Antibiotic policy group in the Ghent University Hospital: experiences and results

Séminaire de pathologie infectieuse
Cliniques Universitaires Saint-Luc, Bruxelles

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Content

- **Introduction**
- **Activities Antibiotic Policy Group UZ Gent**
  - Formulary and guidelines
  - Restrictions/support antibiotic prescribing
  - Surveillance
    - Antibiotic consumption and feedback
    - Resistance profiles
  - Audit
    - Drug Use Evaluation
    - Time of initialisation of antibiotics
    - Kidney failure and antibiotic dose
    - Therapeutic drug monitoring
    - Parenteral to oral conversion
- **Future projects**
- **References for the clinical pharmacist**
- **Conclusion**
Introduction: who are we?

- 1,062 hospital beds
- 34,000 admissions
- 300,000 beddays
- 4,799 staff members
  - 660 physicians
  - 1,500 nurses
  - 20 pharmacists
- Mean LOS: < 9 days
Introduction: Antibiotic Policy Group

- **Multidisciplinary composition (19)**
  - Infectiologists (4) (prof. dr. D. Vogelaers – president)
  - Hospital hygiene physician (1)
  - Microbiologist (1)
  - Virologist (1)
  - Intensive care physicians (4)
  - Haematologist (1)
  - Orthopedic physician (1)
  - Pharmacists (5) (secretary)
  - Scientific collaborators (2)

- **Monthly plenary meeting**
Content

Introduction

Activities Antibiotic Policy Group
- Formulary and guidelines
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- Future projects

References for the clinical pharmacist

Conclusion
Activities Antibiotic Policy Group: general information

Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America Guidelines for Developing an Institutional Program to Enhance Antimicrobial Stewardship

Clinical Infectious Diseases 2007;44:159–177

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Table 1. Infectious Diseases Society of America–United States Public Health Service grading system for ranking recommendations in clinical guidelines.

<table>
<thead>
<tr>
<th>Category, grade</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strength of recommendation</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>Good evidence to support a recommendation for use</td>
</tr>
<tr>
<td>B</td>
<td>Moderate evidence to support a recommendation for use</td>
</tr>
<tr>
<td>C</td>
<td>Poor evidence to support a recommendation for use</td>
</tr>
<tr>
<td>Quality of evidence</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Evidence from ≥1 properly randomized, controlled trial</td>
</tr>
<tr>
<td>II</td>
<td>Evidence from ≥1 well-designed clinical trial, without randomization; from cohort or case-controlled analytic studies (preferably from &gt;1 center); from multiple time-series; or from dramatic results from uncontrolled experiments</td>
</tr>
<tr>
<td>III</td>
<td>Evidence from opinions of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees</td>
</tr>
</tbody>
</table>

**NOTE.** Adapted from [1].
Activities Antibiotic Policy Group: formulary and guidelines

- Local formulary (book and intranet):
  - Product information (dose, indication)
  - Guidelines: empirical, documented and prophylactic treatment (AI)
    - Recent guidelines
      - Empirical treatment for abdominal infections
      - HIV occupational post exposure prophylaxis
      - Bacterial meningitis and meningococcen sepsis
      - Extended and continuous infusions of antibiotics
      - Administration and monitoring of glycopeptides and aminoglycosides
  - Monthly revision of one chapter

- The Sanford Guide for Antimicrobial therapy
- Technical information for drug administration
Content

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Activities Antibiotic Policy Group: restrictions/support antibiotic prescribing

- Elimination of antibiotic stock on the wards
- Implementation of antibiotic/antimycotic order form (BII)
  - Requirements for physicians
    - General
      - Motivation of therapy (empirical, documented and prophylactic treatment)
      - Start date
      - Clinical focus
    - Why no enteral administration (for high bioavailable products)?
    - Detailed motivation for linezolid
  - Information for physicians
    - Price per unit
    - IV/PO possibility
    - Attestation necessary
  - Limited dosages delivered by pharmacy
# Voorschrift gereserveerde antibiotica en antimycotica

**Buiten reservekast**

Een volledig ingevuld voorschrift is geldig voor 4 dagen therapie. Buiten de openingsuren van de apothek zijn de producten beschikbaar in de centrale spoedkast -1K12C, -1K2 en 1K6 (blik 1 antimycotica).

## Motivatie therapie

- **Empirisch** (kliënt onbekend)
- **Gericht** (kliënt vermelden)
- **Prophylactisch**

<table>
<thead>
<tr>
<th>Gene Middel</th>
<th>Prijs per Stuk (EUR)</th>
<th>Adres</th>
<th>Dosis/Toedr.</th>
<th>Gewenad Aantal</th>
<th>Ditur</th>
<th>Gewenad Aantal</th>
<th>APR</th>
<th>Tregar Aantal</th>
</tr>
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<tbody>
<tr>
<td>Amikyna 50 MG IV</td>
<td>161,33</td>
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<td>46322</td>
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<tr>
<td>Avelox 100 MG/20 ML IV</td>
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<td>Avelox 400 MG PO</td>
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<td>283,58</td>
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<td></td>
<td>1596144</td>
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<td></td>
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<tr>
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<td></td>
<td>270080</td>
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<td>33238</td>
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<td></td>
<td></td>
<td>1241798</td>
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<tr>
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<td>1241994</td>
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<td></td>
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</tr>
<tr>
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<td>12,20</td>
<td></td>
<td></td>
<td>1241798</td>
<td></td>
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<td></td>
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</table>

**Startdatum therapie:**

**Diagnose/Klinisch beeld (infecie):**
<table>
<thead>
<tr>
<th>Drug Name</th>
<th>Brand Name</th>
<th>Strength</th>
<th>Quantity</th>
<th>ID No.</th>
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</thead>
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<td>Zensit</td>
<td>100 MG</td>
<td>12.34</td>
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<tr>
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<td>Zensit</td>
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<td>12.34</td>
<td>234567</td>
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<tr>
<td>Cillican 500 MG</td>
<td>Zensit</td>
<td>500 MG</td>
<td>12.34</td>
<td>234567</td>
</tr>
<tr>
<td>Cillican 1000 MG</td>
<td>Zensit</td>
<td>1000 MG</td>
<td>12.34</td>
<td>234567</td>
</tr>
<tr>
<td>Cillican 2000 MG</td>
<td>Zensit</td>
<td>2000 MG</td>
<td>12.34</td>
<td>234567</td>
</tr>
<tr>
<td>Cillican 5000 MG</td>
<td>Zensit</td>
<td>5000 MG</td>
<td>12.34</td>
<td>234567</td>
</tr>
<tr>
<td>Cillican 10000 MG</td>
<td>Zensit</td>
<td>10000 MG</td>
<td>12.34</td>
<td>234567</td>
</tr>
<tr>
<td>Cillican 20000 MG</td>
<td>Zensit</td>
<td>20000 MG</td>
<td>12.34</td>
<td>234567</td>
</tr>
<tr>
<td>Cillican 30000 MG</td>
<td>Zensit</td>
<td>30000 MG</td>
<td>12.34</td>
<td>234567</td>
</tr>
<tr>
<td>Cillican 40000 MG</td>
<td>Zensit</td>
<td>40000 MG</td>
<td>12.34</td>
<td>234567</td>
</tr>
<tr>
<td>Cillican 50000 MG</td>
<td>Zensit</td>
<td>50000 MG</td>
<td>12.34</td>
<td>234567</td>
</tr>
<tr>
<td>Cillican 100000 MG</td>
<td>Zensit</td>
<td>100000 MG</td>
<td>12.34</td>
<td>234567</td>
</tr>
</tbody>
</table>

(1) Indicate Zensit
- Infectie met MSSA, MR-CNS, AVE, VRE
- Resistent of intermediair gevoelig aan antibiotica
- Geclassificeerd als resistent of intermediair gevoelig
- Geclassificeerd als gevoelig aan glycopeptide maar niet gevoelig aan glycopeptide
- Gevoelig aan glycopeptide maar niet gevoelig aan glycopeptide
- IV toediening niet meer nodig
- Zensit opgepast in overleg met infectioloog (zie bijlage)

(2) Indicate toediening (oral of via maagdrainage) en hemodialyse omit gevoelig wegens:
- Braken
- Diarree
- Postoperatieve complicationen
- Darmparalyse

Transport:
- Bijvraag
- Koerier
- Druk
- Datum:
- Klacht en datum
- Decontroleer

Datum, stempel + handtekening arts
(conform KB 19/01/1976 art 5)
Activities Antibiotic Policy Group: restrictions/support antibiotic prescribing

- Support by infectiologists/microbiologists
  - Weekly antibiotic meetings (SICU, MICU, orthopedic ward, pediatric ward ..) (AIII)
  - Consultation on demand
  - Spontaneous consultations based on (AI)
    - Positive hemocultures
    - Antibiotic prescriptions from pharmacy
    - Link database pharmacy and microbiology
  - Education (BII)
### LabView - Microbiologie & Antibiotica

**Patienten List**

<table>
<thead>
<tr>
<th>Datum</th>
<th>Nr</th>
<th>Type staal</th>
<th>Kweek / Antibiotherapie</th>
<th>Aantal</th>
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<tbody>
<tr>
<td>4/12/2006</td>
<td>061204-2381</td>
<td>E.A.L.-vocht</td>
<td>1: Pseudomonas aeruginosa ++</td>
<td>1</td>
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<tr>
<td>4/12/2006</td>
<td>061204-2190</td>
<td>Keeluitstrijk</td>
<td>1: Pseudomonas aeruginosa ++</td>
<td>1</td>
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<tr>
<td>4/12/2006</td>
<td>061204-2098</td>
<td>Aspiraat bij geantesteerd</td>
<td>1: Pseudomonas aeruginosa ++</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Datum</th>
<th>Stadium</th>
<th>GLAZIDIM 2G BOLUS</th>
<th>Aantal</th>
</tr>
</thead>
<tbody>
<tr>
<td>11/12/2006</td>
<td></td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>11/12/2006</td>
<td></td>
<td>TAZOCIN 4G/500MG INJ</td>
<td>4</td>
</tr>
<tr>
<td>7/12/2006</td>
<td></td>
<td>TAZOCIN 4G/500MG INJ</td>
<td>16</td>
</tr>
<tr>
<td>6/12/2006</td>
<td></td>
<td>GLAZIDIM 2G BOLUS</td>
<td>3</td>
</tr>
<tr>
<td>5/12/2006</td>
<td></td>
<td>AUGMENTIN 1G IV FLAC</td>
<td>1</td>
</tr>
<tr>
<td>5/12/2006</td>
<td></td>
<td>GLAZIDIM 2G BOLUS</td>
<td>4</td>
</tr>
<tr>
<td>30/11/2006</td>
<td></td>
<td>CPROXINE CMP 500MG</td>
<td>2</td>
</tr>
</tbody>
</table>

**Geel: Volgt, Groen: geen kweek, Rood: Kweek**

Indien u problemen vaststelt, gebruik indien nodig Zielab en verantwoord Dr. Tom Fiers (4565)
Activities Antibiotic Policy Group: restrictions/support antibiotic prescribing

- **Support by pharmacists**
  - Prospective follow up of IV/PO in the central pharmacy (AI)
  - Clinical pharmacists
    - Pediatric oncology
    - Pediatric intensive care unit
    - Geriatric unit
    - Medical intensive care unit
    - Abdominal surgery
    - Emergency department (funded project “Clinical pharmacy - Federal government”)
  - Education for nurses (BII)
Content

- **Introduction**
- **Activities Antibiotic Policy Group**
  - Formulary and guidelines
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  - **Surveillance**
    - Antibiotic consumption and feedback
    - Resistance profiles
  - **Audit**
    - Drug Use Evaluation
    - Time of initialisation of antibiotics
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- **References for the clinical pharmacist**
- **Conclusion**
Activities Antibiotic Policy Group: surveillance and feedback of consumption (BIII)

- **ATC/DDD classification** *(Anatomical Therapeutic Chemical classification /Defined Daily Dose)*
  - Nominator
    - DDD
    - Costs (euro)
  - Denominator
    - Patient-days
    - Admissions

- **Level of analyses**
  - Global hospital level
  - Ward level

- **Monthly review by Antibiotic Policy Group**
- **Assigned physician by medical discipline for drug consumption**
Activities Antibiotic Policy Group: surveillance and feedback of consumption

Table 1. Evolution antibiotic consumption (correction for admissions and beddays)

<table>
<thead>
<tr>
<th>Year</th>
<th>amount (€uro) per admission</th>
<th>% diff</th>
<th>amount per 100 beddays</th>
<th>% diff</th>
<th>DDD per admission</th>
<th>% diff</th>
<th>DDD per 100 beddays</th>
<th>% diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>99,24</td>
<td></td>
<td>1,088,61</td>
<td>#VERW!</td>
<td>5,84</td>
<td>#VERW!</td>
<td>64,06</td>
<td>#VERW!</td>
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<tr>
<td>2005</td>
<td>104,54</td>
<td>5,34</td>
<td>1,146,92</td>
<td>5,36</td>
<td>5,84</td>
<td>0,01</td>
<td>64,08</td>
<td>0,03</td>
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<tr>
<td>2006</td>
<td>97,43</td>
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<td>1,112,13</td>
<td>-3,03</td>
<td>5,63</td>
<td>-3,58</td>
<td>64,29</td>
<td>0,33</td>
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<tr>
<td>2007</td>
<td>89,22</td>
<td>-8,42</td>
<td>1,040,07</td>
<td>-6,48</td>
<td>5,57</td>
<td>-1,15</td>
<td>64,90</td>
<td>0,94</td>
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</table>

Table 2. Evolution antibiotic consumption in DDD per 100 beddays for products with high bioavailability

<table>
<thead>
<tr>
<th>Year</th>
<th>DDD IV</th>
<th>% diff</th>
<th>DDD PO</th>
<th>% diff</th>
<th>DDD PO+IV</th>
<th>% diff</th>
<th>% IV/IV+Po</th>
<th>% diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
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<td>10,18</td>
<td>#VERW!</td>
<td>18</td>
<td>#VERW!</td>
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<td>7,16</td>
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<td>12,09</td>
<td>8,49</td>
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<td>-4,37</td>
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<td>12,35</td>
<td>2,10</td>
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<td>-8,21</td>
<td>23</td>
<td>-25,09</td>
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</table>
Activities Antibiotic Policy Group:
surveillance and feedback of consumption

Evolution antibiotic consumption

<table>
<thead>
<tr>
<th>Antibiotic Group</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
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<tbody>
<tr>
<td>Penicillin + b-lact. Inhibitors</td>
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<td></td>
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</tr>
<tr>
<td>Fluoroquinolones</td>
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</tr>
<tr>
<td>Carbapenems</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Glycopeptides</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Macrolides, lincomides</td>
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<tr>
<td>Sulfonamides, trimethoprim</td>
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<tr>
<td>2e gen. cefalosporines</td>
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</tr>
<tr>
<td>Aminoglycosides</td>
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</tr>
<tr>
<td>Nitrofurans</td>
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<tr>
<td>Polymyxine</td>
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<tr>
<td>Inhibitors</td>
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<tr>
<td>Tetracyclines</td>
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<tr>
<td>Linezolid</td>
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<tr>
<td>Cefotaxime</td>
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<tr>
<td>Monobactams</td>
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<td>Anphenicolin</td>
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<td></td>
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</table>
Activities Antibiotic Policy Group: surveillance and feedback of consumption

Top 20: Wards with highest antibiotic consumption (in euro)
Activities Antibiotic Policy Group:
surveillance of resistance profiles

- Hospital hygiene committee
- Resistance patterns are available in the formulary
Content

Introduction

Activities Antibiotic Policy Group
- Formulary and guidelines
- Restrictions/support antibiotic prescribing
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Future projects

References for the clinical pharmacist

Conclusion
Activities Antibiotic Policy Group: Audit – Drug Use Evaluation (AIII)

- Experience with vancomycin, teicoplanin, fluoroquinolones, piperacillin/tazobactam

- Main outcome measures
  - Degree of concordance with predefined intra-muros published guidelines
    - initial empiric therapy
    - subsequent therapy beyond 72 hours

  - indication, duration, dosage
Flow Chart for Evaluation of Antimicrobial prescriptions
Ref: Van der Meer & Gysens. Clin Microbiol Infect 2001;7 (suppl 6) 12-15
Activities Antibiotic Policy Group:
Audit – Drug Use Evaluation

- Retrospective observational study in 2001
- Surgical intensive care unit in Ghent University Hospital
- Outcome:
  - Degree of concordance of initial empiric and subsequent directed therapy beyond 72 hours with piperacilline/tazobactam with predefined intra-muros published guidelines.
## Activities Antibiotic Policy Group: Audit – Drug Use Evaluation

<table>
<thead>
<tr>
<th>Indication antibiotic therapy</th>
<th>Number of courses</th>
<th>Inappropriate initial therapy</th>
<th>More effective alternative</th>
<th>Less broad alternative</th>
<th>Inappropriate continuation (&gt;72 hours)</th>
<th>More effective alternative</th>
<th>Less broad alternative</th>
<th>Excessive length</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PIPERACILLIN/TAZOBACTAM COURSES</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abdominal sepsis</td>
<td>9</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Late onset nosocomial infection</td>
<td>14</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>8</td>
<td>1</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Others</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total courses</strong></td>
<td>27</td>
<td>10</td>
<td>4</td>
<td>6</td>
<td>14</td>
<td>4</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td><strong>Percentage (%)</strong></td>
<td>100</td>
<td>37</td>
<td>15</td>
<td>22</td>
<td>52</td>
<td>15</td>
<td>30</td>
<td>7</td>
</tr>
</tbody>
</table>
Content

Introduction

Activities Antibiotic Policy Group
  - Formulary and guidelines
  - Restrictions/support antibiotic prescribing

Surveillance
  - Antibiotic consumption and feedback
  - Resistance profiles

Audit
  - Drug Use Evaluation
  - Time of initialisation of antibiotics
  - Kidney failure and antibiotic dose
  - Therapeutic drug monitoring
  - Parenteral to oral conversion

Future projects

References for the clinical pharmacist

Conclusion

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Activities Antibiotic Policy Group: Audit: time of initialisation of antibiotics

- Concomitant observational study (AIII)
- Patient inclusion criteria
  - a proven or suspected infection
    - community acquired pneumonia (CAP), meningitis, pyelonephritis, erysipelas, intra-abdominal infections and exacerbation of chronic obstructive pulmonary disease (COPD)
  - transfer to a ward after admission to the ED
- Measured indicators
  - time interval between admission to ED and first antibiotic administration
  - antibiotic selection in accordance with local guidelines
Activities Antibiotic Policy Group: Audit: time of initialisation of antibiotics

Patients characteristics

<table>
<thead>
<tr>
<th>Number of patients</th>
<th>65</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of infection</td>
<td></td>
</tr>
<tr>
<td>CAP (%)</td>
<td>35 (54)</td>
</tr>
<tr>
<td>intra-abdominal infections (%)</td>
<td>9 (14)</td>
</tr>
<tr>
<td>exacerbation of COPD (%)</td>
<td>8 (12)</td>
</tr>
<tr>
<td>pyelonephritis (%)</td>
<td>3 (5)</td>
</tr>
<tr>
<td>erysipelas (%)</td>
<td>3 (5)</td>
</tr>
<tr>
<td>meningitis (%)</td>
<td>1 (2)</td>
</tr>
<tr>
<td>others (%)</td>
<td>6 (9)</td>
</tr>
<tr>
<td>Mean age, years</td>
<td>61</td>
</tr>
<tr>
<td>Gender ratio; M:F</td>
<td>32:33</td>
</tr>
</tbody>
</table>

Outcomes

| Time interval (hours) between admission to ED and first antibiotic administration (S.D) | 3.9 (3.7) |
| first dose in the E.D. (N=46) (S.D) | 2.4 (1.3)* |
| first dose on the ward (N=19) (S.D) | 7.5 (4.9)* |
| Percentage treatments in accordance with local guidelines % | 86% |

* P < 0.01

Conclusion

- Administration of the first antibiotic dose on the ward is associated with longer time intervals.

Improvements

- First dose on ED
- Critical antibiotics available on ED
- Accelerate delivery of antibiotics by pharmacy
Content

- Introduction
- Activities Antibiotic Policy Group
  - Formulary and guidelines
  - Restrictions/support antibiotic prescribing
  - Surveillance
    - Antibiotic consumption and feedback
    - Resistance profiles
- Audit
  - Drug Use Evaluation
  - Time of initialisation of antibiotics
  - Kidney failure and antibiotic dose
  - Therapeutic drug monitoring
  - Parenteral to oral conversion
- Future projects
- References for the clinical pharmacist
- Conclusion
Activities Antibiotic Policy Group: Audit: Kidney failure and antibiotic dose (AllI)

- **Retrospective observational study**
- **Inclusion criteria**
  - > 18 years
  - Admitted on internal medicine, abdominal surgery or nephrology (April 2006 – March 2007)
  - eGFR < 60 mL/min/1.73m² (Modification of Diet in Renal Disease (MDRD) formula)
- **Exclusion criteria**
  - Dialysis patients

- **Measurement kidney function**
  - eGFR met MDRD-formula (serum creatinine, age, sex and race)
  - creatinine clearance with Cockroft & Gault (if weight available)

- **Evaluation antibiotic dose**
  - By panel (infectiologist, intensivist, pharmacist) based on creatinine clearance
Activities Antibiotic Policy Group: Audit: Kidney failure and antibiotic dose

Patient characteristics

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of patients</td>
<td>99</td>
</tr>
<tr>
<td>Nephrology</td>
<td>27</td>
</tr>
<tr>
<td>Internal medicine</td>
<td>21</td>
</tr>
<tr>
<td>Abdominal surgery</td>
<td>51</td>
</tr>
<tr>
<td>Mean age (SD) (years)</td>
<td>65 (15)</td>
</tr>
</tbody>
</table>
### Activities Antibiotic Policy Group: Audit: Kidney failure and antibiotic dose

<table>
<thead>
<tr>
<th>Number administered doses</th>
<th>Number correct doses (%)</th>
<th>Number incorrect doses (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.364</td>
<td>1.068 (78.3%)</td>
<td>296 (21.7%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number administered doses with overdose (%)</th>
<th>Number correct doses with underdose (%)</th>
<th>Number doses not possible to evaluate</th>
</tr>
</thead>
<tbody>
<tr>
<td>183 (61.8%)</td>
<td>74 (25.0%)</td>
<td>39 (13.2%)</td>
</tr>
</tbody>
</table>
Activities Antibiotic Policy Group: Audit: Kidney failure and antibiotic dose

**Improvements**

- Warning in the on-line electronic laboratory database
  - Patients between 18 and 70 years and MDRD < 60 ML/MIN/1.73m²
    - “Possible increased kidney function. Take this in account by selecting and dosing drugs”.

- Letter to all physicians

- Task for clinical pharmacist
Content

Introduction

Activities Antibiotic Policy Group
- Formulary and guidelines
- Restrictions/support antibiotic prescribing
- Surveillance
  - Antibiotic consumption and feedback
  - Resistance profiles
- Audit
  - Drug Use Evaluation
  - Time of initialisation of antibiotics
  - Kidney failure and antibiotic dose
  - Therapeutic drug monitoring
  - Parenteral to oral conversion

Future projects

References for the clinical pharmacist

Conclusion
Activities Antibiotic Policy Group: Audit: Therapeutic drug monitoring (AIII)

- Retrospective observational study
- Inclusion criteria
  - Treatment with teicoplanine or vancomycin
  - Admission on infectious diseases, abdominal surgery and nephrology
- Exclusion criteria
  - <= 1 day treatment

- Outcome measurement
  - Degree of concordance with intra-muros guidelines
- Evaluation antibiotic dose and level
  - Panel of 2 senior pharmacists
# Activities Antibiotic Policy Group: Audit: Therapeutic drug monitoring

## Patient characteristics - results

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of patients</td>
<td>50</td>
</tr>
<tr>
<td>Mean age (SD) (years)</td>
<td>56.8 (13.4)</td>
</tr>
<tr>
<td>Number of vancomycin treatments (continuous infusion)</td>
<td>39</td>
</tr>
<tr>
<td>Mean treatment duration (days)</td>
<td>14.6</td>
</tr>
<tr>
<td>Number doses evaluated</td>
<td>583</td>
</tr>
<tr>
<td>Number of teicoplanin treatments</td>
<td>11</td>
</tr>
<tr>
<td>Mean treatment duration (days)</td>
<td>10.8</td>
</tr>
<tr>
<td>Number doses evaluated</td>
<td>108</td>
</tr>
</tbody>
</table>
Activities Antibiotic Policy Group: Audit: Therapeutic drug monitoring - vancomycin

<table>
<thead>
<tr>
<th></th>
<th>Correct loading dose</th>
<th>Correct maintenance dose day 1</th>
<th>Correct maintenance dose day 2</th>
<th>Number correct doses</th>
<th>Correct concentration infusion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>17/28</td>
<td>25/30</td>
<td>25/30</td>
<td>268/583</td>
<td>35/39</td>
</tr>
<tr>
<td></td>
<td>61%</td>
<td>83%</td>
<td>83%</td>
<td>46%</td>
<td>90%</td>
</tr>
</tbody>
</table>

**Improvements**

- Update guidelines for administration and monitoring of glycopeptides (flow chart)
- Pop-up in the on-line electronic laboratory database linked to results drug monitoring
CONTINU INFUUS

1) Dosis geven over 2 uur (Red Man syndroom)
2) Maximale concentratie infuus 0.5% (1% bij vochtrestrictie)
   Vb 500 MG vancomycine in 50 ML NaCl 0.9% of glucose 5%
   Vb 1000 MG vancomycine in 100 ML NaCl 0.9% of glucose 5%
   Vb 1500 MG vancomycine in 250 ML NaCl 0.9% of glucose 5%
3) Check andere medicatie (zie 2.11.) (eventueel infuus maximaal 2 x 2 uur dag onderbreken)

1) Maximale concentratie infuus 0.5% (1% bij vochtrestrictie)
   Vb 1000 MG vancomycine in 100 ML NaCl 0.9% of glucose 5%
   Vb 2000 MG vancomycine in 250 ML NaCl 0.9% of glucose 5%
   Vb 3000 MG vancomycine in 500 ML NaCl 0.9% of glucose 5%
2) Check andere medicatie (zie 2.11.) (eventueel infuus maximaal 2 x 2 uur dag onderbreken)

NA 24 uur

Bloedafname voor spiegelbepaling

DAG 2
Content

- **Introduction**
- **Activities Antibiotic Policy Group**
  - Formulary and guidelines
  - Restrictions/support antibiotic prescribing
  - Surveillance
    - Antibiotic consumption and feedback
    - Resistance profiles
- **Audit**
  - Drug Use Evaluation
  - Time of initialisation of antibiotics
  - Kidney failure and antibiotic dose
  - Therapeutic drug monitoring
  - Parenteral to oral conversion
- **Future projects**
- **References for the clinical pharmacist**
- **Conclusion**
Activities Antibiotic Policy Group:
Audit: Parenteral to oral conversion (Alll)

“Big diseases need big treatments and big treatments come in syringes”
Activities Antibiotic Policy Group: Audit: Parenteral to oral conversion

**Definitions** *(Nathwani et al. JAC 1997;39:441-446)*

**Streamlining therapy:**
- narrowing of the target specific pathogen, encompassing the overall strategy of altering the antimicrobial regimen in response to culture and susceptibility results *(Quintilani)*

**Sequential therapy:**
- Conversion from IV to oral formulation of the same medication (maintaining equivalent potency)

**Step-down therapy:**
- conversion from IV to oral agent of the same or different class of agent, with reduction in potency

**Switch therapy:**
- conversion from IV therapy with one drug to an oral formulation of a different medication without losing potency
Activities Antibiotic Policy Group: Audit: Parenteral to oral conversion

**Advantage for patients**
- faster mobilisation
- shorter stay in hospital
- reduced risk of adverse effects
  - pulmonary embolism
  - phlebitis (no IV line)
  - catheter associated infection

**Advantage for hospital/community budget**
- reduction in drug acquisition cost
- reduction in drug wastage
- reduction laboratory costs, monitoring serum concentration and renal function
- reduced preparation and administration time
Activities Antibiotic Policy Group: Audit: Parenteral to oral conversion

- Guidelines for IV/PO switch differ according to different literature data.
  - body temperature < 38°C during 24 hours
  - decreasing or normal leukocyte count
  - no unexplained tachycardia
  - intact functional gastro-intestinal tractus absence of malabsorption (no vomiting, no diarrhoea)
  - a functional gastric feeding tube
  - no planned operation within 24 hours
  - no severe sepsis

- For which products?
  - Levofloxacin, ciprofloxacin, moxifloxacin, clindamycine, metronidazol, fluconazol, voriconazol linezolid

- Pitfalls
  - Drug-drug interactions
  - Drug-food interactions
  - Crushing of tablets
Activities Antibiotic Policy Group: Audit: Parenteral to oral conversion

controlled before and after prospective study

Design study

A: Publication of guidelines
B: C: education session by infectiologists
D: pro-active conversion by a pharmacist
<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Period B</th>
<th>Period C</th>
<th>Period D</th>
<th>$P$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N= 36</td>
<td>N= 21</td>
<td>N=24</td>
<td></td>
</tr>
<tr>
<td>Type of infection</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urinary tract infection</td>
<td>11</td>
<td>5</td>
<td>12</td>
<td>0.117</td>
</tr>
<tr>
<td>Skin and soft tissue infection</td>
<td>4</td>
<td>7</td>
<td>2</td>
<td>0.048</td>
</tr>
<tr>
<td>gastro-intestinal infections</td>
<td>7</td>
<td>0</td>
<td>6</td>
<td>0.061</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>0.857</td>
</tr>
<tr>
<td>Prothesis-infection</td>
<td>0</td>
<td>5</td>
<td>0</td>
<td>0.001</td>
</tr>
<tr>
<td>Osteomyelitis</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0.065</td>
</tr>
<tr>
<td>Others</td>
<td>11</td>
<td>1</td>
<td>3</td>
<td>0.037</td>
</tr>
<tr>
<td>Pathology index (a)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(source: Medicare) $(S.D)$</td>
<td>1.7 $(1.4)$</td>
<td>1.5 $(0.9)$</td>
<td>1.6 $(1.4)$</td>
<td>0.966</td>
</tr>
<tr>
<td>Mean age, years $(S.D.)$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean time start therapy until fulfilment of criteria (days) $(S.D)$</td>
<td>5.2 $(5.2)$</td>
<td>5.8 $(6.2)$</td>
<td>5.0 $(4.7)$</td>
<td>0.934</td>
</tr>
</tbody>
</table>
Activities Antibiotic Policy Group: Audit: Parenteral to oral conversion

Patient outcome

<table>
<thead>
<tr>
<th></th>
<th>GROUP A</th>
<th>GROEP B</th>
<th>GROEP C</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>N= 36</td>
<td>29,8 (27,4)</td>
<td>23,9 (19,8)</td>
<td>24,7 (21,9)</td>
<td>0,619</td>
</tr>
<tr>
<td>Mean LOS (S.D)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean duration FQ IV treatment in days (S.D)</td>
<td>8,6 (6,6)</td>
<td>9,3 (7,9)</td>
<td>4,7 (4,5)</td>
<td>0,029</td>
</tr>
<tr>
<td>Mean extra IV treatment in days (S.D.)</td>
<td>4,1 (5,8)</td>
<td>3,5 (4,9)</td>
<td>1,0 (1,3)</td>
<td>0,006</td>
</tr>
<tr>
<td>Mean cost caused by extra IV treatment in euro (SD) (a)</td>
<td>188,7 (292,9)</td>
<td>103,6 (131,5)</td>
<td>44,8 (60,2)</td>
<td>0,037</td>
</tr>
</tbody>
</table>
Activities Antibiotic Policy Group: Audit: Parenteral to oral conversion

Year 2005
Activities Antibiotic Policy Group: Audit: Parenteral to oral conversion

Year 2007

Further promotion:
• By clinical pharmacists
• Frequently audits
• Follow up usage indicator
  • % IV/IV+PO
  • in 2007: 23%
Content

- Introduction
- Activities Antibiotic Policy Group
  - Formulary and guidelines
  - Restrictions/support antibiotic prescribing
  - Surveillance
    - Antibiotic consumption and feedback
    - Resistance profiles
- Audit
  - Drug Use Evaluation
  - Time of initialisation of antibiotics
  - Kidney failure and antibiotic dose
  - Therapeutic drug monitoring
  - Parenteral to oral conversion
- Future projects
- References for the clinical pharmacist
- Conclusion
Future projects

- Reducing duration of antibiotic treatment
  - Procalcitonin: better diagnostic marker?
- Extended and continuous infusion of antibiotics (All)
  - Implementation in daily practice
  - Pitfalls
    - Incompatibilities
    - Loadingdose
- ABS project: validation of indicators
  - Staphylococcus aureus bacteremia
  - Prophylaxis in surgery
  - IV/PO switch
- Decision support system into CPOE (computer physician order entry) (BI)
Content

- Introduction
- Activities Antibiotic Policy Group
  - Formulary and guidelines
  - Restrictions/support antibiotic prescribing
  - Surveillance
    - Antibiotic consumption and feedback
    - Resistance profiles
- Audit
  - Drug Use Evaluation
  - Time of initialisation of antibiotics
  - Kidney failure and antibiotic dose
  - Therapeutic drug monitoring
  - Parenteral to oral conversion
- Future projects
- References for the clinical pharmacist
- Conclusion
## References for the clinical pharmacist

| Electronic databases | - Up to date (http://www.utdol.com/online/about/contact_us.html)  
|                      | - Micromedex (www.micromedex.com/products/clinicalxpert)  
|                      | - Clinical Pharmacology (http://www.goldstandard.com)  
|                      | - Clinical pharmacy and therapeutics. Walker R., Edwards C (0-443-07137-3)  
|                      | - The Sanford Guide to antimicrobial therapy  
|                      | - European Society of Clinical Microbiology and Infectious Diseases. [http://www.escmid.org/](http://www.escmid.org/)  
|                      | - The Cochrane Collaboration. Cochrane Reviews “Infectious Diseases”.  
|                      | [http://www.cochrane.org/reviews/en/topics/72.html](http://www.cochrane.org/reviews/en/topics/72.html)  

Content

- Introduction
- Activities Antibiotic Policy Group
  - Formulary and guidelines
  - Restrictions/support antibiotic prescribing
  - Surveillance
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    - Resistance profiles
- Audit
  - Drug Use Evaluation
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- Conclusion
Conclusion

- Multidisciplinary team approach is necessary
- Combination of different interventions can reduce inappropriate use of antibiotics
- Quality indicators in development or already available
Thank you for your attention