Antimicrobial resistance in the hospital

Jesús Rodríguez-Baño
Intercentre Infectious Diseases and Clinical Microbiology Department
Hospital Universitario Virgen Macarena and Virgen del Rocío, Seville, Spain
Spanish Network for Research in Infectious Diseases (REIPI)
No conflicts of interest for this talk

This is nothing to do with an evidence-based approach

Just trying to open a debate...
• MDRO
  – Cause 25.100 extra deaths per year
  – Cost EUR 1.5 billion per year
Duration of hypotension before initiation of effective antimicrobial therapy is the critical determinant of survival in human septic shock*
Agnensitive versus conservative initiation of antimicrobial treatment in critically ill surgical patients with suspected intensive-care-unit-acquired infection: a quasi-experimental, before and after observational cohort study

Tjasa Hranjec, Laura H Rosenberger, Brian Swenson, Rosemarie Metzger, Tanya R Flohr, Amani D Politano, Lin M Riccio, Kimberley A Popovsky, Robert G Sawyer

Lancet Infect Dis 2012; 12: 774-80

 Aren’t there patients in whom it is safe to wait?

Can we identify them?
**Blood culture: *Klebsiella pneumoniae***

<table>
<thead>
<tr>
<th>Antibiotic</th>
<th>Sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ampicillin</td>
<td>R</td>
</tr>
<tr>
<td>Amox/clav</td>
<td>R</td>
</tr>
<tr>
<td>Pip/taz</td>
<td>R</td>
</tr>
<tr>
<td>Cefotaxime</td>
<td>R</td>
</tr>
<tr>
<td>Ceftazidime</td>
<td>R</td>
</tr>
<tr>
<td>Meropenem</td>
<td>R (8 mg/L)</td>
</tr>
<tr>
<td>Aztreonam</td>
<td>R</td>
</tr>
<tr>
<td>Ciprofloxacin</td>
<td>R</td>
</tr>
<tr>
<td>Gentamycin</td>
<td>S</td>
</tr>
<tr>
<td>Fosfomycin</td>
<td>S</td>
</tr>
<tr>
<td>Tigecycline</td>
<td>R</td>
</tr>
<tr>
<td>Colistin</td>
<td>R</td>
</tr>
</tbody>
</table>

- **2-3 active drugs**
  - Carbapenems if possible
  - Meropenem 2g/8h (ei)
    - Gentamicin 5 mg/kg
    - Fosfomycin 4 g/6h

Based on 2 retrospective cohort studies (this combination is not studied)

Tumbarello, CID 2012. Qureshi AAC 2012
Therapy

• Increased mortality due to
  – Delayed active therapy
  – Non-adequate target therapy

• Empirical therapy rely on non-accurate clinical diagnosis leading to
  – Low sensitivity: delay
  – Low specificity: overtreatment

• Best targeted therapy unknown
Proposal 1

- We need large-scale, multinational randomised controlled trials with old antibiotics and combinations*
- We need to increase the sensitivity and specificity in our decisions
  - Improved clinical and epidemiological assessment*
  - Biomarkers, rapid microbiological tests
  - Antibiotic stewardship tools 24h/d, 7d/week*

*Neglected
Surveillance

- Clinical samples – 30-65% of colonised patients
Influx of MDRO/genes into hospitals

• Resistance genes are out there!!
  – D’Costa et al, Science 2006

• Community and LTCF
  – CA-MRSA (D’Agata, Clin Infect Dis 2009)
  – Epidemiological data suggested also for OXA-48, NDMs
The Troyan horse model

- Non-adverted influx of resistance genes from the community
- Logarithmic expansion within the hospital
- Secondary spread out of the hospital
Proposal 2

• Dedicate resources to accomplish universal screening at hospital admission (plus periodical screening in units with suspected transmission)
## What’s in a word

<table>
<thead>
<tr>
<th>“Outbreak”</th>
<th>New</th>
<th>Let’s do it!!</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Interesting</td>
<td>Yes, we can!!</td>
</tr>
<tr>
<td></td>
<td>Challenge (rewarding!)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>“Endemic”</th>
<th>Routine</th>
<th>There are other priorities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boring</td>
<td>Not a low hanging fruit...</td>
</tr>
<tr>
<td></td>
<td>Non affordable</td>
<td></td>
</tr>
</tbody>
</table>
Non-apparent clusters (clinical epidemiology)
Clinical & molecular epidemiology
Proposal 3

• Local epidemiology of MDRO must be characterised in all centers
  – Detailed epidemiology
  – Molecular typing
Rate of MDRO, Hospital Universitario Virgen Macarena

MRSA

A. baumannii

ESBL-K. pneumoniae

ESBL-E. coli

Pooled rate, all Andalusian hospitals
Rate, Hosp. Univ. V. Macarena
Why are rates so different between hospitals and countries?

- Climate?? Community rate??
- Yes, but...
  - Individual rooms vs 3-bed rooms, open units
  - Staffing
  - Antibiotic use
  - Environmental cleaning
  - Adherence to hand hygiene and precautions
  - AS and IC programs
Percentage of responders “I believe there is a god”

Source: Eurobarometer, 2005
Proposal 4

• Dedicate resources to
  – renovate hospitals (individual rooms)
  – adequate staffing
  – quality controlled hospital cleaning
  – compulsory hand hygiene
  – empowered AS and IC teams

• Will that make screening unnecessary?
  • Huang et al, NEJM 2013
MDRO

• Cause 25.100 extra deaths per year
• Cost EUR 1.5 billion per year
13th ESCMID Summer School
Sigtuna, Sweden
July 5th - July 12th 2014

Organizers:
Emmi Andersson, Tibor Paul