How to optimise use of medications in the elderly

Optimising medication use in the elderly is challenging. After an accurate drug history and comprehensive medication review, compliance and polypharmacy should be addressed. With each prescription, it is best to prioritise and simplify, by using the lowest feasible doses and the smallest number of medicines, with the simplest dose regimen.

PETER I. PILLANS
MB BCh, MD, FRACP

MICHAEL S. ROBERTS
PhD, DSc, MBA

Dr Pillans is Director of Clinical Pharmacology and a Medical Specialist at the Princess Alexandra Hospital, Brisbane, Qld; Professor Roberts is a Senior Principal Research Fellow, NHMRC, and Professor, Department of Medicine, University of Queensland, Brisbane, Qld.

Prescribing for the elderly

When prescribing for the elderly, it is important to remember that drug concentrations achieved for a given dose, the duration of drug activity and the organ response may be different from those in younger adults. Furthermore, normal homoeostatic responses to drug-induced effects are impaired with ageing. Elderly patients frequently have multiple illnesses and take many drugs concurrently (polypharmacy). The combination of decreased renal and/or hepatic clearance, impaired homoeostasis and polypharmacy results in frequent adverse drug reactions. If elderly patients have impaired sight, hearing or cortical function, their compliance in taking medications may be poor.

Good prescribing involves a mix of a clearly established need for a drug, a favourable benefit–risk profile, judicious drug use and avoidance of harm.

Practical points to consider

When prescribing medications to older people:

- consider nonpharmacological approaches first
- periodically review the medication regimen (medication review)
- avoid polypharmacy and aim for the simplest feasible regimen
- discontinue medications when there is no ongoing need for treatment
- consider adverse drug effects as a potential cause for any new symptom
- select carefully within a drug class to reduce the risk of adverse effects
- use the lowest feasible dose to achieve the desired therapeutic effect (as a general rule, start with half the usual adult dose)
- provide simple verbal and written instructions to improve compliance.

Physiological changes to consider

The most important pharmacokinetic change in the elderly is decreased clearance due to a decline in glomerular filtration rate with age. For the

IN SUMMARY

- **Regular medication review is essential for optimising medication use in the elderly.**
- **Overprescribing or polypharmacy should be specifically addressed by prioritising and simplifying.**
- **Use the lowest feasible dose to achieve the desired effect in the elderly (often less than half the usual adult dose).**
- **Decreased renal and hepatic clearance and impaired homoeostasis combined with polypharmacy result in frequent adverse reactions.**
- **Compliance is inversely related to the number of medications.**
- **An accurate drug history and an up-to-date medication record are essential.**

continued

Table. Drugs for which dose adjustment in renal impairment is considered essential*

Drug	f_e
ACE inhibitors†	0.9
Aciclovir/valaciclovir	0.7
Allopurinol	0.8
Atenolol	0.9
Captopril	0.5
Ciprofloxacin	0.7
Colchicine‡	0.15
Digoxin	0.8
Ethambutol	0.85
Ganciclovir	0.95
Gentamicin	0.9
Glibenclamide	0.5
Lithium	1.0
Metformin	0.9
Methotrexate	0.85
Netilmicin	0.9
Nitrofurantoin§	0.4
Sotalol	0.6
Tobramycin	0.9
Vancomycin	0.9

*Dose adjustment in renal impairment is considered essential because of a low therapeutic index and, in most cases, a high f_e (fraction excreted unchanged by the kidneys).

†Enalapril, lisinopril, perindopril, quinapril and ramipril. Note the f_e of captopril is 0.5.

‡Total dose reduction required despite low f_e (increased risk of gastrointestinal and myelotoxicity).

§Avoid if CrCl ≤40 mL/min (increased risk of peripheral neuropathy; ineffective if CrCl <10 mL/min).

Calculations

Creatinine clearance

The decrease in glomerular filtration rate (GFR), calculated as creatinine clearance (CrCl), is inversely related to age, as can be seen in the Cockroft–Gault equation:

$$\text{CrCl (mL/min)} = \frac{\text{F x (140 – age) x lean body weight (kg)}}{\text{serum creatinine (mmol/L) x 1000}}$$

(where F = 1.2 for males and 1.0 for females).

Reduced dose rate

Once the patient's creatinine clearance has been estimated, the new dose rate (DR) can be calculated as follows:

$$\text{DR patient} = \frac{\text{calculated CrCl}}{\text{normal CrCl}} \times \text{DR normal}$$

or if the f_e (fraction excreted unchanged by the kidneys) for the drug is <0.9 (see the Table):

$$\text{DR patient} = \left[(1 - f_e) + f_e \frac{\text{(calculated CrCl)}}{\text{(normal CrCl)}}\right] \times \text{DR normal}$$

(where DR normal is the dose rate for a patient with normal renal function and DR patient is the dose rate for the patient with renal impairment).

Lean body weight

Lean body weight (LBW) can be simply estimated using the following equations:

LBW (males) = 50 kg + 0.9 kg for every cm >150 cm in height

LBW (females) = 45.5 kg + 0.9 kg for every cm >150 cm in height).

equation relating glomerular filtration rate (as creatinine clearance) to age, sex and bodyweight, see the box on this page. For drugs that are primarily excreted by the kidneys, a reduction in glomerular filtration rate will reduce the amount of drug excreted.

Drugs with a narrow therapeutic index (where the difference between the plasma concentration associated with efficacy and that with toxicity is small) that are primarily excreted by the kidneys require a reduction in the maintenance dose and/or an increase in the dose interval. Examples of these are shown in the Table. Once the creatinine clearance has been estimated, the appropriate dose reduction can be calculated (see the box above).

For drugs where therapeutic monitoring is available (e.g. aminoglycosides, digoxin, lithium), where drug levels have been determined, the monitoring will provide a preferred measure of appropriate dosage.

There is also a reduction in liver oxidative metabolism – for example, of diazepam, theophylline, propranolol and nortriptyline. Drug distribution changes because of a decrease in lean body mass, a fall in total body water and an increase in body fat. Because of a smaller volume of distribution, the loading doses of water soluble drugs such as digoxin and aminoglycosides should be based on lean body weight (see the box above for the formula for lean body weight). However, the volume of distribution of fat soluble drugs is increased and loading doses of drugs such as diazepam and phenytoin should be based on total body weight.

Drug responses are less predictable in the elderly. It is known that beta adrenoceptor response decreases with age, and there is an increased susceptibility to drugs acting on the central nervous system, with an increased risk of falls and a reduced threshold for developing

confusion. Impairment of secondary compensatory mechanisms may predispose to adverse effects, such as orthostatic hypotension with tricyclic antidepressants and diuretics.

Medication review

To optimise medication use in the elderly, regular medication review is essential. Key points to address are:

- is this the most appropriate drug for the indication(s)?
- is there a desirable response with a satisfactory side effect profile?
- is there an ongoing need for the drug?
- are the dose, frequency and formulation appropriate?
- are there any important contraindications?
- are there potentially important interactions?
- is there any duplication?
- are there any adverse effects?
- can the regimen be simplified?

Unfortunately, medication review can be time consuming, and an accurate drug history is essential. Some general practitioners work with trained pharmacists who can perform an excellent review and make recommendations to the responsible doctor. The NHS in the United Kingdom and the Quality Medication Care Project in Australia are encouraging closer collaboration between general practitioners, suitably trained pharmacists and other health professionals in medication review.

Patients are also playing an increasing role as responsible partners in drug therapy. It is essential that they are well informed and aware of the risks. Education raises awareness of the need to be wise medication users. Communication with the patient also includes assessment of expectations, concerns and compliance, and discussion of a management plan. Up-to-date and easily accessed medication records, such as computerised or patient-held records, are particularly useful.

Overprescribing

Causes

The elderly take three times as many medicines as do younger people, and overprescribing (or polypharmacy) is a particular problem. Multiple pathology, multiple practitioners and an increase in therapeutic options for a widening variety of indications (some with marginal benefit) are contributory. Other factors include the patient's expectation of medication at each consultation, the attraction of novelty, habit, and the pressures of drug promotion.

Consequences

The potential consequences of multiple drug prescribing are numerous. An inverse relationship is to be expected between compliance and the number of medications. Except for the compulsive patient, a regimen of many pills at different times is likely to lead to noncompliance. Estimates of the extent of noncompliance range from 40 to 75% in the elderly.

Duplication becomes a distinct possibility when there are multiple medications, more than one attendant doctor, hoarding of old bottles, and the additional use of over-the-counter medicines.

The likelihood of drug–drug interactions increases with age and the number of medicines taken. Also, the risk of adverse drug reactions has been estimated to be 4% for patients on five drugs, increasing to 54% for patients who are taking 16 drugs or more.

Solution

Overprescribing can be addressed in numerous ways (summarised in the box on this page).

Prevention involves avoidance of prescribing unless there is good evidence substantiating efficacy as well as a strong need for a particular drug. Prescribing for minor, nonspecific or self-limited complaints is often unnecessary.

Review of medication packets is often needed to confirm what the patient is taking. When faced with many medicines, the doctor's next step is to prioritise and simplify, to reduce the regimen to the fewest essential drugs. This is a difficult and time consuming task that involves good rapport with the patient

Tips on overprescribing

Prevention
Avoid prescribing for minor, nonspecific or self-limited complaints.

Regular medication review
Patients on multiple medicines should show them to the GP to facilitate an accurate record.

Communication
Establish a good rapport and communication with the patient and between attending clinicians.

Prioritise
Reduce the regimen to the fewest essential drugs with the simplest dosage regimen. Also consider dose reduction or therapeutic substitution.

Simplify
Many complex drug regimens can be simplified to five medicines or less.

Nonpharmacological approaches
Consider nonpharmacological approaches wherever possible.

Figure. Typical example of multiple medications taken by an elderly patient.

continued

Editor's comment

Your editor, who is firmly in the category of patient discussed in this article, knows how easy it is to be uncertain as to whether he has taken the morning or evening's medication.

An inexpensive solution, one he has recommended to many patients, is to visit the local supermarket and buy a plastic tray of the kind used for making ice-blocks. A marker pen is used to write the days of the week along the long axis, and the appropriate time on the compartments on the short axis – usually only two are necessary, AM and PM.

The more expensive commercial pill containers usually have a little lid over each compartment, which serves no useful purpose unless one is in transit.

John Ellard
Editor, MedicineToday

and any other clinicians involved. However, many complex regimens can be simplified to five essential medicines or less – a challenging but rewarding exercise. The patient should be monitored for the development of adverse drug withdrawal events.

Nonpharmacological approaches should also be considered.

Conclusion

Optimising medication use in the elderly is challenging, and specific time should be designated to obtain an accurate drug history and perform regular reviews of medications. A basic understanding of the important pharmacokinetic and pharmacodynamic changes associated with ageing is required. Consider contraindications, important drug interactions and adverse drug reactions, and avoid duplication. Compliance and polypharmacy should be specifically addressed.

With each prescription, attempt to prioritise and simplify, with a view to prescribing the smallest number of medicines with the simplest dose regimen, using the lowest feasible doses. Iatrogenesis is one of the so-called 'geriatric giants', along with falls, dementia and incontinence, that contribute to the woes of old age. All these factors are mutually interactive, and directly bear on the doctor's responsibilities as a prescriber. MT

Further reading

1. Roberts MS, King M, Stokes JA, et al. Medication prescribing and administration in nursing homes. Age Ageing 1998; 27: 385-392.
2. Parkes AJ, Cooper LC. Inappropriate use of medications in the veteran community: how much do doctors and pharmacists contribute? Aust N Z J Public Health 1997; 21: 469-476.
3. Zwar NA. Principles of rational prescribing in general practice. Aust Prescriber 1991; 14: 75-78.
4. Pillans PI, Roberts MS. Overprescribing: have we made any progress? Aust N Z J Med 1999; 29: 485-486.
5. Montamat SC, Cusack B. Overcoming problems with polypharmacy and drug misuse in the elderly. Clin Geriatr Med 1992; 8: 143-158.
6. Salzman C. Medication compliance in the elderly. J Clin Psychiatry 1995; 56 Suppl 1: 18-22.
7. Graves T, Hanlon JT, Schmader KE, et al. Adverse events after discontinuing medications in elderly outpatients. Arch Intern Med 1997; 157: 2205-2210.
8. Price D, Cooke J, Singleton S, et al. Doctors' unawareness of the drugs their patients are taking: a major cause of overprescribing. BMJ 1986; 292: 99-100.
9. Bradley CP, Taylor RJ, Blenkinsopp A. Developing prescribing in primary care. BMJ 1997; 314: 744-747.
10. Hanlon JT, Weinberger M, Sams GP, et al. A randomised controlled trial of a clinical pharmacist intervention to improve inappropriate prescribing in elderly outpatients with polypharmacy. Am J Med 1996; 100: 428-437.