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Metrics for quantifying antimicrobial use in a hospital setting: results from a systematic review

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Background: Due to differences in case mix, formulary and specific national/local circumstances various measurements for quality and quantity assessment of antibiotic use have been used. In order to assess and improve the quality of antimicrobial treatment, a **standardized method of monitoring and reporting quantity of antimicrobial use** is proposed as a part of the DRIVE-AB project.

Methods: A **four-step RAND-modified Delphi procedure was carried out:**

First step: A *systematic review* of the literature was performed. The MEDLINE/Pub Med database and websites of several (inter)national organizations (e.g. ECDC, ESCMID,…) were searched for eligible studies reporting antibiotic quantity inpatient metrics (IQM) published until January 29, 2015. In addition, the reference lists of included studies were hand searched to identify other potential articles (Figure 2).

Second step: Using a 9-point Likert scale, an interdisciplinary international expert panel of stakeholders from medical, patients, pharmaceuticals and regulators background assessed the relevance of the extracted IQM in *a first internet-based questionnaire survey*.

Third step: A face to face consensus meeting was organized to discuss disagreements derived from the first online survey.

Fourth step: A multidisciplinary expert panel of stakeholders was asked to accept or reject an updated set of IQM in *the second internet-based questionnaire survey.*

Results: From the included studies (Figure 2), 20 quantity metrics composed of 20 different numerators and associated denominators were extracted and proposed for the stakeholders in the consensus procedure. The response rate was 53% to the first survey (23/43 stakeholders) and 87% to the second survey (20/23). The final set of included metrics consisted of five nominators combined with several prioritised denominators. Overall, **12 IQM of responsible antibiotic use** were selected (table 1). The step-by-step results are presented in figure 1.
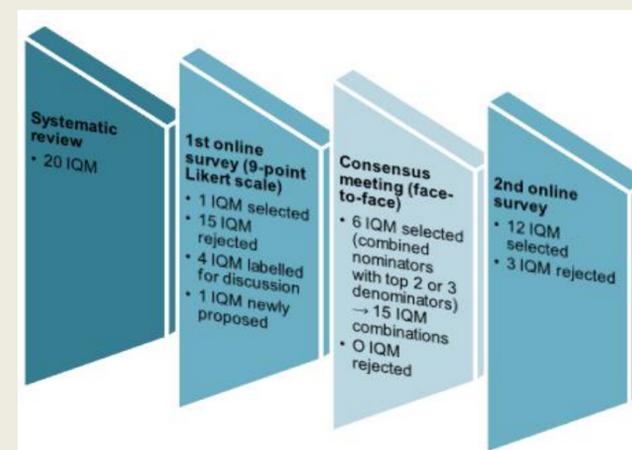

Figure 1: Results of four-step RAND-modified Delphi procedure , IQM* = inpatient quantity metrics

Figure 2: Search strategy

Table 1: Selected inpatient quantity metrics on responsible antibiotic use

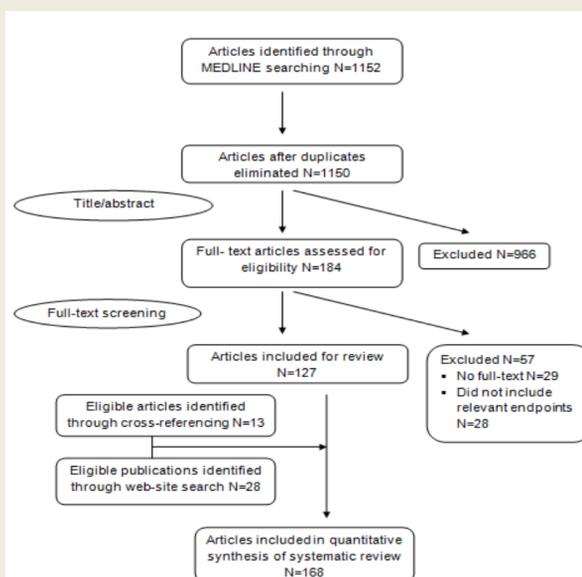| Selected inpatient quantity metrics on responsible antibiotic use |
| --- |
| 1) Defined Daily Dose (DDD) per 100(0) Patient Days/ Bed Days/ Occupied Bed Days |
| 2) Defined Daily Dose (DDD) per Admissions |
| 3) Defined Daily Dose (DDD) per (100 Bed Days per Case Mix Index[*]) |
| 4) Prescribed Daily Dose (PDD) per 100 Patient Days |
| 5) Days of Therapy (DOT) per Patient Days |
| 6) Days of Therapy (DOT) per Patients |
| 7) Days of Therapy (DOT) per Admissions |
| 8) Length of Therapy (LOT) per Admissions |
| 9) Length of Therapy (LOT) per Patients |
| 10) Patients exposed to antibiotics per all Patients |
| 11) Patients exposed to antibiotics per Admissions |
| 12) Antibiotic use should be preferably expressed in at least two metrics simultaneously |

Conclusions: The literature review confirmed that there are numerous different metrics for measuring antibiotic use in the inpatient setting. The DRIVE-AB consensus procedure identified a limited set of quantity metrics that can be used as standard measures for reporting and benchmarking in the inpatient setting.