Views on efficient and cost-effective IPC measures to address AMR in healthcare facilities

Walter Zingg, PD, MD
The increase was driven by low- and middle-income countries, where rising consumption was correlated with gross domestic product per capita (GDPPC) growth ($P = 0.004$).
Only treat bacterial infections
Do not treat colonization/contamination
Re-evaluate prescription after 48 h
Stop treatment when not necessary

Choose initial treatment well
Change for oral treatment when possible

Limit invasive devices
Respect infection control measures
Vaccination

Say no to antibiotics
Use antibiotics wisely
Prevent healthcare associated infections

Dellit TH *Clin Infect Dis* 2007;44:159 (adapted)
How do infection control measures prevent AMR?

Harris SR Lancet Infect Dis 2013;13:130
How do infection control measures prevent AMR?

Diekema DJ *Antimicrob Agents Chemother* 2019;63:e00355

The graph shows the percentage of multidrug-resistant (MDR) Enterobacteriaceae bloodstream infections (BSI) over time, with a trend indicating a decrease in healthcare-associated infections down arrow. The graph includes data for community onset, hospital onset, and overall infections.
Transmission

...hand hygiene
...glove use
...work load
Infections with MRSA occurred during periods when nurses were, on average, overloaded by more than 25% in a surgical ICU in Slovenia

<table>
<thead>
<tr>
<th>Daily TISS score</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 150</td>
<td></td>
</tr>
<tr>
<td>151-200</td>
<td></td>
</tr>
<tr>
<td>201-250</td>
<td></td>
</tr>
<tr>
<td>&gt;250</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Patient days, N</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>317</td>
<td>1096</td>
</tr>
<tr>
<td>332</td>
<td></td>
</tr>
<tr>
<td>248</td>
<td></td>
</tr>
<tr>
<td>199</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MRSA transmissions, N</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>47</td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nursing care days, N</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1311</td>
<td>6876</td>
</tr>
<tr>
<td>1980</td>
<td></td>
</tr>
<tr>
<td>1804</td>
<td></td>
</tr>
<tr>
<td>1783</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>MRSA transmission per 100 nursing care days</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.000</td>
<td>0.683</td>
</tr>
<tr>
<td>0.202</td>
<td></td>
</tr>
<tr>
<td>0.721</td>
<td></td>
</tr>
<tr>
<td>1.682</td>
<td></td>
</tr>
</tbody>
</table>

TISS: Therapeutic Intervention Scoring System

Blatnik J J Hosp Infect 2006;63:162
Correlation of MRSA and bed occupancy in the medical wards of a University-affiliated hospital in Malta

Borg MA Infect Control Hosp Epidemiol 2008;29:496
Hand hygiene opportunities and compliance

On average, 22 opp / hour for an ICU nurse

(adapted from ) Pittet D Ann Intern Med 1999; 130: 126
Contamination of gloves during patient care

<table>
<thead>
<tr>
<th>MDR pathogens</th>
<th>Hands contaminated before room entry</th>
<th>Contaminated gloves</th>
<th>Hands after glove removal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meticillin-resistant <em>Staphylococcus aureus</em></td>
<td>3.2%</td>
<td>11.2%</td>
<td>3.3%</td>
</tr>
<tr>
<td>Vancomycin-resistant Enterococci</td>
<td>0.6%</td>
<td>10.0%</td>
<td>1.7%</td>
</tr>
<tr>
<td>MDR <em>Pseudomonas aeruginosa</em></td>
<td>3.4%</td>
<td>17.4%</td>
<td>3.5%</td>
</tr>
<tr>
<td>MDR <em>Acinetobacter baumannii</em></td>
<td>5.1%</td>
<td>29.3%</td>
<td>4.2%</td>
</tr>
</tbody>
</table>
ABHR consumption
(L/1000 bed-days)

Clinical isolates of ESBL-producing *E. coli* and *Klebsiella* spp.
(N/100 discharges)

Johnson PDR Med J Australia 2005;183:509
Correlation between beds equipped with alcohol hand rub and the composite index of AMR, ECDC-PPS 2016-2017

ECDC point prevalence survey in European acute care hospitals, 2016-2017 (Courtesy: Suetens C)
Transmission

...isolation precaution measures
Containment of a country-wide outbreak of carbapenem-resistant *Klebsiella pneumoniae* in Israel

Physical separation of hospitalized carriers of carbapenem-resistant Enterobacteriaceae - audits

Pre-intervention (retrospective data)

Intervention period (prospective data)

Schwaber MJ *Clin Infect Dis* 2011;52:848
Correlation between single room beds and the composite index of AMR, ECDC-PPS 2016-2017

ECDC point prevalence survey in European acute care hospitals, 2016-2017 (Courtesy: Suetens C)
Healthcare-associated infections
Is hand hygiene effective?

![Graph showing the effectiveness of hand hygiene over time.](image)

**Graph:**
- **X-axis:** Year (1993 to 1998)
- **Y-axis 1:** Attack rates of MRSA (cases per 100 admissions)
- **Y-axis 2:** Nosocomial infections (cases per 100 admissions)

**Legend:**
- Bars: Attack rates of MRSA
- Black dots: Nosocomial infections

**Notes:**
- The graph shows a decreasing trend in nosocomial infections and MRSA attack rates from 1993 to 1998.
- Hand hygiene measures implemented during this period may have contributed to the observed improvements.

A multifactorial action plan improves hand hygiene adherence

RESULTS

There were 63,375 unobtrusive HH observations during the April 2006 to September 2012 study period. There was an overall increase in the hospital-wide HH adherence (Fig 1), from 58% at the start of the program in April 2006, to a mean of 80.5% in 2007 (P = 0.015, comparison of 2006 and 2007 HH adherence data, Student t test, 2-tailed, 2-sample unequal variance), to a mean of 88% in 2009 (P < 0.001, comparison of 2009 and 2006 HH adherence data, Student t test, 2-tailed, 2-sample unequal variance; P = 0.019, comparison of 2009 and 2007 HH adherence data, Student t test, 2-tailed, 2-sample unequal variance), to a mean of 96% in 2011 (P < 0.001, comparison of 2011 and 2006 HH adherence data, Student t test, 2-tailed, 2-sample unequal variance; P < 0.001, comparison of 2011 and 2009 HH adherence data, Student t test, 2-tailed, 2-sample unequal variance), and then to 98% in September 2012 (P < 0.001, comparison of 2012 and 2006 HH adherence data, Student t test, 2-tailed, 2-sample unequal variance; P < 0.001, comparison of 2012 and 2009 HH adherence data, Student t test, 2-tailed, 2-sample unequal variance; P = 0.03, comparison of 2012 and 2011 HH adherence data: Student t test, 2-tailed, 2-sample unequal variance).

The number of monthly HH observations before March 2011, when all observations were conducted by 8 members of the Infection Prevention and Control Department staff, was typically between 300 and 350. After March 2011, with an increase to more than 75 trained (primarily supervisory) HCW observers, the number of monthly HH observations increased to approximately 3000.

The program started with HH education and implementation of a central line bundle in spring 2006. These components substantially increased the overall HH adherence rate to just below 90%. After implementation of all components of the hand hygiene action plan, the HH adherence rate increased further to 98%. HH compliance rates continued at 98%-99% as of November 2013. The HH adherence rate increased after full implementation of the hand hygiene action plan in various groups of HCWs, including nurses (99%), physicians (96%), and food services staff (99%). When the project began in April 2006, the rate of HH adherence for nurses and physicians was 55%.

Before training and deployment of unit-based observers in March 2011, there was likely a short-term improvement in HH adherence rates because of the Hawthorne effect. Observers were known Infection Prevention and Control Department staff, and observations were recognizable. With unit-based observers, the unobtrusive observations were more likely to be unrecognized. Thus, rates after March 2011 are more likely to be consistent with unobserved rates, making the significant improvement in adherence more striking.

The CLABSI rate decreased significantly over the course of the study period, from 4.08 per 1,000 device-days in April-September 2006 to 1.13 per 1,000 device-days in March 2011 and to 0.42 per 1,000 device-days in April-September 2012. To examine the potential lives saved and economic impact of the HH action plan, we took a closer look at our CLABSI reporting over the course of the study period. Between July 2006 and June 2007, we reported 59 CLABSIs, compared with only 7 CLABSIs between July 2010 and June 2011 and 9 CLABSIs between July 2011 and June 2012. This equates to approximately 50 fewer infections per year and 9 fewer deaths per year attributed to CLABSI, assuming an 18% mortality rate from this infection.
PROHIBIT CLABSI prevention study

59,122 hand hygiene opportunities

p < 0.0001

van der Kooi T *Intensive Care Med* 2018;44:48
PROHIBIT CLABSI prevention study

Trend already during baseline [HRsub 0.93; (0.84–1.02) per quarter]

(RR 0.39; 95% CI, 0.32–0.48; p < 0.0001)
Cost
"The budget was about AUD$3.20 per hospital admission - ie about two-thirds the price of a Big Mac"

Grayson L (personal communication)
The most effective for AMR prevention are “standard precaution measures”

...which are the minimum of best practice procedures

...and are not to be challenged in cost-effectiveness discussions
Behaviour change interventions do not need much technology...

...but social investment (and an IPC team!)
Views on efficient and cost-effective IPC measures to address AMR in healthcare facilities

Thank you for your attention

Walter Zingg, PD, MD