A Survey to Characterise the Extent and Quality of Typical Pharmacy Services in Non-Government Nursing Homes in New South Wales.

A thesis submitted in partial fulfilment of the requirements for the award of the degree of

Master of Health Science
from
Charles Sturt University

Mitchell
by
Alison Mary Van Nooten, B Pharm

School of Nursing and Health Administration - Mitchell

1992
DECLARATION

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, contains no material previously published or written by another person nor material which to a substantial extent has been accepted for the award of any other degree or diploma of a university or other institute of higher learning, except where due acknowledgment is made in the text.

Signature ........................................

Date ........................................
ABSTRACT

The elderly as a group are the main consumers of prescription medicines. They are also the group most likely to be suffering from a number of chronic illnesses and to be taking multiple medications. Age-related changes in physiological and pathological processes produce changes in drug disposition and altered responses to drug activity.

These age-related differences predispose elderly people to toxic or undesired effects of drugs. The consequences of taking multiple medications, i.e. polypharmacy, and the changes in drug handling with age are broad and include adverse drug reactions, patient non-compliance, increased morbidity and mortality, and increased health care costs.

A computer literature search generated extensive records for the incidence of polypharmacy and inappropriate prescribing in elderly residents of nursing homes (long term care facilities) in the United States of America and, to a lesser degree, in the United Kingdom and Australia.

Moreover, the experience in the United States of America with mandatory reviews by pharmacists of drug use in long term care facilities has generated a significant literature in which the effects on drug use from
pharmacists advising and reviewing prescribing practices were analysed. From the evidence available, pharmacist review in long term care facilities resulted in highly beneficial effects on drug prescribing, drug consumption and drug costs; adverse outcomes to residents were also reduced.

The literature on patterns of drug use in Australian long term care facilities for the elderly is not substantial. The recently released 'National Health Strategy Issues Paper No. 4' entitled 'Issues in Pharmaceutical Drug Use in Australia' provides important information on current problems with pharmaceutical drug use in Australia. Strategies to improve drug use outcomes are also proposed. Drug use review in nursing homes (and hostels) is one such recommendation.

A possible model of drug use review to be evaluated in nursing homes would include pharmacist-review of drug use. The New South Wales Government has provided nominal recognition for pharmacy involvement in private health establishments by allowing the inclusion of private pharmacies in private health establishments. Similarly, the Pharmacy Board of New South Wales has commended professional input by pharmacists servicing nursing homes. However, the actual participation of pharmacists in non-distributional activities, such as drug reviews, is not well documented.
A descriptive survey was undertaken in two parts to characterise the extent and quality of 'typical' pharmacy services in non-government nursing homes in New South Wales. From the findings of the survey, a secondary aim was to establish questions about what changes need to be made to the existing provision of pharmacy services to our nursing homes.

In Part I, the pilot study, questionnaires were mailed to Directors of Nursing in 19 nursing homes in the Lower North Shore Health Region. In Part II, the full study, questionnaires were mailed to the Directors of Nursing in 200 nursing homes in New South Wales. Data from 14 nursing homes in the pilot study and from 137 nursing homes in the full study were analysed.

In about 60% of participating nursing homes, pharmacy services comprised the collection of prescriptions and the delivery of dispensed medications. For the remaining nursing homes in which a pharmacist "attended", visits ranged from five minutes per day to two hours per day (mean duration of visits was 28 minutes per day).

Non-distributional activities, such as drug product selection, drug therapy monitoring, provision of drug information, patient medication counselling, education, and research, were infrequently undertaken by pharmacists. Twenty-one nursing homes reported that pharmacists reviewed medication regimens and in eighteen
of these nursing homes, this activity was shared with doctors and/or nursing staff. Pharmacists were rarely involved in pharmacokinetic (drug plasma levels) monitoring. Only one nursing home reported that the pharmacist was responsible for drug product selection.

Providing drug information appeared to be the most frequent non-distributional activity undertaken with nearly 50 percent of nursing homes making these requests "often". However, as the majority of these requests were made by nursing staff, it appears that pharmacists were infrequently involved in direct patient medication counselling.

The experience in the United States of America with mandatory, monthly reviews of drug therapy for residents of long term care facilities provides compelling evidence for the contribution of the pharmacist to rational drug use in these settings. However, it is doubtful that the degree of professional input by pharmacists found in this survey is sufficient to promote and achieve rational drug use in the participating nursing homes.
ACKNOWLEDGEMENTS

This research project was undertaken with the assistance of a research seeding grant from the Australian Pharmacy Research Centre. The author also acknowledges, with thanks, the assistance of Ms. Kay Dunkley, Pharmacy Department, Frankston Hospital, Frankston, Victoria, in the development of the questionnaire and Ms. Gwen Higgins, Pharmacy Department, Lidcombe Hospital, Lidcombe, NSW, for her review of the questionnaire.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>DECLARATION</td>
<td>(ii)</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>(iii)</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>(vii)</td>
</tr>
<tr>
<td>CONTENTS</td>
<td>(viii)</td>
</tr>
<tr>
<td>CHAPTER</td>
<td></td>
</tr>
<tr>
<td>1. INTRODUCTION</td>
<td></td>
</tr>
<tr>
<td>2. REVIEW OF THE RELATED LITERATURE</td>
<td></td>
</tr>
<tr>
<td>(i) Geriatric Clinical Pharmacology</td>
<td></td>
</tr>
<tr>
<td>(ii) Polypharmacy and Inappropriate</td>
<td></td>
</tr>
<tr>
<td>Prescribing in the Elderly</td>
<td></td>
</tr>
<tr>
<td>(iii) Promoting Rational Drug Use</td>
<td></td>
</tr>
<tr>
<td>(iv) Conclusions</td>
<td></td>
</tr>
<tr>
<td>3. RESEARCH PROBLEM</td>
<td></td>
</tr>
<tr>
<td>(i) Introduction</td>
<td></td>
</tr>
<tr>
<td>(ii) The Response to Inappropriate</td>
<td></td>
</tr>
<tr>
<td>Medication Use in the Elderly</td>
<td></td>
</tr>
<tr>
<td>by the US Department of Health, Education and Welfare</td>
<td></td>
</tr>
<tr>
<td>(iii) Barriers to Clinical Pharmacy</td>
<td></td>
</tr>
<tr>
<td>Services in Australian Nursing Homes</td>
<td></td>
</tr>
<tr>
<td>4. RESEARCH PURPOSES</td>
<td></td>
</tr>
<tr>
<td>(i) Specific Purposes</td>
<td></td>
</tr>
<tr>
<td>(ii) Assumptions</td>
<td></td>
</tr>
<tr>
<td>5. DESCRIPTION OF RESEARCH METHODOLOGY</td>
<td></td>
</tr>
<tr>
<td>(i) Introduction</td>
<td></td>
</tr>
<tr>
<td>(ii) Development of Questionnaire</td>
<td></td>
</tr>
<tr>
<td>(iii) Administration of Questionnaire</td>
<td></td>
</tr>
</tbody>
</table>
6. DATA ANALYSIS

(i) Introduction ........35
(ii) Strategies to Organise Data ........35
(iii) Assumptions about the Data ........37

7. RESULTS

(i) Pilot Study ........39
(ii) Major Study ........43
   Distribution of Nursing Homes
   According to Number of Residents ........43
   Pharmacist(s) Involvement in the
   Nursing Home ........44
   Medication Supply to Nursing
   Homes ........47
   Medication Summaries and
   Labelling ........48
   Medication Information for the
   Nursing Home ........51
   Therapeutic Drug Monitoring ........53

8. CONCLUSIONS ........56

(i) Discussion of Data from Questionnaires ........56
(ii) Summary ........64

BIBLIOGRAPHY ........67

APPENDICES

Appendix 1: Pilot Questionnaire ........72
Appendix 2: Survey of Pharmacy Services
   in Nursing Homes in NSW Questionnaire ........77
Appendix 3: Accompanying Letter to
   Questionnaire ........81
1. INTRODUCTION

The fastest growing age group in our community and in most other countries in the Western world is the elderly and the majority of elderly people take medication regularly. Although many of these medications help to improve the quality of life and survival of elderly people, there is a body of evidence that a substantial proportion of elderly people entering hospital have symptoms related to the inappropriate use of prescription and nonprescription medication (Caranassos, Stewart & Cluff 1974; Castleden & Pickles 1988; Hurwitz & Wade 1969; Kroenke 1985; Lamour, Dolphin, Baxter 1991; Miller 1974; Williamson & Chopin 1980). The inappropriate use of medication in the elderly is multifactonal. Geriatric pharmacology, self-medication, patient medication noncompliance, overdiagnosis, overtreatment and polypharmacy are all reported to contribute to the significant morbidity and mortality of inappropriate drug use (WHO 1981).

This review aims to discuss the basis for the apparent widespread concern expressed by health professionals about the use of medication in long term care facilities, in which the majority of residents are elderly (Cooper 1985; Cooper & Bagwell 1978; Ingman, Lawson, Pierpali & Blake 1975; Ostrom, Hammarlund, Christensen, Plein & Kethley 1985; Priddle & Rose 1966; Robers 1988; Segal, Thompson & Floyd 1979; Sloane & Lekan-Rutledge 1988;
Weedle, Poston & Parish 1988). Much of this concern appears to have been generated from the findings in three areas of research: the vulnerability of elderly people to the adverse effects of medications (Black & Somers 1984; Brawn & Castleden 1990; Castleden & George 1979; Castleden & Pickles 1988; Hurwitz & Wade 1969; Schmucker 1984; WHO 1981); the extent of polypharmacy and drug interactions in residents of long term care facilities (Burns & Kamerow 1988; Gryfe & Gryfe 1984; Kalchthaler, Coccaro & Lichtiger 1977; Kroenke 1985; Kroenke & Pinholt 1990; Sloane & Lekan-Rutledge 1988; WHO 1981) and, the role of consultant pharmacists in promoting rational drug use in long term care facilities (Cooper & Bagwell 1978; Dyer, Oles & Davis 1984; Strandberg, Dawson, Mathieson, Rawlings & Clark 1980; Thompson, McGhan, Ruffalo, Cohen, Adamcik & Segal 1984).
2. REVIEW OF THE RELATED LITERATURE

Journal citations relating to the areas of geriatric clinical pharmacology, polypharmacy and inappropriate prescribing in the elderly, and promoting rational drug use were sought by computer search (Medline, International Pharmaceutical Abstracts and Health Planning and Administration). The majority of studies identified in the literature derive from the North American, and to a lesser extent, the United Kingdom context. In relating these findings to the local scene, it becomes apparent that there is a dearth of documentation on medication use by elderly residents of our long term care facilities.

(i) Geriatric Clinical Pharmacology

What are the key concerns about medication use in the elderly and why are the elderly more vulnerable to the adverse effects of medication? There are many ways in which ageing and illness can alter drug disposition. Essentially, the elderly differ from the young in the quantity of drug delivered to the target organ, and possibly in the organ's sensitivity to the drug (Schmucker 1984). Age-related changes to the intestinal absorption of drugs are equivocal. Despite the conflicting data, the consensus is that intestinal drug absorption is the least important of the factors that influence drug disposition (Schmucker 1984). Factors
such as an increase in lean body mass or loss of body water can contribute to the decline in drug disposition, but the relative importance of this factor remains uncertain.

On the other hand, important age-related effects on drug metabolism and drug elimination have been reported (Schmucker 1984; WHO 1981). Most drugs are metabolised by the liver and since liver function and liver blood flow decline during ageing, it is not surprising that the elderly eliminate many drugs more slowly than do younger subjects (Castleden & George 1979; Schmucker 1984). Drugs with a narrow therapeutic index, such as digoxin, aminoglycoside antibacterials and antihyperglycaemic agents deserve particular care in the elderly where changes in their elimination rates mean that their pharmacological effects are greater in the elderly for a given dose. Defective elimination is considered to be a major cause of adverse drug reactions in the elderly (Castleden & George 1979; Schmucker 1984). It has been well established that glomerular filtration and renal excretion of drugs are reduced with ageing. Moreover, this age-dependent decline in renal clearance of drugs is reported by WHO (1981) and Schmucker (1984) to be the primary factor responsible for the decline in drug disposition in the elderly. Again, drugs with a narrow therapeutic index, such as digoxin and lithium, are more likely to be associated with toxicity in the elderly with
declining renal function (Brawn & Castleden 1990; Castleden & George 1979).

The elderly also differ from the young in the sensitivity of their target organs to drugs. Notwithstanding this alteration in organ sensitivity to drugs with ageing, drugs tend to be prescribed and taken in similar doses by both young and elderly age groups (Gryfe & Gryfe 1984; Schmucker 1984; WHO 1981). The consequence of this enhanced response for a given dose is, not surprisingly, signs of overdosage or undesired affects. Although there are few drugs for which a specific 'geriatric' dosage is recommended Gryfe and Gryfe (1984) and WHO (1981) provide evidence that drugs acting on the central nervous system produce an enhanced response for a given concentration of the drug in the blood. On the other hand, drugs acting on the cardiovascular system produce a diminished response with ageing (WHO 1981).

These apparent changes in the organ's sensitivity to drugs due to ageing may also be explained by concomitant pathological processes in the elderly. Compensatory mechanisms, for example, baroreflex sensitivity (responding to changes in systemic blood pressure) which decreases with ageing, may be disrupted (Gryfe & Gryfe 1984; WHO 1981).

Thus, important physiological and pathological processes occur with ageing that produce changes in drug
disposition and altered responses to drug activity. These age-related differences predispose elderly people to toxic or undesired effects of drugs and confirm the need for more carefully designed clinical studies involving normal, healthy elderly volunteers.

(ii) Polypharmacy and Inappropriate Prescribing In The Elderly

A second major concern expressed by health professionals about the use of medication in long term care facilities is one of polypharmacy. Polypharmacy, which is the administration of multiple medications to an individual patient, has been found to occur frequently in both community and hospital settings (Brawn & Castleden 1990; Bridges-Webb 1972; Gryfe & Gryfe 1984; Hurwitz 1969; Lamour et al. 1991; Lawson & Jick 1976; Martys 1982; McMillan et al 1986; Ostrom et al. 1985).

The consequences of polypharmacy are broad and include adverse drug reactions, negative effects on patient medication compliance and increased health care costs (Brawn & Castleden 1990; Kroenke & Pinholt 1990; McMillan, Harrison, Rogers, Tong & McLean 1986; WHO 1981).

What attempts have been made to document the incidence and sequelae of polypharmacy in long term care facilities? A computer search provided extensive
documentation for the incidence of polypharmacy in long term care facilities in both the USA and UK.

A review of the major papers identified in this search highlights the undesirability of the apparent indiscriminate use of drugs in this subgroup of elderly people. It is a salutary reminder that many of the diseases or symptoms from which the elderly suffer are doing the elderly person no immediate harm and do not require treatment. Furthermore, there is consensus that there is no need to prescribe a different medication for each disease or symptom simply because of the multiple pathology present in many elderly people.

Approximately 5% of people aged over 65 years in the USA are residents of long term care facilities (Dyer et al. 1984). For this group, the use and costs of medications assume much importance. According to Dyer et al. (1984) systematic drug surveillance in long term care facilities has developed dramatically in the USA since 1974 when the Department of Health, Education and Welfare promulgated regulations to require pharmacists to be the 'primary individual responsible for developing, coordinating and supervising all pharmaceutical services including promoting the rational prescribing and clinical use of drugs' and 'to monitor each patient's drug therapy at least monthly'. To fulfil statutory obligations, many institutions undertook studies of drug utilisation. The early research by Rabin (1973), which culminated in a
report to the US Public Health Service, established some baseline associations between age and polypharmacy. Notably among these was 'the distinct association among chronic illness, limitations of activity and number of drugs acquired during a year'. The pertinence of this report prompted some of the following studies.

A review of the patterns of prescribing and administration of drugs in long term care facilities in the US by Robers (1988) provided evidence of the extent of polypharmacy. In this meta-analysis, most studies reported that about seven medications (or prescriptions) were ordered per resident at any single time. Of particular interest was the extent to which medications were prescribed on a pro re nata (p.r.n.) basis; approximately 50% of all prescriptions for residents of long term care facilities were written with directions for p.r.n. administration. When the use of p.r.n. medication was examined in relation to characteristics of the facility, privately owned facilities and those with a full-time physician had fewer orders. The author also identified a number of other factors that related to prescribing: characteristics of the residents such as age, payment schemes and functional ability; pharmacy characteristics such as formal reviews of drug regimens, the existence of drug protocols; and, characteristics of the facility such as size, full-time medical and pharmacy staff.
Regarding these factors, important findings included results that private-paying residents consumed more medication than residents who received Medicaid and that residents with better functional and mental ability had more medication prescribed. Conversely, a reduction in the number of medications ordered and administered was associated with the presence of pharmacists, either full-time or part-time. From this analysis, it becomes apparent that polypharmacy is associated with 'environmental' factors in addition to determinants such as chronic illness and multiple pathological, anatomical, biochemical and physiological changes that are related to ageing.

Ingman, Lawson, Pierpaoli and Blake (1975) reported similar patterns of drug utilisation. These investigators analysed drug use patterns in 131 residents from an institution caring for 300 residents. Particular attention was paid to the use of hypnotics, analgesics, minor and major tranquillisers, antidepressants, psychostimulants, muscle relaxants, antiparkinsonian drugs and cerebral stimulants. Of particular importance here was the observation that the 300 residents were attended by 30 physicians, 29 of whom were physicians in private practice. The authors reported that by therapeutic class, analgesics (39% of patients) and major tranquillisers (29.8% of patients) were the most frequently prescribed neuroactive drugs. Questionable prescribing practices were identified within these
therapeutic classes. For example, 10 residents were prescribed two analgesics concurrently and two residents were prescribed three; five residents were prescribed two major tranquillisers concurrently and one resident was prescribed three. However, the average number of neuroactive drugs prescribed (2.1 drugs) was different from the average number administered (1.3 drugs). This difference again highlighted the pro re nata prescribing practice and prompts the question 'why did the nurse give this drug to this particular resident at this particular time?'. Certainly, the determinants of drugs actually administered for behavioural symptoms on a discretionary basis may lie outside the written record.

Interestingly, after the implementation of a prescribing recommendation of the US Joint Commission of Accreditation, which required physicians to re-write drug orders every 30 days, a comparison of prescribing patterns during a ten-month period showed that there was a decline in the number of drugs prescribed per resident but an increase in the number of drugs administered in this institution (Ingman et al. 1975). The results of this survey suggested that certain procedural practices necessitating reform are not in themselves the most substantive factors in securing improvement.

St Joseph's Hospital Nursing Home in Westchester County, New York, was the target of Kalchthaler, Coccaro and Lichtiger's investigation in 1977 into the incidence of
polypharmacy in a long term care facility. In their analysis of drug records of 100 residents, the number of drugs prescribed daily per patient, the number of tablets administered per day per patient, and the frequency of the use of drugs from selected classifications including analgesics, antibiotics, antihypertensives, cardiotonics and psychotropics, were recorded. Patients averaged 3.3 drugs per day which were given as 6.4 tablets per day. Moreover, 44% of patients were receiving at least four drugs per day and 22% at least five drugs per day. Interestingly, the most frequently prescribed drugs were analgesics, followed by antihypertensives, cardiotonics and antibiotics.

When the researchers examined the 'appropriateness' of these prescribing patterns, they concluded that the use of simple analgesics such as paracetamol was not directed at the cause of the presenting disorder, i.e. pain due to musculoskeletal inflammation. Similarly, the use of the cardiotonic drug, digoxin, in 31 residents was considered to be inappropriate and the drug was safely withdrawn. The fourth most frequently prescribed class of drugs, the antibiotics, also provided evidence of inappropriate prescribing. By chart review it was determined that antibiotics had been prescribed for chronic urinary tract infections. Yet on available information, Kalchthaler et al. (1977) commented that chronic urinary tract infection was considered to be relatively benign in elderly people with repeated chemotherapy possibly leading to
superinfection. Prescribing psychotropics to 61% of the residents was also questioned.

The authors made a strong plea for the development of a supportive environment and use of placebo in the treatment of anxiety. They also admonished the medical practitioners for their tendency to prescribe for every sign and symptom, rather than carefully assessing symptoms and evaluating the known response of the elderly to a proposed drug before initiating treatment. In the wake on these findings, St Joseph's established a Pharmacy Committee to review all drugs used by residents on a monthly basis and, where deemed necessary, to make appropriate recommendations to the prescribers.

Other investigators have also published their concern about the use of drugs with a narrow therapeutic index in elderly residents of long term care facilities. Weedle, Poston and Parish (1988), for example, examined the extent and appropriateness of the use of digoxin by elderly people in residential homes. The 1888 residents of the fifty-five study residential homes under review received a median of three medications per day (range 1 to 13). Nearly 50% of the entire study population received cardiovascular drugs including 212 residents who received digoxin (or other cardiac glycosides) for a median of 2.3 years (range < 0.1 to 10.1 years). Where diagnoses were recorded for the use of digoxin, congestive heart failure (43 residents), atrial
fibrillation (15 residents), left sided heart failure (8 residents), paroxysmal tachycardia (5 residents), cardiac arrhythmias (4 residents), heart failure (2 residents) and one each for pulmonary heart failure and oedema were cited. Yet available literature challenged the role of maintenance digoxin therapy in the treatment of congestive heart failure and promoted diuretics as the treatment of first choice. Digoxin was also involved in 152 drug interactions in this population; twelve of these interactions were reported to be highly clinically significant.

Apart from the descriptive epidemiological data, this study is important because it questioned the prescribing practices in which these elderly people appeared to have minimal contact with their medical practitioners (and pharmacists) because surrogates ordered, collected and administered their medications. Weedle et al. (1988) concluded that this was a barrier to the review of the effectiveness and toxicity of maintenance digoxin therapy in elderly residents. Other investigators have also highlighted how telephone contacts between physicians and nurses in long term care facilities may be the most common type of patient interaction and that telephone prescribing may be an important cause of polypharmacy (Sloane & Lekan-Rutledge 1988).

Priddle and Rose (1966), in their drug utilisation review of 110 residents of a home for the aged, concentrated on
the prescribing of digitalis and diuretics and a low-
sodium diet. In 35% of residents, all or part of the
regimen was subsequently curtailed. Again the
investigators in this study recommended that a periodic
review of residents' medication regimens was necessary if
therapy prescribed under a set of physical circumstances
which had long resolved were to be used rationally.
Interestingly, there was no mention of the pressures that
produced the prescribing practices, such as an apparent
perception held by many elderly consumers of medication
that there is 'a pill for every ill'.

Regular prescribing for elderly residents in long term
care facilities has continued to attract concern and
criticism. In a review of the regular medication
prescribed to 20 women in a long term care facility,
Bruce (1982) categorised each drug that was prescribed as
justifiable, equivocal or no longer necessary. At the
start of the study, the 20 residents took an average of
2.6 (range 0 to 6) medications. 31 of the 52
preparations being taken had been prescribed for more
than a year, nine for more than five years and four for
more than ten years. Of the 38% of drugs prescribed
which acted on the central nervous system half were
ceased and none had to be re-commenced. Similarly, half
of the drugs prescribed for cardiovascular complaints
were ceased and in only one resident was it necessary to
re-introduce the drug. In addition to correcting
inappropriate prescribing practices, the drug bill for
this institution was halved. The intervention in this study simply involved a rigorous attitude to initial prescribing, something which seemed to be thwarted by administrative practices within the long care facility.

Inappropriate use of psychotropic drugs was also the focus in an analysis of drug utilisation data from the National Nursing Home Study Pretest (Burns & Kamerow 1988). Of the 526 residents randomly selected, 223 residents were prescribed a psychotropic medication; 8% of this group also received a second psychotropic drug. Based on the medical assessment, 30% of the psychotropic prescriptions had no apparent indication at all. Given the serious side effects of some of these drugs, this result is worrisome.

The association between diagnoses, certain drugs and accidental falls in elderly residents of long term care facilities is also a cause for concern. A case-controlled study undertaken by Granek, Baker, Abbey, Robinson, Myers, Samkoff and Klein (1987) explored this association in a 283-bed long term care facility. The odds of being 'a faller' were twice as high for residents taking three or more drugs. Furthermore, the odds of being 'a faller' were especially high for residents taking antidepressants, sedatives or hypnotics, vasodilators, non-steroidal anti-inflammatory drugs or tranquillisers. When diagnosis-subgroups were analysed, osteoarthritis and depression were associated with higher
odds of being 'a faller'. Certainly medications and illness are only part of the profile of 'a faller'; however, falls have substantial direct and indirect costs to elderly residents and attempts to prospectively identify people at high risk of falling need to be pursued.

The literature on the extent and seriousness of pharmaceutical problems in long term care facilities in Australia is far less extensive than that available for countries overseas. Certainly, there are numerous studies that have been undertaken in Australian acute care hospitals which show a number of consistent patterns and which have major implications for prescribing in the elderly. A recent Australian study (Larmour et al. 1991) of drug-related admissions to a Melbourne teaching hospital, found that 2.4% of the 5623 admissions between June and November 1987 were related to drug therapy; a further 1.6% were caused by adverse drug reactions. When compared with a control group of patients, people aged 70 years or older were 3.5 times more likely than younger people to be admitted for adverse drug reactions. Digoxin, aspirin, warfarin, non-steroidal anti-inflammatory drugs, theophylline and methotrexate were the drugs most frequently involved in these adverse drug reactions.

In an earlier Australian study, Black & Somers (1984) identified digoxin, anti-inflammatory analgesics and
antidiabetic drugs as the drugs most frequently associated with 13 drug-related admissions (2.7%) to a medical ward in a Western Australian teaching hospital during 1979. A further 3.5% of the 481 admissions reviewed were possibly caused by drug therapy.

The recently released 'National Health Strategy Issues Paper No. 4' entitled 'Issues in Pharmaceutical Drug Use in Australia' (National Health Strategy 1992) is a very timely addition to the literature. This report provides new and important data on current problems with pharmaceutical drug use in Australia.

In one of the three studies conducted for the National Health Strategy, an analysis was undertaken of the types of drugs and the frequency of their use in nursing homes (and hostels), together with any potential problems in their use. Using the administrative information systems available to the Commonwealth Department of Health, Housing and Community Services, the panel of investigators identified many problems. These included potential clinically significant drug drug interactions, drug-disease interactions, excessive duration of therapy, prescribing more than one drug from the same drug group, prescribing more than the stated daily dose and prescribing relatively or absolutely contraindicated drugs.

When the Drug Use Review Panel analysed the occurrence of
a prescribing pattern that potentially exposed a patient to the risk of an adverse drug outcome, they reported that nursing home residents faced proportionately greater individual risks of adverse drug reactions than the non-hospitalised elderly. Their poor health status and increased intake of medications were recognised as contributory factors. An important feature of the Drug Use Review Panel's analysis was that over half of all residents in nursing homes (54.1%) and hostels (58.7%) were prescribed drugs which exposed them to the risk of an adverse drug reaction. And, residents who were reported to be at risk, had, on average, two or more incidents during the study period.

So, although pharmaceutical drugs are an indispensable part of modern medicine, the situation in Australia and in the United States of America and the United Kingdom is one of sub-optimal drug use that results in significant morbidity and mortality. What then can be done to address these problems?

(iii) Promoting Rational Drug Use

Rational therapeutics has been defined by Segal, Thompson and Floyd (1979) as 'the administration of medicinal agents to man for the prophylaxis, diagnosis or therapy of disease, in a manner consistent with the best available knowledge and with current pharmacokinetic and clinical pharmacologic concepts'.
An important principle for promoting rational drug use in elderly people is to ask the question 'Is this drug required?' because it is not necessary to prescribe a drug for every symptom or disorder. Furthermore, drug therapy should never be considered as a substitute for time spent providing a patient with helpful advice. On the other hand, drug therapy should not be withheld because of old age when appropriate treatment can enhance the quality of life for older people.

If drug treatment is required, then the next principles relate to the number of drugs and the appropriateness of the treatment in older patients. It is also important at this point to consider which dosage form will be the most suitable.

How then can these edicts be supported? Can we regulate for care? The experience in the USA with their mandate for monthly reviews of drug therapy for residents of long term care facilities provides compelling evidence for the contribution of the pharmacist to rational drug use. A description of some of the 'landmark' studies is offered to support this proposition.

The influence of a consultant pharmacist on drug usage over a 12-months period in a rural 116-bed long term care facility was described and quantified by Cooper and Bagwell in 1978. Significant decreases in regularly prescribed drugs (45.9% decrease), pro re nata drugs
(45.9% decrease) and overall drug use (33.8% decrease) were recorded. The impact of these reductions on the facility's medication costs was dramatic.

Changes in drug prescribing in a 72-bed rural, long term care facility were also evaluated by Cooper (1985) when clinical pharmacist services were initiated, ceased and then re-initiated over a four-year period. The clinical pharmacist made an impact on drug use each time he was retained (decreases in drug use of 40% and 42%, respectively). The impact on drug costs was significant with net savings in the drug bill of $32,000 per year against a cost of $3,000 per year for the clinical pharmacist's services. Although this facility may not represent a typical long term care facility, this study is important because it documents a large and repeatable change in drugs used per resident and has implications for the optimal care of residents and for the economics of clinical pharmacist services.

Strandberg and her colleagues (1980), in their evaluation of the effects of comprehensive pharmacy services on drug consumption and costs over an eight-year period in three long term care facilities, also reported significant decreases in consumption of prescription drugs. The average monthly medication bill per patient also decreased significantly. The authors also inferred that multimillion dollar savings in Medicaid and Medicare may
be possible by the regular review of residents' drug regimens by pharmacists.

When clinical pharmacists under the supervision of a physician took responsibility for prescribing drug therapy in a 152-bed long term care facility for twelve months, Thompson et al. (1984) documented positive effects on the death rate, discharge rate and the number of drugs prescribed, compared with control group who received traditional care. The reduction in drug usage represented a saving of $16,000. And the other positive effects, as above, may be a greater saving in the long run.

In all of these studies, the clinical pharmacists' services concentrated on drug utilisation reviews and on-site medication chart reviews to determine medication errors and problems that should be communicated to the physician or nurse. The distinction was clearly made between the distributive and dispensing functions and those of a clinical nature. Therapeutic drug monitoring can also take other forms, for example, pharmacokinetic (drug plasma levels) monitoring. Although pharmacokinetic monitoring services are well established in acute care hospitals, it is not a standard practice in long term care facilities. Hence, the findings from a pilot study undertaken by Pucino and his colleagues (1980) are particularly important. In this prospective study evaluating 28 residents of a 150-bed long term care
facility, 50% of all serum drug levels assayed were sub-
therapeutic. Since 27% of drug levels assayed had never
been measured before and 73% were last measured 28 months
before the study, it can be concluded that therapeutic
drug monitoring was inadequately used in this population.
The implications for optimising drug therapy in
clinically stable residents of a long term care facility
therefore become a source of major concern and confirm
the need for further study.

The effectiveness of consultant pharmacists in reducing
drug use in long term care facilities in the United
States of America has been challenged by Gurwitz,
Soumerai and Avorn (1990). In their review of 17 studies
in this area, they were critical of the methodologies
used, the choice of outcome measures (i.e. medication
orders rather than drugs actually used) and the analysis
of results (changes in average drug use rather than the
appropriate analysis of doctor prescribing practices).
Notwithstanding their claim that the cost-effectiveness
of consultant pharmacists in reviewing drug therapy for
residents of long term care facilities was not
scientifically established, on the balance of evidence,
there seem to be the following conclusions. First,
pharmacist reviews of drug therapy for residents of long
term care facilities are likely to result in reduced
prescribing of drugs. Second, it is likely that
pharmacist reviews would lead to reduced levels of
adverse drug outcomes to residents.
(iv) Conclusions

Pharmacy involvement in long term care facilities in the United States of America, and to a lesser degree in the United Kingdom, has increased during the past 15 years. Pharmacists are involved in traditional distributive and dispensing functions and are also serving as clinical consultants in monitoring residents' drug therapy. This clinical review process has facilitated the promotion of more economical use of drugs by residents of long term care facilities. More importantly, it has facilitated the detection (and prevention) of potential adverse drug reactions and drug interactions.

Is there evidence to support that a similar 'professional' pharmacy service is provided to residents of our long term care facilities? Are our nursing homes different from their counterparts in the United States of America? In light of our current knowledge about geriatric clinical pharmacology and physiological changes associated with ageing (separately or in conjunction with disease states), together with the extensive literature on the prevalence of polypharmacy and adverse drug reactions in the elderly, is sufficient being done by our health professionals, policy makers and health managers to formulate a rational approach to therapeutics by the elderly residents of our nursing homes?

Certainly, there have been occasional and brief 'public awareness raising' campaigns sponsored by the Australian Council of the Ageing, the Australian Consumers
Association, medical and pharmacy organisations, the Commonwealth Government's National Campaign Against Drug Abuse and individual hospitals. The focus of probably all of these campaigns has been drug use in non-institutionalised, ambulatory elderly people. Similar efforts apparently have not been made to address the appropriate use of medication by elderly residents of our nursing homes. When you consider that Commonwealth expenditure on the Pharmaceutical Benefits Scheme in 1988-89 was $990.3m and for nursing home care in 1987-88 was $1,905m (Australian Institute of Health 1990), can we be assured that these allocations of health care resources are sustaining a relatively sophisticated level of care? If policy makers and health care managers are to formulate policy, plan and manage services, and make difficult choices between competing demands for health dollars, they need reliable information. The availability of health statistics and other health information are necessary to evaluate current approaches to health services and to make them equitable, appropriate and efficient. With the experience acquired from overseas, there appears to be an urgent need to examine drug use patterns in our nursing homes.

The National Health Strategy has begun this process and in their Issues Paper No. 4 also presents several strategies to improve drug use outcomes in our nursing homes. Of importance is the following proposal:

"A range of models of drug use review procedures should
be developed and evaluated against uniform outcome standards."
Possible models would include "Drug use review processes, with and without the involvement of pharmacists and Pharmacist review of drug use with reports to doctors and the relevant nursing home or hostel staff" (National Health Strategy 1992).
Another aspect of the examination of drug use patterns in our nursing homes is the characterisation of pharmacy services currently provided to nursing home residents. The Pharmacy Board of New South Wales (1991) has commended professional input by pharmacists servicing nursing homes. However, the actual participation of pharmacists in non-distributional activities in nursing homes in NSW is not well documented. This study aims to characterise the extent and quality of 'typical' pharmacy services in non-government nursing homes in NSW.
Questions to be addressed include the following: Is there a 'typical' pharmacy service? Are only basic dispensing and distributive functions provided? Does a single off-site pharmacy service a nursing home or do numerous pharmacies dispense and deliver prescriptions? Do pharmacists supply original packs or unit doses? Do pharmacists maintain patient medication profiles and undertake regular drug regimen reviews? Who generates prescriptions - nursing staff or doctors? How can the
deleterious consequences of polypharmacy in elderly residents of nursing homes be addressed meaningfully if we simply do not have information about medication management in nursing homes. The proposed survey aims to provide some information on this neglected field of research.
3. RESEARCH PROBLEM

(i) Introduction

There are many studies on the extent and seriousness of pharmaceutical drug use problems in Australia and overseas. In Australia, these studies have been undertaken predominantly in hospitals, and the community. Other studies have looked at problems with particular groups of drugs such as antibiotics and psychotropics. The use of medication by residents of nursing homes in Australia is not well researched even though iatrogenic illnesses are probably the most preventable conditions of old age (Kane, Kane & Arnold 1985).

The recently published "National Health Strategy Issues Paper No. 4" entitled "Issues in Pharmaceutical Drug Use in Australia" provides pivotal information on current problems with pharmaceutical drugs use in Australia and proposes strategies to improve outcomes of drug use.

(ii) The Response to Inappropriate Medication Use in the Elderly by the US Department of Health, Education and Welfare

In responding to the evidence of inappropriate medication use in the elderly, the US Department of Health, Education and Welfare promulgated regulations for the mandatory review (by pharmacists) of drug therapy for elderly residents of long term care facilities (Dyer, Oles & Davis 1984).
Numerous studies have documented the very favourable impact of this clinical pharmacy service on drug usage in long term care facilities (Cooper 1985; Cooper & Bagwell 1978; Gurwitz, Soumerai & Avorn 1990; Strandberg et al. 1980; Thompson et al. 1984). These studies quantified significant decreases in regularly prescribed drugs, "p.r.n." drugs and overall drug consumption. The impact on drug costs was also significant. In each of these studies, the clinical pharmacists' services concentrated on on-site reviews of medication charts to determine prescription and medication errors, and drug utilisation reviews. There was a clear distinction between the distributive and dispensing functions, and those of a clinical nature.

(iii) Barriers to Clinical Pharmacy Services in Australian Nursing Homes

In Australia, there are major barriers to the provision of clinical pharmacy services to elderly residents of nursing homes. Foremost among these is the requirement in the Australian Constitution (Section 51 xxiiiA) for the Commonwealth to legislate for the provision of pharmaceutical benefits rather than pharmaceutical services (Rydon & Mackay 1989). Thus, under the Pharmaceutical Benefits Scheme, no specific component is allowed for remunerating pharmacists who provide pharmaceutical services, such as reviews of medication regimens.
To facilitate the practice of medication reviews, it may be necessary to amend the relevant regulations. But why advocate change when the need for change is incompletely documented? The activities of pharmacists in Australian nursing homes have not been documented to any extent.
4. RESEARCH PURPOSES
(i) Specific Purposes
This study aims to characterise the extent and quality of typical pharmacy services in non-government nursing homes in New South Wales. Specific purposes of the study are:
1. To gain information on the provision of typical pharmacy services to non-government nursing homes in New South Wales.
2. To characterise the extent and quality of pharmacy services in these settings; and,
3. To consider what changes need to be made to the current provision of pharmacy services to nursing homes (in New South Wales).

(ii) Assumptions
That a systematic sampling technique will draw a representative sample from the population of all non-government nursing homes in New South Wales.

That findings from the sample can be generalised to the population from which it was drawn. Limitations of the study may be that the subjects (Directors of Nursing or the Proprietors of nursing homes) may be suspicious of the study and may be reluctant to respond. For example, the questionnaire includes questions about the selection of pharmacists and the frequency of professional activities. There may be some reluctance to acknowledge that some professional activities are undertaken infrequently.
5. DESCRIPTION OF RESEARCH METHODOLOGY

(i) Introduction

A descriptive survey is undertaken to identify or describe concepts in real-life situations (Burns & Grove 1987). Questionnaires are suitable research instruments for the collection of data from large samples. Hence a descriptive survey using a postal questionnaire (Appendices 1 and 2) was undertaken in two parts.

(ii) Development of Questionnaire

1. Information Desired: the extent and characteristics of pharmacy services in non-government nursing homes in New South Wales.

2. Literature search to locate questionnaires that examine pharmacy services: The Society of Hospital Pharmacists of Australia has provided guidelines for the practice of clinical pharmacy (Society of Hospital Pharmacists of Australia 1991). The Society defines clinical pharmacy as:

   'The practice of pharmacy which is responsible for ensuring that:

   * the correct patient receives the optimum dose of the most appropriate medication for a specific condition via a rational dosage form and regimen, over an appropriate time period;

   * untoward effects and interactions of drugs in use are identified and resolved; where
practicable such effects are prevented; patients and prescribers are presented with easily understood information and support with the aim of maximising drug effectiveness whilst minimising unwanted reactions’.

The Society also details tasks performed by clinical pharmacists. These tasks include: the provision of drug information; drug product selection; drug therapy monitoring; patient communication and counselling; education; drug distribution and administration, and research.

In developing the questionnaire, each lead-in question and response set was designed with reference to the Society’s guidelines. Each response set provided closed-ended questions and was narrow and directive.

In addition, a questionnaire used in an Australian survey of the role of the pharmacist in neonatal intensive care (Dunkley 1991) provided useful content to be covered in the questionnaire for this study. Appropriate data elements included structural and process variables. Structural variables include characteristics of a program that are descriptive in nature, e.g. the number of pharmacy personnel and location of pharmacy (McKay, Hepler & Knapp 1987). Process variables relate to pharmacy activities undertaken and include dispensing
prescriptions, providing drug information and attending ward rounds (McKay, Hepler & Knapp 1987).

(iii) Administration of Questionnaires
A pilot test of the questionnaire was performed to determine the clarity of questions, effectiveness of instructions, completeness of the response sets, and successfullness of the techniques of data collection.

In the pilot study, questionnaires were mailed to the Directors of Nursing of 19 nursing homes in the Lower North Shore Health Region. Questions five and seven were subsequently modified. "Profiles" appeared to cause some confusion and was replaced with the word "summaries" in question five. In part (c) of question seven, "requests the measurements" was changed to "initiates the request for measurements of blood drug levels" because the former phrase was confused with the action of the attending medical officer signing the appropriate laboratory form. Question eight was subsequently dropped because several respondents recommended keeping the length of the questionnaire to four pages.

In the full study, modified questionnaires were mailed to the Directors of Nursing of 200 nursing homes throughout New South Wales. Participating nursing homes were systematically sampled by choosing every second and then every third nursing home from the New South Wales Health Department's "List of Nursing Homes, Private Hospitals..."
and Day Procedure Centres, Licensed at 30 June 1991".

A covering letter accompanied each questionnaire explaining the purpose of the study, the name of the researcher and acknowledging the support of a research grant from the Australian Pharmacy Research Centre. Respondents were assured that all data would be pooled and that individual nursing homes would not be identified in the final report.

Response rates to questionnaires are reported to be lower than other forms of self-report, particularly for postal questionnaires (Burns & Grove 1987); response rates as low as 25 to 30% have been reported. In contrast, the researcher in the survey of neonatal intensive care units (Dunkley 1991) reported a response rate of 78%. Strategies to increase the response rate included an enclosed, stamped, addressed envelop and follow-up letters or telephone calls two weeks after mailing out the questionnaire.
6. DATA ANALYSIS

(i) Introduction
All data were pooled and individual nursing homes have not been identified in the report. Qualitative data were analysed for common characteristics. Quantitative data (nominal, ordinal interval and ratio levels of measurement) were analysed using descriptive and inferential statistics.

(ii) Strategies to Organise Data
The first strategy used to organise data was a frequency distribution. For nominal or categorical, ordinal and ratio data ungrouped frequency distributions were developed. The ungrouped frequency distribution, in which all possible measures of a variable are listed and each datum is tallied on the listing, is generally used for discrete data (Burns & Grove 1987). Data organised in this manner included location of a pharmacy in the nursing home, pharmacist-ownership of the nursing home, pharmacist-employment by the nursing home, medication supply to the nursing home, compilation of medication profiles in the nursing home, origins of medication orders and repeat medication orders, inclusion of diagnoses on medication profiles, inclusion of specific directions on medication labels to supplement "p.r.n.", requests for medication information, existence and authors of written protocols for drugs, drugs commonly monitored in nursing homes, and sources of requests for therapeutic drug monitoring.
Continuous data, including duration of visits by pharmacists to nursing homes, time intervals for reviews of medication orders, frequency of provision of formal education to nursing staff by pharmacists, were also organised as ungrouped frequency distributions.

The size distribution of nursing homes was summarised using a grouped frequency distribution. Although any number of classifications is possible, the general rule is that there should be not more than twenty groups (Burns & Grove 1987). Furthermore, the groups that are developed must be exhaustive and exclusive. The range of each group must be equivalent but can allow the last group to be open-ended to include all scores above a specified point. Percentage distributions were calculated for all score values and provided information about frequency with information about the number of measurements.

A measure of central tendency selected to identify the centre of a score distribution, in this sample the numerical average size of the nursing homes, and the time spent by pharmacists visiting the nursing homes, was the mean. The mean is based on all of the measurements in the distribution and should only be applied to data that measure an underlying variable at the interval level or the ratio level (Jaeger 1983). The mean is obtained by summing all of the measurements in the distribution and dividing by the number of measurements in the
distribution (Glenberg 1988).

Measures of variability (the extent to which the measurements in a distribution differ from one another) [Glenberg 1988] calculated in this sample included the range and the standard deviation. The definitional formula for the standard deviation (the positive square root of the variance) used in these calculations (Glenberg 1988) is:

\[ S = \sqrt{S^2} = \sqrt{\frac{\sum(x-x)^2}{n-1}} \]

where \( S^2 \) (the variance) indicates how much the scores in a distribution differ from the mean (\( \bar{x} \)).

(iii) Assumptions About the Data

The inferential statistical test employed to analyse nominal data for independent groups was the chi-square test (\( \chi^2 \)).

The data were in the form of frequencies. The chi-square analysis tests for significant differences between observed frequencies within the data and frequencies that were expected (Polgar & Thomas 1988). The chi-square test requires the following assumptions about the data (Polgar & Thomas 1988). One assumption of the test relates to random sampling - if the sample is not biased, random sampling is not crucial. Another assumption is that there are mutually exclusive categories that include all observations.
A third assumption requires independent observations - if independence does not hold, the chi-square test cannot be done. A fourth assumption requires sufficiently large expected frequencies - no expected frequency should be less than one and no more than 20% of the expected frequencies should be less than five. No assumptions are made about the size of the observed frequencies.

The calculation of the statistic $\chi^2_{\text{obt}}$ used the following formula:

$$\chi^2_{\text{obt}} = \sum \frac{(f_o - f_e)^2}{f_e}$$

where $\chi^2_{\text{obt}}$ is the value of $\chi^2$ calculated from the obtained data; $f_o$ is the observed frequency for a given category and $f_e$ is the expected frequency for a given category.

The decision rule for $\chi^2$ is that if $\chi^2_{\text{obt}} > \chi^2_{\text{crit}}$ (the critical value of the statistic $\chi^2$), reject the null hypothesis. If $\chi^2_{\text{obt}} < \chi^2_{\text{crit}}$, retain the null hypothesis.
7. **RESULTS**

(i) **Pilot Study**

Spontaneous responses, follow-up telephone calls and second mailings to non-respondents yielded a total response of 14/19 (74%) to the pilot survey. Reasons for inability to complete and return the questionnaire included lack of time, staff changes and the proprietor’s direction not to participate.

Participating nursing homes in the pilot study ranged in size from 24 to 79 residents (mean of 47 residents; S.D. = 17.4). A pharmacy was not located in any nursing home included in the pilot study.

**Pharmacist(s) Involvement in the Nursing Home**

No nursing homes were owned or part-owned by a pharmacist and no pharmacists were employed by a nursing home. The majority of nursing homes (78%) used a single, local pharmacist to dispense residents’ prescriptions. The local pharmacist was selected by the Director of Nursing (10 homes) or by the proprietor (4 homes). The time spent by pharmacists in the nursing home ranged from nil to 30 minutes per day (mean of 11 minutes per day; S.D. = 12.3). In three nursing homes, prescriptions were collected and delivered by a pharmacy assistant.
Medication Supply to Nursing Home

Medications were supplied to the nursing home in original packs, labelled for each resident in eight nursing homes. In six nursing homes, a unit dose system e.g. Webster system, was supplied.

Medication orders for first-time therapy were the responsibility of the doctor/nursing staff (6 homes), nursing staff (4 homes), doctor (3 homes) or nursing staff/pharmacist (1 home).

Where the on-going supply of a medication was indicated, the responsibility for initiating orders for repeat medications followed a similar pattern.

Clinical Activities of Pharmacists in the Nursing Home

In the 12 nursing homes in which medication profiles for residents were compiled, doctors compiled them in five homes, nursing staff compiled them in three homes, doctors/pharmacists compiled them in two homes and pharmacists compiled them in two homes.

Medication orders were reviewed by doctors (10 homes), doctors/nursing staff (3 homes) and doctors/nursing staff/pharmacists compiled them in two homes.

Routine medication orders were reviewed monthly (7
homes), 6th-weekly (1 home) and 3rd-monthly (1 home). Medication orders for "p.r.n." (when required) medications were reviewed in a similar fashion.

Residents' diagnoses were recorded on medication profiles in seven homes.

With regard to "p.r.n. directions" on prescriptions, a specific disease/disorder/symptom was included on the dispensary label for residents in ten homes (always = 3 homes; sometimes = 7 homes). A specific time interval was included on the label in 13 homes (always = 6 homes; sometimes = 7 homes).

Medication Information Provided to the Nursing Home

Nine nursing homes often requested medication information from the pharmacist while five homes made occasional requests. The source of these queries was exclusively the nursing staff. Most of the queries related to new drugs (12 homes), side effects of drugs (10 homes), and drug interactions (6 homes). Twelve nursing homes had written protocols on the use of individual drugs. These protocols were prepared by nursing staff (7 homes), doctors (2 homes), nursing staff/doctors (2 homes) and pharmacists (1 home).

The frequency with which pharmacists provided formal education to the nursing staff ranged from never (5
homes) to 3rd-monthly (2 homes) to 6th-monthly (4 homes) to yearly (3 homes).

Therapeutic Drug Monitoring

All participating nursing homes in the pilot study undertook therapeutic drug monitoring. The drugs most frequently monitored were anticonvulsant drug, phenytoin (13 homes); the cardiac drug, digoxin (10 homes); the antipsychotic drug, lithium (10 homes); and the antiasthmatic drug, theophylline (5 homes). Other drugs, e.g. the anticonvulsant, carbamazepine, and the antibiotic, gentamicin, were monitored in residents in two nursing homes. Requests for the measurement of blood drug levels were predominantly made by doctors (8 homes). In five nursing homes, nursing staff and doctors requested the measurements. In one nursing home, these requests were made by the nursing staff.

Changes in drug dosages in response to results of the measurements of drug levels were initiated by doctors (9 homes), doctors/nursing staff (4 homes) and nursing staff (1 home). Pharmacists were not involved in initiating measurements or recommending changes in drug dosages in response to these results.

Adverse Drug Reaction (ADR) Monitoring

The final question related to monitoring adverse drug
reactions (ADR). Three nursing homes often generated reports of adverse drug reactions, two nursing homes occasionally did, and seven nursing homes rarely made reports.

(ii) Major Study
Spontaneous responses to the revised postal questionnaire were received from 137/200 nursing homes (69%). Telephone calls to non-responders yielded reasons for non-participation such as, insufficient time, temporary staff appointments, change to the proprietorship and pending closure of the nursing home. The size distribution of participating nursing homes is shown in Table I.

Table I. Distribution of nursing homes according to number of residents

<table>
<thead>
<tr>
<th>Category</th>
<th>Responders</th>
<th>Non-Responders</th>
<th>NSW Nursing Homes</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 25 residents</td>
<td>9 (6.6%)</td>
<td>2 (3.2%)</td>
<td>46 (10%)</td>
</tr>
<tr>
<td>26 - 50 residents</td>
<td>64 (47%)</td>
<td>34 (54%)</td>
<td>204 (43%)</td>
</tr>
<tr>
<td>51 - 75 residents</td>
<td>27 (19.7%)</td>
<td>15 (23.8%)</td>
<td>108 (23%)</td>
</tr>
<tr>
<td>76 - 100 residents</td>
<td>27 (19.7%)</td>
<td>10 (15.9%)</td>
<td>80 (17%)</td>
</tr>
<tr>
<td>&gt; 100 residents</td>
<td>10 (7%)</td>
<td>2 (3.1%)</td>
<td>33 (7%)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>137 (100%)</td>
<td>63 (100%)</td>
<td>471 (100%)</td>
</tr>
</tbody>
</table>

In determining whether each category was proportionally represented in the sample, chi-square was calculated.

\[ \chi^2_{obt} = \sum \frac{(fo - fe)^2}{fe} \]

\[ \chi^2_{obt} = 1.019 \]

\( \chi^2_{crit} \) which cuts off a proportion of the sampling
distribution equal to $\infty$ (the decision level setting a significance level of 0.05) was obtained from a standard table of chi-square. The degrees of freedom (df) were calculated using $k-1$ where $k$ stands for the number of categories.

Thus $\chi^2_{\text{obt}} = 1.019$

$\chi^2_{\text{crit}} = 9.49$ for $\infty = 0.05$

As $\chi^2_{\text{obt}} < \chi^2_{\text{crit}}$, we may retain the null hypothesis that there is no difference between the expected and observed frequencies in each category. Thus all groups are proportionally represented.

In the major study, the nursing homes ranged in size from seven to 146 residents (mean of 57; S.D. = 26.6). A pharmacy was located "on site" in seven nursing homes (5%).

**Pharmacist(s) Involvement in the Nursing Home**

Three nursing homes (2%) were part-owned by pharmacists. In two of these nursing homes, a pharmacy was located "on site".

Eleven nursing homes (8%) employed a pharmacist. In two of these nursing homes, a pharmacist was a part-owner.

The majority of nursing homes (77.4%) used a single, local pharmacist to dispense residents' prescriptions.
The number of pharmacists servicing a nursing home is summarised in Table II.

Table II. Number of pharmacists servicing a nursing home.

<table>
<thead>
<tr>
<th>Number of pharmacists</th>
<th>Number of nursing homes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>106 (77.4%)</td>
</tr>
<tr>
<td>2</td>
<td>16 (11.7%)</td>
</tr>
<tr>
<td>3</td>
<td>5 (3.6%)</td>
</tr>
<tr>
<td>4</td>
<td>2 (1.5%)</td>
</tr>
<tr>
<td>6</td>
<td>1 (0.7%)</td>
</tr>
<tr>
<td>8</td>
<td>1 (0.7%)</td>
</tr>
<tr>
<td>9</td>
<td>1 (0.7%)</td>
</tr>
<tr>
<td>Not specified</td>
<td>5 (3.6%)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>137 (100%)</td>
</tr>
</tbody>
</table>

The local pharmacist was selected by the Director of Nursing (70 homes), the proprietor (28 homes), the Chief Executive Officer (16 homes), the resident (15 homes), the Board of Directors (11 homes), the doctor (5 homes) and the resident’s family (2 homes). Four nursing homes selected the closest pharmacy and four nursing homes rotated their pharmacist. Two nursing homes "inherited" their pharmacist and two nursing homes had "no choice because only one in town". Five respondents did not complete the answer. In 23 nursing homes (17%), more than one pharmacist dispensed for the same resident.

In 37 nursing homes (27%), prescriptions were collected and delivered by a pharmacist (18%) or a pharmacy assistant (9%). In a further 18 nursing homes (13%), a
pharmacist did not attend. In 12 nursing homes (9%), a pharmacist rarely attended and in 13 nursing homes (9%), a pharmacist attended on request. Eight nursing homes did not specify the time spent by a pharmacist attending the home.

In 49 nursing homes, the time spent by pharmacists in the nursing home ranged from five minutes per day to two hours per day (mean of 28 minutes per day; S.D. = 29). The duration of pharmacists' visits to nursing homes is summarised in Table III. Overall the sample, the mean time spent by pharmacists in nursing homes was 10 minutes per day.

Table III. Duration of visits to nursing homes by pharmacists.

<table>
<thead>
<tr>
<th>TIME</th>
<th>NUMBER OF NURSING HOMES (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collect and deliver only</td>
<td>37 (27%)</td>
</tr>
<tr>
<td>Nil</td>
<td>18 (13%)</td>
</tr>
<tr>
<td>On request</td>
<td>13 (9%)</td>
</tr>
<tr>
<td>Rarely</td>
<td>12 (8.8%)</td>
</tr>
<tr>
<td>Not specified</td>
<td>8 (6%)</td>
</tr>
<tr>
<td>5 minutes/day</td>
<td>2 (1.5%)</td>
</tr>
<tr>
<td>10-15 minutes/day</td>
<td>5 (3.6%)</td>
</tr>
<tr>
<td>30 minutes/day</td>
<td>9 (6.6%)</td>
</tr>
<tr>
<td>1 hour/day</td>
<td>5 (3.6%)</td>
</tr>
<tr>
<td>2 hours/day</td>
<td>3 (2.2%)</td>
</tr>
<tr>
<td>5 minutes/week</td>
<td>2 (1.5%)</td>
</tr>
<tr>
<td>15 minutes/week</td>
<td>5 (3.6%)</td>
</tr>
<tr>
<td>30 minutes/week</td>
<td>4 (2.9%)</td>
</tr>
<tr>
<td>1 hour/week</td>
<td>5 (3.6%)</td>
</tr>
<tr>
<td>2-3 hours/week</td>
<td>8 (6%)</td>
</tr>
<tr>
<td>4 hours/week</td>
<td>1 (0.7%)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>137 (~100%)</td>
</tr>
</tbody>
</table>
Medication Supply to Nursing Homes

Medications were dispensed in original packs in 103 nursing homes (75%) and in unit dose systems in 41 nursing homes (30%). In 19 nursing homes, the 'Webster System' was the unit dose system in use. Seven nursing homes (5%) used both original packs and a unit dose system.

In 81 nursing homes (59%), doctors initiated medication orders. The responsibility for initiating orders for repeat medications was principally undertaken by nursing staff. Pharmacists were rarely involved in either of these clinical activities. The origins of medication orders for the sample are summarised in Table IV.

Table IV. Origins of medication orders and repeat medications.

<table>
<thead>
<tr>
<th>ORIGIN</th>
<th>NUMBER OF NURSING HOMES (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MEDICATION ORDER</td>
</tr>
<tr>
<td>Doctor</td>
<td>81 (59.1%)</td>
</tr>
<tr>
<td>Nursing Staff</td>
<td>20 (14.6%)</td>
</tr>
<tr>
<td>Doctor/Nursing Staff</td>
<td>16 (11.7%)</td>
</tr>
<tr>
<td>Doctor/Nursing Staff/Resident</td>
<td>16 (11.7%)</td>
</tr>
<tr>
<td>Nursing Staff/Resident/Family</td>
<td>2 (1.5%)</td>
</tr>
<tr>
<td>Pharmacist</td>
<td>1 (0.7%)</td>
</tr>
<tr>
<td>Not Specified</td>
<td>1 (0.7%)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>137 (100%)</td>
</tr>
</tbody>
</table>
Medication Summaries (Profiles) and Labelling

In 102 nursing homes (74.5%) in which medication summaries (profiles) for residents were compiled, pharmacists compiled them in 35 nursing homes (34%), doctors compiled them in 35 nursing homes (34%), nursing staff compiled them in 22 nursing homes (22%), doctors/nursing staff compiled them in four nursing homes (4%), pharmacists/nursing staff compiled them in four nursing homes (4%) and doctors/pharmacists compiled them in two homes (2%).

Medication profiles were stored in the nursing home (n = 51; 37.2%), in the pharmacy (n = 39; 28.5%) and in both the nursing home and pharmacy (n = 13; 9.5%). Thirty-four nursing homes (24.8%) did not specify a location. In 64 nursing homes (47%) medication profiles were computerised; 43 homes (31%) maintained manual records and 30 homes (22%) did not respond to this question.

Medication regimens were reviewed by the doctor [64 nursing homes (46.7%)], doctor/nursing staff [50 homes (36.5%)], doctor/nursing staff/pharmacist [14 homes (10.2%)], pharmacist [3 homes (2.1%)], doctor/pharmacist [2 homes (1.5%)], pharmacist/nursing staff [2 homes (1.5%)]. Two respondents did not answer this question.

Residents' routine medications were most frequently reviewed every three months. Table V lists the
frequencies for reviews of routine medication orders.

Table V. Time interval for review of routine medication orders.

<table>
<thead>
<tr>
<th>FREQUENCY</th>
<th>NUMBER OF NURSING HOMES (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekly</td>
<td>11  (8%)</td>
</tr>
<tr>
<td>Monthly</td>
<td>31  (22.6%)</td>
</tr>
<tr>
<td>2nd-Monthly</td>
<td>3   (2.2%)</td>
</tr>
<tr>
<td>3rd-Monthly</td>
<td>33  (24.1%)</td>
</tr>
<tr>
<td>On admission + weekly</td>
<td>11  (8%)</td>
</tr>
<tr>
<td>On admission + monthly</td>
<td>11  (8%)</td>
</tr>
<tr>
<td>On admission + 3rd-monthly</td>
<td>19  (13.9%)</td>
</tr>
<tr>
<td>Monthly + as required</td>
<td>8   (5.8%)</td>
</tr>
<tr>
<td>3rd-Monthly + as required</td>
<td>8   (1.5%)</td>
</tr>
<tr>
<td>No response</td>
<td>2   (1.5%)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>137 (100%)</td>
</tr>
</tbody>
</table>

Residents' "p.r.n." medications were most frequently reviewed every month. The range of time intervals for which reviews of "p.r.n." medications were undertaken is summarised in Table VI.
### Table VI. Time intervals for review of "p.r.n." medications.

<table>
<thead>
<tr>
<th>TIME INTERVAL</th>
<th>NUMBER OF NURSING HOMES (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily</td>
<td>11 (8%)</td>
</tr>
<tr>
<td>Weekly</td>
<td>15 (11%)</td>
</tr>
<tr>
<td>Monthly</td>
<td>31 (22.6%)</td>
</tr>
<tr>
<td>2nd-Monthly</td>
<td>2 (1.5%)</td>
</tr>
<tr>
<td>3rd-Monthly</td>
<td>28 (20.4%)</td>
</tr>
<tr>
<td>On admission + weekly</td>
<td>3 (2.2%)</td>
</tr>
<tr>
<td>On admission + monthly</td>
<td>8 (5.8%)</td>
</tr>
<tr>
<td>On admission + 2nd-monthly</td>
<td>1 (0.7%)</td>
</tr>
<tr>
<td>On admission + 3rd-monthly</td>
<td>10 (7.3%)</td>
</tr>
<tr>
<td>On admission + as required</td>
<td>6 (4.4%)</td>
</tr>
<tr>
<td>Monthly + as required</td>
<td>4 (3%)</td>
</tr>
<tr>
<td>3rd-Monthly + as required</td>
<td>8 (5.8%)</td>
</tr>
<tr>
<td>As required</td>
<td>10 (7.3%)</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>137</strong> (100%)</td>
</tr>
</tbody>
</table>

Residents' diagnoses were always recorded on medication profiles in 49 nursing homes (35.8%), sometimes recorded on medication profiles in 16 homes (11.7%), never recorded on medication profiles in 56 homes (40.9%) and no answer from 16 respondents (11.7%).

Where "p.r.n." appeared on directions on medication orders, a specific disease/disorder/symptom was included on the label in approximately two-thirds of the nursing homes. Specific time intervals were included on labels in over 80 per cent of the nursing homes.
The frequencies with which specific directions were included on medication labels to supplement the abbreviation "p.r.n." are summarised in Table VII.

Table VII. Specific directions on medication labels to supplement "p.r.n." orders.

<table>
<thead>
<tr>
<th>FREQUENCY</th>
<th>NUMBER OF NURSING HOMES (%)</th>
<th>SPECIFIC DISEASE/ SYMPTOM</th>
<th>SPECIFIC TIME INTERVAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Always</td>
<td>32 (23.4%)</td>
<td>94 (68.6%)</td>
<td></td>
</tr>
<tr>
<td>Sometimes</td>
<td>55 (40.1%)</td>
<td>35 (25.5%)</td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>47 (34.3%)</td>
<td>6 (4.4%)</td>
<td></td>
</tr>
<tr>
<td>No Response</td>
<td>3 (2.2%)</td>
<td>2 (1.5%)</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>137 (100%)</td>
<td>137 (100%)</td>
<td></td>
</tr>
</tbody>
</table>

Medication Information for the Nursing Home

Nearly half of the responding nursing homes often requested information on medications from the pharmacist (Table VIII). The majority of these queries were made by the nursing staff (113 nursing homes), followed by the nursing staff/doctor (16 homes), the nursing staff/resident (5 homes), and the doctor (2 homes).
Table VIII. Frequency of requests for medication information from the pharmacist.

<table>
<thead>
<tr>
<th>TIME</th>
<th>NUMBER OF NURSING HOMES (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Often</td>
<td>67 (49%)</td>
</tr>
<tr>
<td>Occasionally</td>
<td>64 (46.7%)</td>
</tr>
<tr>
<td>Rarely</td>
<td>4 (2.9%)</td>
</tr>
<tr>
<td>Never</td>
<td>1 (0.7%)</td>
</tr>
<tr>
<td>No response</td>
<td>1 (0.7%)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>137 (100%)</td>
</tr>
</tbody>
</table>

Most of the queries for medication information related to new drugs (111 homes), followed closely by requests about side effects (108 homes), drug interactions (105 homes), drug dosages (83 homes) and administration (75 homes).

The majority of nursing homes (75.2%) reported that they had written protocols on the use of individual drugs. Of these, 60 nursing homes had less than five protocols, 19 homes had five to 10 protocols and 15 homes had more than 10 protocols. Protocols were prepared by the Director of Nursing in 73 nursing homes, by the Director of Nursing/pharmacist in 18 homes, by the Director of Nursing/doctor (9 homes), by the doctor (2 homes), and by the pharmacist (2 homes). No answer to this question was given in 31 questionnaires.

The provision of formal education to the nursing staff by the pharmacist was an infrequent occurrence in over 50 per cent of the nursing homes. The frequency with which pharmacists provided formal education to the nursing is summarised in Table IX.
Table IX. Frequency of provision of formal education to nursing staff by pharmacists.

<table>
<thead>
<tr>
<th>TIME INTERVAL</th>
<th>NUMBER OF NURSING HOMES (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekly</td>
<td>4 (3%)</td>
</tr>
<tr>
<td>Monthly</td>
<td>7 (5.1%)</td>
</tr>
<tr>
<td>3rd-Monthly</td>
<td>5 (3.6%)</td>
</tr>
<tr>
<td>6th-Monthly</td>
<td>27 (19.7%)</td>
</tr>
<tr>
<td>Never</td>
<td>48 (35%)</td>
</tr>
<tr>
<td>Occasionally</td>
<td>13 (9.5%)</td>
</tr>
<tr>
<td>On request</td>
<td>26 (19%)</td>
</tr>
<tr>
<td>No response</td>
<td>7 (5.1%)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>137 (100%)</td>
</tr>
</tbody>
</table>

Therapeutic Drug Monitoring

One hundred and thirty-two nursing homes (96%) undertook therapeutic drug monitoring. The drugs most commonly monitored were digoxin (120 nursing homes), phenytoin (108 homes), lithium (54 homes) and theophylline (28 homes).

The drugs commonly targeted for therapeutic drug monitoring are listed in Table X.
Table X. Drugs commonly monitored in nursing homes.

<table>
<thead>
<tr>
<th>DRUG</th>
<th>NUMBER OF NURSING HOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digoxin</td>
<td>120</td>
</tr>
<tr>
<td>Lithium</td>
<td>108</td>
</tr>
<tr>
<td>Theophylline</td>
<td>28</td>
</tr>
<tr>
<td>Aminoglycosides</td>
<td>11</td>
</tr>
<tr>
<td>Warfarin</td>
<td>11</td>
</tr>
<tr>
<td>Carbamazepine</td>
<td>8</td>
</tr>
<tr>
<td>Sodium Valproate</td>
<td>6</td>
</tr>
<tr>
<td>Clonazepam</td>
<td>1</td>
</tr>
</tbody>
</table>

Requests for the measurement of drug levels in the blood were mostly initiated by doctors (52 nursing homes) and nursing staff (43 homes). Pharmacists rarely initiated such a request (1 home). The source of the requests for therapeutic drug monitoring is summarised in Table XI.

Table XI. Sources of requests for therapeutic drug monitoring.

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>NUMBER OF NURSING HOMES (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doctor</td>
<td>52 (38%)</td>
</tr>
<tr>
<td>Nursing Staff</td>
<td>43 (31.4%)</td>
</tr>
<tr>
<td>Doctor/Nursing Staff</td>
<td>34 (24.8%)</td>
</tr>
<tr>
<td>Doctor/Nursing Staff/pharmacist</td>
<td>2 (2.5%)</td>
</tr>
<tr>
<td>Pharmacist</td>
<td>1 (0.7%)</td>
</tr>
<tr>
<td>No response</td>
<td>5 (3.6%)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>137 (100%)</td>
</tr>
</tbody>
</table>

In response to results of therapeutic drug monitoring, changes in drug dosages were initiated by doctors (102 nursing homes), nursing staff/doctors (22 homes) and nursing staff (11 homes). Pharmacists were not involved
in initiating or recommending changes in dosage in response to these results.
8. CONCLUSIONS

(i) Discussion of Data From Questionnaires

Pharmacist involvement in the ownership of nursing homes is not well documented. In this study, only three nursing homes reported that pharmacists were part-owners of the nursing home. Interestingly, in two of these nursing homes, a pharmacy was located within the nursing home. It is unclear whether the pharmacist operating these on-site pharmacies was a part-owner of the actual nursing home. Certain questions are raised by this finding. First, if the pharmacist-owner is the pharmacist occupying the on-site pharmacy, does this relationship enhance the provision of a comprehensive pharmacy service to the nursing home? And second, would this relationship be considered a conflict of interest?

Within the context of this study, the answer to the first question is apparently in the negative. In none of the three nursing homes in which a pharmacist was a part-owner, were the pharmacists providing non-distributional (or clinical) pharmacy services. Moreover, in each of these three nursing homes, pharmacists' visits to the nursing home were rare, or never. What are possible explanations for the apparent misfit between the location of an on-site pharmacy and rare attendance by the pharmacist? An explanation could be some confusion in terminology, for example, storage facility for dispensed medications rather than a pharmacy. As pharmacists are required to dispense all non-parenteral medication in a
form able to administered directly to the intended patient from its original or dispensed package (Pharmacy Board of New South Wales 1991), it is to be hoped that these apparently unsupervised pharmacies are actually storage facilities for dispensed medications.

To answer the second question, it would be necessary to closely review drug utilisation patterns of residents in nursing homes in which pharmacists were part-owners. No inference is made that pharmacist-owners of nursing homes facilitated inappropriate or overuse of medication by residents of "their" nursing homes. However, it is an interesting finding and it requires further research.

The majority of nursing homes (77.4%) used a single, local pharmacist to dispense residents' prescriptions. Prima-facie, a single pharmacist could monitor drug therapy for improper durations of treatment, appropriate dosages and adverse drug reactions, particularly if the resident sees more than one doctor. The evidence from the National Health Strategy's (1992) "Issues in Pharmaceutical Drug Use in Australia" suggests that such a monitoring process is, in fact, infrequently undertaken.

The Drug Use Review Panel described widespread potential clinically significant drug/drug interactions between non-steroidal anti-inflammatory drugs and diuretics; between benzodiazepines and tricyclic antidepressant drugs; and
excessive duration of benzodiazepines in 21% of their nursing home population aged more than 75 years. Prescribing more than one drug from the same drug group, prescribing more than the stated daily dose and prescribing relatively or absolutely contraindicated drugs were also described as potentially hazardous prescribing in the National Health Strategy's report. In the ten nursing homes in which three or more pharmacists serviced a nursing home, there is potential for compounding the problems of potentially hazardous prescribing.

The local pharmacist was selected solely by the Director of Nursing in over 50 per cent of the participating nursing homes. The criteria for these selections were not solicited; however, the opportunity to promulgate guidelines for pharmacists' professional responsibilities in their dealings with nursing homes to Directors of Nursing could be explored. There may be potential here to raise the awareness of the significant value of clinical pharmacy services in nursing homes.

The major finding of this study is the very low level of participation of pharmacists in non-distributional activities in nursing homes. In approximately 60% of the participating nursing homes, pharmacy services comprised the collection of prescriptions and the delivery of dispensed medications. In thirty-one of these eighty nursing homes, a pharmacist did not personally undertake
this distributional activity. Thus for a significant number of the participating nursing homes, there was no personal contact between the pharmacist and the staff of the nursing home.

For the remaining nursing homes in which a pharmacist "attended", these visits ranged in time from five minutes per day to two hours per day (mean 28 minutes per day). As the average-sized nursing home had 50 residents, time spent by pharmacists in non-distributional activities appears to be very limited.

Medications were dispensed in original packs in 103 nursing homes (75%) and in unit dose systems in 41 nursing homes (30%). Seven nursing homes (5%) used both original packs and a unit dose system. As the unit dose system attracts a "per patient per week" filling charge which must be borne by the nursing home, it is interesting that 30% of the participating nursing homes used such a system.

Unit dose drug distribution systems decrease nursing workload, and increase safety of drug delivery (Graudins 1989). Commonly reported errors (Rippe & Hurley 1988) involved administering drugs at the wrong time and omitting drugs. A unit dose system may allow quick detection of these types of errors.

Clinical pharmacy activities, as described by the Society
of Hospital Pharmacists of Australia (1991) include (in addition to drug distribution): drug product selection, drug therapy monitoring, provision of drug information, patient communication and counselling, education, and research.

In this study, only one nursing home reported that the pharmacist was responsible for drug product selection ("initiating medication orders"). Similarly, the pharmacist was reported to "initiate repeat medication orders" in only four nursing homes.

In contrast to this finding, pharmacists in selected long term care facilities in the United States of America have taken responsibility for prescribing drug therapy under the supervision of physicians (Thompson et al. 1984). Positive effects on morbidity and mortality were important clinical outcomes.

Drug therapy monitoring was most frequently undertaken by doctors or doctors and nursing staff. Pharmacists were reported to review medication regimens in only three nursing homes. In a further 18 nursing homes, pharmacists were reported to share this activity with either doctors or nursing staff, or both. Although it may be assumed that pharmacists would review patients' medication regimens "off-site", there are potential barriers to optimising drug therapy in residents when the pharmacist does not seek access to residents' medical
histories and diagnoses. Other investigators have described how minimal contact between elderly people and their medical practitioners and pharmacists acts as a barrier to the review of the effectiveness and toxicity of maintenance therapies and may be an important cause of polypharmacy (Sloan & Lekan-Rutledge 1988; Weedle et al. 1988).

The failure of staff to review medication orders frequently and critically and poor communication between the nursing home staff and the pharmacist were identified as relevant problems in the National Health Strategy. The Drug Use Review Panel has recommended strategies to improve drug use outcomes in nursing homes which rely on a range of models of drug use review procedures. Possible models would include drug use review processes (with and without the involvement of pharmacists); drug use reviews using institution-wide profiles of use of drugs (as developed by the Victorian Geriatrician Peer Review Group); and, pharmacist review of drug use with reports to doctors and the relevant nursing home.

Monitoring patterns of drug use is not the total solution. Strategies to change doctors' prescribing practices need to be addressed. Few studies find that community-based pharmacists influence doctors' prescribing practices beyond identifying errors and clarifying the prescribers' intentions. The National Health Strategy (1992) summarises six major ways of
altering physicians' practices - education, feedback, participation, administrative rules, incentives and penalties. There is potential for pharmacists to cooperate with doctors in each of these six areas to improve drug use outcomes.

The frequency with which regimens for routine medication were reviewed ranged from weekly to third-monthly. The review was undertaken most frequently every three months. If this finding is considered with regard to the report of excessive duration of therapy in the National Health Strategy, there is again potential for pharmacists to favourably influence drug use outcomes in residents of nursing homes.

In contrast, residents' "p.r.n." medications were reviewed most frequently every month. This finding is encouraging because it suggests that there is a mindset for frequently reviewing some medication regimens. Any future campaigns which aim to promote a drug review protocol may well build on this experience.

The same medication may be used to treat more than one disorder or disease with appropriate changes in dosage and/or formulation. Yet residents' diagnoses were never recorded on medication profiles in 56 nursing homes (40.9%). An inadequate explanation of how and when the drugs should be taken may be an important contributory factor to adverse patient outcomes.
Drug therapy monitoring can also take other forms, e.g., pharmacokinetic (drug plasma levels) monitoring. Pharmacokinetic monitoring services appeared to be very well established in participating nursing homes with 96% reporting that therapeutic drug monitoring was undertaken. Requests for the measurement of drug levels in the blood were mostly initiated by doctors (52 homes) and nursing staff (43 homes).

Pharmacists, however, very rarely initiated requests for the measurement of drug levels and were not involved in initiating or recommending changes in dosage in response to these results.

As therapeutic drug monitoring services are well established in hospital pharmacies, the reasons for community-based pharmacists ignoring this service deserves further investigation. Strategies to improve their knowledge base in therapeutic drug monitoring may address this deficiency.

Pharmacists were often requested to provide drug information by nearly 50 per cent of participating nursing homes. A further 46 per cent of homes occasionally requested drug information. This activity, therefore, appears to be the most frequent clinical pharmacy service provided (after drug distribution) to the participating nursing homes. Most of the queries related to new drugs, and side effects, drug interactions
and drug dosages.

However, as the majority of requests for drug information were made by the nursing staff, it may be assumed that pharmacists were involved in direct patient medication counselling infrequently. Again, there is potential for pharmacists to discuss these issues directly with the resident (and the resident's family).

Similarly, the provision of formal education to nursing staff was an infrequent clinical pharmacy service in over 70 per cent of nursing homes. Considering the reported interest in new drugs, pharmacists are well placed to be more proactive in this area. Pharmacists' infrequent contribution to written protocols on the use of individual drugs could likewise be remedied.

(ii) Summary
In about 60% of participating nursing homes, pharmacy services comprised the collection of prescriptions and the delivery of dispensed drugs. For the remaining nursing homes in which a pharmacist personally visited, the duration of these "visits" ranged from five minutes per day to two hours per day. Non-distributional activities, such as product selection, drug therapy monitoring, provision of drug information, patient medication counselling, education and research were undertaken by pharmacists infrequently.
Is this degree of professional input by pharmacists sufficient to promote and achieve rational drug use in nursing homes? When you consider that Commonwealth expenditure on the Pharmaceutical Benefits Scheme in 1988-89 was $990.3 million and for nursing home care in 1987-88 was $1,905 million (Australian Institute of Health 1990), can we be assured that these allocations of health care resources are sustaining a relatively sophisticated level of care? It is difficult to know. However, with the experience acquired from overseas, there appears to be an urgent need to examine drug use patterns in our nursing homes.

Since 1974, systematic drug surveillance has developed dramatically in long term care facilities in the USA (Cooper & Bagwell 1978; Ingman et al. 1975; Kroenke & Pinholt 1990; Lawson & Jick 1970; Priddle & Rose 1966; Pucins et al. 1988; Robers 1988; Segal et al. 1979; Strandberg et al. 1980). The impetus for many of these studies was the promulgation of regulations to require pharmacists to be "the primary individual responsible for developing, co-ordinating and supervising all pharmaceutical services including promoting the rational prescribing and clinical use of drugs" and "to monitor each patient's drug therapy at least monthly" (Dyer et al. 1984). The experience in the USA with their mandate for monthly reviews of drug therapy for residents of long term care facilities provides compelling evidence for the contribution of the pharmacist to rational drug use.
Reviews by pharmacists were associated with reductions in regularly prescribed drugs, with reductions in "when required" drugs and with reductions in overall drug use (Cooper 1985; Cooper & Bagwell 1978; Strandberg et al. 1980). Positive effects on death rate, discharge rate and levels of adverse drug effects were also described (Thompson et al. 1984).

However, it is doubtful that the degree of professional input by pharmacists found in this survey is sufficient to promote and achieve rational drug use in the participating nursing homes.

Further studies are required in Australia to support the introduction of similar clinical pharmacy services in our nursing homes.
BIBLIOGRAPHY


Cooper, J.W. 1985, 'Effect of initiation, termination, and reinitiation of consultant clinical pharmacist services in a geriatric long-term care facility', Medical Care, vol. 23, pp. 84-88.


Pharmacy Board of New South Wales. 1991, 'Guidelines for pharmacists' professional responsibilities in their dealings with private hospitals and nursing homes', *Pharmacy Board of New South Wales Bulletin*, Dec, pp. 6-7.


World Health Organization (Regional Office for Europe). 1981, 'Health care in the elderly: Report of the
technical group on use of medicaments by the elderly', *Drugs*, vol. 22, pp. 279-294.
Appendix 1.

Pilot Questionnaire

This questionnaire relates to pharmacy services to your nursing home. In order to characterise "typical" pharmacy services in nursing homes, information is being sought on the extent and quality of pharmacy involvement in nursing homes. Please mark the appropriate answer and specify details where requested. In some questions, more than one answer may be indicated. Further comments to qualify an answer or provide extra information will be appreciated. The identification of participating nursing homes will not be disclosed in my written report.

1. Total number of residents in nursing home? ..............................................................

2. Is a pharmacy located within the nursing home? YES/NO

3. Pharmacist(s) involvement in the nursing home
   a) Is a pharmacist(s) a part-owner of the nursing home? YES/NO
   b) Is a pharmacist(s) employed by the nursing home? YES/NO
   c) How many local pharmacists service the nursing home? ............
   d) How is a local pharmacist(s) selected?
      • By the Director of Nursing? ☐
      • By the resident? ☐
      • By the prescribing doctor? ☐
      • Other, please specify .................................................................
   e) Does more than one pharmacist dispense for the same resident? YES/NO
   f) How often does a pharmacist(s) attend the nursing home? Please specify total number of hours per day?
      • Once daily - total time of visit ........... hours
      • Once weekly - total time of visit ........... hours
      • Other, please specify .................................................................

4. Medication supply to nursing home

More than one answer may be correct.

a) How are medications supplied to the nursing home?
   • Original packs, labelled for each resident ☐
   • Unit dose system e.g. Webster system, pre-loaded Dosette ☐
b) Who is responsible for ordering medication?

- Resident □
- Doctor □
- Nursing staff □
- Pharmacist □
- Family member □

5. Medication orders, profiles and labelling

a) Are medication profiles compiled for individual residents? YES/NO

b) If medication profiles are compiled, who does this?

- Doctor □
- Nursing staff □
- Pharmacist □

- Other, please specify


c) Where are these profiles stored?

- Nursing home □
- Pharmacy □
- Other, please specify


d) Are medication profiles computerised? YES/NO

e) Who reviews medication orders?

- Doctor □
- Nursing staff □
- Pharmacist □

- Other, please specify


f) How often are routine medication orders reviewed?

- On admission □
- Daily □
- Weekly □
- Monthly □
- 3rd-monthly □
- Never □

- Other, please specify
g) How often are orders for "p.r.n." medications reviewed?

- On admission □
- Daily □
- Weekly □
- Monthly □
- 3rd-monthly □
- Never □
- Other, please specify .................................................................

h) Are residents' diagnoses recorded on medication profiles?

- Always □
- Sometimes □
- Never □

i) Where "p.r.n." appears on directions on medication order or script:

Is a specific disease/disorder/symptom included on label e.g. for acute angina chest pain?

- Always □
- Sometimes □
- Never □

Is a specific time interval included on label e.g. 4-hourly, "at night"?

- Always □
- Sometimes □
- Never □

6. Medication information for the nursing home

a) How often does the nursing home request medication information from the pharmacist?

- Often □
- Occasionally □
- Rarely □
- Never □

b) Who generates the queries?

- Doctor □
- Nursing staff □
- Resident □
- Other, please specify .................................................................

c) What is the nature of the medication information requested?

- Dosage □
- Administration □
- Side effects □
- Drug interactions □
- Information on new drugs □
- Other, please specify .................................................................
d) Does the nursing home have written protocols on individual drugs? e.g. record apex beat before giving digoxin, laxative use. YES/NO

e) If "yes", how many?  □ < 5  □ 5-10  □ > 10

f) Who prepares these protocols?

- Doctor  □
- Nursing staff  □
- Pharmacist  □
- Resident  □
- Other, please specify .................................................................

g) How often does a pharmacist(s) provide formal education to the nursing staff?

- Weekly  □
- Monthly  □
- 3rd-monthly  □
- 6th-monthly  □
- Other, please specify .................................................................

7. Therapeutic drug monitoring

a) Are residents' blood levels of drugs measured? YES/NO

b) If so, which drugs are monitored?

- Aminoglycosides (e.g. gentamicin)  □
- Digoxin (e.g. "Lanoxin")  □
- Theophylline (e.g. "Theo-Dur")  □
- Phenytoin (e.g. "Dilantin")  □
- Lithium (e.g. "Lithicarb")  □
- Other, please specify .................................................................

c) Who requests the measurement of blood drug levels?

- Doctor  □
- Nursing staff  □
- Pharmacist  □
- Resident  □
- Family member  □
- Other, please specify .................................................................

d) Who is responsible for initiating changes in dosage in response to blood drug levels?

- Doctor  □
- Nursing staff  □
- Pharmacist  □
- Other, please specify .................................................................
8. Adverse drug reaction (ADR) monitoring

a) How often does the nursing home generate ADR reports?
   - Often □
   - Occasionally □
   - Rarely □
   - Never □

b) Who initiates ADR reports from the nursing home?
   - Doctor □
   - Nursing staff □
   - Pharmacist □
   - Resident □
   - Other, please specify .................................................................

Thank you very much for your contribution.

Please return the completed questionnaire in the enclosed reply-paid envelop to:

Alison Van Nooten
PO Box 738
BALGOWLAH NSW 2093
SURVEY OF PHARMACY SERVICES IN NURSING HOMES IN N.S.W.

This questionnaire relates to pharmacy services to your nursing home. In order to characterise "typical" pharmacy services in nursing homes, information is being sought on the nature of pharmacy involvement in nursing homes. Please mark the appropriate answer and specify details where requested. In some questions, more than one answer may be indicated. Further comments to qualify an answer or provide extra information will be appreciated. The identification of participating nursing homes will not be disclosed in my written report.

1. Total number of residents in nursing home?

2. Is a pharmacy located within the nursing home? YES/NO

3. Pharmacist(s) involvement in the nursing home
   a) Is a pharmacist(s) a part-owner of the nursing home? YES/NO
   b) Is a pharmacist(s) employed by the nursing home? YES/NO
   c) How many local pharmacists service the nursing home? .........
   d) How is a local pharmacist(s) selected?
      - By the Director of Nursing? □
      - By the resident? □
      - By the prescribing doctor? □
      - Other, please specify ........................................
   e) Does more than one pharmacist dispense for the same resident? YES/NO
   f) How often does a pharmacist(s) attend the nursing home? Please specify total number of hours per day?
      - Once daily - total time of visit ........ hours
      - Once weekly - total time of visit ........ hours
      - Other, please specify ........................................

4. Medication supply to nursing home

   More than one answer may be correct.

   a) How are medications supplied to the nursing home?
      - Original packs, labelled for each resident □
      - Unit dose system e.g. Webster system, pre-loaded Dosette □
b) Who is responsible for initiating medication orders?

- Resident □
- Doctor □
- Nursing staff □
- Pharmacist □
- Family member □

c) Who is responsible for initiating repeat medication orders?

- Resident □
- Doctor □
- Nursing staff □
- Pharmacist □
- Family member □

5. Medication orders, summaries and labelling

a) Are medication summaries (profiles) compiled for individual residents? YES/NO

b) If medication summaries are compiled, who does this?

- Doctor □
- Nursing staff □
- Pharmacist □

- Other, please specify ........................................................................................................

c) Where are these summaries stored?

- Nursing home □
- Pharmacy □

- Other, please specify ........................................................................................................

d) Are medication profiles computerised? YES/NO

e) Who reviews medication orders?

- Doctor □
- Nursing staff □
- Pharmacist □

- Other, please specify ........................................................................................................

f) How often are routine medication orders reviewed?

- On admission □
- Daily □
- Weekly □
- Monthly □
- 3rd-monthly □
- Never □

- Other, please specify ........................................................................................................
g) How often are orders for "p.r.n." medications reviewed?

- On admission □
- Daily □
- Weekly □
- Monthly □
- 3rd-monthly □
- Never □
- Other, please specify ........................................................................................................

h) Are residents' diagnoses recorded on medication summaries?

- Always □
- Sometimes □
- Never □

i) Where "p.r.n." appears on directions on medication order or script:

Is a specific disease/disorder/symptom included on label e.g. for acute angina chest pain?

- Always □
- Sometimes □
- Never □

Is a specific time interval included on label e.g. "4-hourly", "at night"?

- Always □
- Sometimes □
- Never □

6. Medication information for the nursing home

a) How often does the nursing home request medication information from the pharmacist?

- Often □
- Occasionally □
- Rarely □
- Never □

b) Who would normally generate the queries?

- Doctor □
- Nursing staff □
- Resident □
- Other, please specify ........................................................................................................

c) What is the nature of the medication information requested?

- Dosage □
- Administration □
- Side effects □
- Drug interactions □
- Information on new drugs □
- Other, please specify ........................................................................................................
d) Does the nursing home have written protocols on individual drugs? e.g. record apex beat before giving digoxin, laxative use. YES/NO

e) If "yes", how many? □ < 5 □ 5-10 □ > 10

f) Who prepares these protocols?
   - Doctor □
   - Director of Nursing □
   - Pharmacist □
   - Resident □
   - Other, please specify ..........................................................

    g) How often does a pharmacist(s) provide formal education to the nursing staff?
   - Weekly □
   - Monthly □
   - 3rd-monthly □
   - 6th-monthly □
   - Other, please specify ..........................................................

7. Therapeutic drug monitoring

a) Are residents' blood levels of drugs measured? YES/NO

b) If so, which of the following drugs are monitored?
   - Aminoglycosides (e.g. gentamicin) □
   - Digoxin (e.g. "Lanoxin") □
   - Theophylline (e.g. "Theo-Dur") □
   - Phenytoin (e.g. "Dilantin") □
   - Lithium (e.g. "Lithicarb") □
   - Other, please specify ..........................................................

c) Who initiates the request for the measurement of blood drug levels?
   - Doctor □
   - Nursing staff □
   - Pharmacist □
   - Resident □
   - Family member □
   - Other, please specify ..........................................................

d) Who is responsible for initiating changes in dosage in response to blood drug levels?
   - Doctor □
   - Nursing staff □
   - Pharmacist □
   - Other, please specify ..........................................................

Thank you very much for your contribution.

Please return the completed questionnaire in the enclosed reply-paid envelop to:

Alison Van Nooten
PO Box 738
Balgowlah NSW 2093
Dear Matron

Survey of Pharmacy Services in Nursing Homes in NSW

Medication use in the elderly is attracting much interest from health professionals. One aspect of this is medication use by residents of nursing homes. There is, however, a paucity of published information on medication use in our nursing homes.

As part of my master's degree in health science, I am undertaking a research project which aims to look at an aspect of medication use in nursing homes. Specifically, I am seeking information on pharmacy services in nursing homes in NSW, which have been randomly selected from the NSW Health Department's list.

With this in mind, I enclose a copy of the questionnaire which I hope you will have time to complete. I would be very grateful to receive your response by 20 April. Please be assured that all data provided will be pooled and that individual nursing homes will not be identified in my written reports. A report will be submitted to the Australian Pharmacy Research Centre (they have provided me with a modest seeding grant) and to the Charles Sturt University-Mitchell.

I look forward to receiving your completed questionnaire at your earliest convenience and thank you for your assistance.

Yours sincerely

Alison Van Nooten
BPharm, MSHP, RN, RM