Estimating antibiotic use in human-health sector

Pan-Africa Workshop on Effective Implementation of National Action Plan on Antimicrobial Resistance

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ICARS
International Centre for Antimicrobial Resistance Solutions
ICARS is a new solution development partnership that will respond to the United Nations call for accelerated action against AMR in LMICs.

ICARS will use research to bridge the gap between policy and practice in LMICs.

ICARS has been initiated by the Danish government with the support from the World Bank and is seeking partners.
Vision and Mission

Vision
We envisage a world where resistance to antimicrobial drugs no longer poses a threat to the health of humans and animal, the environment, global food security and economic prosperity.

Mission
ICARS will be a leading international One Health knowledge, intervention and implementation research partnership, generating, assessing, and using evidence to support development and implementation of cost-effective and context-specific solutions to mitigate antimicrobial resistance in low- and middle-income counties.
Core Principles

Country Ownership
• Country-led
• Priorities defined by the individual countries based on needs and challenges

One Health
• A collaborative, multisector and holistic approach, involving human and animal sciences, environmental sciences, social sciences and economics.

Partnership
• Delivering in partnerships with key stakeholders
Core Principles

**Solution-focused**
- Providing policy-relevant evidence-based solutions
- Translation of national action plans and international policies into practice on the ground

**Sustainability**
- Cost-effective solutions
- Laying the foundation for change and supporting initial implementation
- Capacity and capability building in country
- Alignment to other agenda and priorities (e.g. SDGs, Universal Health Coverage)
Surveillance

- Measurement
  - Resistance
  - Antibiotic use
  - Infections

- Objectives
  - Assess simultaneously antibiotic use and antimicrobial resistance (AMR) impact
  - Define empiric treatments
  - Analyze epidemiology trends (resistance and antimicrobial use)
  - Evaluate interventions and allocate resources efficiently: set targets for improvement and measure the impact of interventions

- To be done at hospital, local, regional, national, global levels
Why measure consumption data?

Data on the consumption of antimicrobial medicines can be used to:

• Identify and provide an early warning of problems related to changes in antimicrobial exposure and use, and develop interventions to address the problems identified;

• Monitor the outcomes of interventions;

• Assess the quality of prescribing in terms of adherence to practice guidelines;

• Raise awareness among health professionals, consumers and policy-makers about the problems of the inappropriate use of antimicrobials and its contribution to AMR;

• Link antimicrobial exposure to the development of AMR
Definition of consumption and use

- **Consumption**
  - refers to estimates of aggregated data, mainly derived from import, sales or reimbursement databases

- **Use**
  - refers to data on antibiotics taken by the individual patients
  - Patient level data that might include - indication, treatment schemes and patient characteristics

- **Product level (proprietary and generic products) data is collected**
  - active substance(s) of the product,
  - route of administration, s
  - strength per unit,
  - number of units per package
  - total number of packages consumed
Ways of measuring consumption

• Defined Daily Dose (DDD)
• Prescribed Daily Doses (PDD)
• Days of Therapy (DOT)
MEASUREMENT?
Anatomical Therapeutic Chemical Classification & Daily Defined Doses

- The ATC/DDD system classifies therapeutic drugs. The purpose of the ATC/DDD system is to serve as a tool for drug utilization research in order to improve quality of drug use.
- Drugs are divided into different groups according to the organ or system on which they act and their chemical, pharmacological and therapeutic properties

<table>
<thead>
<tr>
<th>Level 1</th>
<th>J: Antiinfectives for systemic use</th>
<th>Anatomical main group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 2</td>
<td>J01: Antibacterials for systemic use</td>
<td>Therapeutic main group</td>
</tr>
<tr>
<td>Level 3</td>
<td>J01X: Other antibacterials</td>
<td>Therapeutic subgroup</td>
</tr>
<tr>
<td>Level 4</td>
<td>J01XD: Imidazole derivatives</td>
<td>Pharmacological subgroup</td>
</tr>
<tr>
<td>Level 5</td>
<td>J01XD01: Metronidazole</td>
<td>Chemical substance subgroup</td>
</tr>
</tbody>
</table>
### Table 3.1 Core and optional classes of antimicrobials in the WHO global surveillance programme of antimicrobial consumption

<table>
<thead>
<tr>
<th>Class of antimicrobials</th>
<th>ATC</th>
<th>Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antibacterials for systemic use</td>
<td>J01</td>
<td></td>
</tr>
<tr>
<td>Antibiotics for intestinal tract</td>
<td>A07AA</td>
<td></td>
</tr>
<tr>
<td>Nitroimidazole derivates</td>
<td>P01AB</td>
<td></td>
</tr>
<tr>
<td>Antimycotics for systemic use</td>
<td>J02</td>
<td>Core</td>
</tr>
<tr>
<td>Antifungals for systemic use (dermatologicals)</td>
<td>D01BA</td>
<td>Optional</td>
</tr>
<tr>
<td>Antivirals for systemic use</td>
<td>J05</td>
<td>Optional</td>
</tr>
<tr>
<td>Antimycobacterial for treatment of tuberculosis</td>
<td>J04A</td>
<td></td>
</tr>
<tr>
<td>Antimalarials</td>
<td>P01B</td>
<td></td>
</tr>
</tbody>
</table>

Data Sources

The most common data sources are:

• Import records: for example from custom records and declaration forms;
• Production records from domestic manufacturers;
• Wholesaler records: both procurement data by the wholesaler or sales data from wholesaler to health care facilities and pharmacies;
• Public sector procurement: from centralized or decentralized purchasing of medicines for the public sector, e.g. records from central medical stores;
• Donation records: usually related to specific programmes (e.g. HIV, TB and malaria) or specific populations (e.g. migrants and refugees).
• Dispensing records: for example records from community and hospital pharmacies and licensed drug stores;
• Insurance and reimbursement records: data from health insurance schemes based on reimbursement of medicines;
• Prescribing data: from either physician records or patient-based dispensing data from pharmacies;
• Commercial data sources: for example IQVIA
Daily Defined Dose

- Assumed average maintenance dose per day for a medicine used for its main indication in Adults

- Sometimes a dose that is rarely prescribed, as it is an average of two or more commonly used dose sizes

**Uses:**
- Technical measurement that allows measurement and comparison of volume of medicine use
- Rough estimate of consumption, not an exact picture of actual use
Calculating DDD

- Dose varies 250 mg, 500mg & 750mg
- Available in PO and IV
- You have a report that says 300 doses used in December of Levo 750 mg IV and 150 doses of Levo 500 mg
Calculating Levofloxacin DDD

<table>
<thead>
<tr>
<th>Dose</th>
<th>Route</th>
<th>Total Dispensed</th>
<th>Total amount (mg)</th>
<th>Total amount (grams)</th>
<th>WHO DDD</th>
<th>Levo DDD</th>
</tr>
</thead>
<tbody>
<tr>
<td>500mg</td>
<td>PO</td>
<td>150</td>
<td>75000</td>
<td>75</td>
<td>0.5</td>
<td>150</td>
</tr>
<tr>
<td>750mg</td>
<td>IV</td>
<td>300</td>
<td>225000</td>
<td>225</td>
<td>0.5</td>
<td>450</td>
</tr>
</tbody>
</table>

Typically expressed per 1000 patient days

<table>
<thead>
<tr>
<th>Levofloxacin</th>
<th>Route</th>
<th>DDD</th>
<th>Total patient days</th>
<th>DDD/1000 pt days</th>
</tr>
</thead>
<tbody>
<tr>
<td>500mg</td>
<td>PO</td>
<td>150</td>
<td>7,500</td>
<td>20</td>
</tr>
<tr>
<td>750mg</td>
<td>IV</td>
<td>450</td>
<td>7,500</td>
<td>60</td>
</tr>
</tbody>
</table>

\[(DDD/pt days) \times 1000\]
Daily Defined Dose

• **Commonly used measures:**
  - DDDs per 1000 inhabitants per day
    - Eg: 10 DDDs / 1000 inhabitants/day => 1% of population can receive a certain treatment daily
  - DDDs per 100 bed days
    - E.g: 60 DDDs/ 100 bed days of analgesics => 60% of the inpatients might receive a DDD of an analgesic every day
    - Useful for benchmarking in hospitals
  - DDDs per 1000 inhabitants per year
    - Estimate the average number of days for which each inhabitant is treated annually
WHO Reporting – Metrics and Indicators

• Antibiotic consumption is presented using the following key indicators:
  • Quantity of antibiotics as DDD per 1000 inhabitants per day for total consumption and by pharmacological subgroup (ATC3);
• Quantity of antibiotics as weight in tonnes for total consumption
• Relative consumption of antibiotics as a percentage of total consumption by route of administration (oral, parenteral, rectal and inhaled) and AWaRe categories (Access, Watch and Reserve) (1);
• List of the most frequently used antibiotic substances comprising 75% of the total consumption, stratified by route of administration-Drug Utilization 75 (DU75).
Conclusion
If You Can't Measure It, You Can't Improve It

(William Thomson, Lord Kelvin)