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Improving Medication Outcomes in Older People

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ABSTRACT

Older people are at risk of adverse medication events due to altered pharmacokinetics and pharmacodynamics, polypharmacy and inappropriate prescribing. Polypharmacy also contributes to increased non-compliance, a major problem associated with drug therapy. It is important to understand the magnitude of the problem and the factors responsible for adverse medication events. Effective strategies to address issues of poly-pharmacy, inappropriate prescribing and medication non-compliance are discussed. The multidisciplinary approach, involving the prescriber and the pharmacist, appears to be an essential component in improving medication outcomes in older people.

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INTRODUCTION

The 1995 National Health Survey estimated that 12.4 million Australians or 68% of the population used some form of medication in the 2 weeks prior to the interview.¹ The use of medications increased with age to 91.6% for people older than 75 years.¹ It is estimated that community dwelling individuals greater than 60 years of age have more than three prescription drugs per person.² These figures do not account for the large number of non-prescription medications used in this group. An increase in the number of medications leads to increased morbidity due to adverse drug reactions, drug interactions and patient non-compliance.

In a review of trials assessing drug-related admissions to Australian hospitals, it was found that 12% of all admissions to medical wards and 15-22% of all emergency admissions among the elderly were medication related.³ Disturbingly, approximately half of these admissions were considered possibly or definitely preventable. Patient non-compliance contributed up to 50% of drug-related admissions and was considered avoidable in most instances.

The large number of drug-related problems in older people suggests that steps need to be taken to improve medication outcomes. In this review, we will focus on problems that precipitate adverse drug events. This includes issues related to altered pharmacology in older people, polypharmacy, inappropriate prescribing and compliance with drug therapy. We will also outline effective strategies to address these problems.

PHARMACOLOGICAL FACTORS

There have been numerous articles looking at pharmacokinetic and pharmacodynamic changes related to ageing. Absorption is the only component which does not appear to be affected by age.⁴ Reduction in lean body mass and increases in body fat cause lipid soluble medications like diazepam and chlormethiazole to have a greater volume of distribution thus prolonging the elimination half-life. In contrast, non-lipid soluble drugs such as digoxin, ethanol and cimetidine may have a decreased tissue distribution leading to increased serum levels and greater effects.⁵

Other consequences of ageing include reduced microsomal oxidative (phase I) metabolism in the liver. Drugs like diazepam, alprazolam, nortriptyline and propranolol may be affected.⁵ Renal excretion is also reduced in parallel with a decline in glomerular filtration and tubular secretion. Examples of renally excreted drugs are gentamicin, digoxin, lithium, trimethoprim and penicillins. Although reductions in clearance have been demonstrated with ageing for individual drugs, there remains a large degree of variability among patients, making quantitative prediction of dosage regimens extremely difficult.⁶ In most cases, the general principle of starting at less than the normal adult dose and titrating upwards, watching carefully for side effects, ensures safety with prescribing. It is also important to consider that drugs with narrow therapeutic indices like phenytoin, lithium and digoxin may cause toxicity even with normal serum levels.

The pharmacodynamic changes associated with ageing are less well studied. It is known that the elderly are much more susceptible to the dosage effects of warfarin and benzodiazepines. Loss of homeostatic reserve also predisposes older people to side effects such

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as falls, postural hypotension, confusional states and incontinence. Tricyclic antidepressants, phenothiazines, opiates and benzodiazepines may cause these problems.

POLYPHARMACY

Apart from understanding the pharmacokinetic and pharmacodynamic changes associated with ageing, prescribing in older people is complicated by polypharmacy. The term polypharmacy has been defined differently by various groups. The US Department of Health and Human Services has defined it as 'use of multiple prescriptions and over-the-counter medications by older people with chronic health problems'.⁷ Kruse et al. define it as a medical regimen that includes five or more drugs.⁸ Others suggest that this definition should encompass the use of more medications than is clinically indicated.⁹ All authors however accept that polypharmacy represents the use of multiple medications by an individual patient.

Effects

Polypharmacy has important implications to the older patient in that it increases the risk of adverse drug events, drug-drug interactions, drug-disease interactions and non-compliance which will be discussed later.

There is evidence that increasing the number of medications prescribed to an individual exposes them to an increase in adverse drug events. An Italian multicentre study demonstrated that polypharmacy, duration of hospital stay and medical problems were found to be independent risk factors for adverse drug events. Although there was an increase in adverse drug events in older patients, age was not a significant independent predictor when adjusted for these other variables.¹⁰

Studies in drug-drug interactions have been less prevalent. In a study looking at 1000 consecutive patients admitted to a geriatric unit, 60.2% of the 894 patients who took two or more drugs were exposed to a potential drug-drug interaction and 14.5% had a documented side effect.¹¹ The most implicated drugs were psychotropics (benzodiazepines and neuroleptics) and cardiovascular medications (diuretics and ACE inhibitors).

Increasing the number of drugs consumed also predisposes patients to drug-disease interactions, particularly in individuals who have multiple pathologies and comorbidities. Prescribing a drug, for example a β -blocker eye drop for glaucoma, may lead to worsening of a disease process, in this instance asthma or congestive cardiac failure. An adverse reaction to a drug may also be misinterpreted as a new medical condition and lead to additional drug therapy. An example of this would be the commencement of antiparkinsonian medications to treat the extrapyramidal side effects of a phenothiazine.

Reduction

While polypharmacy should be recognised as a major issue in prescribing, the solution to the problem proba-

bly lies in a multidisciplinary approach involving the physician, pharmacist and the patient. A randomised controlled trial was performed in 436 older patients (221 intervention and 215 controls) admitted to an acute care community hospital comparing a multidisciplinary team approach with standard medical practice. The intervention involved assessment of patients by a ward pharmacist who then presented medication problems and recommendations at a team conference. Patients in the study group had fewer medications than the control group by the third day of their admission (5.3 vs 5.9, $p < 0.05$).¹² There was also a statistically significant reduction in the number of inappropriate medication choices in the group that received the multidisciplinary intervention. This suggests that regular review of medications and education of doctors (about side effects and drug interactions) would be an effective method in reducing polypharmacy.

A Cochrane review of published literature that included randomised controlled trials, interrupted time series analysis and pre-post studies with controls showed that interventions by pharmacist services decreased prescribing and costs of drugs.¹³ Delivery of interventions targeted at patients also showed a decrease in the use of non-scheduled health services and improved patient outcomes.

Specific Drugs

Studies into adverse drug reactions have highlighted the high morbidity of specific drugs on older people.³ These include non-steroidal anti-inflammatory drugs (NSAIDs),¹⁴ psychotropic medications and cardiovascular drugs.¹⁵ NSAIDs are heavily prescribed and constitute 5% of all prescriptions in Australia. They also account for one-third of all admissions for bleeding ulcers in the elderly.¹⁶

In a prospective study of community-dwelling older people, an independent association between psychotropic medications (benzodiazepines, phenothiazines and antidepressants) and falls was found.¹⁷ While the purpose of this review is not to assess the side effects of each medication, it is clear that specific guidelines need to be designed to ensure appropriate prescribing of these medications.

IMPROVING THE QUALITY OF PRESCRIBING

In clinical practice, attempts have been made to develop prescribing indicators targeting high risk drugs. Batty et al. developed prescribing indicators for benzodiazepines and then performed an audit of hospital-based patients. This was followed by an educational intervention aimed at clinicians. A repeat audit showed a reduction in inappropriate benzodiazepine prescribing.¹⁸ A similar trial is currently underway in several general and aged care hospitals in Victoria.

Griffith and Robinson demonstrated a reduction in prescribing of hypnotics from 60% to 25% using audits and the introduction of prescribing policy.¹⁹ Other

interventions such as patient education and relaxation training led to a significant decrease in benzodiazepine usage in a group of residents in an aged-care facility.²⁰

In aiming to educate healthcare workers, the development of reference material like the *Australian Medicines Handbook*²¹ is important. The National Health and Medical Research Council has also published recommendations highlighting the importance of developing quality assurance and education programs for both the prescribing team and the patient, where appropriate.²²

Strategies have also been used to enhance communication between physicians and pharmacists. Monane et al. described a computer alert system which was triggered when a potentially unsafe medication was detected. Physicians involved in patient care were then contacted by pharmacists with training in geriatric pharmacology to review these medications. This system evaluated 23 269 patients aged 65 years and older and resulted in a 24% rate of change in drugs prescribed.²³

Liddell et al. described an intervention which involved an education session for general practitioners and pharmacists followed by a trial of a modified prescription form. A high rate of utilisation of new notations, in particular indicating the purpose of medications to the pharmacist, occurred in 35% of prescription items.²⁴

COMPLIANCE

Definition

Compliance in health literature is defined as 'the extent to which a person's behaviour coincides with medical advice'. This applies to various modalities of treatment, including taking medications, attending appointments and carrying out lifestyle changes.²⁵ Other terms like adherence and concordance have recently been used to replace compliance. For the purposes of this review, the main focus will be on compliance with medications.

Non-compliance with medications can be divided into the types of behaviour illustrated in Table 1.²⁶

Table 1. Types of non-compliance²⁷

Not having a prescription filled
Taking the wrong dose
Taking the medication at an incorrect time
Forgetting to take one or more medications (partial compliance)
Ceasing medications too soon
Not taking any medications at all (intentional non-compliance)
Taking medications for the wrong indication or when the correct indication is not present

Non-compliance rates vary significantly between studies. On the whole, adherence rates for prescribed medications are thought to be about 50%.²⁷ Clinical judgment cannot be relied on to detect non-compliance. In a study of primary care physicians, the sensitivity of clinical judgment in detecting non-compliance was only 10%.²⁸ Most studies have used structured question-

naires to measure medication compliance. Over half of people who do not comply can be identified with careful questioning.²⁹

Cost of Non-Compliance

There has been little research in Australia into the cost of non-compliance. In the US, non-compliance with medications is estimated to cost US citizens more than 100 billion dollars annually. It is estimated that at least 10% of admissions to hospital are related to patients' non-adherence to various medications.³⁰

When non-compliance occurs under-adherence is the most common problem. In one study, 90% of all cases of non-compliance were due to under-medication.³¹ This leads to significant wastage of medications. In the 1992 Health and Pharmacy Education program, more than 50% of medicines returned were almost completely unused. Sixty per cent of returned medicines were prescription drugs and the majority of these were cardiovascular and central nervous system drugs.³²

Even when patients take medications prescribed, there is the issue of partial compliance. One study performed by Psaty and colleagues showed the consequences of partial compliance in a group of hypertensive patients taking β -blockers. In this study, subjects who were less than 80% compliant had a fourfold increased risk of developing cardiovascular disease. In comparison, subjects who were 80-99% compliant had a twofold increased risk.³³ This suggests that a reduction in compliance leads to a reduction in drug efficacy and worse outcomes.

Causes of Non-Compliance

The nature of non-compliant behaviour is not well understood. In older people, cognitive deficits and memory problems may contribute to low adherence rates. In addition, a proportion suffer from decreased visual acuity and reduced manual dexterity. One study showed that 63% of older people had trouble negotiating child-proof caps on pill bottles.³⁴

Complex and expensive regimens, including medications that need to be taken long term, may reduce compliance. Non-compliance increases with the number of medications taken³⁴ as well as the increased frequency of dosage schedules.³⁵ Although age per se has not been identified as an independent factor responsible for non-compliance, the elderly are on average prescribed more medications than their younger counterparts, thus increasing their risk.

Compliance with health care is also an important risk factor. Longer waiting times in clinics as well as longer times between clinic appointments lead to high drop-out rates of patients from care.²⁹ As patients leave care, compliance with medications drops. Psychiatric problems and physical disabilities caused by disease are also factors which are associated with low compliance.²⁹ Poor communication between healthcare professionals and patients has also been implicated as a major cause of non-compliance.³⁶⁻³⁸

A study by Cooper et al. found that 70% of patients were intentionally non-compliant. The causes were diverse and included patients feeling that they were overmedicated as well as discontinuing medications due to unexpected side effects.³¹ Other factors like the cost of taking medications and the inconvenience also need to be considered.

Demographic factors such as age, gender, race, intelligence and education are not thought to be related to compliance.²⁹

Methods to Improve Patient Compliance

Strategies to improve compliance involve educating both the healthcare provider and patient. Knowledge provided to the patient, however, has not been shown to change behaviour. An intervention which increased the accessibility of clinics as well as an educational program improved knowledge but failed to improve compliance in a group of Canadian steelworkers on antihypertensive therapy.³⁹ Similarly, an Australian study by Lourens et al. in older people showed increased knowledge with counselling supplemented by a medication card but did not demonstrate a statistically significant increase in compliance.⁴⁰

Despite this, it is important for the patient to both understand the reasons certain medications have been prescribed as well as the side effects they may cause. Although inserts provided in drug packaging provide information about the benefits as well as the side effects of treatment, they have been shown to have minimal effects on changing behaviour.⁴¹

Following instructions seems to be more important than having a good general knowledge of the disease processes. Klein and colleagues found that compliance was similar in young and old patients despite older patients having a significantly reduced understanding of their medication purposes and disease.⁴²

In educating patients about their drug regimens, a few factors have been shown to improve adherence. Firstly, setting aside time to instruct patients about their treatment improves compliance.⁴³ Combined use of verbal and written instructions may also be of benefit.⁴⁴ Personalised instructions are therefore an important component in improving compliance.

A combination of educational and behavioural strategies have been assessed. Bailey et al. used pamphlets, workbooks, counselling, telephone follow-up and support groups to improve compliance and treatment outcomes in a group of subjects with asthma.⁴⁵ Two other studies on treatment of hypertension used interventions including care provided at the worksite, counselling, support groups and even special pill containers.^{39,46} As these interventions are labour-intensive as well as costly to administer, their role in maintaining medication adherence outside research settings is questionable. Also, these studies did not target the older population.

Simplifying dosage regimens by reducing the frequency of medications and reducing polypharmacy may

improve compliance. Tailoring medications to a person's daily routine is also an effective strategy to enhance adherence.

Some controlled studies have looked at the role of 'reminders' such as pill calendars and specific pill packaging. They found significant improvement in predominantly short-term compliance, especially with antibiotic administration.⁴⁷ In one study, calendar blister packs improved the compliance rate compared to conventional pill bottles.⁴⁸ However, older people with visual impairment and reduced manual dexterity may have difficulties managing pill calendars, blister packs and administration aids such as Dossets. Palm-sized, screw-top, clear bottles may be ideal to repack medications for the elderly. Labels should also be in large print to compensate for visual impairment.

In the older population, it is also important to assess patients for cognitive deficits which may impair their ability to recall doses and the times at which they should be taken. Under these circumstances, enlisting the assistance of family, carers or other forms of social supports may be necessary. In the absence of a carer, use of calendar packs or alarm clocks to serve as reminders may be employed.

The use of a multidisciplinary team approach in older patients following discharge from hospital reduced readmission rate as well as mortality in a study on patients with congestive cardiac failure.⁴⁹ Stewart et al. also showed in a randomised study in South Australia that a team approach, with home visits provided by a nurse and a pharmacist in high risk older patients following hospital discharge, had a beneficial effect on patient outcomes over a 6-month period.⁵⁰ It is not clear if these approaches were directly related to improvement in patient compliance as measures of compliance were not undertaken on the entire study group over the whole follow-up period.

CONCLUSION

Despite the large body of literature identifying problems related to prescribing, adverse drug events, polypharmacy and drug compliance, strategies to address these problems are relatively few and remain largely untested. For example in the area of compliance, Haynes in a review published in 1996 was only able to identify 13 randomised trials which had adequate measures of both adherence rates and outcome.⁵¹ No randomised controlled studies which targeted patients with multiple chronic diseases on multiple medications—a group characteristic of older patients—were identified.

The multidisciplinary team approach with a significant expansion in the outpatient pharmacist role appears to hold the most promise in improving medication outcomes, especially in the area of polypharmacy and inappropriate prescribing. Strategies which improve compliance to medications such as personalised instructions, simplifying dosage regimens, tailoring medication taking to daily routines and compliance aids for patients with sufficient manual dexterity also have prov-

en efficacy. The use of a centralised database to enable identification of patients at risk from adverse drug events may also play an important role in reducing labour-intensive interventions, particularly in the ongoing environment of budgetary constraints.

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