Inappropriate long-term medication in patients admitted to a coronary care unit

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Many patients admitted to coronary care have a previous history of illness and are already on long-term drug therapy. Some are on multiple drug regimes. We have investigated the indications and need for many of the drugs encountered in our patients, in an effort to assess the appropriateness of their drug treatment.

Methods

A structured drug history was taken from 100 successive patients of both sexes and all ages admitted to coronary care between 1 April 1988 and 17 June 1988 under the care of one consultant cardiologist (R.M.). All patients had been admitted as suspected or confirmed cardiac or cardiorespiratory emergencies. Details of drugs taken on a regular basis included the dosage, method of administration, duration of treatment and by whom the drug was prescribed. The incidence of side effects, the patient’s knowledge of the purpose of treatment, and his or her perception of benefit were recorded as well as stated compliance to treatment. Allowance was made for any changes in indication and efficacy which may have occurred as a result of the admission illness. Drugs newly prescribed in the week prior to admission were excluded. At the time of discharge, after investigation and treatment, the merits of each drug were assessed. We aimed to reach a consensus about the indication and efficacy of each drug by including it in one of four categories: essential, helpful, unnecessary or harmful.

We defined a drug as ‘essential’ if significant clinical deterioration was likely to occur on withdrawal. A drug was considered ‘helpful’ if it was likely to improve symptoms but could be withdrawn without adverse clinical consequences. If no reason for prescription of the drug could be determined, it was classified as ‘unnecessary’. Drugs considered ‘harmful’ were those that had, or could have, an adverse effect on clinical status and which had no clinical justification; this group included drugs that were contraindicated and those associated with harmful or potentially harmful drug interactions. In the case of drug interactions, only the medication that was withdrawn was classified as harmful. Minor side effects, such as headaches associated with nitrate therapy or occasional palpitation with beta-agonists, were not included.

Results

One patient died shortly after admission and was not fully assessed, so he was excluded from the study; 73 of the remaining 99 patients were male, the mean age of the group being 63.8 years. At the time of admission, the 99 patients had prescriptions for a total of 232 separate drug items for a duration of more than 1 week, 149 (60%) of which had been prescribed for more than 6 months (see Fig. 1). Since 20 patients were not taking any drugs, this left 79 taking an average of 3.3 different drugs each; 42 took 3 or more drugs (Table 1).

The most commonly prescribed drugs were those acting on the cardiovascular system (Table 2). Table 3 records the drugs prescribed because of their action on the respiratory, gastrointestinal and central nervous systems. Table 4 deals with miscellaneous drugs. Tables 2–4 record the number of patients taking each drug and our perception of the drug’s efficacy.

| Table 1 | The number of drugs being taken by 99 patients in this study. |
|---|---|
| Number of drugs | Number of patients |
| None | 20 |
| One | 21 |
| Two | 16 |
| Three | 13 |
| Four | 16 |
| Five | 6 |
| Six | 6 |
| Seven | 0 |
| Ten | 1 |
Of the 36 patients taking diuretics, 9 (25%) had been given prescriptions for these drugs for left ventricular impairment for which no clinical evidence could be found, or for perceived or imagined limb oedema of non-cardiac origin. The side effects from diuretics were insignificant and the serum potassium was less than 3.5 mmol/litre in only 3 patients.

Only 4 of the 11 patients on long-term medication with oral nitrates derived clinical benefit. For 4 patients oral nitrates were prescribed after myocardial infarction despite the absence of chronic angina or left ventricular impairment. In 1 patient oral nitrates did not influence the severity of angina, and 2 took the drug regularly for non-cardiac pain. Sublingual nitrates were properly prescribed for 17 of 21 patients.

Calcium channel blockers were considered unhelpful in 6 of 11 patients, 4 of whom had been prescribed the drug post-infarction despite the absence of hypertension or chronic angina. Two other patients, one with Raynaud’s disease and the other with ‘poor circulation’ without obvious organic cause, derived no benefit from nifedipine. Two patients on long-term nifedipine were in congestive heart failure on admission.

Of the 10 patients on beta-blockers, 3 were deemed to be on unnecessary or harmful medication. Admission to coronary care was precipitated by the drug in two of these patients, one with left ventricular failure and the other with syncope who was already on verapamil for hypertension.

Of the 20 patients on digoxin, 6 were taking the drug long-term in the absence of a history of heart failure or supraventricular tachyarrhythmias.

Of the 9 patients on aspirin, 2 were taking the drug without obvious reason and one of these had peptic ulcer disease. Another two patients with valvular heart disease were on warfarin plus aspirin.

Dipyridamole was inappropriate treatment in all 6 patients who received it; 4 were on the drug long-term in combination with aspirin, either for a single transient ischaemic episode or dizzy spells, and 2 were on the drug for no obvious reason.

Poor inhaler technique was evident in 5 of the 8 patients on beta-2 agonist inhalers, and we concluded

![Fig. 1. Duration of treatment with essential/helpful and unnecessary/harmful drugs.](image)

| Table 2. Drugs acting on the cardiovascular system (see text). |
|---------------------------------------------------------------|
| **Drug** | **Number of patients prescribed drug** | **Number of times essential/helpful** |
| Diuretics | 36 | 27 (75%) |
| Sublingual nitrates | 21 | 17 (81%) |
| Digoxin | 20 | 14 (70%) |
| Oral nitrates | 11 | 4 (36%) |
| Calcium blocker | 11 | 5 (45%) |
| Beta-blockers | 10 | 7 (70%) |
| ACE inhibitors | 6 | 4 (66%) |
| Anti-arrhythmics | 3 | 3 (100%) |
| Warfarin | 5 | 5 (100%) |
| Aspirin | 9 | 5 (55%) |
| Dipyridamole | 6 | 0 (0%) |
| Arterial vasodilators | 7 | 6 (85%) |
| Peripheral vasodilators | 2 | 0 (0%) |
| **Total** | 147 | 97 (66%) |

| Table 3. Drugs acting on the respiratory, central nervous and gastrointestinal systems (see text). |
|---------------------------------------------------------------|
| **Drug** | **Number of patients prescribed drug** | **Number of times essential/helpful** |
| Beta-2 agonists (inhaursors) | 8 | 3 (37%) |
| Oral theophylline | 9 | 2 (22%) |
| Oral steroids | 7 | 5 (71%) |
| Benzodiazepines | 12 | 1 (8%) |
| Hypnotics | 11 | 2 (18%) |
| H-2 blockers | 5 | 1 (20%) |
| Oral antacids | 2 | 1 (50%) |
| Oral antispasmodics | 3 | 0 (0%) |
| Anticonvulsants | 1 | 0 (0%) |
| **Total** | 58 | 15 (26%) |
Table 4. Miscellaneous drugs (see text for details).

| Drug            | Number of patients prescribed drug | Number of times essential/helpful |
|-----------------|------------------------------------|----------------------------------|
| Oral hypoglycaemic agents | 10                                  | 10 (100%)                        |
| Allopurinol      | 2                                  | 2 (100%)                         |
| Antihistamines   | 1                                  | 0 (0%)                           |
| L-Thyroxine      | 1                                  | 1 (100%)                         |
| Non-steroidal anti-inflammatory drugs | 5                                  | 1 (20%)                          |
| Quinine sulphate | 3                                  | 0 (0%)                           |
| Dihydrocodeine   | 2                                  | 1 (50%)                          |
| Propantheline    | 1                                  | 0 (0%)                           |
| Prochlorperazine | 2                                  | 0 (0%)                           |
| Total           | 27                                 | 15 (55%)                         |

that 7 of the patients on theophylline appeared to derive no benefit; 5 of them had no evidence of chronic lung disease and one patient had cardiac dyspnoea.

Regular oral benzodiazepines or hypnotics, or both, were being taken by 18 patients. The majority had been on these drugs for several years and were, to all intents and purposes, unsupervised.

Of the 5 patients who had been taking H-2 blockers for several years, 4 had never been investigated and were on long-term treatment for chronic dyspepsia. It is doubtful if they enjoyed any benefit.

Table 4 records the experience with miscellaneous drugs. Non-steroidal anti-inflammatory drugs had been prescribed for 5 patients; in 3 there was no evidence of arthritis or musculoskeletal disease, and another was admitted with acute interstitial nephritis secondary to fenbufen. Of the other 22 miscellaneous prescriptions, only 4 were considered to be of benefit. Most of these drugs had been prescribed for a particular symptom and continued to be taken without medical supervision. They were not withdrawn when indicated, either because there was no further contact with the doctor or because of the doctor’s reluctance to withdraw the drug.

Overall, of the 232 drug items being taken regularly by the patients, only 127 (54.8%) were deemed to be essential or helpful.

Discussion

The mean figure of 2.32 drugs taken over the long term by our patients corresponds closely to the 2.14 drugs per patient over 65 years admitted to general medical and geriatric wards reported by Gosney and Tallis [1]. Most studies that have evaluated patient prescriptions and the hazards of drug treatment concentrated on the elderly [2, 3]. One multicentre study found that drug treatment either contributed to or was the major reason for approximately 10% of admissions of elderly patients to general hospitals [4]. Adams et al. reported that 19.7% of elderly patients attending at casualty had been on drug combinations with potentially harmful interactions [5]. All the patients in this study admitted to coronary care were a miscellaneous group; 59 of them suffered from documented unstable angina or myocardial infarction, 28 were admitted with other cardiac or cardiorespiratory emergencies, and 13 complained of non-cardiac chest pain. There was a history of a previous cardiac event in 60 patients. All were non-elective or emergency admissions. Many had multisystem disease and had been in hospital previously. Most were elderly, their mean age 63.8 years. Clearly, they were a selected sample of the population and probably represent a minority of the older population which provides most of the admissions throughout general hospitals.

The fact that 80% of the group were on chronic drug therapy may suggest that there is considerable recycling of a relatively small number of patients through the emergency services in our hospitals. It is the experience of one of us (R.M.) that recycling of patients with multisystem disease, who are subjected to chronic polypharmacy, is an increasing feature of emergency medical and cardiological practice, and may be the result of an ageing patient population. The mean age of all admissions to the coronary care unit at St Vincent’s Hospital in 1974 was 56.6 years, and in 1987 it was 64.3 years. The present ageing trends would suggest that cardiology may be concerned with an increasing elderly population in the future, with the attendant problems in terms of reduced benefits and increasing hazards of drugs. This trend emphasises the importance of exercising optimum judgement in the use of drugs.

Most patients in our study were on chronic drug treatment at the time of admission. Many had only a vague idea as to the purpose of the drugs and were mostly motivated by medical advice given in the recent or distant past. However, most patients felt that they were deriving some benefit from their medication, but in at least three cases drugs were the direct cause of admission. At admission we discontinued all drugs we deemed to be unnecessary or harmful without any obvious ill effects. Our study cannot pretend to measure the global side effects of drugs in view of the likelihood that most patients affected by side effects are likely to stop treatment of their own accord.

Assessing dyspnoea, and in particular evaluating left ventricular function, appears to cause a particular problem. Many inappropriate prescriptions of diuretics, digitalis and theophylline were due to poor evaluation of dyspnoea and its causes. These shortcomings are particularly unfortunate in relation to the unnecessary prescription of diuretics owing to their well recognised adverse effects on potassium levels, and on glucose, lipid and uric acid metabolism. In the case of nitrates, there is great individual variation in the oral dose required to modify angina of effort [6]. Because of the development of tolerance [7] the dosage may require review. As with most other drugs, nitrate treatment needs regular and well informed supervision.
The initial prescription of drugs, whether deemed necessary or not, was made by a variety of doctors, including physicians, cardiologists and general practitioners. All shared in the inappropriate drug prescribing, including cardiologists in the case of cardiovascular drugs.

There are a number of obvious reasons for the present haphazard state of drug prescribing. The failure of undergraduate and postgraduate education to keep up with the increasing complexity of drug technology is a fundamental problem. Undergraduate education is still dominated by academic pharmacology without adequate emphasis on practical therapeutics. Much postgraduate education is influenced by the pharmaceutical industry, and there are strong commercial pressures to prescribe drugs, with little or no personal opportunity for objective evaluation.

The deficiencies in professional education must at least partly account for the medical profession's generally limited knowledge of the indications, efficacy, interactions, limitations, and physical and psychological side effects of drugs. Doctors are not sufficiently aware of the medical and financial implications of excessive and inappropriate drug therapy, nor are they always willing to adopt alternative non-drug methods of treatment, including advice and explanation about healthy eating, regular exercise and risk factor modification.

The publication by Cartwright and Smith [8], sponsored by the DHSS in the United Kingdom, deals comprehensively with doctors' prescribing habits for the elderly. Our general conclusions about the standards of drug prescribing agree with theirs. They state '... nearly a quarter of the elderly people on prescribed medicines were taking some pharmacologically inappropriate medicine and a further two-fifths medicines that were borderline in this respect'.

In Ireland, approximately 40% of the patient population are entitled to free medication and in 1987 the health service paid out more than £60 million for outpatient prescriptions; no figures are available on the cost of private prescriptions. The adverse effects of poor prescribing, in terms of inadequate treatment, side effects and cost, are difficult to measure but must be considerable and should be a major concern for the profession and the public.

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References

1. Gosney, M. and Tallis, R. (1984) Prescriptions of contraindicated and interacting drugs in elderly patients admitted to hospital. Lancet, ii, 564-7.
2. Hewit, N. (1969) Predisposing factors to adverse reactions to drugs. British Medical Journal, i, 536-9.
3. Bliss, M. R. (1981) Prescribing for the elderly. British Medical Journal, 283, 203-6.
4. Williamson, J. and Chopin, J. (1960) Adverse reactions to prescribed drugs in the elderly: a multicentre investigation. Age and Ageing, 9, 73-80.
5. Adams, K., Al-Hamouz, S., Edmund, E. et al. (1984) Inappropriate prescribing in the elderly. Journal of the Royal College of Physicians, 18, 7-17.
6. Glancy, D., Richter, M., Ellis, E. and Johnson, W. (1977) Effect of swallowed isosorbide dinitrate on blood pressure, heart rate, and exercise capacity in patients with coronary artery disease. American Journal of Medicine, 62, 39-46.
7. Abrams, J. (1986) Tolerance to organic nitrates. Circulation, 74, 1181-5.
8. Cartwright, A. and Smith, C. (1988) Elderly people, their medicines, and their doctors. London: Routledge.