

<table>
<thead>
<tr>
<th>Table 5. Nosocomial infection rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nosocomial infections per 1000 device-days</td>
</tr>
<tr>
<td>BSI</td>
</tr>
<tr>
<td>UTI</td>
</tr>
<tr>
<td>VAP</td>
</tr>
</tbody>
</table>

BSI, bloodstream infection; UTI, urinary tract infection; VAP, ventilator-associated pneumonia.

Our experience

- Staff compliance to Contact Precautions about 50%
- Visitors’ compliance about 5%

Gown and gloves

- But I am not touching the patient!
- I am only serving him his food tray!
- I am just talking to the patient!

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Challenge #3 - Contact precautions: Get Real

- Achieving >90% compliance to Contact Precautions
- What we can do
  - Making it easier for staff to do it right all the time
  - Focus on hand hygiene

Patient and his visitors

- Hand hygiene and patient involvement
  - Patient education
  - Getting them to ask if you have cleaned their hands

Challenge #4

- Developing effective partnership with patients and their families
- What we can do
  - Get them involved

Effectiveness of strategies for informing, educating, and involving patients

Evidence that strategies to strengthen patient engagement are effective is substantial; argue Angela Coulter and Jo Ellis, but any strategy to reduce health inequalities must promote health literacy.

Vision

- Building trained IC professionals
- Example in Korea

Infection control nurse specialist education in Korea

With the amendment of the Nursing Act in 2007, the reference to nurse specialists was added as one of the professions in recognition of their long-standing role in providing infection control services in the context of Indonesian public health practice. Under Community Health Nurse (CHN) regulations, the CHN is expected to protect and educate the public and patients about infection control. Emphasis on professional education and development for infection control nurses in Indonesia.

- 3 graduate schools
- Master’s program for registered nurses with a bachelor’s degree or higher and more than 3 years of experience at an infection control department or more than 6 years of experience at a general hospital

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The changing and expanding roles of the ICPs
- Management
- Engineer
- Educator / facilitator

Challenge #5: Trained ICPs
- Adequate numbers of able IC professionals
- What we can do:
  - Train, train

Conclusion
- MDROs remind us that our IC programs need ‘upgrading’

Conclusion
- 5 pillars need strengthening or work to be done:
  - MDRO program
  - Equipment and environment safety
  - Practical Contact Precautions
  - Patient involvement
  - Trained ICPs

Thank you
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