Global-PPS and antimicrobial quality indicators: Towards effective hospital antimicrobial stewardship

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What are quality indicators for appropriate antibiotic/antimicrobial use

• Antimicrobial control measures which lead to an improvement in quality of prescribing, cost-effectiveness and reduction in resistance. (Nathwani D. et al, J Hosp Infect. 2002)

• Allows to measure appropriateness of antibiotic use in the treatment of bacterial infections in hospitalized patients and ...

• Are a requirement for an effective antibiotic stewardship program (Van den Bosch et al, CID, 2015)

• Allows to monitor the appropriateness of hospital antibiotic use (Van den Bosch et al, CMI, 2016)
Types of indicators

• **Structure**
  – Attributes of care settings
    • Material resources
    • Human resources
    • Organisational structure
e.g. presence of an antimicrobial stewardship team

• **Process**
  – describe the important processes that contribute to the achievement of outcomes e.g. quality of training

• **Outcome**
  – Accomplishment of desired outcomes e.g. Number of antibiotic prescriptions
The ideal indicator should be

- Clearly defined (which, target, timing, ...)
- Evidence-based
- Specific and sensitive
- Accurate and reproducible
- Valid
- Feasible
- Allow discrimination and comparison
- Action-focused

ref: https://www.slideshare.net/balbiger/ntiobiotc-stewardship-indicators
Which quality indicators does the Global-PPS offer to measure appropriate antimicrobial use in the hospital?

1. Overall prevalence (%) of antimicrobial (AM) use
2. Prevalence of antimicrobial use by ward type
3. Prevalence broad-spectrum antibiotic prescribing
4. Hospital-acquired infection rate (patient level)
5. Antibiotic prevalence for hospital-acquired infections (HAI) (at antibiotic level)
6. Overall targeted therapeutic antibiotic prescribing
7. Targeted broad-spectrum antibiotic prescribing for HAI
8. Prevalence of patients treated with antibiotics targeting resistant organisms
Which quality indicators does the Global-PPS offer to measure appropriate antimicrobial use in the hospital?

9. Antibiotic prevalence for community acquired infections (CAI)
10. Empirical broad-spectrum antibiotic prescribing for CAI
11. Parenteral administration of antibiotics
12. Number of antibiotic combination therapies
13. Documentation of reason for AM prescribing in notes
14. Prevalence of stop/review date documented
15. Antibiotic prescriptions for which guidelines were available
16. Antibiotic prescriptions prescribed according to local guidelines

Ref: Versporten et al, JAC, 2016; Versporten et al, LGH, 2018
Which quality indicators does the Global-PPS offer to measure appropriate antimicrobial use in the hospital?

17. Broad-spectrum antibiotic prescribing for surgical prophylaxis
18. Prolonged antibiotic prescribing for surgical prophylaxis
19. Prevalence of antibiotic use following the WHO Essential Medicines List (EML) Access/Watch/Reserve (AWaRe) classification*

Which quality indicator to choose in your hospital?

- Feedback report
- Own analyses using the excel file with your own raw hospital data
## Quality indicators for antibiotic use

<table>
<thead>
<tr>
<th></th>
<th>Africa</th>
<th>Latin AM</th>
<th>North AM</th>
<th>East-South Asia</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Medical</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reason in notes</td>
<td>1289 (68.1%)</td>
<td>2119 (89.1%)</td>
<td>1030 (90.4%)</td>
<td>4853 (66.3%)</td>
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<td>Guidelines missing</td>
<td>794 (42.0%)</td>
<td>448 (18.8%)</td>
<td>177 (15.5%)</td>
<td>1751 (23.9%)</td>
</tr>
<tr>
<td>Guideline compliant</td>
<td>390 (67.7%)</td>
<td>1062 (78.2%)</td>
<td>608 (83.7%)</td>
<td>2818 (71.4%)</td>
</tr>
<tr>
<td>Stop/review date</td>
<td>437 (23.1%)</td>
<td>1088 (45.8%)</td>
<td>728 (63.9%)</td>
<td>1771 (24.2%)</td>
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<tr>
<td><strong>Surgical</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reason in notes</td>
<td>1298 (66.4%)</td>
<td>1262 (72.5%)</td>
<td>442 (79.8%)</td>
<td>2592 (51.5%)</td>
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<tr>
<td>Guidelines missing</td>
<td>1050 (53.7%)</td>
<td>346 (19.9%)</td>
<td>101 (18.2%)</td>
<td>1389 (27.6%)</td>
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<tr>
<td>Guideline compliant</td>
<td>272 (54.3%)</td>
<td>638 (67.0%)</td>
<td>237 (69.1%)</td>
<td>1536 (58.9%)</td>
</tr>
<tr>
<td>Stop/review date</td>
<td>550 (28.1%)</td>
<td>679 (39.0%)</td>
<td>357 (64.4%)</td>
<td>1540 (30.6%)</td>
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<tr>
<td><strong>ICU</strong></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Reason in notes</td>
<td>414 (57.7%)</td>
<td>1377 (88.4%)</td>
<td>390 (90.1%)</td>
<td>1103 (58.8%)</td>
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<tr>
<td>Guidelines missing</td>
<td>232 (32.3%)</td>
<td>224 (14.4%)</td>
<td>87 (20.1%)</td>
<td>337 (18.0%)</td>
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<tr>
<td>Guideline compliant</td>
<td>175 (68.1%)</td>
<td>636 (76.3%)</td>
<td>176 (77.9%)</td>
<td>701 (74.7%)</td>
</tr>
<tr>
<td>Stop/review date</td>
<td>120 (16.7%)</td>
<td>726 (46.6%)</td>
<td>284 (65.6%)</td>
<td>534 (28.4%)</td>
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</table>
### Antibiotic quality indicators – adult wards (2017)

<table>
<thead>
<tr>
<th></th>
<th>Hospital</th>
<th>Country</th>
<th>Continent</th>
<th>Hospital type</th>
<th>Europe</th>
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<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
<td>N</td>
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<tr>
<td>Medical</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reason in notes</td>
<td>74</td>
<td>96.1</td>
<td>281</td>
<td>66.3</td>
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<tr>
<td>Guidelines missing</td>
<td>66</td>
<td>85.7</td>
<td>271</td>
<td>63.9</td>
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<tr>
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<td>3</td>
<td>37.5</td>
<td>17</td>
<td>48.6</td>
<td></td>
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<tr>
<td>Stop/review date</td>
<td>75</td>
<td>97.4</td>
<td>129</td>
<td>30.4</td>
<td></td>
</tr>
<tr>
<td>documented</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surgical</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reason in notes</td>
<td>173</td>
<td>100.0</td>
<td>658</td>
<td>80.3</td>
<td></td>
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<tr>
<td>Guidelines missing</td>
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<td>97.7</td>
<td>553</td>
<td>67.5</td>
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<tr>
<td>Guideline compliant</td>
<td>0</td>
<td>0.0</td>
<td>29</td>
<td>45.3</td>
<td></td>
</tr>
<tr>
<td>Stop/review date</td>
<td>173</td>
<td>100.0</td>
<td>357</td>
<td>43.6</td>
<td></td>
</tr>
<tr>
<td>documented</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICU</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reason in notes</td>
<td>4</td>
<td>100.0</td>
<td>20</td>
<td>76.9</td>
<td></td>
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<tr>
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<td>4</td>
<td>100.0</td>
<td>6</td>
<td>23.1</td>
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<td>Guideline compliant</td>
<td>0</td>
<td>0.0</td>
<td>2</td>
<td>66.7</td>
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<tr>
<td>Stop/review date</td>
<td>4</td>
<td>100.0</td>
<td>6</td>
<td>23.1</td>
<td></td>
</tr>
<tr>
<td>documented</td>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>

Need to develop antibiotic guidelines!

Antibiotic quality indicators by activity (medical, surgical, ICU) for patients admitted on adult wards receiving antibacterials for systemic use (ATC J01).
- For reason in notes and stop/review date documented: Count at antibacterial level.
- For guidelines missing: Count on NA (= no local guidelines for the specific indication) at patient level and diagnosis over total scores for this indicator.
- For guideline compliance: Count at patient level and diagnosis for compliance = yes or no only. For combination therapy with >1 antibiotic: if 1 antibiotic by diagnosis is not compliant, this combination therapy as a whole for this diagnosis will be counted as non-compliant. If there are less than three participating hospitals, results are not reported.
### Targeted therapeutic antibiotic prescribing

#### Example of Feedback

<table>
<thead>
<tr>
<th></th>
<th>Africa</th>
<th>Latin AM</th>
<th>North AM</th>
<th>East-South Asia</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td><strong>All patients</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Empiric</td>
<td>4325</td>
<td>94.7</td>
<td>4526</td>
<td>79.8</td>
</tr>
<tr>
<td>Targetted</td>
<td>240</td>
<td>5.3</td>
<td>1148</td>
<td>20.2</td>
</tr>
<tr>
<td>Adults (&gt;= 18 years)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Empiric</td>
<td>2846</td>
<td>95.2</td>
<td>3854</td>
<td>78.7</td>
</tr>
<tr>
<td>Targetted</td>
<td>143</td>
<td>4.8</td>
<td>1040</td>
<td>21.3</td>
</tr>
<tr>
<td>Children (&lt; 18 years)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Empiric</td>
<td>1198</td>
<td>94.3</td>
<td>558</td>
<td>85.8</td>
</tr>
<tr>
<td>Targetted</td>
<td>72</td>
<td>5.7</td>
<td>92</td>
<td>14.2</td>
</tr>
<tr>
<td>Neonates (NICU)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Empiric</td>
<td>281</td>
<td>91.8</td>
<td>114</td>
<td>87.7</td>
</tr>
<tr>
<td>Targetted</td>
<td>25</td>
<td>8.2</td>
<td>16</td>
<td>12.3</td>
</tr>
</tbody>
</table>
Prolonged surgical prophylaxis is very common in Africa, year 2017

- Africa (N = 1019 patients in 5 countries): 3.0% in green, 6.0% in yellow, 91.0% in red
- East & South Asia (N = 2542 patients in 9 countries): 10.0% in green, 7.0% in yellow, 83.0% in red
- South America (N = 694 patients in 7 countries): 28.0% in green, 30.0% in yellow, 42.0% in red
- North America (N = 159 patients in 2 countries): 15.0% in green, 34.0% in yellow, 52.0% in red
- Europe (N = 2036 patients in 18 countries): 14.0% in green, 25.0% in yellow, 61.0% in red
Top 5 most frequently used antibiotics for surgical prophylaxis in adults and children (2017)

Top 5 most prescribed antibacterials for systemic use (ATC code J01) for surgical prophylaxis use at hospital level, supplemented with the most prescribed antibiotics at country, continent and hospital type level if they do not fall within the top 5 of the hospital. Selection on indication = SP; All patients are included with exception of patients admitted on NMW and NICU.
National initiatives derived from ESAC-PPS
Northern Ireland

Comparison:
- between hospitals
- 2008-2009 PPS

Public Health Agency strategic action plan (2012) recommended repeat PPS

Track progress in achieving the objectives of ensuring better patient outcomes
From intermittent antibiotic point prevalence surveys to quality improvement: experience in Scottish hospitals

William Malcolm1, Dilip Nathwani1, Peter Davey3, Tracey Cromwell4, Andrea Patton5, Jacqueline Reilly1, Shona Cairns1 and Marion Bennie3,6

**POLICY COMPLIANCE (2009 baseline-PPS)**
Antibiotic choice compliant with local policy measured in acute admissions wards
*(Mean result 76% compliance)*

**SURGICAL PROPHYLAXIS (2009 baseline-PPS)**
Duration <24 hours in several surgical specialties
*(Mean result 69% <24h while 48% in EU)*

**TARGETS**
≥95% National compliance
≥95% National compliance with single dose

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National initiatives derived from ESAC-PPS
Scotland – set targets
National initiatives derived from ESAC-PPS Scotland, timeline

Figure 1

Time line showing progress from Point Prevalence Survey to Continuous Quality improvement.
National initiatives derived from ESAC-PPS Scotland, policy compliant, indication documented

Figure 2 Hospital empiric prescribing: National compliance with Indication Documented and Policy Compliant (antibiotic choice) and overall mean, December 2009-March 2011.
National initiatives derived from ESAC-PPS Scotland, surgical prophylaxis

Implementation of quality indicators of antibiotic use:
• Promotion of local policies through clinical engagement and staff education
• Local feedback of results monthly and national reporting every 3 months

Figure 5 Surgical prophylaxis: National compliance with Single dose and Policy Compliance in elective colorectal procedures and overall mean, April 2011-March 2012.

Malcolm et al. Antimicrobial Resistance and Infection Control 2013, 2:3
Lessons learned from the past?

• Setting measurable and achievable targets for reducing antibiotic consumption is essential for securing commitment and for raising awareness

• These targets can be very misleading due to the complexity of the measurement units:
  – DDDs unreliable in countries where the number of units per package and the amount of active substance per unit increased over time for antibiotics that are proportionally frequently prescribed
  – Standard units suffer similar problems as DDD

• Coordinated and harmonized approach is needed, locally, nationally and globally

• Exchange of experiences between countries is essential
PPS methodology is easy and practical

- Stimulates local networking
- Allows identification of quantifiable outcome measures and high-impact targets for quality improvement (Antimicrobial Stewardship Programs)
- Tool for assessing interventions to improve antibiotic prescribing in hospitals – repeated PPS
What makes the network work?

- Shared goal
- Bottom up network with highly engaged members
- Relevant for local, national and regional public health policies
- Ownership
- Trust
- Transparency
- Flexibility and solidarity
- Accountability
- Rigorous & scientific
- Personal relationships

sustained awareness
If you want to go Fast, go alone.
If you want to go Far, go together.