Inappropriate prescribing in the elderly

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Drug-induced disease in elderly patients is common, important and much discussed [1]. The elderly consume proportionately more drugs than younger adults [2–4] and they also have a much higher rate of adverse reactions to drugs [5]. A multi-centre survey of geriatric units in the UK, carried out in 1980 [6], showed that adverse drug reactions had contributed to over 10 per cent of hospital admissions, and in only one third of these patients was recovery complete. The prescription of contra-indicated and interacting drugs may be more significant in the elderly because of pharmacokinetic [7–8] and pharmacodynamic [9] changes in the ageing body.

Our recent survey of prescriptions for elderly patients admitted to hospital [10] identified contra-indicated or adversely interacting drugs prescribed in 200 (3.2 per cent) of 6160 prescriptions involving 136 individuals (23.7 per cent of the patients sampled). Of these, undesirable prescriptions (65.6 per cent) were deemed to be avoidable, and the frequency of 'errors' was higher in admission medication (5.3 per cent) prescribed by general practitioners than in hospital prescriptions (2.9 per cent). Relatively little information is available about 'adverse prescribing' for elderly patients in the community. Moir [3] interviewed 1070 elderly patients in the community and found that on only 15 occasions were drugs prescribed which might potentially interact with each other. Unfortunately, the study was carried out by non-medical personnel and did not include information about diagnosis.

In view of our own findings, we decided to extend our studies into the community, and on this occasion took advantage of a computer program devised for signalling contra-indicated, cautioned and interacting drugs. We chose to look at patients presenting to the Accident and Emergency Department, rather than obtaining access to patients directly through GPs, lest our results might be biased by the prescribing habits of individual practices and because of the possibility that those GPs most willing to co-operate would be precisely those who would have the least problems with prescribing.

Patients and methods

Patients

All pensioners attending as new patients, for whatever reason, during a seven-week period at a District General Hospital Accident and Emergency (A & E) Department were included in the study. Reasons for attendance ranged from the trivial (dog bites, bee stings) to major medical and surgical emergencies. Forty-seven patients (4.3 per cent) came from residential homes and the remainder from their own homes.

A questionnaire was completed by the A & E staff for 1094 patients out of a total of 1099. Details were recorded of the drug therapy that patients were already receiving at the time of attendance. Current diagnoses were obtained from all patients and, where necessary, diagnoses and drug data were checked by direct communication with the GP (23 per cent) or by access to case notes (27 per cent). Of those patients who had laboratory tests, 380 (35 per cent) had plasma urea, sodium and potassium measured, 248 (23 per cent) had blood glucose estimations and 382 (35 per cent) had haemoglobin and white count estimations. The results of these tests were taken into account in our analysis.

Data analysis

The data obtained were entered into an LSI Octopus microcomputer containing the LIFESAVE [11,12] system for identifying drug combinations and drugs cautioned or contra-indicated in the light of the patient's known diagnosi(e)s. The contra-indications and cautions carried in the database of the system are those given in the *British National Formulary* (BNF), and the drug interactions are those listed in Appendix 1 of the BNF.

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Results

There were 371 men (33.9 per cent) and 723 women (66.1 per cent) in the study, including 27 brought in dead. Twenty-seven per cent were admitted to medical, surgical, geriatric, orthopaedic and psychiatric wards.

Number of drugs per patient: 871 subjects (79.6 per cent) were taking at least one prescribed drug, 62 of these (7.1 per cent) were taking six or more drugs. One patient was taking 13 different drug preparations. Patients were receiving on average 2.2 drugs per day. The most commonly consumed preparations (as a proportion of all subjects in the study) were diuretics (32.0 per cent), analgesics and non-steroidal anti-inflammatory drugs (25.2 per cent), hypnotics and sedatives (18.5 per cent), broncho-dilators (14.5 per cent) and nitrates (10.0 per cent).

Contra-indicated drugs: 42 (4.8 per cent of patients taking drugs) prescriptions were signalled by the LIFESAVE system as being contra-indicated in relation to the recorded diagnosi(e)s. Of these, we considered 32 (3.7 per cent) to be seriously contra-indicated (Table 1). A further seven

Table 1. Drugs seriously contra-indicated in relation to Diagnosi(e)(s)

Drug/drug group	Diagnosis	Patients affected
Non-selective beta-blockers	Obstructive airways disease	5
Beta-blockers	Peripheral vascular disease	4
Beta-blockers	Congestive cardiac failure	3
Metformin	Congestive cardiac failure	3
Sinemet	Dementia	2
Actifed	Hypertension	2
Procainamide	Congestive cardiac failure	1
Phenylbutazone	Congestive cardiac failure	1
Actifed	Congestive cardiac failure	1
Aspirin	Peptic ulcer	1
Pentazocine	Hypertension	1
Betamethasone skin preparation	Varicose ulcer	1
Emepronium	Prostatic hypertrophy	1
Methyldopa	Cirrhosis	1
Methyldopa	Depression	1
Quinestradol	Breast carcinoma	1
Progesterone	Breast carcinoma	1
Flupenthixol	Parkinson's disease	1
Haloperidol	Depression	1
Total		**32**

prescriptions were considered to be relatively contra-indicated (disopyramide in congestive cardiac failure – 3 cases, morphine sulphate or buprenorphine in chronic obstructive airways disease – 4 cases). It was difficult to evaluate the remaining contra-indiations as this would have required more complete clinical data.

A further 40 prescriptions affecting 38 patients (4.4 per

Table 2. Drugs contra-indicated in relation to laboratory tests.

Laboratory test	Drug	Patients affected
Urea 10–20 mmol/l (Renal impairment)	Moduretic	8
	Chlorpropamide	2
	Metformin	2
	Dyazide	1
	Frumil	1
	Distalgesic	1
	Septrin	1
	Azapropazone	1
	Penicillamine	1
Urea >20 mmol/1 (Renal failure)	Spironolactone	4
	Potassium chloride	2
	Navidrex-K	2
	Bendrofluazide	1
	Diumide-K	1
	Lasilactone	1
	Warfarin	1
	Distalgesic	1
	Bacampicillin	1
	Septrin	1
	Mefanamic acid	1
Potassium >5.5 mmol/1	Spironolactone	5
	Potassium chloride	1
Total		**40**

cent), were noted to be contra-indicated in the light of laboratory tests (Table 2). These drug-laboratory test contra-indications affected over 10 per cent of patients who had urea and electrolyte measurements performed. Sixteen prescriptions were contra-indicated because the patient was in 'renal failure' (arbitrarily defined as a urea >20 mmol/l) and a further 18 were contra-indicated because of renal impairment (urea 10–20 mmol/l). In six patients, contra-indications were noted because of hyper-kalaemia. The particular contra-indicated drug was the potassium-sparing diuretic spironolactone. An additional 15 patients had abnormal tests that suggested contra-indications to their drugs; seven patients on moduretic, two on spironolactone and one on acetazolamide were hyponatraemic, a further patient on acetazolamide was hypokalaemic and two patients on aspirin and cotrimoxazole, respectively, were leucopenic.

Drug interactions: 356 interacting drug combinations were identified in the 2,353 prescriptions affecting 216 (19.7 per cent) of patients taking drugs. Not all of these interactions were clinically significant. We classified the interactions as follows: potentially dangerous, 6; potentially serious, 6; liable to lead to suboptimal treatment, 191; of uncertain clinical significance, 69; and possibly beneficial or intended, 85. The individual drugs involved in the potentially dangerous and potentially serious categories are listed in Table 3.

Table 3. Dangerous and serious drug interactions

Severity	Drug affected	Drug interacting	Effect	Number
Potentially dangerous	Captopril	Potassium	Hyperkalaemia	3
	Spironolactone	Potassium	Hyperkalaemia	2
	Spironolactone	Navidrex-K	Hyperkalaemia	1
Potentially serious	Digoxin	Quinine	Potentiation	2
	Metoprolol	Nifedipine	BP down if CCF	2
	Sinemet	Promazine	Extrapyramidal effects	1
	Benzhexol	Haloperidol	Extrapyramidal effects	1
			Total	12

Discussion

The purpose of the present work was to extend the studies we have already carried out on elderly inpatients. Because hospital inpatients are especially vulnerable to the prescription of contra-indicated and interacting drugs, elderly patients presenting at an A & E department may constitute a more representative cross-section of the community. Only 27 per cent of the 1,094 patients studied were admitted to hospital.

Our findings confirm our suspicion that prescriptions for the elderly often include contra-indicated, cautioned and interacting drugs. We found a total of 72 serious contra-indications affecting 66 patients, of 6.0 per cent of the total sample. Interestingly, over half of these contra-indications were revealed as a result of laboratory measurements of urea and electrolytes. This indicates the importance of monitoring these parameters in patients who have been started on medication; 670 cautions were applicable to the drug therapy received by these patients. In many cases, the cautions were not clinically very important, but they are more likely to be relevant in elderly patients who have a reduced tolerance to medication because of altered pharmacodynamics [9] and pharmacokinetics [1,7,8].

This last observation may be especially applicable to the evaluation of the significance of drug interactions. We noted 356 interacting drug combinations affecting 19.7 per cent of patients. Of these, 154 were either possibly potentially beneficial, or intended, or of uncertain medical significance. The remaining 202 were undesirable, although in the majority of cases, this was liable only to lead to sub-optimal treatment. Possibly dangerous or serious interactions were observed in only 12 cases. Even so, all of the interactions noted are listed in the BNF (13). We may have underestimated the seriousness of interactions in the elderly as the therapeutic window is narrower for this age group.

The present study was conducted using LIFESAVE, a specially designed computer system [11,12]. There are many computer programs now available for the detection of drug interactions [14], but relatively few portable programs for the contra-indications and cautions. The reasons for this are easy to understand [12], as there are many technical problems which have to be solved in drawing up such a program. The tendency for computer prescribing systems to deal predominantly with interactions that are relatively easy to solve technically, may be inappropriate as the problem seems to lie more in contra-indications and cautions.

Our findings support those of our previous study [10], that there is a significant incidence of inappropriate prescribing in the elderly. It is clear that prescribers of the future are going to be increasingly in need of more sophisticated information support systems if they are to make the best choice of medication.

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