Quantitative metrics and quality indicators to assess antibiotic use

Output of the DRIVE-AB project

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Train-the-trainer course – 10th of April 2016
Background

- Antibiotic use is frequently inappropriate, both in the outpatient and inpatient settings\(^1,2\)
- Antibiotic consumption varies significantly across countries\(^3\)
- There is huge methodological variability in the evaluation of antibiotic use

**Need for standardized indicators and metrics for an appropriate qualitative and quantitative evaluation of antibiotic use**

1: Adriaenssens N et al., J Antimicrob Chemother 2011
2: Hulscher ME et al., Lancet Infect Dis 2010
Objectives

Obtain global consensus on:

1. Quality indicators of responsible antibiotic use
2. Quantity metrics of responsible antibiotic use
Methods: definitions

- **A quality indicator** reflects the degree in which an antibiotic prescription is correct or appropriate.

  example: ‘Empirical antibiotic therapy should be prescribed according to the local guidelines’

- **A quantity metric** reflects the volume or the costs of antibiotic use.

  example: ‘Consumption of antibiotics expressed in DDD per 1000 inhabitants and per day’
Methods: protocol

<table>
<thead>
<tr>
<th>Quality Indicators (QI) Structure/Process/Outcome measures</th>
<th>Quantity Metrics (QM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inpatient (IQI)</td>
<td>Outpatient (OQI)</td>
</tr>
<tr>
<td>Radboudumc</td>
<td>University of Lorraine</td>
</tr>
<tr>
<td>Radboudumc</td>
<td>University of Rijeka</td>
</tr>
<tr>
<td>Radboudumc</td>
<td>University of Antwerp</td>
</tr>
</tbody>
</table>
Methods: protocol

4-step RAND-modified Delphi procedure

1. Systematic review of the literature
2. First online survey of a multidisciplinary expert panel
3. Face-to-face consensus meeting
4. Second online survey of the multidisciplinary expert panel

Schouten et al., Clin Infect Dis 2005;
Hermanides et al., Clin Infect Dis 2008;
Van den Bosch et al., BMC Infect Dis 2014
**Systematic review**

- Medline + websites’ search
- 2 independent reviewers

**Example: for OQIs**
- 96 search terms organised around 7 « concepts »
- 3563 articles for title/abstract screening
- 325 articles for full text screening
- 61 included references

Articles found in PubMed
N = 3563

Excluded after title/abstract screening
N = 3276

Included after title/abstract screening
N = 287

Excluded after full-text screening
N = 242

Included after full-text screening
N = 45

Articles found interesting through cross-referencing
N = 29

References found through website search N = 7

Cross-referencing articles excluded
N = 20

Total included article
N = 61
Consensus procedure (1)

- First online survey (SurveyMonkey®)

- Sent to a multidisciplinary panel of experts (stakeholders)
- Appraisal of the relevance of indicators/metrics for ‘assessing the quality of antibiotic use’ or ‘measuring the quantity of antibiotic use’
- Likert scale ranging from 1 to 9 + ‘I cannot assess’

<table>
<thead>
<tr>
<th>Median Rating</th>
<th>Likert Scale ≥8</th>
<th>Likert Scale &lt;8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agreement: ≥70 % highest percentiles</td>
<td>Selection</td>
<td>Exclusion</td>
</tr>
<tr>
<td>Disagreement: &lt;70 % highest percentiles</td>
<td>Discussion</td>
<td>Exclusion</td>
</tr>
</tbody>
</table>
Consensus procedure (2)

The stakeholders:

• Medical Community
  GPs, Medical specialists, Clinical Societies, Pharmacists and Clinical Pharmacologists, Nurses

• Patients/Global Public Health
  Patient societies, Public health, (bio)ethicists/jurists

• R&D/Pharmaceutical Industry
  Big pharma, small/medium Companies, Economists, Health Economists

• Payers/Policy makers/Government/Regulators
Consensus procedure (3)

- Face to face meeting: 30th of September 2015 at Schiphol (NL)
  - Discussion among stakeholders to solve disagreements observed in the first survey
  - Evaluation of indicators/metrics newly suggested during the first survey

- Second online survey (SurveyMonkey®)
  - Final validation of indicators/metrics
    - Accept/reject + reason(s) for disagreement
Results: Outpatient quality indicators (OQIs)

Systematic review
43 OQIs

First survey
27 selected
6 disagr.
+2 newly suggested
10 rejected

Face-to-face meeting
33 selected*
*(2 OQIs were merged)
1 rejected

Second survey
32 selected
1 rejected
Results: some of highest appraised OQIs

‘generic’ OQIs:
- OQI-3 Outpatients should receive antibiotic therapy compliant with guidelines; this includes, but is not limited to indication, choice of the antibiotic, duration, dose and timing.
- OQI-13 Antibiotics in stock should not be beyond the expiry date.
- OQI-14 Antibiotics that are dispensed to outpatients should be adequately labelled (patient name, antibiotic's name, when antibiotics should be taken).

OQIs for Outpatient Parenteral Antibiotic Treatment (OPAT):
- OQI-23 All OPAT plans should include dose, frequency of administration and duration of therapy.
- OQI-25 Administered doses of OPAT intravenous therapy should be documented on a medication card.
- OQI-30 The OPAT (Outpatient Antibiotic Parenteral Treatment) plan should be communicated to the general practitioner (GP) at discharge.
**Results: one example of OQI**

**OQI-5 Acute upper respiratory infections and bronchitis should not be treated with antibiotics within the first three days, unless there is documented indication for treatment**

<table>
<thead>
<tr>
<th>Clinical situation</th>
<th>Numerator</th>
<th>Denominator</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delayed AB prescribing strategy should be agreed for patients with the included conditions</td>
<td>Patients with delayed prescribing</td>
<td>Patients with the included conditions (acute otitis media, acute sore throat/acute pharyngitis/acute tonsillitis, common cold, acute rhinosinusitis, acute cough/acute bronchitis.)</td>
<td>NICE – 2008 (29)</td>
</tr>
<tr>
<td>Acute upper respiratory infection (AURTI)</td>
<td>Number of patients with an AURTI where the AB are avoided within 3 days of unique visit</td>
<td>Number of patients with an AURTI</td>
<td>Wessel – 2008 (30)</td>
</tr>
<tr>
<td>Acute otitis media</td>
<td>Patients &gt; 2 yo with less than 3 days of symptoms of AOM with AB</td>
<td>Patients &gt; 2 yo with AOM</td>
<td>Hansen – 2010 (4) Hansen – 2013 (5)</td>
</tr>
<tr>
<td>Acute bronchitis</td>
<td>Number of patients with an acute bronchitis where the AB are avoided within 3 days of unique visit</td>
<td>Number of patients with an acute bronchitis</td>
<td>Wessel – 2008 (30)</td>
</tr>
<tr>
<td>Acute pharyngitis</td>
<td>Number of patients with an acute pharyngitis where the AB are avoided within 3 days of unique visit</td>
<td>Number of patients with an acute pharyngitis</td>
<td>Wessel – 2008 (30)</td>
</tr>
</tbody>
</table>
Systematic review: IQIs

- Medline + websites’ search
- 2 independent reviewers

For IQIs
- 20 search terms organised around 2 « concepts »
- 620 articles for title/abstract screening
- 272 articles for full text screening
- 140 included articles
Results: Inpatient quality indicators (IQIs)

Systematic review
70 IQIs

First survey
48 selected
10 disagr.
+2 newly suggested
12 rejected

Face-to-face meeting
53 selected
7 rejected

Second survey
51 selected
2 rejected
Results: highest appraised IQIs

• IQI-9 An antibiotic stewardship programme (antibiotic prescribing control programme and/or antibiotic prescribing policy) should be in place at the health care facility.

• IQI-17 An antibiotic plan should be documented in the medical record at the start of the antibiotic treatment. (Antibiotic plan includes: indication, name, doses, duration, route, and interval of administration)

• IQI-19 The results of bacteriological susceptibilities should be documented in the medical records.

• IQI-34 The local guidelines should correspond to the national guidelines but should be adapted based on local resistance patterns.

• IQI-49 Allergy status should be taken into account when antibiotics are prescribed.
Systematic review: OQMs

- Medline + complementary websites’ search

For OQMs

- 66 OQMs based on metric numerator
- 597 articles for title/abstract screening
- 138 included articles
Results: Outpatient quantity metrics (OQMs)

Systematic review

20 OQMs

First survey

0 selected
6 disagr.
+3 newly suggested
14 rejected

Face-to-face meeting

5 selected
+2 newly suggested
4 rejected

Second survey

6 selected
1 rejected
Results: OQMs

OQM-1 DDD per defined population

OQM-2 Treatments/courses per defined population

OQM-3 Treatments/courses per physician contacts

OQM-4 Prescriptions per defined population

OQM-5 Prescriptions per physician contact

OQM-6 Seasonal variation of total antibiotic use
Systematic review: IQMs

- Medline + references + websites’ search
- 3 independent reviewers

For IQMs

- 73 nominator/denominator combinations organised around 20 groups
- 1150 articles for title/abstract screening
- 168 included articles
Results: Inpatient quantity metrics (IQMs)

- Systematic review
  - 20 IQMs

First survey
- 1 selected
- 4 disagr.
- +1 newly suggested
- 15 rejected

Face-to-face meeting
- 6 IQMs selected (combined with top 3 or top 2 denominators)
  - 15 IQMs
- 0 rejected

Second survey
- 12 selected
- 3 rejected
Results: some examples of IQMs

• IQMs 1-3: Defined Daily Dose (DDD)
  • per 100(0) PD/ BD/ OBD
  • per Admissions
  • per (100 BD per CMI)

• IQMs 5-7: Days of Therapy (DOT)
  • per Patient Days
  • per Patients
  • per Admissions

• IQM-12: Antibiotic use should be preferably expressed in at least two metrics simultaneously
Further developments of DRIVE-AB indicators and metrics

- Evaluation of feasibility in different settings
- Application in clinical studies
- Implementation in antimicrobial stewardship policies
- Use for education/teaching material
Variation in metrics / indicators


Abstracts screened: N=5204

Full text screened N=628

Excluded references: N=4576

Included references N=147

Excluded references N=481
Variation in metrics

Studies reporting variation in antibiotic use among hospitals in Defined Daily Doses/1000 inhabitant days

- SWITZERLAND: 2006 Kuster SP
- JAPAN: 2010 Muraki Y
- FRANCE: 2007 Dumartin C
- FRANCE: 2009 Gbaguidi-Haore H
- FRANCE: 2007 Amadeo B
- FRANCE: 2007 Miliani K
- SWITZERLAND: 2008 Pluss-Suard C
- FINLAND: 2005 Kanerva M
- EUROPE: 2006 Ansari F
- UK: 2013 Cooke J

Definitions:
- MAX
- MEAN
- MIN
The reasons for the observed variation remain ill-explained.
DRIVE-AB WP-1a:
5 presentations at ECCMID 2016!

#P1291 Metrics for quantifying antimicrobial use in the inpatient setting: results from a systematic review
*Paper Poster Session, Poster area*
Monday, 11 April 2016 - 13:30 - 14:30

#P1294 Variation in indicators of antibiotic use among and within different settings: a systematic review
*Paper Poster Session, Poster area*
Monday, 11 April 2016 - 13:30 - 14:30

#P1328 Quality indicators assessing antibiotic use in the outpatient setting: a systematic review followed by consensus procedure
*Paper Poster Session, Poster area*
Monday, 11 April 2016 - 13:30 - 14:30

#EP0126 Quantity metrics assessing antibiotic use in the outpatient setting: a global consensus procedure
*ePoster Session, Poster area*
Tuesday, 12 April 2016 - 12:30 - 13:30

#O599 Quality indicators of antibiotic use in the inpatient setting: a global consensus procedure. 2-hour *Oral Session*
Hall C
Tuesday, 12 April 2016 - 13:30 - 15:30

Thanks for your attention!