Antimicrobial stewardship in practice

Prof. Céline Pulcini
Infectious Diseases specialist
Nancy, France
ESGAP secretary

Dr. Pilar Retamar Gentil
ID&C&M&PM Department
HUV. Macarena, Seville
Spain
Introduction and resources
Definition - **Antimicrobial stewardship**

Prescription:

- The most efficient for the patient
- With as few side effects as possible: toxicity, *Clostridium difficile* infections and selection of resistance

Dellit TH *et al.* Clin Infect Dis. 2007;44(2):159-77
Interested in AMS... Join ESGAP!
References for further reading

- WHO: http://www.who.int/drugresistance/en/
- CDC: http://www.cdc.gov/drugresistance/
- UK: https://www.gov.uk/government/collections/antimicrobial-resistance-amr-information-and-resources
- Practical guide (D. Nathwani et al.): http://www.biomerieux-industry.com/node/886
Antimicrobial Stewardship: Managing Antibiotic Resistance

Join now – started 28 Sep

INTRODUCTION

Understand antibiotic resistance, and how antimicrobial stewardship can slow down or reduce it, with this free online course

WATCH THE TRAILER

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How to start an ASP?
Case 1

- 450-beds secondary hospital
- The Manager Director calls the Pharmacy Department Head: great increase in meropenem consumption...so he calls the ID Department Head...

- What to do now?
AB stewardship

Taking care of Abs while others are using them
Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America Guidelines for Developing an Institutional Program to Enhance Antimicrobial Stewardship

Evidence-base recommendations

PROGRESSIVE IMPLEMENTATION:
- Basic
- Advance
- Excellent
Implementing an Antibiotic Stewardship Program: Guidelines by the Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America

How to start an ASP?

1. Look for an opportunity for institutional support
2. Create a Team
3. Describe a basal situation
4. Establish priority targets
5. Present a protocol to your Hospital Director
6. Balance your resources/targets
7. Redefine a protocol: possible interventions
8. Present it to your colleagues
How to start an ASP?: The TEAM

- Is there an ASP team in your hospital?

- Do you know who belongs to the ASP team?

- Do you think they should include anyone more? Why?
The TEAM: core elements

- Clinical Microbiologist
- Pharmacist
- ID physician
- Data manager
- Epidemiologist

Dellit et al. CID 2007
How to start a ASP: the basal situation

- What information is essential to plan an ASP?

- What information is available in your setting?

  - To start with:
    - Pharmaceutical data
    - Microbiological data
    - Demographic data
At least....

Consumo de Antimicrobianos (DDD/100 estancias)

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PROA HUV. Macarena
How to start a ASP: confronting targets and resources

Basal situation

- Facilities
  - Place to meet
  - Informatic support
  - Lab-facilities
  - E-prescription

- Human resources
  - Pharmacist
  - Micro-lab
  - Clinicians
  - Data managing

Define a PROGRAM

Reports-measurements
Interventions
Feedback reports
The ASP PROGRAM&TEAM...
before start:

- Present it to your Manager Director.
- Present it to your colleagues....
ASP: the best intervention
Case 2

The Hospital Director call us:

“……some notifications have been reported regarding septic patients in the vascular unit. Most of them are being treated with linezolid…..”

How should the ASP team react?
Time for work!

- Bring together your team! and:
  - Describe the situation
  - Consider the resource/intervention implemented at that moment and evaluate
  - Plan an intervention (included target physician as collaborators in that intervention)
Which is the best intervention?

[Intervention Review]
Interventions to improve antibiotic prescribing practices for hospital inpatients

Peter Davey, Erwin Brown, Esmina Chatani, Lynda Felson, Ian M Gould, Alison Holme, Craig R Ramsey, Philip J Wiffen, Mark Wilcox
Different interventions...

- What interventions are implemented in your hospital?
- Have you ever taken part in any ASP intervention? How did you feel?
- Do you know the results of such interventions?
Restrictive interventions

- Pharmacy availability
- Pre-solicited form
- Cycling disposal

Evaluation of antimicrobial orders circumventing antimicrobial stewardship programs: Investigating the strategy of “stealth dosing”


Figure 2. Proportion of Orders for Restricted Antimicrobials by Hour

Educative & Persuasive

- External guidelines
- Local guidelines
- Surgical prophylaxis protocols
- Educative sessions
- Audit and feed-back interventions
- ID interconsultations

Educative interventions: Guidelines & protocol forms
Persuasive interventions: (pre-selected) Audits and feedback

**FIRS STEP:**
Pharmacist:
Case selection:
- BE Ab*
- >7d
Clinical/microdata

**Cases selected for audit**

**SECOND STEP**
9:30 Farmacia & EEII:
AUDIT: Appropriate?

**Case selected for intervention**

**THIRD STEP: ID & clinicians**
Recommend to
Stop– Simplify

* carbapenem, cefepime, aztreonam, tigecycline, colistin, daptomycin, linezolid, and equinocandins
Global impact of an educational antimicrobial stewardship programme on prescribing practice in a tertiary hospital centre

Cisneros JM et al. CMI 2014

**FIG. 1.** Decreasing rates of inappropriate antimicrobial use during the first year of the programme.

**FIG. 2.** Evolution of the consumption by class of antibiotics during the first year of the programme, expressed in defined daily doses (DDDs) per 1000 occupied bed-days.
Bacteremia programs and MALDI TOF

Huang CID 2015
### Bundles: *S. aureus* Bacteremia

#### Table 4. Adherence to Quality-of-Care Indicators

<table>
<thead>
<tr>
<th>Quality-of-Care Indicator</th>
<th>Preintervention Period</th>
<th>Intervention Period</th>
<th>Median Improvement in Percentage of Adherence to QCI (IQR)</th>
<th>Relative Risk for Adherence to QCI (95% CI)</th>
<th>P Value</th>
<th>Adjusted OR for Adherence to QCI (95% CI)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Follow-up blood culture</td>
<td>131/214 (61.2)</td>
<td>159/198 (80.3)</td>
<td>25 (6.9–54.4)</td>
<td>1.31 (1.15–1.49)</td>
<td>&lt;.001</td>
<td>2.83 (1.78–4.49)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Source control</td>
<td>88/122 (70.2)</td>
<td>105/115 (91.3)</td>
<td>22 (10.2–50)</td>
<td>1.29 (1.13–1.49)</td>
<td>&lt;.001</td>
<td>4.56 (2.12–9.79)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Echocardiography</td>
<td>76/144 (52.8)</td>
<td>74/101 (73.3)</td>
<td>18.8 (0–95.7)</td>
<td>1.33 (1.13–1.68)</td>
<td>.001</td>
<td>2.50 (1.42–4.41)</td>
<td>.002</td>
</tr>
<tr>
<td>Early cloxacillin in MSSA</td>
<td>120/211 (56.9)</td>
<td>124/174 (71.3)</td>
<td>11.2 (0–51.1)</td>
<td>1.25 (1.07–1.45)</td>
<td>.014</td>
<td>1.79 (1.15–2.78)</td>
<td>.009</td>
</tr>
<tr>
<td>Vancomycin dosing</td>
<td>23/49 (48.9)</td>
<td>30/54 (55.6)</td>
<td>20 (0–54.3)</td>
<td>1.18 (0.80–1.73)</td>
<td>.38</td>
<td>1.42 (0.65–3.10)</td>
<td>.38</td>
</tr>
<tr>
<td>Treatment duration</td>
<td>151/207 (72.9)</td>
<td>161/183 (85.2)</td>
<td>10.2 (2–29.2)</td>
<td>1.16 (1.05–1.29)</td>
<td>.003</td>
<td>2.13 (1.24–3.64)</td>
<td>.006</td>
</tr>
</tbody>
</table>

#### Table 7. Multivariate Analyses of Variables Associated With 14- and 30-Day Mortality Among Patients With *Staphylococcus aureus* Bacteremia

<table>
<thead>
<tr>
<th>Variables</th>
<th>OR (95% CI)</th>
<th>P Value</th>
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</thead>
<tbody>
<tr>
<td>14-day mortality</td>
<td></td>
<td></td>
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<tr>
<td>Age &gt;60 y</td>
<td>2.97 (1.51–5.87)</td>
<td>.002</td>
</tr>
<tr>
<td>Pitt score &gt;2</td>
<td>3.04 (1.74–5.33)</td>
<td>&lt;.001</td>
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<tr>
<td>High-risk source</td>
<td>2.80 (1.32–5.92)</td>
<td>.007</td>
</tr>
<tr>
<td>Intervention</td>
<td>0.49 (.28–.87)</td>
<td>.016</td>
</tr>
<tr>
<td>30-day mortality</td>
<td></td>
<td></td>
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<tr>
<td>Age &gt;60 y</td>
<td>3.48 (1.89–6.41)</td>
<td>&lt;.001</td>
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<tr>
<td>Pitt score &gt;2</td>
<td>2.34 (1.40–3.92)</td>
<td>.001</td>
</tr>
<tr>
<td>High-risk source</td>
<td>3.11 (1.54–6.26)</td>
<td>.001</td>
</tr>
<tr>
<td>Intervention</td>
<td>0.59 (.36–.97)</td>
<td>.04</td>
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</table>

López-Cortes CID 2013
Pieces of advice

- Start small, with low-hanging fruits
- With friendly colleagues
- Stepwise approach
- Build on successes
- Use behaviour change theories
And......

DO NOT GIVE UP!!!!!!
Process and outcome measures
Case 3

- You have started implementing some interventions in your hospital
- Your director asks you to present your progress
- How will you do that?
Think and plan!

- Action is good
- But planning, monitoring and assessing are crucial steps
# Measuring the impact of an AMS programme

<table>
<thead>
<tr>
<th>Indicators Measures</th>
<th>Quality</th>
<th>Accountability</th>
<th>Research</th>
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</thead>
<tbody>
<tr>
<td><strong>Objective</strong></td>
<td>Improving practices</td>
<td>Public benchmarking</td>
<td>Knowledge</td>
</tr>
<tr>
<td><strong>Measures</strong></td>
<td>Few Easy to collect</td>
<td>Few Complex collection Valid Reproducible</td>
<td>Many Complex collection Valid Reproducible</td>
</tr>
<tr>
<td><strong>Period of time</strong></td>
<td>Short Real time feedback</td>
<td>Long Delayed feedback</td>
<td>Long Delayed feedback</td>
</tr>
</tbody>
</table>

Pulcini C *et al.*, Disease Management Health Outcomes 2007
How to measure to bring about change?

Few measures (20/month), run chart, real time feedback

Pulcini et al., Disease Management Health Outcomes 2007
Measuring the impact of an AMS programme

- Accurate definition of numerators/denominators

- Structure/activity measures

- Process measures (surrogate markers):
  - IV-oral switch
  - Review of antibiotic prescriptions
  - Expert advice for bacteremia
  - Prescription compliant with guidelines...

- Outcome measures: influenced by many factors
  - Antibiotic use
  - Bacterial resistance
  - C. difficile infections
  - S. aureus bacteremia mortality rate
  - SSI's rate...

- Balancing measures:
  - Readmission rate for infections
### Outcomes and Metrics for Antimicrobial Stewardship: Survey of Physicians and Pharmacists

<table>
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<tr>
<th>Indicator</th>
<th>Example</th>
<th>Comments</th>
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<tbody>
<tr>
<td>Patient outcomes</td>
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<tr>
<td>In-hospital mortality</td>
<td>Crude mortality for specific infections</td>
<td>Attributable mortality is more difficult to define</td>
</tr>
<tr>
<td>Length of stay</td>
<td>Average length of stay of patients, average length of stay in ICU</td>
<td>Need to adjust for case mix</td>
</tr>
<tr>
<td>Rate of readmission</td>
<td>Rate of readmission</td>
<td>Need to adjust for case mix</td>
</tr>
<tr>
<td>Unintended consequences</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antibiotic-resistant organisms</td>
<td>Percentage resistance or rates of resistant pathogens Use of antibiogram data to monitor resistance issues is difficult</td>
<td>Key resistance profiles and pathogens must be considered Rate may be affected by a change in the diagnostic assay used</td>
</tr>
<tr>
<td>Clostridium difficile</td>
<td>Rate of C. difficile-associated disease</td>
<td>Influence of active search for cases must be considered</td>
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<tr>
<td>Antibiotic utilization and costs</td>
<td>Money spent purchasing, dispensing, or administering Antibiotics per admission or per patient-days</td>
<td>Cost of purchased drugs is easy to obtain but is not reflective of utilization</td>
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<tr>
<td>Antibiotic utilization</td>
<td>DDD, PDD, or DOT* per admission or patient-days</td>
<td>Potentially useful for benchmarking (need to adjust for case mix), but limitations exist for all measures</td>
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<tr>
<td>Length of treatment</td>
<td>Average duration of treatment (days) for specific infections</td>
<td>Need to collect individual data</td>
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<td>Process measures</td>
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<tr>
<td>Appropriate therapy</td>
<td>Proportion of appropriate regimens according to guidelines</td>
<td>Need to collect individual data; subjective</td>
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<tr>
<td>Rate of de-escalation</td>
<td>Proportion of de-escalated regimens</td>
<td>No consensus definitions</td>
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Practical tips to communicate with colleagues and your director
Case 4

- You want to convince your Director that you need an additional ID physician in your AMS team, given the huge workload.

- How will you communicate?
Some practical tips

- Speak the ‘same language’
- LOS, costs, quality of care and patient safety
- Regulatory requirements
- Simple process and outcome data
Human resources needed to perform antimicrobial stewardship teams’ activities in French hospitals

Ressources humaines nécessaires aux équipes multidisciplinaires en antibiothérapie dans les établissements de santé français

P. Le Coz a,*, b, J. Carlet c, F. Roblot d, e, C. Pulcini f, g
Case 5

- You want to convince the head of general surgery that a weekly ID round is necessary, given their high antibiotic use.
- How will you communicate?
Some practical tips

- Speak the ‘same language’
- Quality of care, patients’ outcomes
- Simple process and outcome data
- Use past success to demonstrate your added value
- Make other colleagues talk to the surgeons
If needed

- Suggest a ‘free trial’
- Use regulatory requirements to make restrictive measures more acceptable
- And implement educative and persuasive measures at the same time
AntibioLegalMap 2016

- Are you a senior Infectious Diseases or Clinical Microbiologist?
- Can you help us learn about legal responsibility associated with antibiotic prescribing and advising?

The European Society of Clinical Microbiology and Infectious Diseases would like to invite you to participate in a short online survey about legal liability and antibiotic stewardship.

The survey is anonymous, takes 10 minutes to complete, and can be accessed at: https://www.surveymonkey.com/r/AntibioLegalMap

Thank you all for your help!