Antimicrobial stewardship nella postacuzie

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ID Unit, S. Orsola Teaching Hospital
All healthcare facilities, including hospitals, long-term care facilities, long-term acute care facilities, ambulatory surgical centers, and dialysis centers should develop and implement an antimicrobial stewardship plan.
A. Multidisciplinary, interprofessional, physician directed ASP team.

B. A formulary limited to nonduplicative antibiotics with demonstrated clinical need.

C. Institutional guidelines for the management of common infection syndromes.

D. Additional interventions to improve the use of antimicrobials, to eliminate:
   - Multidrug regimens with redundant antimicrobial spectra
   - Antibiotic therapy for nonbacterial syndromes, contamination, colonization
   - Empiric regimens that are either inadequately or excessively broad spectrum
   - Regimens that do not adequately treat culture-confirmed infections

E. Processes to measure and monitor antimicrobial use at the institutional level

F. Periodic distribution of a facility-specific antibiogram indicating the rates of relevant antibiotic susceptibilities to key pathogens.
Interventions to improve antibiotic prescribing practices for hospital inpatients.

Davey P et al, 2013

**PERSUASIVE**
- educational materials
- educational meetings
- reminders
- audit and feedback

**RESTRICTIVE**
- selective antibiograms
- prior authorization
- antibiotic policy change strategy
- formulary restrictions
- automatic stop orders

**STRUCTURAL**
- change from paper to computerized records
- rapid laboratory testing
- computerized decision support systems
# Metrics for Assessing the Impact of ASPs

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Patient outcomes</strong></td>
<td></td>
</tr>
<tr>
<td>In-hospital mortality</td>
<td>Attributable mortality is difficult to define</td>
</tr>
<tr>
<td>Length of stay</td>
<td>Need to adjust for case mix</td>
</tr>
<tr>
<td>Rate of readmission</td>
<td>Need to adjust for case mix</td>
</tr>
<tr>
<td><strong>Unintended consequences</strong></td>
<td></td>
</tr>
<tr>
<td>Antibiotic-resistant Organisms (rates of MDRO)</td>
<td>Key resistance profiles and pathogens must be considered</td>
</tr>
<tr>
<td>Clostridium difficile</td>
<td>Use of antibiogram data to monitor resistance issues is difficult</td>
</tr>
<tr>
<td></td>
<td>Influence of active search for cases must be considered</td>
</tr>
<tr>
<td></td>
<td>Rate may be affected by a change in the diagnostic assay used</td>
</tr>
<tr>
<td><strong>Antibiotic utilization and costs</strong></td>
<td>Costs of purchased drugs is not reflective of utilization</td>
</tr>
<tr>
<td>Expenditure</td>
<td>Potentially useful for benchmarking (need to adjust for case mix)</td>
</tr>
<tr>
<td>Antibiotic utilization (DDD)</td>
<td>Need to collect individual data</td>
</tr>
<tr>
<td>Length of treatment</td>
<td></td>
</tr>
<tr>
<td><strong>Process measures</strong></td>
<td></td>
</tr>
<tr>
<td>Appropriate therapy</td>
<td>Need to collect individual data; subjective</td>
</tr>
<tr>
<td>Rate of deescalation</td>
<td>No consensus definitions</td>
</tr>
</tbody>
</table>

E.S. Dodds Ashley, *CID* 2014
No relevant studies on stewardship objectives in longterm care facilities were identified, and results obtained in the hospital setting cannot automatically be extrapolated because the populations of patients and amount of diagnostic resources differ.

The lack of available evidence for the long-term care facilities is concerning, and this should be an area for urgent research.
The Effect of Interventions to Reduce Potentially Inappropriate Antibiotic Prescribing in Long-Term Care Facilities: a Systematic Review of Randomised Controlled Trials
A.Fleming et al. Drugs Aging (2013) 30:401-408

FLOWCHART FOR STUDY SELECTION

1904 references identified in databases & reference screening

25 full text articles evaluated for inclusion

1879 references not relevant

21 full text articles excluded:
8 not RCTs
13 not set in LTCF

4 RCTs included
The Effect of Interventions to Reduce Potentially Inappropriate Antibiotic Prescribing in Long-Term Care Facilities: a Systematic Review of Randomised Controlled Trials
A.Fleming et al. Drugs Aging (2013) 30:401-408

<table>
<thead>
<tr>
<th>Study</th>
<th>Setting</th>
<th>Personnel</th>
<th>Intervention</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monette, 2007</td>
<td>4 LTCF in Canada (4 controls)</td>
<td>Physicians</td>
<td>Educational material and prescribing feedback</td>
<td>Adherence to the prescribing guide</td>
</tr>
<tr>
<td>Petterson, 2011</td>
<td>26 LTCF in Sweden (20 controls)</td>
<td>Physicians and nurses</td>
<td>Educational group sessions, feedback on prescribing, guidelines and educational material</td>
<td>Proportion of quinolones prescribed for lower UTI</td>
</tr>
<tr>
<td>Loeb, 2005</td>
<td>10 LTCF in Ontario and Idaho (10 controls)</td>
<td>Nurses and physicians</td>
<td>Small group interactive educational sessions, one to one meetings with the physicians, educational material and UTI treatment algorithms</td>
<td>Number of antimicrobials prescribed for suspected UTI</td>
</tr>
<tr>
<td>Naughton, 2001</td>
<td>10 LTCF in New York</td>
<td>Physicians vs nurses</td>
<td><strong>Physicians only intervention</strong>: small group educational meetings, laminated card with a summary of the guidelines. <strong>Multidisciplinary intervention</strong>: 1 h training sessions with nurses as well as the small group meetings with physicians.</td>
<td>Antibiotic use for NHAP and antibiotic use in adherence with the guidelines</td>
</tr>
</tbody>
</table>

Due to the poor quality of evidence and mixed results, no definitive conclusion can be reached about the effect of the interventions.
Effective Antimicrobial Stewardship in a Long-Term Care Facility through an Infectious Disease Consultation Service: Keeping a LID on Antibiotic Use
R. Jump et al. ICHE, December 2012

DESIGN

A LTCF infectious disease consultation service (LID service) was created. It provided on-site consultations to residents of a 160-bed Veterans Affairs LTCF once a week and was available for remote consultation the remainder of the week.
Systemic antibiotic administration decreased by 30% (P< .001);

- tetracyclines - 64%
- clindamycin - 61%
- SMX/TMP - 38%
- FQs - 38%
- BL-BLIs - 28%
Effective Antimicrobial Stewardship in a Long-Term Care Facility through an Infectious Disease Consultation Service: Keeping a LID on Antibiotic Use
R. Jump et al. ICHE, December 2012

Rate of positive *C. difficile* tests declined in the post-intervention period (p=.04)

![Graph showing the rate of positive C. difficile tests declined in the post-intervention period](chart.png)
Effective Antimicrobial Stewardship in a Long-Term Care Facility through an Infectious Disease Consultation Service: Keeping a LID on Antibiotic Use
R.Jump et al. ICHE, December 2012

CONCLUSIONS
Implementation of an LTCF ID service led to a significant reduction in total antimicrobial use.

Bringing providers with ID expertise to the LTCF represents a new and effective means to achieve antimicrobial stewardship.
Recommendation 26. In nursing homes and skilled nursing facilities, we suggest implementation of antibiotic stewardship strategies to decrease unnecessary use of antibiotics (good practice recommendation).

Comment: Implementing ASPs at nursing homes and skilled nursing facilities is important and must involve point of-care providers to be successful. The traditional physician-pharmacist team may not be available on-site, and facilities might need to investigate other approaches to review and optimize antibiotic use, such as obtaining infectious diseases expertise through telemedicine consultation.
A REAL-LIFE EXPERIENCE:
ANTIMICROBIALS STEWARDSHIP IN A
REHABILITATION HOSPITAL

Setting: Montecatone Rehabilitation Institute, 150-bed rehabilitation hospital mainly dedicated to patient with spinal cord injury
ASP in a SCI patients rehabilitation facility: WHY?

- SCI/D patients have greater need for antibiotic treatment as a result of frequent infections including UTIs, RTIs, and SSTIs involving pressure ulcers.
- Opportunities for inappropriate antibiotic use may be more likely than in the general patient population.
- A significant proportion of healthcare providers caring for SCI patients is unaware of ASP aims and manage antimicrobials without knowledge of susceptibility data.
Knowledge and Use of Antimicrobial Stewardship Resources by Spinal Cord Injury Providers
Evans CT et al. PM R. 2011 Jul;3(7):619-23

**Objective:** To assess the knowledge and the use of ASP resources, such as hospital antibiograms and infectious disease consultants, by SCI providers.

**Design and setting:** Anonymous Internet-based, cross-sectional survey.

**Results:**

- 118 providers (80 physicians, 20 nurse practitioners, 18 physician assistants) completed the survey.
- One-third indicated that they did not have access to (11.0%) or were unsure of (28.0%) the existence of facility antibiograms.
- 50% never used antibiograms to determine treatment for their patients.
- More than one-third never or seldom used ID consults.
Montecatone Rehabilitation Institute

PHYSICIANS

NURSES

INTENSIVISTS

NURSE ASSISTANTS

THERAPISTS

LOGOTHERAPISTS

CONSULTANTS
- Neurosurgeon
- Orthopedic surgeon
- Urologists
- Cardiologist
- Psychiatrist
- ID specialist
- ENT specialist
- Thoracic surgeon
- Plastic surgeon
- ...
Montecatone Rehabilitation Institute

**CONSULTANTS**
- Neurosurgeon
- Orthopedic surgeon
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- Psychiatrist
- ENT specialist
- Thoracic surgeon
- Plastic surgeon
-...

**PHYSICIANS**

**NURSES**

**NURSE ASSISTANTS**

**CAREGIVERS**

**THERAPISTS**

**INTENSIVISTS**

**LOGOTHERAPISTIS**

**ID SPECIALIST**

**Dal 2012**
ACTIVITY OF THE ID SPECIALIST

REGULATORY LEVEL

• Antimicrobial stewardship
• Infection control
• Education
• Revision of internal protocols for antibiotic prophylaxis

POINT-OF CARE LEVEL

• Bedside consultation 3 times a week for hospitalized patients
• On demand consultation for outpatients
• Availability for remote consultations (phone, emails)
# ANTIBIOTIC CONSUMPTION

(DDD/100 patient-days)

<table>
<thead>
<tr>
<th></th>
<th>Systemic antibiotics (ATC J01)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRI</td>
<td>42</td>
</tr>
<tr>
<td>Imola Hospital</td>
<td>78</td>
</tr>
<tr>
<td>Bologna AOU</td>
<td>94</td>
</tr>
<tr>
<td>Bologna AUSL</td>
<td>92</td>
</tr>
<tr>
<td>AUSL Romagna</td>
<td>97</td>
</tr>
</tbody>
</table>

2011
MULTIDRUGRESISTANT MICROORGANISMS
“ESKAPE”

**ENTEROCOCCUS SPP**

**STAPHYLOCOCCUS AUREUS** - MRSA

**KLEBSIELLA PNEUMONIAE** - Carbapenem resistant (CR)

**ACINETOBACTER** - XDR

**PSEUDOMONAS AERUGINOSA** - XDR

**ENTEROBACTERIACEAE** - ESBL

XDR: non-susceptible to ≥1 agent in all but ≤2 categories

Magiorakos, CMI 2011
MULTIDRUG RESISTANT MICROORGANISMS

- S. aureus
- K. pneumoniae
- A. baumannii
- P. aeruginosa
- E. coli
- P. mirabilis

- MRSA
- CR
- XDR
- ESBL

2011
ASP STRATEGY

- Audit and feedback provided by the ID specialist during bedside consultation activity.
- Education based on quarterly interactive sessions.
- Monitoring of antibiotic consumption and patterns of antibiotic resistance.
- Providing updates on MDROs isolations and antimicrobial resistance patterns to healthcare providers.
MAIN CHANGES IN ANTIBIOTIC PRESCRIPTIONS

- No antibiotic therapy in case of:
  - asymptomatic bacteriuria
  - pressure ulcers without signs and symptoms of systemic infection

- Avoidance of fluoroquinolones and 3\textsuperscript{rd} generation cephalosporines in empirical treatment of UTIs.

- No carbapenems in empirical therapy.
## Indicators of Activity and Outcome Measures

<table>
<thead>
<tr>
<th></th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admissions – n°</td>
<td>485</td>
<td>655</td>
<td>721</td>
<td>740</td>
</tr>
<tr>
<td>Patient-days - n°</td>
<td>55039</td>
<td>55319</td>
<td>55377</td>
<td>55254</td>
</tr>
<tr>
<td>Mean length of stay (days)</td>
<td>113.48</td>
<td>84.46</td>
<td>76.81</td>
<td>74.67</td>
</tr>
<tr>
<td>In-hospital mortality – n° (%)</td>
<td>16 (3.3)</td>
<td>11 (1.6)</td>
<td>14 (1.9)</td>
<td>12 (1.6)</td>
</tr>
</tbody>
</table>
## RESULTS

### ANTIBIOTIC CONSUMPTION (DDD/100 patient-days)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>42</td>
<td>41</td>
<td>19</td>
<td>22</td>
<td>- 48%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Carbapenems</td>
<td>13</td>
<td>5</td>
<td>0.6</td>
<td>0.4</td>
<td>- 97%</td>
<td>0.01</td>
</tr>
<tr>
<td>Fluoroquinolones</td>
<td>11.8</td>
<td>9</td>
<td>1.28</td>
<td>0.99</td>
<td>- 92%</td>
<td>0.006</td>
</tr>
<tr>
<td>Aminoglicosydes</td>
<td>2</td>
<td>0.7</td>
<td>0.11</td>
<td>0.06</td>
<td>- 97%</td>
<td>0.05</td>
</tr>
<tr>
<td>Clindamycin</td>
<td>0.6</td>
<td>0.76</td>
<td>0.1</td>
<td>0.1</td>
<td>- 83%</td>
<td>0.317</td>
</tr>
<tr>
<td>Macrolides</td>
<td>0.5</td>
<td>0.3</td>
<td>0.15</td>
<td>0.11</td>
<td>- 78%</td>
<td>0.07</td>
</tr>
<tr>
<td>Tetracycline</td>
<td>0.5</td>
<td>2.5</td>
<td>0.24</td>
<td>0.24</td>
<td>- 52%</td>
<td>0.083</td>
</tr>
<tr>
<td>3rd gen cephalosporines</td>
<td>1.6</td>
<td>1.9</td>
<td>1.3</td>
<td>1.5</td>
<td>- 6%</td>
<td>0.379</td>
</tr>
<tr>
<td>BL-BLIs</td>
<td>8.2</td>
<td>11</td>
<td>10.2</td>
<td>11</td>
<td>+ 34%</td>
<td>0.245</td>
</tr>
<tr>
<td>Glycopeptides</td>
<td>2.5</td>
<td>5.9</td>
<td>2.4</td>
<td>3.9</td>
<td>+ 56%</td>
<td>0.182</td>
</tr>
<tr>
<td>Fosfomycin</td>
<td>0.3</td>
<td>1</td>
<td>0.7</td>
<td>0.9</td>
<td>+ 200%</td>
<td>0.318</td>
</tr>
<tr>
<td>Others</td>
<td>1</td>
<td>2.9</td>
<td>1.9</td>
<td>2.8</td>
<td>+ 180%</td>
<td>0.186</td>
</tr>
</tbody>
</table>
ANTIBIOTIC PRESCRIPTION PATTERN

- **Others**
- **Fosfomycin**
- **Clindamycin**
- **Tetracycline**
- **Macrolides**
- **Aminoglicosydes**
- **Glycopeptides**
- **BL-BLIs**
- **3rd-gen cephalosporines**
- **Fluoroquinolones**
- **Carbapenems**

2011

2012

2013

2014
MICROBIOLOGY

- 5920 clinical isolates
- 446 stool samples submitted for *C. difficile* diagnosis
Enterobacteriaceae

RESULTS

<table>
<thead>
<tr>
<th>Year</th>
<th>E. coli</th>
<th>P. mirabilis</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>167</td>
<td>34</td>
</tr>
<tr>
<td>2012</td>
<td>248</td>
<td>96</td>
</tr>
<tr>
<td>2013</td>
<td>241</td>
<td>104</td>
</tr>
<tr>
<td>2014</td>
<td>233</td>
<td>95</td>
</tr>
</tbody>
</table>

Non ESBL: 167, 248, 241, 233
ESBL: 82, 81, 61, 87

p=0.001
p<0.001
Non-fermentative Gram negative bacilli

RESULTS

P. aeruginosa

<table>
<thead>
<tr>
<th>Year</th>
<th>Non XDR</th>
<th>XDR</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>111</td>
<td>109</td>
</tr>
<tr>
<td>2012</td>
<td>282</td>
<td>51</td>
</tr>
<tr>
<td>2013</td>
<td>251</td>
<td>50</td>
</tr>
<tr>
<td>2014</td>
<td>240</td>
<td>50</td>
</tr>
</tbody>
</table>

A. baumannii

<table>
<thead>
<tr>
<th>Year</th>
<th>Non XDR</th>
<th>XDR</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>5</td>
<td>129</td>
</tr>
<tr>
<td>2012</td>
<td>24</td>
<td>99</td>
</tr>
<tr>
<td>2013</td>
<td>10</td>
<td>84</td>
</tr>
<tr>
<td>2014</td>
<td>11</td>
<td>38</td>
</tr>
</tbody>
</table>

p<0.001

p=0.002
### RESULTS

**Staphilococcus aureus**

<table>
<thead>
<tr>
<th>Year</th>
<th>MSSA</th>
<th>MRSA</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>57</td>
<td>126</td>
</tr>
<tr>
<td>2012</td>
<td>56</td>
<td>107</td>
</tr>
<tr>
<td>2013</td>
<td>43</td>
<td>78</td>
</tr>
<tr>
<td>2014</td>
<td>62</td>
<td>53</td>
</tr>
</tbody>
</table>

p < 0.001
RESULTS

*Klebsiella pneumoniae*

<table>
<thead>
<tr>
<th></th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non CP</td>
<td>113</td>
<td>203</td>
<td>163</td>
<td>179</td>
</tr>
<tr>
<td>CP</td>
<td>64</td>
<td>87</td>
<td>70</td>
<td>55</td>
</tr>
</tbody>
</table>

$p=0.007$
IMPLEMENTATION OF AN ASP BASED ON SYSTEMATIC ID
CONSULTATION IN A REHABILITATION FACILITY

Long-term monitoring needed to confirm results

Reproducibility of the model in other healthcare setting?

Very good compliance

Significant reduction of antibiotic use

Improvement of antibiotic prescription patterns

Reduction of antimicrobial resistance