

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 DRIVE-AB project.

Methods: A four-step RAND-modified Delphi procedure consisted of **systematic review** of the literature, two online surveys of a multidisciplinary expert panel and face-to-face consensus meeting was applied to extract relevant quantity metrics of antibiotic use in inpatient setting (IQM).

A MEDLINE/Pub Med database was searched for eligible studies published until January 29, 2015. Websites of several (inter)national organizations (e.g. ECDC, ESCMID, etc...) were also reviewed. Articles on systemic antibiotic use in humans, written in English, involving IQM (numerator/denominator) were included for screening. Three reviewers independently screened titles and abstracts of the records retrieved by the electronic search engine. Discrepancies between the reviewers were resolved through a discussion. In addition, the reference lists of studies identified by the literature search were hand searched to identify other potential articles (Figure 2).

An interdisciplinary international expert panel of stakeholders from medical, patients, pharmaceuticals and regulators background assessed the relevance of extracted IQM. The consensus procedure consists of **two** rounds of **internet-based questionnaire surveys** and a **face-to-face meeting** which took place between two online surveys. Using 9-point Likert scale stakeholders evaluated included IQM in first online survey and were asked to accept or reject updated set of IQM in the second survey.

Results: Based on included studies (Figure 2), 20 quantity metrics composed of 20 different numerators and associated denominators were identified and proposed for the stakeholders in the consensus procedure. Response rate was 53% to the first survey (23/43 stakeholders) and 87% to the second survey (20/23). Final set of included metrics was consisted of five nominators combined with top two or three denominators. Overall, **12 IQM of responsible antibiotic use** were selected (table 1). Step-by-step results are presented in figure 1.

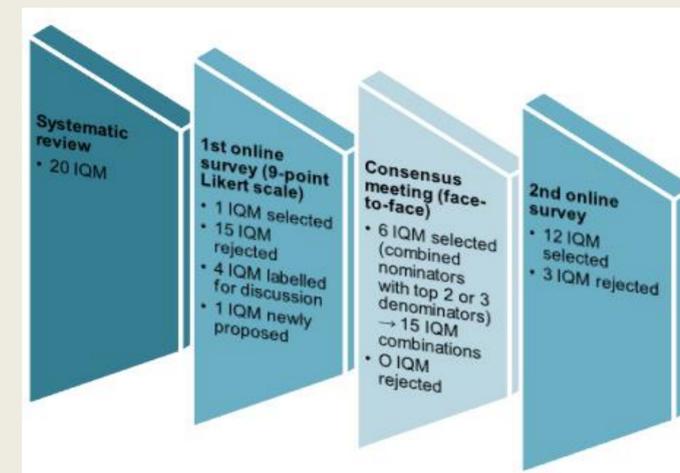


Figure 1: Results of four-step RAND-modified Delphi procedure , IQM* = inpatient quantity metrics

Table 1: 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

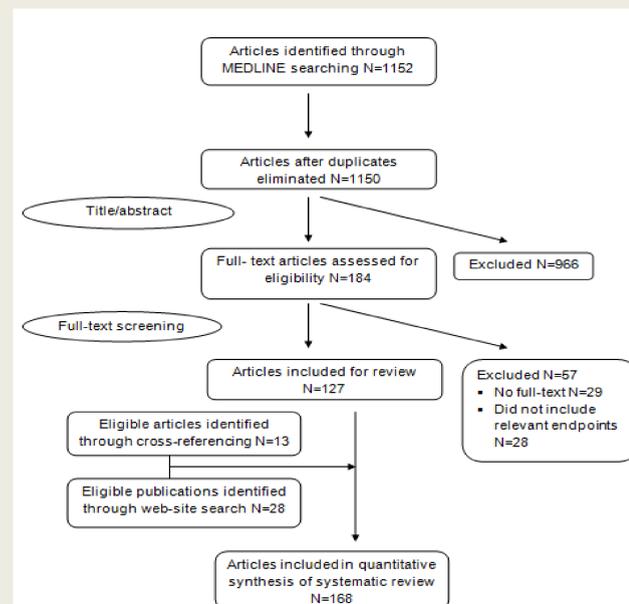


Figure 2: Search strategy

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.