Field tests for rational drug use in twelve developing countries


Summary
Increasing efforts are being made to improve drug-use practices and prescribing behaviour in developing countries. An essential tool for such work is an objective and standard method of assessment. We present here a set of drug-use indicators produced and tested in twelve developing countries. We describe practical applications, which include the use of indicators to increase awareness among prescribers in Malawi and Bangladesh, to identify priorities for action (eg, polypharmacy in Indonesia and Nigeria, overuse of injections in Uganda, Sudan, and Nigeria, and low percentage of patients and doctors adhering to treatment guidelines in Yemen, Uganda, Sudan, and Zimbabwe). To quantify the impact of interventions in Yemen, Uganda, Sudan, and Zimbabwe.

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See Commentary on page 1376

Introduction
In 1985, WHO convened a conference in Nairobi, Kenya, on the rational use of drugs.1 Since that time efforts have increased to improve drug-use practices in developing countries.2 An essential tool for such work is an objective and standard method to describe drug-use patterns and prescribing behaviour in health facilities. However, the lack of agreement on such a method has caused persistent difficulties.

A standard set of drug-use indicators is needed to assess the problems of clinically or economically inappropriate drug use, to make comparisons between groups or to measure changes over time, as a supervisory tool to identify individual prescribers or health facilities with especially poor patterns of drug use, and to measure the effect of interventions.

Early studies in Yemen4 and Uganda5 used a limited set of indicators to quantify the impact of essential drugs programmes. Building on this work, members of the International Network for the Rational Use of Drugs (INRUD), in close collaboration with the WHO Action Programme on Essential Drugs, undertook a programme to develop, standardize, field-test, and refine a set of basic drug-use indicators. The method for collecting the necessary data was first developed and tested in Indonesia, Bangladesh, and Nepal; other tests took place in Guatemala, Malawi, Nigeria, and Tanzania. The indicators have also been used in Ecuador, Sudan, and Zimbabwe. We present here the selected drug-use indicators and the recommended method for data collection. The indicators and methods are described in more detail in a WHO manual.*

*How to investigate drug use in health facilities is available on request from the Action Programme on Essential Drugs, World Health Organization, 1211 Geneva-27, Switzerland. This practical manual contains detailed information on the use of standardised indicators, study design and sample size, sampling procedures, and blank data collection forms.
Methods
Selection of indicators
Only a small number of basic drug-use indicators were selected, referred to as the core indicators (table 1). These are highly standardised as regards definition and sample size and do not require national adaptation. They provide a simple tool for quick and reliable assessment of a few important features of pharmaceutical use in primary health care. Studies with these indicators can identify particular drug-use issues that may need examination in more detail. The field tests showed that data needed for these indicators can be easily collected from medical records or by direct observations at individual health facilities, in a few hours per facility. In addition, a set of complementary indicators have been defined (table 2); these are less standardised and depend on local variables that need to be defined before the indicator can be used. These indicators are therefore country or locale specific.

Sampling frame
The number of health facilities at which data should be collected depends on the purposes of the study. For a survey of health facilities in a region or country, a random or stratified sample of twenty facilities is recommended, with thirty randomly selected general outpatient encounters per facility. These numbers were chosen after statistical simulation studies with real prescription data from developing countries had confirmed that this sample size results in a 95% CI of within 7-5% in most cases. We should mention here that since prescription patterns tend to be more uniform within than between health facilities, it is more cost-effective to increase the number of facilities than the number of prescriptions per facility.

The studies also showed that at least a hundred prescriptions per health facility or per prescriber should be reviewed when it is important to describe or compare drug use by individual facilities or prescribers; this sample will usually give a 95% CI of within 10% for the individual result. If indicators are used only to identify facilities or prescribers that differ grossly from a set standard, the number of cases can be lower, depending on the degree of accuracy needed. This method of 'Lot quality assurance sampling' is described in the WHO manual and merits further testing as a supervisory tool.

Patient-care and facility indicators are always collected prospectively. For prescribing indicators, retrospective data for the previous year are preferred because they are easier to collect. However, when these data are not available, prospective data can be equally useful. In several studies that compared the results of prospective and retrospective data for the same facilities, the only significant difference found was for the indicator of the use of injections.

Practical applications
In the past few years drug-use indicators have been used for many different purposes. Descriptive indicator studies have been carried out to increase awareness of the problem of inappropriate prescribing. In Malawi, before a nationwide prescriber training programme and to maximise involvement in the exercise, each of twenty-four district medical officers was asked to survey three health facilities. In a survey in Bangladesh, eighty facilities were surveyed by four different universities, which studied twenty facilities in each of the country’s four zones. In results from twelve developing countries (table 3), both similarities and differences in drug-use patterns can be seen. Of special interest are outlying values—for example, the high average numbers of drugs per encounter in Indonesia and Nigeria (3-3 and 3-8), the high percentages of prescriptions of one or more antibiotics in Uganda and Sudan (56% and 63%) and of injectable drugs in Uganda, Sudan, and Nigeria (36-48%), and the low availability of essential drugs in Ecuador (38%).

The indicators have also been used to identify priorities for action. For example, since 94% of drugs are prescribed by generic name in Zimbabwe there is no need to expend more resources on this feature, whereas in Ecuador, with

### Table 1: Core drug-use indicators

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average consultation time</td>
<td>The time personnel dispensing drugs spend with patients.</td>
</tr>
<tr>
<td>Average dispensing time</td>
<td></td>
</tr>
</tbody>
</table>

### Table 2: Complementary drug-use indicators

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average dispensing time*</td>
<td></td>
</tr>
<tr>
<td>Percentage of drugs actually dispensed</td>
<td></td>
</tr>
<tr>
<td>Percentage of drugs adequately labelled</td>
<td></td>
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<tr>
<td>Pediatric knowledge of correct dosage</td>
<td></td>
</tr>
</tbody>
</table>

### Table 3: Results of indicator studies in twelve developing countries

<table>
<thead>
<tr>
<th>Study reference (no of facilities)*</th>
<th>4 (n=19)</th>
<th>5 (n=42)</th>
<th>7 (n=37)</th>
<th>8 (n=72)</th>
<th>9 (n=20)</th>
<th>10 (n=80)</th>
<th>11 (n=56)</th>
<th>12 (n=20)</th>
<th>13 (n=20)</th>
<th>14 (n=20)</th>
<th>15 (n=19)</th>
<th>16 (n=20)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average no of drugs per encounter</td>
<td>15</td>
<td>19</td>
<td>14</td>
<td>18</td>
<td>33</td>
<td>14</td>
<td>13</td>
<td>13</td>
<td>22</td>
<td>38</td>
<td>21</td>
<td>13</td>
</tr>
<tr>
<td>% generic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>63</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>63</td>
</tr>
<tr>
<td>% antibiotics</td>
<td>46</td>
<td>56</td>
<td>63</td>
<td>34</td>
<td>43</td>
<td>25</td>
<td>29</td>
<td>39</td>
<td>48</td>
<td>43</td>
<td>37</td>
<td>72</td>
</tr>
<tr>
<td>% injections</td>
<td>25</td>
<td>48</td>
<td>36</td>
<td>19</td>
<td>17</td>
<td>11</td>
<td>29</td>
<td>37</td>
<td>5</td>
<td>19</td>
<td>13</td>
<td>14</td>
</tr>
<tr>
<td>% formulary drugs</td>
<td></td>
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<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Average consultation time (min)</td>
<td>2.3</td>
<td>3.0</td>
<td>1.0</td>
<td>1.0</td>
<td>3.0</td>
<td>6.3</td>
<td>3.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average dispensing time (s)</td>
<td>23</td>
<td>78</td>
<td>13</td>
<td>86</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% patient knowledge</td>
<td>27</td>
<td>82</td>
<td>55</td>
<td>75</td>
<td>81</td>
<td>56</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% drugs in stock</td>
<td>67</td>
<td>54</td>
<td>72</td>
<td>62</td>
<td>90</td>
<td>38</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

*Study 4 was in Yemen, 5 in Uganda, 7 in Sudan, 8 in Malawi, 9 in Indonesia, 10 in Bangladesh, 11 in Zimbabwe, 12 in Tanzania, 13 in Nigeria, 14 in Nepal, 15 in Ecuador, 16 in Guatemala.
only 37\% generic prescribing, there is a clear need. In public facilities in Tanzania and Nepal, very few drugs not on the national list of essential drugs are prescribed. In Nigeria the average dispensing time per patient is extremely short (13 s) and the number of drugs per prescription is rather high; both could be topics for focused training and supervision. The same applies to the low percentage of patients in Malawi who understood the dosage schedule for the drugs they received.

The indicators can also be used to quantify the impact of an intervention. In Yemen a comparison was made between an essential drugs project area and a control area that had had no essential drugs programme. The numbers of drugs per encounter were 1.5 and 2.4, respectively, the percentages of antibiotics 46\% and 67\%, and the numbers of injections 22\% and 45\%. In Uganda, a study on the effect of training showed a decline in the use of injections (50\% to 41\%), an improvement in use of oral rehydration treatment for diarrhoea (52\% to 89\%), and a reduction in antidiarrhoeal drug use (60\% to 39\%). In rural health facilities in the Nile province in Sudan the percentage of drugs prescribed by generic name increased from 17\% to 70\% between 1989 and 1991. In Zimbabwe, drug-use surveys are carried out every 2 years.

**Discussion**

For many indicators, the ideal value is obvious. Values for the availability of the local formulary and essential drugs list, the percentages of drugs prescribed from the formulary, prescribed by generic name, actually available, actually dispensed, and adequately labelled, and patient knowledge of the dosage schedule should, of course, be as high as possible. Optimum values for consultation time and dispensing time are more difficult to define; high values do not give much information but low values may indicate a problem. However, dispensing time as a process indicator is less important than output indicators such as adequate labelling and patient knowledge.

Optimum values for the other three prescribing indicators are even harder to define. In ten developing countries the average number of drugs per prescription for general outpatient encounters lies between 1.3 and 2.2 (table 3), but in Indonesia and Nigeria it is 3.3 and 3.8. The number should be lower in these two countries, but by how much? In rural facilities in Sudan in 1989, the figure was 0.9, because of a general failure of the drug supply system, not because of rational prescribing. When the supply was improved, the number of drugs per encounter rose to 1.2. In Yemen the theoretical need was estimated at 1.4 on the basis of morbidity patterns and therapeutic guidelines.

Similarly, for the percentage of encounters with an antibiotic prescribed the median of 41\% (range 27–63\%) in the twelve countries reflects actual prescribing, not optimum values. The Yemen study estimated the theoretical need at 23\%. For the percentage of encounters with an injection prescribed the median is 19\% (range 0.2–48\%); the Yemen study estimated the need at 17\%. However, some countries have much lower figures.

Which indicators are missing? First, there is no indicator for diagnostic precision. This would require a prospective procedure to validate the diagnosis with the original patient, which is difficult to standardise, difficult to arrange in practice, and subject to observer bias. Second, a measure of adherence to standard treatment guidelines would be very useful for supervision; however, despite intensive efforts, no standard measure has yet been identified. The main reason is that global standard treatments do not exist, although adherence to national guidelines would be a good local substitute. In addition, such an indicator cannot be measured reliably from retrospective data; review of the patient is usually necessary because there may be special requirements for that individual. The indicator is presently classified as complementary, and we recommend that intensive efforts be made to develop such an indicator at national level.

Research is needed to test additional indicators, especially those measuring adherence to standard treatment guidelines and dosage schedules. Such research should probably first be done within countries. National estimates should also be made of the ideal value for the number of drugs and the use of antibiotics and injections, based on morbidity patterns and agreed standard treatment guidelines. It is also important to study the use of indicators for supervision at the district level, with lot quality assurance sampling as a simple method to identify, for focused intervention, facilities or prescribers that differ significantly from a predefined standard.

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**References**