Ways for prescribing to be measured

In the second of four articles on measuring prescribing, **Suzanne Jones**, **Susan Holdsworth** and **Helen Kendall** describe the units used in the Prescription Pricing Authority's prescribing reports and information systems and explain how prescribing data are standardised

The characteristics of prescribing usually of most concern are cost, volume and quality, and prescribing data allow these to be assessed. To ensure consistency and accuracy in the interpretation of prescribing data it is important that the limitations of different methods for measuring prescribing are appreciated — each will have advantages and disadvantages.

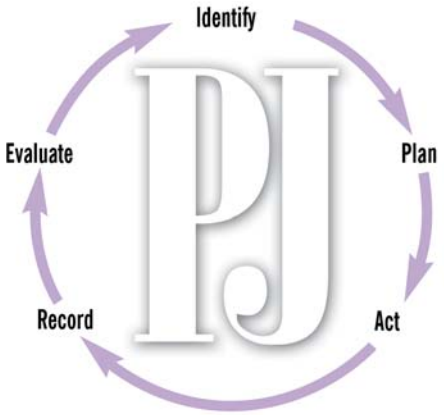
Units of measurement

A variety of units are commonly used to measure prescribing. As an illustration, Table 1 shows several ways in which the prescribing of ramipril 10mg capsules by three GP practices can be presented, using different units of measurement. Some of these units (eg, average daily quantities) are not used in Scotland and Wales and only apply to prescribing in England.

Some units are more useful than others, depending on the characteristic you are interested in (eg, cost) and how you are using the information. For example, you might want to look at how prescribing in one GP practice has changed over a year or to compare prescribing in your primary care trust with prescribing in another.

Items It is easy to count each item on a prescription form and knowing the number of prescription items is of greatest value in measuring the frequency or volume of prescribing of treatments that are given in courses. For example, this unit allows us to present data in terms of how many courses of penicillin a doctor has prescribed during the past three months. However, this unit is of less value in measuring chronic drug use because a GP issuing repeat prescriptions at monthly intervals would appear to prescribe twice as many items as a GP issuing repeats every two months.

From Table 1, we can see that although all three of the GP practices prescribed ramipril on seven occasions between April to June, this does not tell us anything about cost or quantity. The number of items prescribed are, therefore, a poor measure for comparing different GP practices but, where data from many practices are aggregated (eg, to provide national data), this unit is a useful measure of trends over time. The number of items are also useful when expressed as ratios. For example, the ratio of bendroflumethiazide 2.5mg items to all bendroflumethiazide items is a measure of prescribing quality.



Identify knowledge gaps

1. What units can be used to measure the volume of prescribing and are there any advantages or disadvantages to using different units?
2. What are "defined daily doses" and why are these used to compare prescribing between different countries?
3. How can prescribing data be standardised in order to compare prescribing in different populations?

Before reading on, think about how this article may help you to do your job better. The Royal Pharmaceutical Society's areas of competence for pharmacists are listed in "Plan and record," (available at: www.rpsgb.org.uk/education). This article relates to "the effective and efficient application of information" (see appendix 4 of "Plan and record").

Quantity "Quantity" usually refers either to the number of dosage units prescribed or, for undivided preparations, to the total weight or volume. Quantity is easy to determine, but could be misleading if a drug is available in many different formulations or dosing schedules. For example, if one GP prescribes isosorbide mononitrate 20mg three times daily and another GP prescribes isosorbide mononitrate 60mg once daily, looking at the quantity of tablets prescribed, the first GP will appear to be prescribing three times as much as the second, even though they are both prescribing the same amount of drug in milligrams. Care is, therefore, required and quantity should only be used to measure the volume of prescribing for a drug in a specified form and strength.

The number of packs prescribed is unsuitable as a measure if products are available in different pack sizes. Using the amount of active ingredient in the preparation as a measure is not an appropriate alternative because at equally effective doses high potency drugs would have smaller amounts prescribed than drugs of low potency. For example, the volume of indapamide prescribing could not be fairly compared with furosemide prescribing using the amount of active ingredient.

Cost Cost can be described in different ways, depending on the elements that are used to determine the price of a drug. Usually, cost is expressed as one of the following:

- Net ingredient cost (NIC), or gross ingredient cost in Scotland
- Actual cost

The NIC of a drug is the basic price listed in the Drug Tariff. If a product is not in the Drug Tariff the price published by the drug's manufacturer, wholesaler or supplier is used. From Table 1, we can see that from April to June, the cost of prescribing ramipril 10mg for Practice A appears eight times lower than that for Practice C. NIC is how cost is expressed in PACT reports and prescribing cost analysis data used by the Department of Health. It is normally used to compare the cost of individual products.

Actual cost is the NIC minus a national, average discount figure (calculated from the discount deducted from each pharmacy

Table 1: Prescribing of ramipril 10mg capsules in three GP practices (April to June 2003)

	Items	Net ingredient cost (£)	Actual cost (£)	Quantity (no of capsules)	DDD* (mg)	ADQ† (mg)
Practice A	7	24.92	22.58	49	98	196
Practice B	7	99.68	89.69	196	392	784
Practice C	7	199.36	179.11	392	784	1,568

* The defined daily dose (DDD) for ramipril is 2.5mg;
† The average daily quantity (ADQ) for ramipril is 5mg

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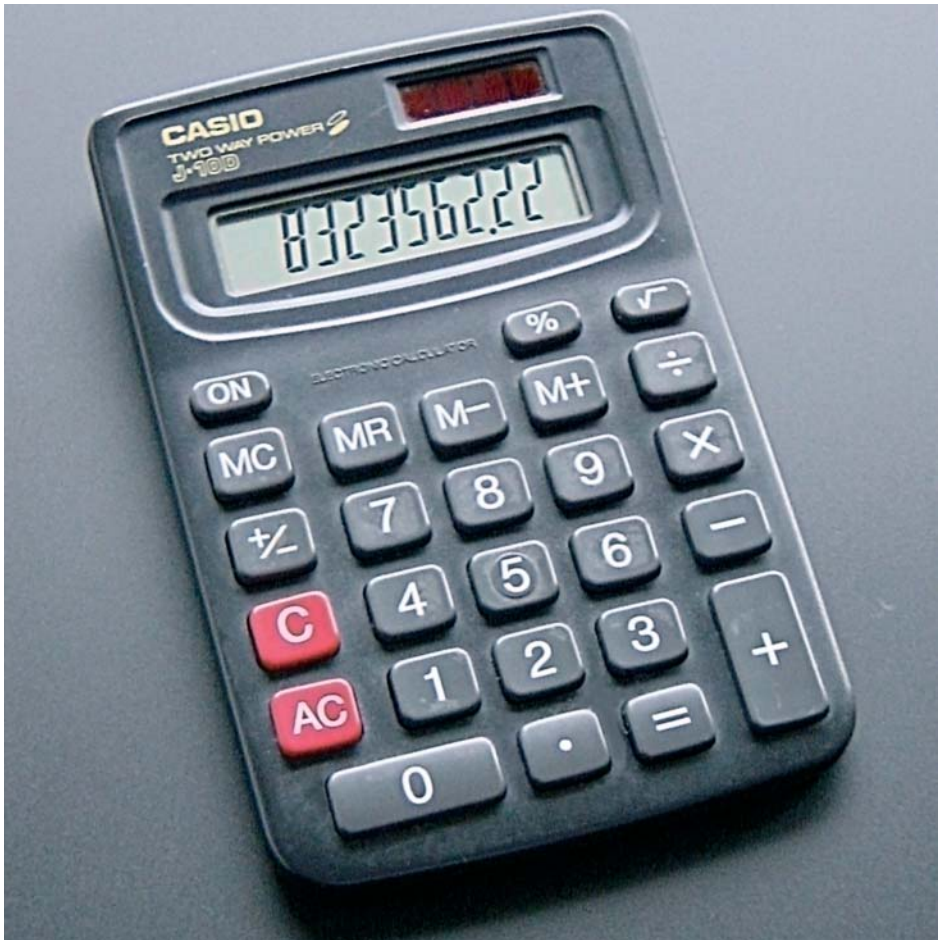
Panel 1: How to calculate the number of DDDs prescribed

Sulfadiazine tablets 500mg have a strength of 500mg and a defined daily dose of 600mg. If the total quantity prescribed was 300, the number of DDDs prescribed would be:
(300 x 500) ÷ 600 = 250

account) plus a container allowance. For example, in Table 1, we can see that the figures for actual cost are lower than those for NIC. Actual cost gives a closer reflection of the real price paid by the NHS and is therefore of most value for monitoring budgets. Actual cost is used in the Prescribing Monitoring Document and the Itemised Prescribing Payment reports produced by the Prescription Pricing Authority.

Cost is not normally used as a measure of volume of prescribing, especially when looking at the volume of prescribing for a class of drugs, because there may be large differences in price between the drugs in that class (eg, chlorpromazine compared with olanzapine). However, cost can provide a guide to volume where drugs in the same class are similarly priced at equivalent doses. It should be noted, when looking at trends in prescribing over time, that price changes will affect the amount of money spent on a product.



Calculating the cost of prescribing can lead to better use of primary care trust or acute trust funds

Defined daily dose The World Health Organization, in an attempt to overcome some of the problems in measuring the volume of prescribed drugs (eg, different quantities being prescribed for different durations), developed and now maintains the anatomical therapeutic chemical (ATC) system as an international standard for studies on drug use.

The ATC system classifies drugs into different groups according to the organ or body system on which they act and their chemical, pharmacological and therapeutic properties, and assigns each with an ATC code. A "defined daily dose" (DDD) is then established for each ATC-coded drug and the number of DDDs can be used to express the consumption of that drug.

The definition of DDD is the assumed average maintenance dose (per day) for a drug used for its main indication in adults. It is important to note that the DDD is a unit of measurement; it is not a recommended dose and it may not even be a dose that a patient would usually receive in practice. For example, simvastatin has a DDD of 15mg but is available only in 10mg or 20mg tablets.

The number of DDDs can be calculated by multiplying the quantity of each dosage form prescribed by the strength of each dosage form, then dividing by the DDD value (see Panel 1 above). Table 1 shows that the number of DDDs of ramipril 10mg prescribed by Practice A is a quarter of that prescribed by practice B.

The DDD value of a drug may be different depending on the route of administration used and the number of DDDs must, therefore, be calculated separately for each formulation. It is also important to ensure that the strength of the dosage form and DDD value are presented in the same units (eg, mg). DDDs and guidance on their use is available at www.who.org.

The advantage of this system is that the number of DDDs of all the drugs within the same broad therapeutic class can be added together and this allows trends in drug use to be assessed or comparisons between population groups to be made. For example, the NIC per DDD for ulcer healing drugs is a measure of prescribing quality.

There are, however, particular groups of products for which the use of DDDs is inappropriate. These include:

- Topical preparations
- Contraceptive pills and hormone replacement therapy
- Combination products, mixtures and compounds

Most topical preparations are prescribed in original packs and patients apply different quantities depending on the area of skin being covered and also how thickly the product is applied, so it is not possible to produce a meaningful "daily dose". For oral contraceptives, different preparations are given for varying periods (eg, oral contraceptives may be taken for 21 days out of 28 or continuously) and for HRT, patients can use tablets, patches or a combination of both, so it is difficult to determine a meaningful DDD.

Combination products, such as co-amilofruse, contain more than one drug, so it may be difficult to establish a DDD. The DDD for a single drug in the combination could be used but the total number of DDDs for the combination would vary depending on which drug was chosen and care would be needed in making comparisons. The WHO does not calculate DDDs for combination products in this way and advice on how to determine the DDD for a combination product is available on the WHO website. In addition, since DDD is defined as a maintenance dose this means that vaccines and other "one-off" treatments should not be measured using DDDs.

Average daily quantities WHO bases DDDs on international prescribing habits and there are occasions when these do not give a true reflection of prescribing in England. For example, the DDD for oral metronidazole is 2g, which reflects the dose prescribed for treating invasive intestinal amoebiasis whereas, in England, metronida-

Panel 2: How to calculate prescribing units

Dr Smith has 1,500 registered patients. 600 of these are aged 65 years or over and the remaining 900 are under 65. The number of prescribing units is therefore:
(600 x 3) + 900 = 2,700

Dr Jones also has 1,500 registered patients. 400 of these are aged 65 or above and the remaining 1,100 are under 65. The number of prescribing units is therefore:
(400 x 3) + 1,100 = 2,300

zole is usually prescribed at a lower dose for treating anaerobic infections.

In order to reflect prescribing in England more accurately there is an expert group to develop values known as "average daily quantities" (ADQs), which are the English equivalent of DDD values. Although this group, which includes members from the PPA, Prescribing Support Unit, primary care trusts, the National Prescribing Centre and the Department of Health, has determined ADQ values for the most commonly prescribed drugs, the coverage is not as extensive as for DDDs. ADQ values can be found on the Prescribing Support Unit website (www.psu.co.uk).

Standardisation of data

To compare one GP practice or PCT with another, the size of the practice or PCT must be taken into account. Practices with more patients on their lists will need to prescribe more drugs. The prescribing rate can be expressed as the number of prescriptions per patient on the practice list. However, comparisons of prescribing between GP practices or PCTs is further complicated by the facts that the age structure of the population within each practice or PCT will be different and morbidity of specific diseases varies by age. The way of overcoming variables such as age and disease prevalence is to standardise the raw data and this can be achieved through standardisation methods such as using prescribing units.

Prescribing units The prescribing unit (PU) was developed to take into account the fact that elderly patients have a greater need for medicines than younger adult patients. To calculate the number of PUs, each patient on a GP's list aged 65 years or over is counted as three prescribing units, while each patient under 65 and temporary residents count as one PU (see Panel 2 for example calculations). So, for example, if you want to compare prescribing within two practices, you could find out how much each has spent on antidepressants in terms of cost per 1,000 PUs.

Age standardisation Age standardisation allows comparisons across geographical areas by taking into account differences in age structure of local populations. This is done by dividing a population into age groups and deriving an age-specific rate for each group. An example of an age specific-rate is the total cost of prescribing per month in people aged between 15 and 24 years.

There are two methods of age standardisation: direct and indirect. Direct standardisation involves applying the age-specific rates of a sample population (eg, a PCT) to the age structure of a standard population (eg, the population of England) to derive the expected rates for that standard population. Conversely, indirect standardisation involves applying age-specific rates of a standard population to the age structure of a sample population.

ASTRO-PUs Indirect age standardisation methods were used to develop "age-sex temporary resident originated prescribing units" (ASTRO-PUs) as a more sophisticated weighting system than PUs. ASTRO-PUs weight individual practice populations for age in a number of bands (0-4, 5-14, 15-24, 25-34, 35-44, 45-54, 55-64, 65-74 and 75+ years), by sex (different weightings for male and female) and by number of temporary residents, and are based on cost of overall prescribing. They are used to compare the costs of total prescribing between practices or PCTs. For example, the overall prescribing cost per ASTRO-PU is a useful measure of cost minimisation.

Because prescribing habits change over time, the Prescribing Support Unit adjusted the weightings of the age bands in 1997. These new values became known as ASTRO(97)-PUs. ASTRO(97)-PUs were reviewed again in 2001 but reweighting them was found to be unnecessary. ASTRO-PUs based on the number of items prescribed are also now available.

STAR-PUs In addition to these denominators, "specific therapeutic group age-sex related prescribing units" (STAR-PUs) have been developed along the lines of ASTRO-PUs. However, STAR-PUs are based on costs in specific therapeutic areas. ASTRO-PUs were devised from the total of all drug costs, therefore it is incorrect to use NIC per ASTRO-PU for making comparisons within a specific therapeutic group because the age-specific weightings for the drugs in a specific therapeutic group will differ from the ASTRO-PU weightings. STAR-PUs are particularly useful for groups of drugs which are specifically for one sex or used for a distinct age band. The number of items per STAR-PU for antibiotics is a measure of prescribing quality.

STAR(97)-PUs are available for the eight leading therapeutic groups: gastrointestinal, cardiovascular, respiratory, central nervous system, infection, endocrine, musculoskeletal and skin. These eight therapeutic groups account for 85 per cent of prescribing in England. Two more groups have been added by the Prescribing Support Unit: "all other groups" (which includes all those British National Formulary chapters not included in the eight above) and "nurse prescribing formulary".

As well as STAR(97)-PUs for the therapeutic groups listed above, there are STAR-PUs for sub-groups of the above. For example, the central nervous system group has values for hypnotics, anxiolytics, antidepressant drugs, drugs used in nausea and vertigo, analgesics, treatment of acute migraine, antiepileptics and drugs used in parkinsonism and related disorders. For example, the number of DDDs of benzodiazepines per benzodiazepine STAR-PU is a measure of prescribing quality. These sub-group STAR-PUs have recently been updated using 2001 data and hence are known as STAR(01)-PUs.

Values for ASTRO-PU and STAR-PU weightings are available from the Prescribing Support Unit website at www.psu.co.uk.

Action: practice points

Reading is only one way to undertake CPD and the Society will expect to see various approaches in a pharmacist's CPD portfolio.

1. Select five prescriptions from four or five different GPs for the same strength of a commonly prescribed drug like lansoprazole, and calculate the volumes prescribed using the quantity on the prescription, the cost and the number of items. Which of these measures would you use in practice?
2. Explore the Prescribing Support Unit website to identify the STAR-PU weightings for different therapeutic areas and the ADQ values assigned to drugs from these areas.
3. Using either data from a PACT catalogue or from FP10 prescriptions calculate the number of DDDs prescribed for dothiepin or lofepramine (dothiepin DDD = 150mg, ADQ = 75mg, lofepramine DDD = 105mg, ADQ = 140mg). Compare the doses that have been prescribed to the DDD and ADQ values.

Evaluate

For your work to be presented as CPD, you need to evaluate your reading and any other activities. Answer the following three questions:
What have you learnt?
How has it added value to your practice? (Have you applied this learning or had any feedback?)
What will you do now and how will this be achieved?

Topics in this series

Further articles in this series on measuring prescribing will look at:

- The systems and reports available for presenting and analysing prescribing data
- How to analyse PACT data

Correction

The DDD and ADQ figures in Table 1 (p58) were transposed.