Prescribing for older people

James C Milton,[1] Ian Hill-Smith,[2] Stephen H D Jackson[1]

[1]Clinical Age Research Unit, Department of Clinical Gerontology, King's College Hospital Foundation Trust, London SE5 9PJ

[2]Stopsley Group Practice, Churchfield Medical Centre, Luton LU2 9SB

Correspondence to: J C Milton
jim_milton@hotmail.com

BMJ 2008;336:606-9
doi:10.1136/bmj.39503.424653.80

About a fifth of the population in the United Kingdom is 60 years or older,[1] yet people in this age group receive 59% of dispensed prescriptions and account for more than half of NHS drug costs.[2] Older people often have several coexisting medical problems and take multiple drugs. Increasing age is associated with changes in pharmacokinetics and pharmacodynamics, so prescribing in this age group can be problematic.[3]

Many randomised controlled trials involving older patients focus on managing a single disease state, such as hypertension or osteoporosis, but people in this age group often have many interacting conditions and are taking many drugs, so guidance on their treatment often has to be based on consensus and involves extrapolating data derived from healthier patients. This review highlights some of the difficulties in prescribing in older patients and offers guidance for appropriate prescribing.

Sources and selection criteria

We searched the National Library for Health, PubMed, and Embase databases using the keywords "elderly" and "prescribing", including synonyms by the MeSH or major descriptor headings. Our search was limited to studies undertaken in humans that were published in English during the past five years. We displayed abstracts of interest using Abstract Plus before obtaining the full text of articles of interest. In addition, we searched the Cochrane Library and our own personal archives of references

What physiological changes occur with ageing?

Pharmacokinetic and pharmacodynamic changes

With age the body undergoes several changes that can affect the distribution, metabolism, and excretion of drugs. These changes included a reduction in renal clearance, liver size, and lean body mass.[4] Hepatic enzyme activity and serum albumin may also be reduced in the presence of chronic disease. The most clinically important of these changes is the reduction in renal clearance, which results in reduced excretion of water soluble drugs. This is especially important for drugs with a narrow therapeutic window (ratio of desired effect to toxic effect), such as digoxin, lithium, and gentamicin.

As well as changes in pharmacokinetics, older people are also more sensitive to the effects of some drugs, especially those that act on the central nervous system, such as benzodiazepines, which are associated with an increase in postural sway and risk of falls.

Multiple pathology and polypharmacy

Polypharmacy is common in older people—around 20% of people over 70 take five or more drugs.[5] In the past decade, the average number of items prescribed to people aged 60 and over has almost doubled from 21.2 to 40.8 items for each person each year.[6] Previously, polypharmacy implied inappropriate prescribing, but this is not necessarily true, because all of the prescribed drugs may have an appropriate indication.

Polypharmacy is associated with increases in many adverse outcomes, including drug interactions, adverse drug reactions, falls, hospital admissions, length of hospital stay, readmission rate soon after discharge, and mortality rate.[5 7 8] However, these effects may result from polypharmacy acting as a marker of multiple pathology or frailty, as opposed to being an independent risk factor.

Box 1 Guidelines for good prescribing in elderly patients

- Carry out a regular medication review and discuss and agree all changes with the patient
- Stop any current drugs that are not indicated
- Prescribe new drugs that have a clear indication
- If possible, avoid drugs that have known deleterious effects in elderly patients, such as benzodiazepines, and recommend dosage reduction when appropriate
- Use the recommended dosages for elderly patients
- Use simple drug regimens and appropriate administration systems
- Consider using once daily or once weekly formulations and using fixed dose combinations when possible
- Consider non-pharmacological treatments if appropriate
- Limit the number of people prescribing for each patient if possible
- Where possible, avoid treating adverse drug reactions with further drugs

Drugs that pose a particular risk for older people[10]

Drug	Adverse drug reactions
Long term non-steroidal anti-inflammatory drugs	Gastrointestinal haemorrhage, renal impairment, hypertension
Benzodiazepines	Falls caused by impaired balance
Anticholinergic drugs	Unmasking Alzheimer's disease, urinary retention
Tricyclic antidepressants	Orthostatic hypotension, sedation
Chlorpropramide	Hypoglycaemia
Doxazosin	Orthostatic hypotension, dry mouth, urinary problems

What is inappropriate prescribing?

Inappropriate prescribing for older patients encompasses all of the normal indicators of inappropriate prescribing for adults in general, but the problem is especially relevant to older patients because they often take a large number of drugs. Not only does this increase their chance of having an adverse event, but it means that unnecessary drugs may be obscured by the large number of necessary ones. Dose, formulation, and delivery need to be adjusted according to the age and frailty of the patient, and some drugs are best avoided altogether. This is familiar territory to general practitioners, who also see very young patients and routinely adjust drug dose according to the *British National Formulary for Children*—perhaps we need an equivalent publication for older patients to highlight the importance of taking age into account. Problems arise when older patients are assumed to respond to drugs in the same way that an average adult does.[9] In addition, as patients grow older, it is easy to forget to adjust drug doses appropriately. This is where a review by someone other than the usual prescriber can be particularly helpful.

Which drugs should we avoid in older patients?

Some adverse drug reactions occur at a similar prevalence regardless of age, such as cough induced by angiotensin converting enzyme inhibitors. However, a greater prevalence of adverse drug reactions may be seen as a result of the pharmacokinetic or pharmacodynamic changes seen with ageing. An American consensus guideline known as the Beers criteria—first published in 1991 and last updated in 2003—provides a list of drugs that the panel of experts thought to be particularly problematic for older patients.[10] The table gives examples from this list that are especially relevant to prescribing in the United Kingdom.

What drugs should we routinely consider in older patients?

Older people have been under-represented in clinical trials of new drugs, but there is a solid evidence base using some newer treatments in this population. Warfarin reduces strokes in patients with atrial fibrillation, with no significant increase in the risk of bleeding, and it is recommended for most patients over 75 years with atrial fibrillation.[11 12]

Recent reviews also provide convincing evidence for the use of angiotensin converting enzyme inhibitors and β blockers in left ventricular systolic dysfunction, statins in hypercholesterolaemia, and bisphosphonates in osteoporosis in older patients.[13-16] These drugs were well tolerated in older people, but few studies included patients who were taking several drugs at the same time.[11 13-16] We therefore advise monitoring the introduction of new agents carefully, often starting with low doses and titrating upwards.

How can inappropriate prescribing in older people be reduced?

Good prescribing practice

Box 1 offers some guidelines to aid prescribing in older patients. Some of these guidelines, such as using as few prescribers as possible, are evidence based,[17] but because of the paucity of evidence in this area, most are consensus opinion.

Medication review

The national service framework for older people recommends regular medication reviews, with patients taking four or more drugs being reviewed every six months and those taking fewer reviewed annually.[18] General practitioners, who do most of the prescribing, can set the authorisation of repeat prescriptions for a period of time or a number of repeats, and automatically generate a recall using their clinical software. A medication review for all patients being prescribed four or more repeat medicines is part of the quality and outcomes framework of the general practitioner contract, and the National Prescribing Centre has issued detailed guidance on how it should be done.[19] However, the government has recently threatened to withdraw funding this target in favour of extended opening hours.

The medication review not only examines the indication for taking existing drugs and checks their dosage, but it also provides an opportunity to identify and treat new conditions, such as atrial fibrillation, cardiac failure, or Alzheimer's disease, which increase in prevalence with advancing age. Older people with complex medication or medical needs should be referred for a specialist review by a geriatrician.[18]

A systematic review of the effects of pharmacist led interventions in reducing polypharmacy identified only 14 trials that met the inclusion criteria, and these tended to report cost savings rather than benefits to the patients.[20] A recent randomised controlled trial found that regular telephone counselling by a hospital pharmacist increased concordance and reduced all cause mortality without altering the total number of drugs taken,[21] but it would be difficult to implement this intervention in the wider community. The 2005 contract for community pharmacists included a review of the use of drugs as the first advanced level service to be implemented,[22 23] but the aim of this review is to ensure that drugs are taken and taken properly. Without the clinical records pharmacists cannot review the indications for treatment. Community pharmacists

TIPS FOR NON-SPECIALISTS

- Older people's drugs should be reviewed regularly. People taking fewer than four drugs should be reviewed at least annually. People taking four or more should be reviewed at least every six months
- Patients taking several drugs who have multiple comorbidities may benefit from a specialist review by a geriatrician. The referral should include a history of adverse events or intolerances as well as a list of drugs that are currently being taken

Box 2 Types of prescribing quality indicators[35]

Quantitative indicators

Such as the mean number of drugs prescribed or the number classified in the *British National Formulary* as "black triangle" or "less suitable for prescribing."[11] These indicators are best used in conjunction with others

Qualitative indicators

These are drug specific indicators of unnecessary or ineffective prescribing (such as prescribing both an H_2 receptor blocker and a proton pump inhibitor) or potentially harmful drugs (such as long acting hypoglycaemic agents)

Evidence based indicators

These measure the extent to which research evidence is put into practice, such as the use of antithrombotic therapy in atrial fibrillation, while allowing the prescriber to identify reasons why the evidence base should not be followed—for example, because a palliative care pathway is being followed or the patient has a history of an adverse reaction

have an important role in spotting adverse drug reactions, drug interactions, and concordance problems, even though we have no evidence that this reduces mortality or emergency admissions.[24]

Using as few prescribers as possible

In the UK, most prescribing is done by the patient's general practitioner, but it is often started or adjusted in secondary care, so good communication is crucial. Unintentional discrepancies in medication are found in half of older patients after they have left hospital, an error rate that can be halved if the community pharmacist is sent a copy of the discharge summary.[25]

A recent study in the United States found that the incidence of adverse drug reactions is directly related to the number of doctors who prescribe for a patient.[17] The effects of non-medical prescribing, by nurses and other health professionals, have not been studied. It results in a similar number of prescriptions to physician prescribing,[26] but does increase the potential number of prescribers (although independent nurse prescribers cooperate closely with the patient's general practitioner).

Education

A Cochrane review concluded that educational outreach visits are a promising way to modify the behaviour of health professionals, especially prescribing behaviour.[27] In a UK study of 75 randomly selected general practices, those assigned educational outreach had a small improvement in prescribing practice.[28] Interestingly, smaller practices (two or fewer full time equivalent practitioners) improved by 13.5%, whereas larger practices did not improve significantly. This may have been because a greater proportion of doctors in smaller practices attended the outreach meetings. A randomised controlled trial showed that similar interventions can also change prescribing in hospital practice.[29]

ADDITIONAL EDUCATIONAL RESOURCES

Information for patients

Patient UK (www.patient.co.uk/dils.asp)—Free drug information site for patients

CKS (www.cks.library.nhs.uk/patient_information)—NHS sponsored patient information site

Information for health professionals

National Service Framework: Medicine and Older People (www.hcsu.org.uk/index.php?option=com_docman&task=doc_download&gid=322%20)—Provides a format for detailed medication review

Electronic prescribing

Electronic prescribing (ePrescribing) aims to reduce prescribing and administration errors by eliminating the risk of errors when generating or reading paper prescriptions.[30] This is one step in the overall goal of integrating the entire patient record across the health service as a way to minimise errors or delays in communication between service providers. Prescribing advice software can be integrated within this structure. This promises to be of particular benefit to older patients with several morbidities who are taking multiple drugs, but setting up ePrescribing is only half the challenge—patients may need help and encouragement to use it initially.[31]

Before and after studies in a surgical ward of a London teaching hospital provide an early indication of benefit. The introduction of closed loop electronic prescribing resulted in fewer prescribing errors, fewer errors related to medication administration, and fewer prescription endorsements by a pharmacist.[32,33]

Audit

Auditing of prescribing is integral to providing good clinical care, but the traditional audit loop of data gathering, data interpretation, and feedback produces a long delay between an action and its feedback, which reduces any effect on behaviour. Furthermore, amalgamated data distance the prescriber from specific errors and make it harder to see obvious ways to improve. Audit does not necessarily change behaviour,[34] but prescribing indicators have been developed for older patients,[35-37] which could provide immediate feedback when integrated into electronic prescribing systems. Box 2 shows the types of indicators used to assess prescribing quality.

What improvements can we expect in future?

Unified medical records, electronic prescribing with decision support, and instant feedback on prescribing have potential to reduce errors in prescribing and improve patients' care. Trials of new treatments, even if they include older people, currently tend to be highly selective, and the results do not easily generalise to a frail elderly population with multiple comorbidities. Ideally, such randomised controlled trials would include representative samples of frail older patients, but the practical problems with this are considerable.

Conclusions

Prescribing for elderly patients presents many challenges, most of which have not changed in the past 20 years.[38] Changes in pharmacodynamics and pharmacokinetics mean that these patients often need lower doses, and the presence of multiple medical problems

SUMMARY POINTS

Prescribing for older people is problematic

Older people are often prescribed unnecessary drugs, drugs that are contraindicated in their age group, or the wrong dose for their age

Misconceptions about age may prevent them being given drugs with a specific indication and evidence base

Inappropriate prescribing may be reduced by reviewing drugs regularly, electronic prescribing, regular auditing, and limiting the number of prescribers

and subsequent polypharmacy makes adverse drug reactions and interactions more common.

The evidence base for specific treatments in older people is increasing but, even when the evidence base does not extend to a particular age group, effective treatments should not be withheld purely on the basis of age, just as treatments would not be denied to specific ethnic groups who are under-represented in clinical studies.

Contributors: JCM and IH-S searched the literature and wrote the article. SHDJ reviewed and revised the article. JCM is guarantor.
Competing interests: None declared.
Provenance and peer review: Commissioned; externally peer reviewed.

1 Office for National Statistics. *Key population and vital statistics*. 2005. www.statistics.gov.uk/downloads/theme_population/KPVS32_2005/KPVS2005.pdf.
2 Department of Health. *Prescriptions dispensed in the community for 1993 to 2003*. England: DH, 2004.
3 Mallet L, Spinewine A, Huang A. Prescribing in elderly people 2: the challenge of managing drug interactions in elderly people. *Lancet* 2007;370:185-91.
4 Mangoni AA, Jackson SHD. Age-related changes in pharmacokinetics and pharmacodynamics: basic principles and practical applications. *Br J Clin Pharmacol* 2003;57:6-14.
5 Rollason V, Vogt N. Reduction of polypharmacy in the elderly: a systemic review of the role of the pharmacist. *Drugs Aging* 2003;20:817-32.
6 Information Centre (Health Care). *Prescriptions dispensed in the community. Statistics for 1996 to 2006: England*. 2007. www.ic.nhs.uk/webfiles/publications/PrescDispensed%2096to06/Bulletin%20220807%20version%20for%202006.pdf.
7 Campbell SE, Seymour DG, Primrose WR. A systematic literature review of factors affecting outcome in older medical patients admitted to hospital. *Age Ageing* 2004;33:110-5.
8 Frazier SC. Health outcomes and polypharmacy in elderly individuals. *J Gerontol Nursing* 2005;31:4-11.
9 Edwards RF, Harrison TM, Davis SM. Potentially inappropriate prescribing for geriatric inpatients: an acute care of the elderly unit compared to a general medicine service. *Consult Pharmacist* 2003;18:37-49.
10 Fick DM, Cooper JW, Wade WE, Waller JL, Maclean JR, Beers MH. Updating the Beers criteria for potentially inappropriate medication use in older adults. *Arch Intern Med* 2003;163:2716-24.
11 Mant J, Hobbs R, Fletcher K, Mant J, Hobbs FD, Fletcher K, et al; BAFTA investigators; Midland Research Practices Network (MidReC). Warfarin versus aspirin for stroke prevention in an elderly community population with atrial fibrillation (the Birmingham atrial fibrillation treatment of the aged study, BAFTA): a randomised controlled trial. *Lancet* 2007;370:493-503.
12 The National Collaborating Centre for Chronic Conditions. *Atrial fibrillation. National clinical guideline for management in primary and secondary care*. London: Royal College of Physicians, 2006.
13 Mangoni AA, Jackson SHD. The implications of a growing evidence base for drug use in elderly patients. Part 2. ACE inhibitors and angiotensin receptor blockers in heart failure and high cardiovascular risk patients. *Br J Clin Pharmacol* 2006;61:502-12.
14 Mangoni AA, Jackson SHD. The implications of a growing evidence base for drug use in elderly patients. Part 3. β-adrenoceptor blockers in heart failure and thrombolytics in acute myocardial infarction. *Br J Clin Pharmacol* 2006;61:513-20.
15 Mangoni AA, Jackson SHD. The implications of a growing evidence base for drug use in elderly patients. Part 1. Statins for primary and secondary cardiovascular prevention. *Br J Clin Pharmaol* 2006;61:494-501.
16 Dhesi JK, Allain TJ, Mangoni AA, Jackson SHD. The implications of a growing evidence base for drug use in elderly patients. Part 4. Vitamin D and bisphosphonates for fractures and osteoporosis. *Br J Clin Pharmacol* 2006;61:521-8.
17 Green JL, Hawley JN, Rask KJ. Is the number of prescribing physicians an independent risk factor for adverse drug events in an elderly outpatient population? *Am J Geriatr Pharmacother* 2007;5:31-9.
18 Department of Health. *Medicines and older people: implementing medicines-related aspects of the NSF for older people 2001*. 2001 www.hcsu.org.uk/index.php?option=com_docman&task=doc_download&gid=322%20.
19 Middlesborough Primary Care Trust. *Guidance to support the production of a repeat prescribing protocol*.www.npc.co.uk/repeat_prescribing/Policy%203%20-%20Sue%20Prout.pdf.
20 Rollason V, Vogt N. Reduction of polypharmacy in the elderly: a systemic review of the role of the pharmacist. *Drugs Aging* 2003;20:817-32.
21 Wu JYF, Leung WYS, Chang S, Lee B, Zee B, Tong PC, et al. Effectiveness of telephone counselling by a pharmacist in reducing mortality in patients receiving polypharmacy: randomised controlled trial. *BMJ* 2006;333:522-7.
22 Noyce PR. Providing patient care through community pharmacies in the UK: policy, practice, and research. *Ann Pharmacother* 2007;41:861-8.
23 Blenkinsopp A, Celino G, Bond C, Inch J. Medicines use reviews: the first year of a new community pharmacy service. *Pharm J* 2007;278:218-23.
24 Bond C, Matheson C, Williams S, Williams P, Donnan P. Repeat prescribing: a role for community pharmacists in controlling and monitoring repeat prescriptions. *Br J Gen Pract* 2000;50:271-5.
25 Duggan C, Feldman R, Hough J, Bates I. Reducing adverse prescribing discrepancies following hospital discharge. *Int J Pharm Pract* 1998;6:77-82.
26 Horrocks S, Anderson E, Salisbury C. Systematic review of whether nurse practitioners working in primary care can provide equivalent care to doctors. *BMJ* 2002;324:819-23.
27 O'Brien T, Oxman AD, Davis DA, Haynes RB, Freemantle N, Harvey EL. Educational outreach visits: effects on professional practice and health care outcomes. *Cochrane Database Syst Rev* 2000;(2):CD000409.
28 Freemantle N, Nazareth I, Eccles M, Wood J, Haines A; Evidence-based OutReach Trialists. A randomised controlled trial of the effect of educational outreach by community pharmacists on prescribing in UK general practice. *Br J Gen Pract* 2002;52:290-5.
29 Batty GM, Oborne CA, Hooper R, Jackson SHD. Investigating intervention strategies to increase the appropriate use of benzodiazepines in elderly medical inpatients. *Br J Clin Gov* 2001;6:252-8.
30 National Health Service. *ePrescribing*. 2008. www.connectingforhealth.nhs.uk/systemsandservices/eprescribing.
31 Lapane KL, Dubé C, Schneider KL, Quilliam BJ. Patient perceptions regarding electronic prescriptions: is the geriatric patient ready? *J Am Geriatr Soc* 2007;55:1254-9.
32 Franklin BD, O'Grady K, Donyai P, Jacklin A, Barber N. The impact of a closed-loop electronic prescribing and administration system on prescribing errors, administration errors and staff time: a before-and-after study. *Qual Safety Health Care* 2007;16:279-84.
33 Franklin BD, O'Grady K, Donyai P, Jacklin A, Barber N. The impact of a closed-loop electronic prescribing and automated dispensing system on the ward pharmacist's time and activities. *Int J Pharmacy Pract* 2007;15:133-9.
34 Batty GM, Grant RL, Aggarwal R, Lowe D, Potter JM, Pearson MG, et al. National clinical sentinel audit of evidence-based prescribing for older people. *J Eval Clin Pract* 2004;10:273-9.
35 Oborne CA, Batty GM, Maskrey V, Swift CG, Jackson SHD. Development of prescribing indicators for elderly medical patients. *Br J Clin Pharmacol* 1997;43:91-7.
36 Oborne CA, Hooper R, Swift CG, Jackson SHD. Explicit, evidence-based criteria to assess the quality of prescribing to elderly nursing home residents. *Age Ageing* 2003;32:102-8.
37 Batty GM, Grant RL, Aggarwal R, Lowe D, Potter JM, Pearson MG, et al. Using prescribing indicators to measure the quality of prescribing to elderly medical in-patients. *Age Ageing* 2003;32:292-8.
38 Swift CG. Prescribing in old age. *BMJ* 1988;296:913-5.