How To Improve Antibiotic Use In Hospitals

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THE DEMING CYCLE

Plan
Act
Check
Do

P A D C

Plan

- Strategy: national, hospital (multidisciplinary teams)
- Formulary restriction, pre-authorization
- Guidelines, Clinical pathways
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- Cycling
- Combination therapy
- Streamlining, de-escalation
- Dose optimization
- Parenteral-to-oral
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- Auditing
- Surveillance of consumption
- Surveillance or resistance
- Outcome tracking: mortality, hospital infections, LOS...
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- Revision of guidelines
- Revision of strategy
- “tailored” interventions

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Evidence-based antibiotic stewardship

1. Team (All-AIII)
2. Collaboration with hospital infection control (AIII)
3. Collaboration with administration, medical staff leadership and local providers (AIII)
4. Authority, obtained by administration (AIII)
5. Administrative support (AIII)
6. Core strategies: audit with feedback (AI), formulary restriction/pre-authorisation (AII)

*Dellit TH, et al. IDSA and SHEA guidelines for developing an institutional program to enhance antimicrobial stewardship. CID 2007; 44: 159.*
Evidence-based antibiotic stewardship (cont’d)

7. Elements as supplements
   • Education (AIII, BII)
   • Guidelines, clinical pathways (AI, AIII)
   • Cycling (CII)
   • Order forms (BII)
   • Combination (CII, AII)
   • Streamlining and de-escalation (AII)
   • Dose optimizing (AII)
   • Parenteral to oral (AII)
8. Information technology (AIII, BII)
9. Computer-based surveillance (BII)
10. Clinical microbiology (AIII)
11. Outcome measures (BIII)

_Dellit TH, et al. IDSA and SHEA guidelines for developing an institutional program to enhance antimicrobial stewardship. CID 2007; 44: 159._
MD per 1000 inh in 2004: Slovenia 2.2, EU 3.2  
(OECD and Slovenian Medical Chamber)

MRSA rate: 2000: 21.4 % → 2007: 8.3%  

(ESAC Study Group)
Situation in AMR in Slovenia

- Intersectoral mechanism from 2005
- Strategy from 2006
- Antimicrobial committees in all general hospitals
- Hospital hygiene committees in all hospitals (by law from 1999)
- Susceptibility data: EARSS and other national/international projects
- Consumption data: ESAC (all hospitals)
Figure 20: Hospital use of antimicrobials for systemic use (ATC group J01) in the participating countries in 2006
Figure 20: Hospital use of antimicrobials for systemic use (ATC group J01) in the participating countries in 2006

- Other J01 classes
- Sulfonamides and trimethoprim (J01E)
- Quinolones (J01M)
- Macrolides, lincosamides and streptogramins (J01F)
- Tetracyclines (J01A)
- Cephalosporins and other beta-lactams (J01D)
- Penicillins (J01C)

ESAC Report 2006
# Consumption of antibacterials for systemic use (J01) DDD/100 bed-days in European countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Included hospitals</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slovenia</td>
<td>all</td>
<td>47.6</td>
<td>47.3</td>
<td>48.6</td>
<td>49.5</td>
<td>50.4</td>
</tr>
<tr>
<td>Slovenia</td>
<td>teaching + general</td>
<td>56.9</td>
<td>58.0</td>
<td>59.3</td>
<td>58.0</td>
<td>59.4</td>
</tr>
<tr>
<td>Denmark</td>
<td>teaching + general</td>
<td>55.0</td>
<td>58.2</td>
<td>63.0</td>
<td>63.9</td>
<td>68.8*</td>
</tr>
<tr>
<td>Sweden</td>
<td>all?</td>
<td>50.8</td>
<td>53.5</td>
<td>58.9</td>
<td>60.2</td>
<td>NP</td>
</tr>
<tr>
<td>The Netherlands</td>
<td>~ 60 %</td>
<td>50.2</td>
<td>53.8</td>
<td>58.3</td>
<td>62.2</td>
<td>NP</td>
</tr>
</tbody>
</table>

*Courtesy of Čičman M.*
Use of restricted and non-restricted antibacterials (J01) in Tertiary Care Center Ljubljana, Slovenia 1998-2007
ATC/WHO version 2007 (DDD/100 bed-days)

![Graph showing the use of restricted and non-restricted antibacterials (J01) in Tertiary Care Center Ljubljana, Slovenia 1998-2007. The graph displays the DDD/100 Bed-days for each year from 1998 to 2007, with a comparison between restricted and unrestricted antibacterials.]

Courtesy of Čižman M.
University Medical Centre Ljubljana

- cca 100.000 admissions/year
- Published guidelines: 1998, 2006
- List of restricted antimicrobials: 1999
- In most cases pre-authorisation of restricted ATB mandatory by ID
- Consultations on the wards, rounds, telephone consultations
- Education, education, education…
ID Guided ATM Therapy: an Observational Study

- A: restricted antimicrobials approved by ID
- B: restricted antimicrobials approved by the head of the department
- C: all antimicrobials prescribed by ID

Consumption of Antibiotics: DDD ATC 2005
Statistics: SPSS 15.0 (correlate : bivariate)

Beović B, Čižman M, Seme K, Kreft S. J Chemother (accepted for publication in February 2009)
Relative Change in Antimicrobial Consumption (DDD/100 patient-days)

Graph showing the relative change in antimicrobial consumption from 1998 to 2005 with a statistical significance of P=0.006.
Relative Change in Antimicrobial Consumption (DDD/100 patient-days)

A: P = 0.006


Values: 0, 0.2, 0.4, 0.6, 0.8, 1.0, 1.2

Legend:
- A
- B
- C
Relative Change in Antimicrobial Consumption (DDD/100 patient-days)

- A
- B
- C

P = 0.006
Relative Change in Antimicrobial Consumption (DDD/100 patient-days)
Relative Change in Antimicrobial Consumption (DDD/100 patient-days)

- A
- B
- C

NS

P=0.006
Relative Change in Antimicrobial Consumption (DDD/1000 patients)

P = 0.002
Relative Change in Antimicrobial Consumption (DDD/1000 patients)

- A
- B
- C

P = 0.002
Relative Change in Antimicrobial Consumption (DDD/1000 patients)

![Graph showing relative change in antimicrobial consumption from 1998 to 2005.](image)
Relative Change in Antimicrobial Consumption (DDD/1000 patients)

![Graph showing relative change in antimicrobial consumption from 1998 to 2005.](Image)
Relative Change in Antimicrobial Consumption (DDD/1000 patients)

- A
- B
- C

P=0.002

0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0

1998 1999 2000 2001 2002 2003 2004 2005

NS

P=0.006

P=0.002
Relative Change in Antimicrobial Cost (Eur)

- Mean: 0.94, 2001: 1.87
- Mean: 0.53, 2004: 0.53

p = 0.026

Graph showing changes in antimicrobial cost from 1998 to 2005 with three categories A, B, and C.
Relative Change in Antimicrobial Cost (Eur)

The diagram shows the relative change in antimicrobial cost (in Euros) from 1998 to 2005. The x-axis represents the years from 1998 to 2005, and the y-axis represents the relative change in cost from 0 to 1.8. The data points are represented by different line styles and colors for different categories (A, B, C) indicated in the legend. The p-value for the relative change in cost is 0.026.
Relative Change in Antimicrobial Cost (Eur)
Relative Change in Antimicrobial Cost (Eur)

1998 1999 2000 2001 2002 2003 2004 2005

A B C

p=0.016

p=0.026

153 941 Eur

94 537 Eur

p=0.026

NS
In-hospital Mortality in %

all trends non-significant
In-hospital Mortality in %

all trends non-significant
In-hospital Mortality in %

All trends non-significant
In-hospital Mortality in %

all trends non-significant
$P. \text{ aeruginosa}$ : % susceptible to ciprofloxacin

![Graph showing the percentage susceptible to ciprofloxacin over years from 1998 to 2005.](image)
P. aeruginosa: % susceptible to ciprofloxacin
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P. aeruginosa: % susceptible to ciprofloxacin

p = 0.018

p = 0.04

NS
Klebsiella spp.: susceptibility to 3rd gen. cephalosporins
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Klebsiella spp.: susceptibility to 3rd gen. cephalosporins

- A
- B
- C

p = 0.02

NS
S. aureus: susceptibility to methicillin
S. aureus: susceptibility to methicillin
S. aureus: susceptibility to methicillin

![Graph showing the susceptibility to methicillin of S. aureus from 1998 to 2005. The graph compares three categories: A, B, and C. Over the years, category A shows a steady increase, category B fluctuates with a slight rise, and category C remains relatively stable.]
S. aureus: susceptibility to methicillin

![Graph showing the susceptibility of S. aureus to methicillin over the years from 1998 to 2005. The graph includes three lines labeled A, B, and C, each representing different susceptibility levels. The x-axis represents the years from 1998 to 2005, and the y-axis represents the level of susceptibility from 0 to 2.]
S. aureus: susceptibility to methicillin
Length-of-stay
Length-of-stay

A\nB
C

1998 1999 2000 2001 2002 2003 2004 2005
Length-of-stay

![Graph showing the length of stay from 1998 to 2005 for categories A, B, and C. The graph indicates trends and values for each category over the years.]
Length-of-stay

Beović B, Čižman M, Seme K, Kreft S. Unpublished
The Role of ID in Antibiotic Stewardship


<table>
<thead>
<tr>
<th>ID pre-authorisation</th>
<th>Studies showing an effect in lowering consumption/cost</th>
<th>Studies showing no effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>YES</td>
<td>19</td>
<td>1</td>
</tr>
<tr>
<td>NO</td>
<td>5</td>
<td>3</td>
</tr>
</tbody>
</table>
to summarize...

ID guided total ATB use may

- Decrease consumption
- Decrease cost
- Decrease LOS
- Decrease resistance in some bacteria
- No impact on mortality
- BUT...
...21. CALLS UPON THE MEMBER STATES to
-develop and implement strategies
-establish intersectoral mechanisms
-strengthen surveillance systems and improve data quality on AMR and use of antimicrobial agents from both human health and veterinarian sector, and HCAI
-further promote prudent use of antimicrobials
-promote development and use of guidelines for best practices....
1st European Antimicrobial Resistance Day
18th November 2008

COLD? FLU?
TAKE CARE
NOT ANTIBIOTICS

An initiative of the European Union
Does low prescribing mean improvement?