HARMONISATION OF INFECTION CONTROL: MISSION IMPOSSIBLE?

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EUCIC Chair
ATTENTION SPAN

• “Attention span” refers to the amount of time an individual can remain focused on a task without becoming distracted.
• Current researchers argue that the average attention span of American adults has dropped and it is limited to 20, 10, or even five minutes.
Road map

Harmonisation

Germs are small .... but still scary
Infection prevention works

Infection control
Road map

Sources of heterogeneity

Corrective actions
Consistently changes
Often unpredictable
Usually exciting
Incredibly rewarding for health impact
DOCTORS WORKING IN INFECTIOUS DISEASE AND HIV EARN LESS

Evelina Tacconelli @EvelTacconelli · 30 apr
Could be this the reason why some of us are so smart, thoughtful and funny? A sort of positive selection bias....

Eli Perencevich @eliowa
Why aren't folks choosing Infectious Diseases as a subspecialty? Extra training and lowest SALARY haircontroversies.blogspot.com/2016/04/the-de... by @mike_edmond
IF NOT TACKLED, RISING AMR COULD HAVE A DEVASTATING IMPACT

By 2050, the death toll could be a staggering one person every three seconds if AMR is not tackled now.

http://amr-review.org/
CR-Klebsiella spp.
First OUTBREAKS & total numbers
Laxminarayanmì, LID 2016
**TABLE 1. Contact Isolation Practices for Multidrug-Resistant (MDR) Bacteria, Reported by Society for Healthcare Epidemiology of America Research Network Members**

<table>
<thead>
<tr>
<th></th>
<th>MRSA</th>
<th>VRE</th>
<th>ESBL-producing bacteria</th>
<th>CRE</th>
<th>MDR* Pseudomonas</th>
<th>MDR* Acinetobacter</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Isolate patients with this organism (n = 66)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>United States (n = 46)</td>
<td>100.0</td>
<td>100.0</td>
<td>87.0</td>
<td>95.7</td>
<td>87.0</td>
<td>89.1</td>
</tr>
<tr>
<td>International (n = 20)</td>
<td>80.0</td>
<td>80.0</td>
<td>45.0</td>
<td>90.0</td>
<td>70.0</td>
<td>75.0</td>
</tr>
<tr>
<td><strong>Duration of isolation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isolate patients with this organism (n = 62)</td>
<td>6.5</td>
<td>9.7</td>
<td>8.2</td>
<td>6.5</td>
<td>7.4</td>
<td>7.1</td>
</tr>
<tr>
<td>United States (n = 49)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duration of hospitalization</td>
<td>12.9</td>
<td>11.3</td>
<td>26.5</td>
<td>12.9</td>
<td>27.8</td>
<td>28.6</td>
</tr>
<tr>
<td>Until negative surveillance cultures</td>
<td>64.5</td>
<td>50.0</td>
<td>32.7</td>
<td>29.0</td>
<td>35.2</td>
<td>33.9</td>
</tr>
<tr>
<td>Indefinitely</td>
<td>41.3</td>
<td>24.2</td>
<td>34.7</td>
<td>43.5</td>
<td>31.5</td>
<td>33.9</td>
</tr>
<tr>
<td>How soon cultures may be obtained*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isolate patients with this organism (n = 31)</td>
<td>45.0</td>
<td>54.8</td>
<td>37.5</td>
<td>44.4</td>
<td>42.8</td>
<td>42.1</td>
</tr>
<tr>
<td>United States (n = 16)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>After completion of antibiotics</td>
<td>15.0</td>
<td>19.4</td>
<td>25.0</td>
<td>22.2</td>
<td>14.3</td>
<td>21.1</td>
</tr>
<tr>
<td>After hospital discharge</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;3 months</td>
<td>12.5</td>
<td>19.4</td>
<td>12.5</td>
<td>27.8</td>
<td>28.6</td>
<td>26.3</td>
</tr>
<tr>
<td>≥1 year</td>
<td>7.5</td>
<td>6.5</td>
<td>0.0</td>
<td>5.6</td>
<td>0.0</td>
<td>5.3</td>
</tr>
<tr>
<td>Isolate readmitted patients</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>77.8</td>
<td>74.6</td>
<td>55.6</td>
<td>72.1</td>
<td>53.2</td>
<td>58.1</td>
</tr>
<tr>
<td>Allow cohorting (n = 66)</td>
<td>54.5</td>
<td>42.4</td>
<td>21.2</td>
<td>18.1</td>
<td>19.7</td>
<td>21.2</td>
</tr>
<tr>
<td>Perform active surveillance in at least one area of hospital (n = 66)</td>
<td>75.8</td>
<td>34.8</td>
<td>18.2</td>
<td>21.2</td>
<td>7.5</td>
<td>15.2</td>
</tr>
</tbody>
</table>

*Drees, ICHE 2014*
MDR: a word with hundreds of meanings....

- > 3 antibiotic classes
  - Acinetobacter (44%)
  - Pseudomonas (35%)
  - Enterobacteriaceae (35%)
- 14 definitions for Acinetobacter
- 18 definitions for Pseudomonas
- 22 definitions for Enterobacteriaceae

Disagreement or excess of fantasy?

Drees, ICHE 2014
Figure 4.9: *Klebsiella pneumoniae*: percentage (%) of invasive isolates with resistance to third-generation cephalosporins, by country, EU/EEA countries, 2011

- ≤ 1%
- 1% to ≤ 5%
- 5% to < 10%
- 10% to ≤ 25%
- 25% to ≤ 50%
- ≥ 50%
- No data reported or less than 10 isolates
- Not Included

**WHY?**

Non-visible countries
- Liechtenstein
- Luxembourg
- Malta
Most frequent explanations for differences (personal data)

- The Head of the Division is a dummy
- The Head of the Department cares only about his private patients
- The nurses are not trained
- The nurses are not motivated
- The young fellows are not as we were when we were young

1. The economic crisis
2. The hospital architecture
3. The weather
4. Culture of the country
5. The lack of infection control practitioners
1. It's the economic crisis

Granados, Health Policy 2015
Economic crisis and communicable disease control in Europe: A scoping study among national expert

Table 2
Likely impact of the economic crisis on aspects of communicable disease control systems and health services.

<table>
<thead>
<tr>
<th>Aspects of the health system for the control of communicable diseases</th>
<th>Number of respondents</th>
<th>Will deteriorate (%)</th>
<th>Will improve (%)</th>
<th>Don't know (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial resources</td>
<td>27</td>
<td>85.2</td>
<td>3.7</td>
<td>11.1</td>
</tr>
<tr>
<td>Human resources</td>
<td>25</td>
<td>72.0</td>
<td>4.0</td>
<td>24.0</td>
</tr>
<tr>
<td>Non-physical infrastructure/networks (e.g. provision of vaccines, laboratory network, etc.)</td>
<td>28</td>
<td>57.1</td>
<td>17.9</td>
<td>25.0</td>
</tr>
<tr>
<td>Physical infrastructure (e.g. buildings, equipment, etc.)</td>
<td>26</td>
<td>42.3</td>
<td>15.4</td>
<td>42.3</td>
</tr>
</tbody>
</table>

Aspects of the health service for the control of communicable diseases

<table>
<thead>
<tr>
<th>Prevention of disease</th>
<th>In-patient care</th>
<th>Surveillance</th>
<th>Out-patient care/follow-up care</th>
<th>Primary care</th>
</tr>
</thead>
<tbody>
<tr>
<td>68.0</td>
<td>50.0</td>
<td>44.0</td>
<td>44.0</td>
<td>28.0</td>
</tr>
<tr>
<td>20.0</td>
<td>16.7</td>
<td>24.0</td>
<td>16.0</td>
<td>32.0</td>
</tr>
<tr>
<td>12.0</td>
<td>33.3</td>
<td>32.0</td>
<td>40.0</td>
<td>40.0</td>
</tr>
</tbody>
</table>

Rachel, Health Policy 2011
The evidence does not support the claim that there is a health crisis in Greece. On the basis of the extant evidence, claims of a public health tragedy in Greece seem overly exaggerated.

Granados, Health Policy 2015
2. It is the weather

Stenseth et al. (2006)
Geographic variability and BSI due to gram-negative

Fisman Plos One 2014
3. It’s the country’s culture.
28% of the total variation in antibiotic resistance among countries is attributable to variation in antibiotic usage.
Corruption is the main socioeconomic factor that explains antibiotic resistance.

The income level of a country appeared to have no effect on resistance rates in the multivariate analysis.
Results

Outbreak distribution by infection site and etiology

Tacconelli E, ECCMID 2016
Country-specific antibiotic use practices impact the human gut resistome

Forslund, Genome Res 2013
I do not see – I do not hear – I do not speak...

is not more acceptable
What did you do between…

| Table 1. Incidence of *Klebsiella* spp. infections and isolation percentages by year |
|---------------------------------|---|---|---|---|---|---|---|---|
|                                | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | Total |
| Number of *Klebsiella* spp. isolates | 122 | 127 | 118 | 118 | 104 | 100 | 124 | 840 |
| % of *Klebsiella* spp. among NI isolates   | 11.7 | 10.3 | 9.3 | 8.2 | 7.5 | 8.5 | 9.2 | 10.1 |
| % of *Klebsiella* spp. among Gram-negative isolates | 17.1 | 16.3 | 14.4 | 13.4 | 11.8 | 13.5 | 13.8 | 14.9 |
| % of carbapenem resistance               | 0    | 3.1 | 2.7 | 3.3 | 4.8 | 10  | 10.4 | 5    |
Can we do something?

Sypsa, PlosOne 2012
Transmission of CPKP in a Surgical Unit

Control measures

- $p=60\%$
- $p=80\%$
- $p=60\% + 60\%$ reduction of colonized admissions
- $p=60\% + 90\%$ reduction of colonized admissions
- $p=80\% + 90\%$ reduction of colonized admissions

Prevalence of CPKP colonization (%)

Days since the introduction of one CPKP colonized patient

Sypsa, PlosOne 2012
HOW SURVEILLANCE CAN IMPROVE HEALTH OUTCOMES

Globally
Provide early warnings of emerging threats and data to identify and act on long-term trends

Nationally
Guide policy and ensure appropriate and timely public health interventions

Locally
Allow healthcare professionals to make better informed clinical decisions to ensure better patient outcomes
Glycopeptide consumption and prevalence of BSI due to MRSA, VSE and CoNS
COMBACTE – The Pillars

**CLIN-Net:** a high-quality clinical research network in all European countries; to develop GCP training program and offer certification.

**LAB-Net:** a high-quality laboratory network in all European countries; to assess existing laboratory methods and quality, develop specimen and strain repository.

**STAT-Net:** a high-quality network of statistical experts; to develop novel trial design strategies, improve of clinical trial delivery, conduct of advanced biostatistical and PK/PD modelling studies.

**EPI-Net:** the highest quality network of epidemiologic surveillance experts and stakeholders in Europe; to map current systems, define methodological challenges and develop research strategy addressing them, pursue consensus for best-practices, support and guide antimicrobial development.
EFFORTS TO HARMONISE THE COLLECTION AND INTERPRETATION OF DATA ARE ESSENTIAL AND MUST CONTINUE

- Whether current surveillance system methods form the best basis for a **sustainable and cost-effectiveness** surveillance in EU needs to be discussed
- Hospital information systems become gradually more sophisticated throughout EU and an **increasing amount of data is made available for electronic data collection** on infections and risk factors
- Increased patients / individuals **mobility within the countries**
- **Extension** or establishment of other surveillance components
- Surveillance systems should be capable of capturing **clusters of other emerging pathogens** or unusual variants of old pathogens
- Accumulate risk factor data to analyse the elements of **patient demographics that provide the environment for drug resistance to emerge** (DRIVE-AB outcome)
- **Integrated schemes of patients, animals and food**
LOWERING DEMAND FOR ANTIMICROBIALS AND REDUCING UNNECESSARY USE

- Public awareness
- Sanitation and hygiene
- Antibiotics in agriculture and the environment
- Vaccines and alternatives
- Rapid diagnostics
- Human capital

Demand

Quantity

http://amr-review.org/
Antimicrobial stewardship: systems and antimicrobial medicine use

NICE guidelines [NG15] Published date: August 2015

Implementing an Antibiotic Stewardship Program: Guidelines by the Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America

1. Übermäßiger Einsatz und unsachgemäßer Gebrauch von Antibiotika ist ein Hauptgrund für Antibiotika-Resistenz
2. Antibiotika-Resistenz und damit verbundene Mortalität steigen weltweit
3. Die Antibiotika-"Pipeline" ist derzeit leer

Kein Patient sollte unnötig Antibiotika bekommen

NOT ist ein Projekt der UKT gegen übermäßigen Gebrauch von Antibiotika
Zusammenfassung der Woche (21. bis 28.02.)

Anzahl der Patienten in der Notaufnahme: 195

1. Patienten (5,7%) waren nicht gemäß NTG Empfehlungen behandelt
2. Patienten, die keine schriftlich niedergeschriebene Indikation für AB-Therapie hatten: 3 (0,7%)

WICHTIGSTE ERGEBNISSE

- Antibiosegabe bleibt weiter niedrig
- Keine Mesopenis-Gäbel
- Außer schriftlich niedergeschriebene Indikation für AB-Therapie hatte: 0,7% der Fälle

KULTUREN AUS ERGEBNIS

<table>
<thead>
<tr>
<th>Kultur</th>
<th>Menin (4)</th>
<th>Enterobacter (3)</th>
<th>E. coli (1)</th>
<th>Proteus mirabilis (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>2 (100%)</td>
<td>1 (50%)</td>
<td>1 (50%)</td>
<td>1 (50%)</td>
</tr>
</tbody>
</table>

Ihr NOT Team

Infektiologe, Innere Medizin
Eleven QIs were extracted and sent to the expert group for evaluation.

After three rounds of consultation 6 QIs were classified as “relevant” and were included as recommendation in a 5-day ABC-Bundle.
Is something else?

- PubMed search 1990-2014: infection control and MDR gram negative: 645 articles
- Restriction:
  - Carbapenem resistant Enterobacteriaceae 70
- 45% of the paper included more than 100 patients
- 95% of the paper did not mention any issue related to infection control
"WHO ARE YOU TO JUDGE THE LIFE I LIVE? I KNOW I'M NOT PERFECT AND I DON'T LIVE TO BE, BUT BEFORE YOU START POINTING FINGERS, MAKE SURE YOUR HANDS ARE CLEAN"

kushandwizdom.tumblr
bobmarley
Increased procurement of AHR was strongly independently associated with reduced rates of MRSA BSI and *C difficile* infection, as were publication of the Health Act 2006 and trust visits by Department of Health improvement teams. These associations remained after adjustment for other interventions.

Stone, BMJ 2012
ESCMID guidelines for the management of the infection control measures to reduce transmission of multidrug-resistant Gram-negative bacteria in hospitalized patients

E. Tacconelli\textsuperscript{1}, M. A. Cataldo\textsuperscript{2}, S. J. Dancer\textsuperscript{3}, G. De Angelis\textsuperscript{4}, M. Falcone\textsuperscript{5}, U. Frank\textsuperscript{6}, G. Kahlmeter\textsuperscript{7}, A. Pan\textsuperscript{8,9}, N. Petrosillo\textsuperscript{2}, J. Rodríguez-Baño\textsuperscript{10,11,12}, N. Singh\textsuperscript{13}, M. Venditti\textsuperscript{5}, D. S. Yokoe\textsuperscript{14} and B. Cookson\textsuperscript{15}
• 10 studies
• Overall quality: moderate
• There is evidence (level ++) from studies that report MULTI-FACETED INFECTION CONTROL BUNDLES for the effectiveness of early implementation of:

a) active surveillance (screening) by rectal screening for ESBL-E carriage on admission to specific wards/units;
b) pre-emptive isolation of high-risk patients upon admission;
c) active surveillance during outbreaks

Magiorakos, Tacconelli, Borg, Burns, Dumpis, Lucet, Moro, Rodríguez-Baño, Skov Simonsen, Szilágyi, Weber, Voss; December 2014
Quality of evidence by intervention and microorganism in outbreaks in ESCMID guidelines

<table>
<thead>
<tr>
<th>Intervention</th>
<th>MDR A. baumannii</th>
<th>MDR P. aeruginosa</th>
<th>MDR K. pneumoniae</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand hygiene (HH)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>contact precautions (CP)</td>
<td></td>
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<tr>
<td>Active surveillance cultures (ASC)</td>
<td></td>
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</tr>
<tr>
<td>Alert code and pre-emptive CP</td>
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<tr>
<td>Cohort patients</td>
<td></td>
<td></td>
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<tr>
<td>Cohort staff</td>
<td></td>
<td></td>
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<tr>
<td>environmental cleaning (EC)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>isolation room</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>environmental screening</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Healthcare-workers (HCWs) screening</td>
<td></td>
<td></td>
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<tr>
<td>Chlorhexidine gluconate for patient bathing</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Otter and Tacconelli, CMI 2016
MDR-GN
Failure of interventions

- Overall failure rate: 31%
- Risk factors:
  - not applying a bundle approach (45% vs 28%)
  - endemic situation (47% vs 27%)
  - MDR *P. aeruginosa*.

  Tacconelli (under submission)

- Endemic setting:
  - lack of implementation of HH plus EDU (RR 4.7)
  - lack of implementation of HH plus CP (RR 1.8)

- Epidemic setting:
  - lack of implementation of HH plus PI plus CP (RR 2.3)
  - lack of implementation of HH plus PE plus CP plus ASC (RR 1.7).
http://www.flightradar24.com/  17.03 um 17:35 Uhr
Travel-associated faecal colonization with ESBL-Enterobacteriaceae

262 travellers
Before travel: 2.4%
After travel: 30%
Risk factors: Indian subcontinent, Asia and Africa north of the equator

Ostholm-Balkhed, JAC 2013
Finding friends with the same mental disorder as you...

Priceless!

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Would you like to contribute?

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  Advisory Board Representative Belgium
• Dr. Nico T. Mutter
  Scientific Coordinator

European Committee on Infection Control (EUCIC)
Infection prevention and control: an ESCMID priority!
Major Goals

Contribution to the harmonization and standardization of IPC procedures

Development of new educational and training tools

Development of new EU network of excellence centers to run clinical research on IC
If you wait until you can do everything for everybody, instead of something for somebody, you'll end up not doing anything for anybody.
The Ethical Significance of Antimicrobial Resistance

- AMR is a distinct ethical issue.
- Successful responses to the problem of AMR will **not only be a scientific or medical undertaking**, it must also be an ethical undertaking.
- Every level of an AMR response (improving surveillance and reporting, reducing ATB usage, ..) strategy will inevitably involve **making decisions with ethical implications**.
- Promoting research and innovation into different preventative, diagnostic and therapeutic interventions will require us to make funding and allocation decisions that **prioritise AMR over other important projects and policies**.

*Littmann, Public Health Ethics*
Antimicrobial stewardship including ER

1. Sepsis
2. Infection control
3. ATBS

Prediction of future resistance
www.drive-ab.eu

Surveillance of MDR
www.combacte.com

1. Education
2. Gap analysis for implementation in EU
www.escmid.org
Conclusions

• Extended heterogeneity of infection control measures plays a significant role in the rapid spread of ARB worldwide and related morbidity and mortality.
• Some of these deaths are avoidable.
• The difference between countries cannot be totally explained on the basis of health investment or geographic variability.
• It is time to set up minimum criteria for IC that must be satisfied in all countries.
• Responsibility lies in the hand of the single doctor as well as in international and national societies.
• To increase society and political attention we need to better quantify the burden of ARB and HAIs.
WHAT WE CAN'T DO ALONE
WE CAN DO TOGETHER

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