FIGHTING ANTIMICROBIAL RESISTANCE THROUGH INFECTION PREVENTION AND CONTROL

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Disclosure

No Disclosures
OBJECTIVES

1. Review the current status of Antimicrobial Resistance (AMR) and Infection Prevention and Control (IPC) globally

2. Discuss the role of IPC in the Global action plan in reducing AMR.

3. Review the IPC evidence based strategies for reducing AMR (Hand Hygiene, Standard and Additional Precautions in reducing MDRO’s, bundles, multimodal strategies)

4. Recall a regional example on the Impact of IPC on AMR :- Barbados
Antibiotic-Resistant Bacterial Infections Increasing in the US and Globally

- Analysis of data from US Medical Expenditure Panel Survey\(^1\)
- By 2050, global estimates of the impact of antimicrobial resistance include\(^2\):
  - 10 million deaths per yr, including > 300,000 deaths per yr. in North America
  - Overall global GDP loss of $60 to $100 trillion USD, with 300 million premature deaths

Resistant infections have more than doubled in US since 2000

Added cost of treating a resistant vs sensitive infection: $1383 ($2.2 billion annually)

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We are using a lot of antibiotics worldwide!!

"The development of new antibiotics without having mechanisms to ensure their appropriate use is much like supplying your alcoholic patients with a finer brandy.”
Global Action Plan on AMR
AMR: a Tripartite priority

- Major global public health threat
- Theme of the WHD 2011
- Global Action Plan on AMR
  - FAO and OIE contributions
  - Endorsed by WHA May 2015
- WHO, OIE and FAO Resolutions 2015
  - Presented to Governing Bodies

Final Report

DRUG-RESISTANT INFECTIONS
A Threat to Our Economic Future

March 2017

World Health Organization
Global Action Plan: Priority areas

Members States to develop National Plans on Antimicrobial Resistance by May 2017

1. Improve awareness and understanding of AMR
   - Risk communication
   - Education
   - National AMR surveillance
   - Laboratory capacities
   - Research and development

2. Strengthen knowledge through surveillance and research
   - IPC in health care
   - Community level prevention

3. Reduce the incidence of infection
   - Animal health: prevention and control

4. Optimize the use of antimicrobial medicines
   - Access to qualified antimicrobial medicines, regulation, AMS
   - Use in veterinary and agriculture

5. Ensure sustainable investment in countering AMR
   - Measuring the burden of AMR
   - Assessing investment needs
   - Establishing procedures for participation
Infection prevention and control

Objective 3:
Reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures

IPC
• **Effective hand hygiene**
• Cleaning/sterilization procedures
• Reduce healthcare associated infection

Prevention at community level
• Vaccination
• Hand hygiene
• Environmental sanitation

Animal health:
• Vaccination
• Biosecurity and hygiene
• Sustainable animal production
Ultimate Requirement
In AMR Prevention is IPC

“LOW HANGING FRUIT”
**Figure 1** Factors that influence the acquisition of a nosocomial antibiotic-resistant bacterial infection
Hand hygiene remains the cornerstone of decreasing the transmission of MDROs

• Alcohol-based hand rubs are a cheap, effective and convenient means of performing hand hygiene.

<table>
<thead>
<tr>
<th>Year</th>
<th>Country</th>
<th>Setting</th>
<th>Effect on hand hygiene compliance and/or consumption of alcohol-based handrubs (ABHR)</th>
<th>Impact on MDROs’</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>Spain</td>
<td>Hospital-wide</td>
<td>Significant HH compliance increase from 57% to 85%</td>
<td>Significant reduction of MRSA infections/colonization/10 000 pt-days*</td>
<td>Mestre G et al (25)</td>
</tr>
<tr>
<td>2011</td>
<td>Australia</td>
<td>Nationwide (521 hospitals)</td>
<td>In sites not previously exposed to the campaign, increase of HH compliance went from 43.6% to 67.8%</td>
<td>Significant reduction of overall MRSA BSI (from 0.49 to 0.3497 per 10,000 patients-days) but not of hospital-onset MRSA BSI</td>
<td>Grayson ML et al (10)</td>
</tr>
<tr>
<td>2010</td>
<td>Canada</td>
<td>3 tertiary care hospitals</td>
<td>Significant difference of HH compliance between the intervention group (48.2 %) and the control group (42.6%)</td>
<td>No reduction in MRSA colonization. Intervention group: 48.2%; control group: 42.6%; intervention group: 0.73 cases per 1,000 patient-days, mean in control group, 0.66 cases per 1,000 patient-days (statistically insignificant)</td>
<td>Mertz D et al (8)</td>
</tr>
<tr>
<td>2010</td>
<td>USA</td>
<td>2 acute hospitals</td>
<td>Significant increase of HH compliance from 65% to 82%</td>
<td>51% decrease in hospital-acquired MRSA cases during the 12-month*</td>
<td>Carboneau C et al</td>
</tr>
<tr>
<td>2009</td>
<td>USA</td>
<td>Hospital-wide 7 acute care facilities</td>
<td>Significant increase of HH compliance from 49% to 98% with sustained rates greater than 90%</td>
<td>Significant reduction of MRSA rates from 0.52 to 0.24 episodes/1000 patient days</td>
<td>Lederer JW et al</td>
</tr>
<tr>
<td>2000</td>
<td>Switzerland</td>
<td>Hospital-wide</td>
<td>Significant increase in HH compliance from 48% to 66%. Increased consumption of ABHR from 3.5 to 15.4 L/1000 patient-days</td>
<td>Significant reduction in the annual overall prevalence of HAI (42%) and MRSA* cross- transmission rates (87%). Continuous increase in ABHR use, stable HAI rates and cost savings, in a follow-up study</td>
<td>Pittet D et al (9)</td>
</tr>
</tbody>
</table>
MDR Gram-Negative Bacterial Infections Associated With Increased Mortality

CDC Mortality Estimates, 2013\(^1\)

<table>
<thead>
<tr>
<th>Infection</th>
<th>Estimated Annual Deaths, n</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRE</td>
<td>610</td>
</tr>
<tr>
<td>ESBL-producing <em>Enterobacteriaceae</em></td>
<td>1700</td>
</tr>
<tr>
<td>MDR Acinetobacter</td>
<td>500</td>
</tr>
<tr>
<td>MDR <em>P. aeruginosa</em></td>
<td>440</td>
</tr>
</tbody>
</table>

- Analysis of 9 studies assessing mortality with carbapenem-resistant vs susceptible *Enterobacteriaceae* infection found **increased risk of death with CRE** (N = 985; RR: 2.05; 95% CI: 1.56-2.69)\(^2\)

- Studies frequently report mortality rates of 30% or greater in patients with CRE\(^2-4\)

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How to Prevent Multi-Drug Resistant CRE with IPC

CRE – Carbapenem-Resistant Enterobacteriaceae

Hand Hygiene

Contact precautions if infected/colonized with CRE

Minimize use of devices (ventilator, central line)

Antimicrobial Stewardship

Environmental cleaning

Care bundles have been shown to reduce the incidence of common healthcare-associated infections including:

1. Catheter-associated Urinary Tract Infection,
2. Ventilator-associated Pneumonia,
3. Central Line-associated Bloodstream Infection
4. Surgical Site Infection

• These bundles are relatively inexpensive, and can play an important role in reducing antibiotic use and improving clinical outcomes.
Regional Example on Impact of IPC ON AMR: Barbados

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Case (n = 53), n (%)</th>
<th>Non-Cases (n = 246), n (%)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Female</td>
<td>30 (56.6%)</td>
<td>153 (62.2%)</td>
</tr>
<tr>
<td>Age (years)</td>
<td>Mean (Min, Median, Max)</td>
<td>64.7 (25.65, 95.6)</td>
<td>48.7 (40, 49.102)</td>
</tr>
<tr>
<td>Length of Stay</td>
<td>Mean (Min, Median, Max)</td>
<td>42.5 (1, 15, 746)</td>
<td>27.0 (1, 8, 410)</td>
</tr>
<tr>
<td>&gt;10 days</td>
<td></td>
<td>36 (67.8%)</td>
<td>113 (46.1%)</td>
</tr>
<tr>
<td>Invasive Devices</td>
<td>Mean Number of Devices (Min, Median, Max)</td>
<td>1.02 (0.5)</td>
<td>0.51 (0.5)</td>
</tr>
<tr>
<td>Any Device</td>
<td></td>
<td>35 (66.0%)</td>
<td>76 (31.7%)</td>
</tr>
<tr>
<td>Urinary cath</td>
<td></td>
<td>29 (54.7%)</td>
<td>60 (24.4%)</td>
</tr>
<tr>
<td>Mechanical Ventilation</td>
<td></td>
<td>2 (3.8%)</td>
<td>12 (4.9%)</td>
</tr>
<tr>
<td>Nasogastric Tube</td>
<td></td>
<td>11 (20.8%)</td>
<td>29 (11.8%)</td>
</tr>
<tr>
<td>Invasive Vascular Line</td>
<td></td>
<td>7 (13.2%)</td>
<td>18 (7.3%)</td>
</tr>
<tr>
<td>Antimicrobials</td>
<td>On Antimicrobials</td>
<td>48 (90.6%)</td>
<td>113 (45.9%)</td>
</tr>
<tr>
<td>Mean Number of Antimicrobials (Min, Median, Max)</td>
<td>2.1 (0.2, 6)</td>
<td>0.9 (0.0, 5)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Location</td>
<td>In Intensive Care Unit</td>
<td>5 (9.4%)</td>
<td>1 (0.4%)</td>
</tr>
</tbody>
</table>

Min, Minimum; Max, Maximum; Urinary Catheter, Nasogastric Tube, Intensive Care Unit
*p ≤ 0.05 considered significant

https://doi.org/10.1371/journal.pone.0175791.k001
Incidence of CRKP

Month

Cases identified per 100 admissions

January | February | March | April | May | June | July | August | September | October | November | December

For more information email the Infection Control Department HICO@qeh.gov.bb
THE BUTTERFLY EFFECT

- AMR Coupled With Stewardship Programs, When Implemented Alongside IPC Measures Are More Effective Than Implementation Of ASP Alone\(^1\)

<table>
<thead>
<tr>
<th>CO-IMPLEMENTATION (IPC &amp; ASP) WITH HAND HYGEINE INTERVENTIONS</th>
<th>ANTIBIOTIC STEWARDSHIP ALONE</th>
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<tr>
<td>66% REDUCTION IN ANTIMICROBIAL RESISTANCE</td>
<td>17% REDUCTION IN ANTIMICROBIAL RESISTANCE</td>
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</tbody>
</table>

THANK YOU

YOU ONLY GET OUT WHAT YOU PUT IN.