Drug Utilization Studies

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Definition

Prescription, dispensing, ingesting, marketing, distribution, and use of drugs in a society, with special emphasis on the resulting medical, social and economic consequences

Objectives of Drug Utilization

- Description of patterns of drug use in specific populations
- Identification and definition of likely problems
- General analysis of the problem
- Establishment of decisions on problem-solving
- Assessment of the effects of the action taken
Why are drug utilization studies important?

- More new drugs in the market
- Wide variation in the patterns of drug prescribing and consumption
- Concern about delayed ADRs (e.g. FDA PMS)
- Increase drug costs
Type of Drug Utilization Studies

- Quantitative
  - Quantify current state of drug use
  - Study trends of drug use
  - Study time course of drug usage at national, regional, local or institutional levels
- Qualitative (DUR)
  - Study appropriateness of drug utilization
  - Links prescription data with drug indications

Uses of Quantitative Drug Utilization Studies

- To estimate drug utilization in populations by demographic characteristics
- Used as denominators to calculate rates of ADRs
- To monitor
  - Specific therapeutic categories
  - Effects of regulatory activities
- Markers for crude estimates of disease prevalence
- To plan importation, production & distribution
- To estimate drug expenditures

Uses of Qualitative Studies

- To study appropriateness of drug uses
  - Indications
  - Daily dose
  - Length of therapy
- To assess clinical efficacy (high intrinsic value) of most common sold drugs
Drug Utilization in Pharmacovigilance Studies

- Use of drugs for wrong indications
- Use of “toxic” drugs when other less toxic are available
- Use of concurrent medications
- Use of over/under doses

- Morbidity and Mortality – Medication Errors, higher disease-related complications
- Poor patient compliance
- Discontinuation of drugs

Drug Utilization Concepts

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Quantitative approach</th>
<th>Qualitative approach</th>
<th>Continuous (ongoing)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drug Statistics (drug utilization data)</td>
<td>One time</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Drug Utilization Study</td>
<td>One time or time limited investigations</td>
<td>Usually</td>
<td>May be</td>
</tr>
<tr>
<td>Drug Utilization Review (DUP, drug intervention program, drug use review, drug audit)</td>
<td>Assess appropriateness or attempt to change practice. They include an intervention</td>
<td>Usually</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Drug Utilization. Coding Systems

- ATC: Anatomical Therapeutic Chemical
- AHFS: American Hospital Formulary Service System
- IDIS: Iowa Drug Information System
- AC system: Anatomical classification system
Drug Utilization

- Drug Statistics
- Drug Utilization Studies
- Drug Utilization Review or Drug Programs

Drug Statistics

- Drug Costs
  - Unitary cost (cost/tablet, cost/package, cost/dose, cost/treatment course)
  - Total costs
- Drug Volume
  - Number of tables, capsules or doses sold
  - Number of prescriptions
  - Number of patients ingesting drugs
- Defined Daily Dose (DDD)
- Prescribed Daily Dose (PDD)
- Minimum marketed dose (MMD)

DDD: Defined Daily Dose

- Unit of measurement that estimates the proportion of patients within a community who receive a particular drug
- Assumed average maintenance dose per day for a drug used for its MAIN indication in adults (compliance is assumed)
- Proportion of the population that may receive treatment with a particular drug
### DDD: Example

<table>
<thead>
<tr>
<th>DDDs/1000 people/day</th>
<th>Amount of drug (mg) sold in 1 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>(DDD (mg) X 365 days X # people) X 1000</td>
<td></td>
</tr>
</tbody>
</table>

**Example**

- DDDs/1000 people/day = Amount of drug (mg) sold in 1 year
  
  
  \[
  \frac{400,000,000 \text{ doses of 5 mg tablet of diazepam}}{10 \text{ mg DDD of diazepam}} \times 50,000,000 \text{ people for 1 year} = 11 \text{ DDD/1000 people/day} 
  \]

### DDDs as Measure of Drug Consumption

1. **DDD/1000 inhabitants/day**
   
   (e.g., 10 DDD/1000 inhabitants/day = 1% of the population on average gets treatment “x” daily)

2. **DDD/100 bed days**

### Drugs used during short periods

1. **DDD/ inhabitants/ year**
   
   (e.g., 5 DDDs/inhabitant/year = the consumption is equivalent to the treatment of every inhabitant with a 5 days course during a “Y” year)

### DDDs in Pharmacovigilance Studies

- Frequency of ADR
  
  \[
  \text{Adverse Drug Reaction} = \frac{\text{Frequency of ADR}}{\text{DDD/1000 inhabitants/day}} 
  \]

- To study trends in the frequency of adverse reaction reports against trends in drug utilization
**DDD and Costs**

DDD should be used with caution to compare the costs of two formulations of the same drug.

DO NOT USE DDDs TO COMPARE COSTS OF DIFFERENT DRUGS OR DRUG GROUPS.

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**DDD Uses**

- To describe and compare patterns of drug utilization
- To provide denominator data to estimate ADRs
- To perform epidemiological screening for problems in DU
- To monitor the effects of informational and regulatory activities

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**Advantages of DDDs**

- To work with gross drug statistics at various levels of the health chain
- To allow comparisons between drugs in the same therapeutic class and between different health care settings or geographic areas
- To evaluate trends over time
- Relatively easy and inexpensive
Disadvantages of DDDs

- Drugs not marketed in Nordic countries do not have DDDs
- DDD is a technical unit of comparison but not a recommended dose
- DDDs do not reflect actual prescribing patterns
- DDDs varies with drugs that have > 1 indication, have various doses, are used in combination with other drugs, drugs are used in children, do not take into account compliance variation

Prescribed Daily Dose (PDD)

- Average daily dose prescribed
- Based on actual doses ordered by physicians for new prescriptions
- It can be derived from the National Prescription Audit

Minimum Marketed Dose (MMD)

- Minimum dosage strength marketed by the manufacturer which will correspond to the minimum dose that will produce a desired therapeutic concentration
Drug Utilization

- Drug Statistics
- Drug Utilization Studies
- Drug Review or Drug Programs

Drug Utilization Studies

- Number of Prescriptions
  - # Prescriptions/patient (by type of prescription)
  - # First prescription/patient
  - # Refills/patient
  - Cost/prescription

Unable to provide data on quality of: indication, dose, type of patient, duration of treatment

DUS: Sources of Data

- Surveys
  - IMS America provides:
    - National Prescription Audit - measures the prescription volume that moves out of pharmacies into consumers
    - National Disease and Therapeutic Index - Represents up to 92 primary specialties grouped into 27 specialty groups
    - Mail Order Prescription Audit - Measures the level of prescriptions dispensed from non-government mail-order pharmacy services via US Postal Service, United Parcel Service
  - US Department of Health and Human Services
    - National Health Care Expenditure Survey
  - National Center for Health Statistics, CDC
    - National Health Ambulatory Care
    - National Ambulatory Medical Care Surveys (NAMCS)**
  - Registries
    - Hepatic Events Registry and others
### Computerized Databases
- **Not diagnosis-linked**
  - Drug sales
  - Drug movement at drug distribution channel level
  - Pharmaceutical or medical billing data
  - Samples of prescriptions
- **Diagnosis-linked**
  - Drug & morbidity data included

### Non-diagnosis Linked Databases
- National Prescription Audit (IMS America) – drug distribution
- US Pharmaceutical Market (drugstores, hospitals) (drug distribution)
- Medicaid Management Information Systems (billing data)
- Saskatchewan Health Plan
- UK Prescription Pricing Authority (billing data)
- Spain’s Drug Data Bank (NIH) (billing data)
- Denmark’s Pharmacoepidemiologic Prescription Database of the County of North Jutland

### Diagnosis-linked Databases
- National Disease and Therapeutic Index (NDTI) (physician prescribing-industry)
- Kaiser Permanente Medical Plan
- Group Health Cooperative of Puget Sound
- COMPASS: Health Information Designs, Inc
- DURbase: Health Information Designs, Inc
- Sweden’s Community of Tierp
- Center for Primary Care Research
- University of Uppsala, Sweden
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Drug Utilization Review or Drug Utilization Programs

- Definition: Structured, ongoing initiatives that interpret patterns of drug use in relation to predetermined criteria, and attempt to prevent or minimize inappropriate prescribing
- Objective: To improve quality and reduce costs in health care

Appropriateness

Quantitative data
- Drug indications
- Morbidity and mortality data
- Patient or household surveys
- Hospital records
- Physician records
Prescription Errors in Hospitals

- Errors of Omission
- Physician ignorance on drug costs
- Failure to review medication orders
- Inability to keep update drug information
- Lack of communication between physicians and pharmacists

DUR Programs

- Formularies
- Co-payments
- Mandatory generic drug substitution
- Reference-based pricing of prescription drugs

Prospective | Retrospective

Patient Receives the Medication

Q&A