DRUG-RELATED PROBLEMS AMONG GERIATRIC OUTPATIENTS AT A PUBLIC SECTOR HOSPITAL: AN INTERVENTION STUDY

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A DEDICATION

To my mother

Your unfailing support, love and encouragement has made this dissertation a reality.

Thank you.

ABSTRACT

Introduction: Although drug-related problems (DRPs) are known to be prevalent in elderly patients, there are not many studies that have been performed in geriatric out-patients at public health facilities in South Africa. Thus, the prevalence of DRPs in elderly outpatients attending Addington Hospital was investigated and suitable preventive intervention strategies to overcome or minimise these DRPs were developed.

Research Methodology: The study was conducted in two phases. Phase1 was conducted in March and April 1998, during which 281 elderly patients on chronic medical treatment were chosen for the study by systematic random sampling, according to specific inclusion criteria. Data collection was via a retrospective review of the elderly patient's medical notes and by personally interviewing the patient. Two research instruments were used in this phase. The customised Patient Profile (PF) form helped to delineate DRPs in the elderly patients. A Prescription Intervention Form (PIF) was used to inform the prescriber of the DRP and to make recommendations to change the drug therapy in order to overcome the DRP. In phase 2 of the study, intervention strategies were devised to address some of the major DRPs identified in phase 1 of the study. A patient counselling leaflet, prescribing guidelines for geriatric patients and a protocol for counselling of in-patients were developed. In addition, two DRP reporting systems were developed for surveillance of adverse drug reactions and medication errors during dispensing.

Results and Discussions: Most geriatric subjects suffered from multiple, chronic conditions, these being hypertension (64.8%) followed by ischaemic heart disease (43.8%), musculoskeletal disorders (arthritis or gout) (42.7%), diabetes (29.2%), chronic obstructive airways disease (13.2%), hypercholesteremia (11.7%) and arrythmias (atrial fibrillation) (11.0%).

The 281 patients were taking 1730 prescribed drugs, with a mean of 6.2 (range 3 to 15) prescribed drugs per patient. An astounding 45.6% of the total geriatric patients were taking or using between 7 to 9 medicines and 10.3% were taking or using between 10 to 15 medicines.

The antihypertensives (15.9%) were the most widely prescribed drugs followed by medicines acting on CNS (10.9%), coronary vasodilators (9.1%), diuretics (9.1%) and medicines acting on the musculoskeletal system (8.7%).

A total of 856 actual DRPs experienced by 262 geriatric patients (93.2%) ranged from 1 to 11 DRPs. The greater the number of prescribed drugs the greater the actual DRPs experienced by geriatric patients ($p = 0.000$). The most common DRPs were those involved in drug safety (56.6%); effectiveness of the drug therapy (20.8%); compliance (7.8%) and indication of drug therapy (7.6%). 159 elderly patients (56.6%) experienced 223 adverse effects either with their current or past prescribed medicines. The most common ADRs were as follows: gastro-intestinal ulceration (11.0%), cough (9.3%), diuretic side effects (dehydration, fatigue, hypotension, etc) (7.1%), constipation (6.8%), equilibrium problems (6.4%) and headaches (6.4%).

For those DRPs warranting interventions, the mean number of prescription interventions in the entire sample population of 281 elderly patients was 0.65 ± 1.16. 87 elderly patients (30.1%) had from 1 to 4 interventions on their current prescription. The most common prescription interventions were on problems involving drug therapy monitoring (26.9%), safety of drug therapy (26.5%), indication of drug therapy (17.5%), prescribing errors (15.3%) and prescription information omission (11.1%). The three intervention strategies and DRPs surveillance reporting systems were successfully devised and developed.

Conclusions: A profile related to the elderly patient's medical history and pharmacotherapy was completed for each of the 281 patients. General trends of prescribing pattern prevalence of DRPs and the prescribed inappropriate medication was established. The interventions of problem prescriptions were based on a newly developed PIF. The development and implementation of suitable intervention strategies to minimise DRPs were as follows: a compliance information leaflet, prescribing guidelines and the protocol for counselling in-patients. A medication error form as well as an adverse drug reaction reporting forms was developed for surveillance of DRPs. The recommendations for clinical practice and directions for future research that are presented should help to make drug therapy in the elderly safer and more effective.

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OPERATIONAL DEFINITIONS

Adverse drug reaction(s): Any harmful or unwanted effect(s) caused by a drug taken in it's regular dosage. For the purposes of this study, adverse drug reactions will be used interchangeably with side effects.

Contra-indication: A history or established diagnosis in a patient that would necessitate the assessment of the use of the current medication, due to the potential for an adverse reaction e.g. aspirin in patients with gastric ulcers.

Diagnosis: The process of determining the nature of a disorder by considering the patients signs and symptoms, medical background, and when necessary results of laboratory tests and X-ray examinations. In this study the term ' diagnosis' and 'medical condition' will be used interchangeably.

Drug: The Oxford Concise Medical Dictionary (1996) defines a drug as any substance that affects the structure or functioning of a living organism. Drugs are widely used for the prevention, diagnosis, and treatment of disease and for the relief of symptoms. In this study the term's " drug" and "medicine" will be used interchangeably.

Drug-duplication: Usually use of more than one drug with the same pharmacological properties for a problem usually treated with a single agent in variable doses.

Drug-interaction: A drug-drug interaction refers to the concurrent use of two or more drugs that may produce an adverse reaction or alter the desired therapeutic response. Drug interactions also include interaction of drugs with disease states, food, age and alcohol.

Drug-related Problems (DRPs): An undesirable event a patient experiences that involves, or is suspected to involve, drug therapy and that actually or potentially interferes with a desired patient outcome (Strand, 1990). A DRP is any unwanted consequence of the drug-utilisation process.

Essential Drugs: Essential drugs are those that satisfy the needs of the majority of the population. They should therefore be available at all times, in adequate amounts, and in the appropriate dosage forms. The Essential Drugs List (EDL) comprise of the essential drugs in South Africa.

Geriatric: Patient over 65 years of age as defined by the World Health Organisation (WHO). In this study the terms "elderly patient " or" older patient" or "the aged" will be used interchangeably with geriatric.

Intervention: Any action taken to optimise the patient's drug therapy and/or minimise the risk of harmful effects e.g. counseling activities.

Medicine: The Oxford Concise Medical Dictionary (1996) defines a medicine as any drug or preparation used for the treatment or prevention of disease, particularly a drug that is taken by mouth. For the purposes of this study, the term "medicine" will be used interchangeably with "drug".

Prescription Intervention: Any action taken to clarify or change a prescription to optimise the patient's drug therapy and / or minimise the risk of harmful effects (Hulls and Emmerton, 1996) e.g. prescribing errors, illegibility and omissions or unsolicited advice to the prescriber if it was thought that a change in drug choice, dose, frequency, route or any other aspect of drug therapy was considered advisable.

OPERATIONAL ABBREVIATIONS

ACE	:	Angiotensin Converting Enzyme
ACEI	:	Angiotensin Converting Enzyme Inhibitor
ACEIK	:	Angiotensin Converting Enzyme Inhibitor with potassium supplements
ADR	:	Adverse Drug Reaction
AF	:	Atrial Fibrillation
CCF	:	Congestive cardiac failure
CI	:	Contraindication
CNS	:	Central Nervous System
COAD	:	Chronic obstructive airway disease
CRF	:	Chronic renal failure
CVA	:	Cerebrovascular accident
DRP	:	Drug related problem
EDP	:	Essential Drugs programme
EDL	:	Essential Drugs List
GAO	:	General Accounting Office
GIT	:	Gastrointestinal tract
GP	:	General Practitioner
HMO	:	Health Maintenance Organisation
IDDM	:	Insulin dependent diabetes mellitus
IHD	:	Ischaemic heart disease
IM	:	Institute of Medicine
MAO-Is	:	Monoamine oxidase inhibitors
MCC	:	Medicine control council
NIDDM	:	Non-insulin dependent diabetes mellitus
NSAIDs	:	Non-steriodal anti-inflammatory drugs
OTC	:	Over-the-counter
PF	:	Patient profile
PIF	:	Prescription Intervention Form
PI	:	Prescription Intervention
PIL	:	Patient Information Leaflet

PRN	:	When necessary
PVD	:	Peripheral Vascular disease
RCP	:	Royal College of Physicians
SAMF	:	South African Medicines Formulary
SAPC	:	South African Pharmacy Council
SSRIs	:	Selective Serotinin Re-Uptake Inhibitors
STGs	:	Standard treatment Guidelines
TIA	:	Transient Ischaemic attack
TCAs	:	Tricyclic anti-depressants
UTI	:	Urinary tract infection

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CHAPTER 1

INTRODUCTION

1.1 MOTIVATION FOR THE STUDY

For the vast majority of South Africans, access of drug related services from a geographic, functional and financial point of view is restricted and difficult. 90% of South Africa's population live in magisterial districts where community pharmacies are situated and in 81 of these districts, no State hospitals are available (SAPC, 1995). Treatment in the public and private sector is fragmented, the quality of drug distribution and drug use personnel in rural and periurban areas is low and drug personnel are not used effectively (Eagles, 1994). These are just some of the problems facing pharmaceutical health care in South Africa.

Patient-orientated pharmacy particularly in the clinical setting is coming of age at a time when the health care systems throughout most developing countries and in South Africa are characterised by change, in the form of powerful economic forces. It is the time when the health care system is caught up in economic determinism and its impact on shaping policy. There are increasing demands on pharmacists to define their functions, purpose and value in relation to the pharmacotherapeutic impact pharmacy has on actual patient outcome. The identification, resolution and prevention of drug-related problems (DRPs) are the focus of a professional role that is truly proactive and patient-focused, and contributes to positive patient outcomes (Strand *et al.*, 1990).

Hepler and Strand (1990) emphasized that pharmacists should accept responsibility for patients by defining pharmaceutical care as the " responsible provision of drug therapy for the purpose of achieving definite therapeutic outcomes that improves the patient's quality of life." Pharmaceutical care is that component of pharmacy practice, which entails the direct interaction of the pharmacist with the patient for the purpose of caring for that patient's drug-related needs. The process of pharmaceutical care is aimed at improving the patient's quality of life by ensuring the correct use of drugs.

Therefore, one has to consider ways in which services provided by pharmacists could be developed to increase their contribution to health care and to the overall positive outcome in patient well being. One envisaged role of the pharmacist is to advise patients on how to use their medicines correctly. However, many of the people who need such advice may not have access to a hospital or pharmacy (Naylor, 1997). One such special need group are the geriatrics who may be frail, forgetful and housebound and will consequently have less contact with health care professionals. Geriatrics are defined by the World Health Organisation (WHO) as patients over 65 years of age. In this study, the terms "elderly patients", "older patients", or "the aged" will be used interchangeably with geriatrics.

There have been distinct and marked changes in population demographics in recent times and the elderly now represent a larger proportion of the population than ever before. South Africa is experiencing demographic transition and over the next 20 years; the proportion of elderly in the population can be expected to increase. The population in South Africa aged 60 years and over comprised 6.1% in 1995 and will comprise 9.2% by the year 2020 (HST, 1997). An October Household Survey in 1995 indicated that the proportion of the population over 65 years was 4.3% in South Africa and 4.1% in Kwazulu-Natal. Other developing countries are presently, also experiencing a continued increase in the number of elderly people in their populations. There is little doubt that this has a profound influence on the demands for health care particularly because there is an abundance of evidence that the elderly are major consumers of all health services (Fletcher, 1995). Dr Alec Walter of the SAIMR has estimated that elderly patients take over a third of a doctor's time, are responsible for as much as 40% - 50% of all hospital admissions, and use a quarter to a third of all medicines prescribed (PPAC, 1995).

The geriatrics are a special category of patients, having unique needs in drug therapy due to age-related biologic and physiological changes which may lead to altered pharmacokinetics. The volume of distribution, half-life, systemic clearance, and receptor sensitivity have been shown to change with advancing age and can predispose some elderly to unintended or undesired drug effects (Jarvis and Greenblatt, 1981; Ouslander, 1981). Reduced hepatic perfusion, renal function and altered homeostatic mechanisms contribute to unexpected changes in drug metabolism or unanticipated drug responses (Beech, 1996; Ouslander, 1981). Disease is often difficult to recognise in the elderly. Other facts which may complicate drug therapy in geriatrics are that they may have multiple disease states concurrently, chronic disabling conditions and failing memory. This may lead to drug-drug, drug-nutrient, drug-disease interactions, as well as poor compliance and potentially harmful polypharmacy. Physical, psychologic, and socioeconomic considerations often interfere with the geriatrics ability to obtain and comply with health care (Ouslander, 1981). For those geriatric patients who have multiple disease and are on long-term medication, the risks of poor patient concordance with medication are increased with polypharmacy.

It can, therefore be expected that the elderly might have trouble with the management of their medicines. Several of these elderly people are left to manage their own medicines whilst some have untrained caregivers. It is also common for carers to collect prescriptions and medication for the elderly (Beech, 1996). Treatment for older people is often prescribed to relieve symptoms rather than to completely control or cure a condition and patients may have difficulty understanding the limitations of drug therapy. The geriatric patient's effort to maintain independence is set against a potentially increasing burden of disease, which may threaten their quality of life. The therapy of one condition can interfere with the control of another and the presence of co-morbidity complicates the assessment of drug therapy. Loss of dexterity and memory can impair the reliability of patients to take their medicines. Pharmacokinetic and pharmacodynamic changes associated with ageing and disease add emphasis to the need for individualisation of care in elderly patients. Pharmaceutical care therefore requires attention to the health changes brought about by ageing, including the social and behavioural changes patients face (Hudson and Boyter, 1977).

There is also widespread concern about the level of use, particularly the inappropriate use, of drugs amongst geriatrics (Monette *et al.*, 1995). One study of drug use and drug prescribing found that 92% of the elderly population was taking medicine (Lamy, 1985). The elderly are the recipients of large numbers of prescription drugs

(Fletcher, 1995) and medication consumption by individuals in this group is reported to be among the highest of any patient population (Monette *et al.*, 1995). Elderly people are prescribed twice as many medicines as younger people and many of these medicines are supplied on repeat prescriptions (Beech, 1996). Further, they are twice as likely to suffer from a chronic illness, their recovery time is longer and there is a possibility that they overuse services relative to true need (Pulliam, 1985).

As many as five million elderly people in the USA are prescribed inappropriate medications (US General Accounting Office (GAO) 1995). One study reviewed by the GAO estimated that 17% of hospitalisations of elderly patients are due to adverse drug reactions. Other studies found that 32 000 hip fractures and 16 000 car accidents resulting in injuries are caused by adverse drug reactions (ADRs) in the elderly patients each year. "Over-medication is the order of the day. Blood pressure must be normalised yesterday! NSAIDs must be the first line approach for every ache or pain! Every cough and cold must be medicated! " Thus we must agree that polypharmacy is a problem in the USA, and there is every indication that it is no better in South Africa (Straughan, 1996).

Elderly people are at risk concerning drug-related problems. A number of factors could increase the risk of DRPs, including inappropriate prescribing, medication errors and non-compliance. Medication non-compliance is a common problem. Cognitive impairment and diminished vision may make patient education difficult, and compliance poor (Ouslander, 1981). On average, 50 per cent of elderly patients are non-compliant. It had been found that intentional non-compliance was more common in the elderly compared with younger patients. Inappropriate prescribing also occurred commonly in elderly patients. One study of 236 ambulatory elderly patients' medication had found that 88% had "potential prescribing problems" (FIP Lisbon Congress, 1994). Another review found a 37% incidence of drug interactions among 639 elderly patients (Manchon, *et al.*, 1989).

Problems may arise at different stages in the drug utilisation process, of which the most important steps are:

- the prescribing and information dissemination by the practitioner,
- the dispensing and information dissemination by pharmacists, and
- the medication management in the home and the intake of the drugs by the patient.

(Knudsen Stromme and Botten, 1993).

It is the primary objective of all health care providers to improve the quality of each patient's life to the extent that they are able to. Physicians, nurses, pharmacists and other allied health care providers need to work continuously to produce the following general clinical outcomes (GCOs):

- Prevent a disease or symptoms
- Cure the disease state
- Eliminate or reduce a patient's symptoms
- Arrest or slow progression of disease
- Normalise physiological parameters

Pharmacists contribute to these general patient outcomes by ensuring successful drug therapy. The pharmacist applies unique knowledge, skills, and tools to determine if a patient is experiencing potential or actual DRPs. When the pharmacist proceeds to resolve any actual DRPs, very specific, desired pharmacotherapeutic outcomes are identified for each patient's problems. However, to intervene in a patient's drug therapy prospectively and consistently, and to document how that intervention can lead to positive patient outcomes, it is important to understand the eight major types of patient-specific DRPs as outlined by Strand *et al.*, (1990).

A DRP relates to a patient experiencing (or has the potential to experience) an undesirable event (medical problems, complaints, symptoms, diagnosis or syndrome) that is of psychological, physiological, social, emotional, or economic origin. Eight drug related problems have been identified and are as follows:

The patient has a medical condition:

- that requires drug therapy (a drug indication) but the patient is not receiving a drug for that indication.
- for which the wrong drug is being taken.
- for which too little of the correct drug is being taken.
- for which too much of the correct drug is being taken.
- resulting from an adverse drug reaction.
- resulting from a drug-drug, drug-food or nutrient, and drug-laboratory interaction.
- that is the result of not receiving the prescribed drug.
- that is the result of taking a drug for which there is no valid medical indication.

Two important and potentially preventable drug-related problems that could occur in ambulant elderly patients were therapeutic failure and adverse drug reactions. Adverse drug reactions are a complication, which often resulted from polypharmacy. Studies have shown that between three and six percent of patients had drug reactions leading to admission to hospital. One study indicated that there was a two-fold increase in the development of DRPs in patients over 80 years of age. Furthermore, in a study of 42 geriatric centres in the United Kingdom, researchers had found that 10 per cent of patients had been admitted because of DRPs (FIP Lisbon Congress, 1994).

These less than optimal outcomes can lead to hospitalisation. Col *et al.* (1990) studied 315 elderly patients who were consecutively admitted to hospital, and found that 89 admissions were caused by drug-related problems. Thirty-six were attributable to non-compliance, and 53 to adverse drug reactions (Col *et al.*, 1990).

In another multicentre investigation conducted by Williamson and Chopin (1980), it was discovered that of 1998 patients consecutively admitted to Geriatric Medicine Departments in England, Wales and Scotland in 1975-6, 81.3% were receiving prescribed drugs at the time of admission. Adverse reactions were noted in 248 patients, representing 15.3% of prescribed drug takers. In 209 of these patients, it was thought that an adverse reaction had contributed to the need for admission to hospital. Full recovery from adverse reactions and sequelae occurred in 68% of those with such reactions. Hypotensive drugs, antiparkinsonian drugs and psychotrophics carried the greatest risk of adverse reactions although the largest single number of adverse drug reactions (60) were due to diuretics which were by far the most commonly prescribed drugs (37.4% of sample population) (Williamson and Chopin, 1980). Few investigators have examined ADRs among outpatients (Hutchinson, 1986), and even fewer have studied ADRs among elderly outpatients (Klein *et al.*, 1984; Larson *et al.*, 1987).

One of the most significant causes of sub-optimal outcomes following the incorrect use of medicines identified by Hepler and Strand (1990) was the lack of monitoring of therapy. Given the multiple diseases and vulnerability of geriatric patients to develop DRPs, it is incumbent on the pharmacist to monitor drug therapy in the elderly. Pharmacists practicing in hospitals are in an important position to impact positively upon proper drug utilisation. In a study to determine the impact of chart reviews, pharmacist drug regimen reviews pinpointing ADRs have been shown to decrease hospitalisation in 68 out of 517 patients in long-term care facilities (Kidder, 1982).

Talley and Laventurier (1974) estimated that in the USA in 1971 adverse reactions to prescribed drugs accounted for 140 000 deaths and one million admissions to hospitals. In 1987, the United States Food and Drug Administration (FDA) recorded 12 000 deaths and 15,000 hospital admissions associated with adverse reactions to prescription drugs. The number of adverse reactions reported to the FDA may be a small fraction – perhaps only 10% - of the actual number (Manasse, 1989). The importance of the pharmacist involvement, functioning independently as well as collaborating with physicians, in DRP monitoring cannot be understated in the rising prevalence of iatrogenic disorders (i.e. adverse reactions to medications).

Hospital pharmacists have made a major impact upon the delivery of pharmaceutical services in institutions through monitoring of DRPs on a concurrent basis. In addition, multidisciplinary programs involving physicians, nurses, caregivers and pharmacists may be implemented. Through an assessment of many cases from numerous reports, patterns of sub-populations at risk for occurrence of DRPs with certain drugs can emerge (Fincham, 1990). Methods for documentation of

prescription-related problems and the actions taken in their resolution have been developed over recent years. Documentation of clinical services has taken a more formative role, whereby patient-related details and decisions have been recorded for the benefit of patient care.
Studies of pharmacists' interventions in the hospital setting have been conducted in various countries. Intervention rates have ranged between 1.6% and 8.4% due to differences in definitions, survey periods, the type of institution or ward examined and various other factors. Evaluation has focused on summarising the incidence, nature and outcomes of interventions, while some methods have been suggested for assessing the quality of interventions (Hulls and Emmerton, 1996).

Ideally, drug therapy should result in beneficial effects and an improved quality of life for patients. However, the increasing prescription and consumption of drugs by the elderly causes widespread anxiety on grounds of cost, inappropriateness of prescribing and the high adverse reaction rates. The development of drug-related problems in geriatrics can compromise the expected benefits of pharmacotherapy and may present a public health problem of considerable magnitude. Drug-related problems (DRPs) are prevalent in elderly patients in the community and in hospitals and are responsible for hospital admissions. Preventability has only been assessed in few studies, none of which has targeted an exclusively elderly population (Cunningham *et al.*, 1997). Early studies suggested that many such problems may be avoidable due to their predictability, which others have reported that around half the problems identified were considered preventable. Further, although a few practical suggestions for reducing adverse drug reactions and non-compliance have been proposed, literature on implementation and outcome of these preventative strategies is minimal (Cunningham *et al.*, 1997). The publication of the National Drug Policy for South Africa in January 1996 by the Department of Health recognises that South Africa has drug related needs and pharmacy has been given the opportunity to identify and respond o them. The present intervention study addresses these drug-related problems among geriatric patients in a public sector hospital setting.

The public sector hospital was targeted because the elderly patients here are faced with escalating problems, which are not present in private hospitals and community pharmacies. This especially takes into account the fact that in South Africa, the State supplies approximately 80% of the medicines in South Africa with only 14% of pharmacist involvement in this sector (Van Niekerk, 1994). In addition with the implementation of the Essential Drugs List (EDL) in the public sector in South Africa, in 1998 with its main objective being to ensure availability and accessibility of medicines for all people, it is known to have logistical problems related to drug availability, hospital policy and prescribing restrictions to elderly patients. However, it will ensure rational drug prescribing for the elderly, if the guidelines are adhered to (STG and EDL for SA, 1998). Addington Hospital was chosen, as the site for the study as it is one of the major secondary hospitals in KwaZulu - Natal with a large geriatric outpatient attendance.

This background information was the deciding factor to investigate DRPs among geriatric outpatients in a public sector hospital, to establish prescribing patterns, prevalence of adverse drug reactions and the prescribed inappropriate drugs. These findings are considered crucial in implementing suitable intervention strategies to minimise and prevent these DRPs not only in the selected site, but also at other health settings.

1.2 AIMS AND OBJECTIVES OF THE STUDY

1.2.1 RESEARCH AIMS

The aims of the study are:

(a) To assess the incidence of drug related problems (DRPs) among geriatric outpatients at Addington Hospital, a regional public sector hospital in the Central Durban District.

(b) To subsequently recommend suitable pharmaceutical intervention strategies to overcome or minimise these DRPs.

1.2.2 STUDY OBJECTIVES

The objectives of the present study are to:

(1) Develop a patient profile to determine whether the patient has one or more actual or potential drug-related problems (such as a potential drug interaction, or a medicine that was contraindicated).

(2) Establish prescribing patterns, prevalence of DRPs and identify the prescribed inappropriate drugs.

(3) Design a suitable intervention tool, for example a customised Prescription Intervention Form (PIF) that will address and minimise DRPs.

(4) Devise and evaluate suitable DRPs preventative strategies.

(5) Devise in-house DRP reporting systems or surveillance monitoring effective drug use in the hospital.

CHAPTER 2

GERIATRICS: PHARMACOTHERAPY, DRUG RELATED PROBLEMS AND INTERVENTION STRATEGIES

This chapter will comprise of a comprehensive literature overview of geriatrics and the drug-related problems as well as recommendations for improving medication use in this population. The review will include: characteristics of disease in old age; medical conditions or disorders; drug bioavailability and ageing; drug-related problems; prescription monitoring for elderly patients; pharmaceutical care of the elderly; etc.

2.1 CHARACTERISTICS OF DISEASE IN OLD AGE

In this section, the age-related challenges to provision of medical care for the elderly will be reviewed and will include: physiological systems that may be affected with ageing, drug bioavailabilty, multiple pathology and non-diagnoses of treatable ailments.

2.1.1 PHYSIOLOGICAL SYSTEMS WHICH MAY BE AFFECTED WITH AGEING

It is important to note that the primary cause of functional loss in old age is disease and not normal ageing. Many people accept symptoms as simply part of growing older, when in fact they could be helped if the underlying diseases were treated. In addition, the first signs of physical illness, often reversible, are often mental or emotional. If these are accepted at face value, proper diagnosis and treatment will not occur. Normal ageing is more likely to be responsible for physiological changes, which make drug efficacy and safety in elderly people different from younger adults. Physiological changes due to normal ageing can affect the concentration and distribution of drugs (pharmacokinetics) and the effects of drugs at the effects of drugs at their target sites of action (pharmacodynamics) (Osman, 1996; Salom and Davis, 1995).

Table 2.1 illustrates how physiological systems may be affected with ageing. These physiological changes affect the bioavailabilty of drugs in the elderly patients (Section 2.1.2).

Table 2.1 Physiological systems, which may be affected with ageing.

Physiological System	Example
Cardiovascular	Increase in rigidity of blood vessels, heart
Gastrointestinal tract	Elevation of gastric pH
Immune system	Reduction of immune response
Hepatic	Reduction in enzyme activity
Renal	Reduction in glomerular filtration rate
Musculoskeletal	Reduction in bone mass
Respiratory	Loss of breathing capacity
CNS	Cognitive decline

(Miot, 1998, Pg. 25)

2.1.2 DRUG BIOAVAILABILITY AND AGEING

There are a number of factors that put elderly patients at risk of altered bioavailability of the medication they take or use. This could suggest that they are either taking an incorrect dose viz. insufficient amount of medication, or perhaps too much.

Age-related changes in body composition and physiological processes predispose older patients to adverse drug reactions. The pharmacodynamics and pharmacokinetics of many drugs are affected by age-related changes in body composition and physiological processes. Physiological changes due to normal ageing and chronic disease can lower the therapeutic index for prescribed drugs (such as heparin, warfarin, aspirin and digoxin) (Salom and Davis, 1995). These changes make the older patient particularly vulnerable to adverse effects. Extra care is therefore required in prescribing for the elderly.

With increasing age, there are predictable changes in the handling of drugs by the body caused by the following **physiological changes** as summarized by Scott (1997).

- increases in body fat percentage
- decreases in lean body mass
- hepatic metabolism
- renal elimination

2.1.2.1 PHARMACODYNAMIC CHANGES

Pharmacodynamic changes are due to changes in the responsiveness of the target organ giving rise to an increased or decreased effect of a given dose compared with that seen in a younger patient (Hudson and Boyter, 1997; Chapron 1988). Changes in the molecular or cellular responses to drugs manifest in either the reduction in maintenance of homeostatic reserve or changes at receptor or target sites.

**Homeostatic responses*

The mechanisms responsible for maintaining blood pressure and body temperature are likely to be impaired by advancing age.

* *Target organ sensitivity*

There are alterations in receptor function with increasing age with a change in the sensitivity and density of drug receptors. Enhanced sedation from benzodiazepines, greater efficacy of anticoagulants due to decreased synthesis of coagulation factors and greater potency of narcotic analgesics are examples of pharmacodynamic changes in receptor responsiveness seen in the elderly (Hudson, 1997; Salom and Davis, 1995). The World Health Organisation has recommended that these drugs be given to elderly patients in reduced dosages because of the increased sensitivity experienced (Scott, 1997).

Decreased sensitivity is shown to some drugs because of reduced receptor sites, e.g. decreased antihypertensive effectiveness of ß-blockers (propranolol) and β_2 agonist bronchodilator agents (Osman, 1996).

Table 2.2 Drugs, which reduce homeostatic reserve.

Function	Characteristics	Drug Involvement
Postural control	Postural stability is mediated by dopamine receptors in the brain	Affected by sedatives and hypnotic.
Othostatic circulatory responses	i.e. the moving from sitting position to upright position; controlled by aterio/ vaso-constriction and heart rate; mechanisms dampened in old age	Drugs which make this effect more pronounced: antihypertensives; tricyclic anti-depressants (TCAs); phenothiazines; some buteryphenones; barbiturates; benzodiazepines; antihistamines; anti-parkinsonin drugs
Thermo-regulation	Less responsive in the elderly	Drugs, which further impair this: phenothiazines; benzodiazepenes; (TCAs); opiods; alcohol.
Cognitive function	Drug-induced impairment of cognitive function can be profound in the elderly and may lower quality of life	Drugs causing confusion in the elderly :anti-cholinergics; hypnotics; ß-blockers; H_2-agonists
Visceral function	Decreased gastric motility results in constipation. Urinary retention mainly in elderly males	Drugs causing constipation: anticholinergics, TCAs; antihistamines; opiods. Drugs aggravating urinary retention-anticholinergics.

(Osman, 1996, Pg. 49).

2.1.2.2 PHARMACOKINETICS

Therapeutic doses of certain products attain higher blood levels, and have a longer active period in the elderly patient than in the younger patient. The effect of absorption, distribution, metabolism, elimination and half-life on drugs in the elderly will be reviewed next.

2.1.2.2.1 Drug absorption in the elderly

Drug absorption is theoretically reduced in the elderly as loss of mucosal intestinal surface, reduced gastric acid secretion, decreased mesenteric blood flow and a decrease in active transport mechanisms occur with ageing. However, while nutrient absorption (calcium, iron and thiamine) is known to be compromised by age, there are few examples of specific drug absorption problems of demonstrable clinical significance. More commonly co-existing disease and drug-related causes of reduced gastric emptying, such as reduced gastric emptying, decreased gastrointestinal motility produced by anticholingeric agents, are likely to affect the rate rather than the extent of drug absorption. Drugs undergoing high first pass metabolism (such as propranolol) may have a higher bioavailability in the elderly due to changes in liver blood flow and hepatic function (Hudson and Boyter, 1997).

While the rate and extent of drug absorption from the gastro-intestinal tract is usually minimally affected, there are some changes in gastric pH and gut wall metabolism that can affect the bioavailability of some agents. For example, with levodopa there tends to be an increase in the bioavailability in the elderly patient because of reduced levels of the enzyme dopa-decarboxylase in the stomach. However, there may be a decrease in patients with delayed gastric emptying due to loss through metabolism. It has been found that the net effect of all these factors is relatively small with most drugs not being predictably influenced by differences in absorption in the elderly. Other factors that need to be considered are the effects of food, pathological conditions, surgical alterations to the gut, as well as the administration of concurrent medication.

Drug interactions, however, may affect absorption of drugs in all patients. For example, the anticholinergic effects of drugs such as antidepressants and antihistamines may delay gastric emptying, which will affect absorption of other drugs (Merck Manual, 1992).

2.1.2.2.2 Drug distribution in elderly

Drug distribution is affected by the changes in body composition associated with ageing, particularly the increase in adiposity, which rises from 18 per cent in young adults to 36 per cent in elderly men and 48 per cent in women. The volume of distribution for lipid soluble drugs tends to increase, leading to prolonged half-life of drugs such as with psychotropic agents, particularly benzodiazepines. Increased body fat, for example, can retard the excretion of fat-soluble drugs such as diazepam and nitrazepam, so that these drugs will be accumulated and their actions prolonged (Merck Manual, 1992).

Total body water can decrease by up to 15 per cent in older patients and the volume of distribution of water-soluble drugs may consequently be decreased, leading to higher plasma concentrations of polar drugs such as lithium, cimetidine and many antibiotics. The use of diuretics further exacerbates this problem.

Since the elderly have a decreased lean body mass, the volume of distribution of drugs that are highly bound to muscle, notably digoxin is reduced and plasma concentrations increased. Changes in volume of distribution alone tend to affect the loading doses of drugs and dose intervals rather than overall total daily maintenance doses. (Hudson and Boyter, 1997; Merck Manual, 1992). Loading doses of water soluble drugs or those with a small volume of distribution should be based on ideal body weight while the loading dose of drugs which are fat soluble and have a large volume of distribution should be based on total body weight.

Important biochemical changes in geriatrics include reduction in plasma albumin of as much as 25 per cent exacerbated by many chronic disease states. These results in a higher free (active) concentration of drug for highly protein bound agents, which can produce either therapeutic or toxic effects. Examples include, most benzodiazepines (increased sedation), warfarin (increased anti-coagulation, therefore possible bleeding), and phenytoin (increased toxicity). Other highly protein-bound drugs frequently used by elderly patients include digoxin, non-steriodal anti-inflammatory and sulphonylurea hypoglycaemic preparations. Such cases may remain undetected by therapeutic drug monitoring in which both the free and the bound drug concentrations are routinely measured (Hudson and Boyter, 1997; Merck Manual, 1992).

2.1.2.2.3 Drug metabolism in the elderly

With advancing age there is a loss of liver mass (and therefore the number of functioning hepatocytes), reduction of hepatic microsomal enzyme activity, and hepatic blood flow, resulting in a general decrease in the ability to biotransform and inactivate drugs. Phase 1 metabolic pathways, such as microsomal oxidation and reduction, are more susceptible to age-related change than phase 2 conjugation pathways. Potentially those drugs whose liver metabolism is blood flow dependent, such as propranolol, morphine, and phenothiazines. may be susceptible to increases in bioavailability due to reduced first pass metabolism (Hudson and Boyter, 1997;

Ouslander, 1981).

The slow acetylator group also tends to increase in the elderly. Many drugs, e.g. diazepam, amobarbital, propranolol and paracetamol, have an increased half-life and therefore a prolonged clearance. Phenytoin, however, is cleared more rapidly. There is no change in metabolism of isoniazid and ethanol. However, the clinical significance of age on drug handling by the liver is difficult to judge and the effects of concomitant disease make age-related changes in hepatic function unpredictable. Changes in liver function vary from patient to patient, making it difficult to predict accurately the changes in dose that may be required. It is thought that smoking and alcohol consumption have more influence on hepatic metabolism of drugs than does aging. Poor nutrition may also adversely affect metabolism (Hudson and Boyter, 1997; Merck Manual, 1992).

2.1.2.2.4 Renal elimination in the elderly patient

Renal function steadily deteriorates with age, and may be one of the most important physiological variables in the disposition of drugs (Bressler, 1981). Acute illness, dehydration and hypotension aggravate this. Kidney function in the elderly is often impaired, although there is a large inter-patient variability. In the kidney, there are decreases in renal blood flow, renal tubular secretion and glomerular filtration rate. The body's ability to excrete water-soluble drugs is therefore diminished. Many of these drugs have a narrow therapeutic range, and toxic blood levels may be rapidly attained (Merck Manual, 1992; Ouslander, 1981; Scott, 1997).

Renal elimination is more predictably affected by ageing. Glomerular filtration rate (GFR, normally 100-140ml/min) declines by 1 per cent per year from age 40. On average, the glomerular filtration rate is reduced by 35% in those patients over the age of 65 years. This is accentuated in those patients who have other disease affecting the kidneys directly or indirectly through renal blood flow such as heart disease, renal disease, diabetes, and hypertension (Scott, 1997). Creatinine clearance (Clcr) is a suitable indicator of GFR. In practice, creatinine clearance is more often estimated from serum creatinine rather than measured from urinary output in the elderly, who have a reduced muscle mass, serum creatinine concentrations within the normal range are compatible with marked renal function impairment.

Table 2.3 illustrates some of the potentially serious problems associated with the excretion of certain drugs.

Table 2.3 Potentially serious problems associated with altered excretion of drugs

DRUG	PROBLEMS
Lithium	Renal toxicity, manifested by weight gain, lethargy, nausea, vomiting
	Central nervous system toxicity, manifested by drowsiness, giddiness, lack of co-ordination, convulsions.
	Muscle weakness
	Blurred vision
	Gastrointestinal disturbances, e.g. vomitting, diarrhoea.
Digoxin	Cardiac toxicity, e.g. low or high pulse, palpitations
	Confusion
	Nausea and vomiting
Cimetidine	Sedation
	Gynaecomastia
	Confusion
Tetracyclines	Renal toxicity (as for lithium)

(Osman, 1996, Pg. 49).

2.1.2.2.5 Half-life of drugs in the elderly

The $t_{1/2}$ may be prolonged in the elderly and this should be considered when determining dosage intervals. Dosage adjustments are often necessary.

2.1.3 MULTIPLE PATHOLOGY IN THE ELDERLY

Many elderly people suffer from three or more health related problems simultaneously. Disease in one organ system may stress another weakened system in the body. Early medical intervention may prevent compounding of problems, and improve the patient's quality of life (Osman, 1996).

Elderly patients with multiple pathology present with a wide array of symptoms, abnormal investigations and have complex drug regimens. Careful assessment of presenting features contributing to acute deterioration is essential, in viewing the patient 'as a whole'. Treating a single pathology is inappropriate, and the aims are to improve overall health and function. Treating multiple pathology in the elderly is a considerable medical challenge. It is a common problem, and acute illness often presents atypically. Many 'little' problems add together precipating a crisis in health and dependency. Therefore, it is important to monitor drug therapy in patients with multiple pathology (Section 2.7). The following table illustrates the atypical presentation of intellectual impairment, instability, immobility and incontinence in the elderly.

Table 2.4 Atypical presentation in the elderly may be with one (or more) of the Four ' I 's.

Intellectual impairment	**Immobility**
Can be caused by:	Some common causes include:
*Acute illness	*Musculoskeletal problems
*Withdrawal of drugs	*Nail and foot problems
*Drug excess	*Parkinsonism
*Sensory deprivation	*Mental disorders
*Other factors (pain, anxiety)	*Excess drugs
(May be complicated by underlying dementia)	*Restraint by carers
Instability	**Incontinence**
Some causes:	*urinary, common causes:
*Cardiovascular problems	-anxiety, depression or confusion
*Neurological problems	-infection
*Musculoskeletal problems	-detrusor instability
*Excess drugs	*Faecal, caused by:
*Environmental problems	-impaction
	-Local causes (tumor)
	-Colitis
	-rectal prolapse

(Jenner, 1993 Pg. 119)

2.1.4 NON-DIAGNOSIS OF TREATABLE AILMENTS

Because of the belief that old age is a time of sickness and disability, elderly people are often reluctant to seek help for legitimate complaints, which may be symptoms of treatable diseases. They may complain about not feeling well, but neither they nor family members do anything about it. Common treatable conditions include Vitamin B12- or iron-deficiency anaemia, heart failure, gastrointestinal bleeding, uncontrolled diabetes mellitus, active tuberculosis, foot disease (which interferes with mobility), or oral disorders (which interferes with eating, and may be as simple to treat as getting new dentures), correctable hearing and vision defects, and a high incidence of depression and dementia.

2.2 MEDICAL CONDITIONS OR DISORDERS IN GERIATRICS

A review of the common medical conditions and atypical disorders in the elderly will be presented.

2.2.1 COMMON DISORDERS IN THE ELDERLY

Osman (1998) has reported the following common disorders in the elderly:

- Accidental hypothermia
- Polymyalgia rheumatica
- Hip fracture and its rehabilitation
- Metabolic bone disease
- Falling
- Basal cell carcinoma
- Herpes zoster
- Diabetic hyperosmolar nonketotic coma
- Urinary incontinence
- Decubitus ulcers
- Dementia
- Degenerative osteoarthritis
- Prostatic carcinoma
- Parkinsonism
- Alzheimer's disease
- Stroke

Constipation, urinary incontinence and diabetes are three medical conditions that are very common among elderly patients and will be discussed in detail.

2.2.1.1 Constipation

Constipation is a common complaint among the elderly since many believe that a bowel movement is necessary each day to maintain good health. The commonly accepted definition of constipation is fewer than three bowel movements per week (Scott, 1997). It should be borne in mind that drugs, which may cause constipation, should be identified and where possible discontinued or replaced. These drugs include aluminum and calcium containing antacids, antidepressants, and antipsychotics, calcium channel blockers and opiates. A low fluid intake, an inadequate fibre intake and immobility contribute to constipation. The initial management of constipation in the elderly should involve non-pharmacological measures such as an adequate fluid intake of at least 1500ml per day, regular physical activity and dietary changes, counseling the patient on accepting bowel habits. The pharmacist should assess the patient's medication and advise on stopping or changing medications that may be causing the constipation.

2.2.1.2 Urinary Incontinence

Bladder control problems are common in the elderly with urge incontinence being the most common type. Physiological changes such as a small bladder capacity and impaired ability to delay bladder emptying predispose to incontinence. Stress incontinence in which the bladder outlet tends to be weak occurs in up to 20% of women and is most commonly due to pelvic floor laxity. Overflow incontinence accounts for 10 to 15% of cases in the elderly and tends to occur when the bladder fails to contract when it should or when the bladder outlet is too tight. Transient causes of incontinence may be due to lower urinary tract infections. Simply treating the infection, managing the incontinence, or withdrawing problematic medication, can restore continence. The treatment depends on the underlying cause. In men with urge incontinence, a visit to the urologist may be necessary as prostate problems can be involved. The mainstay of treatment is still bladder retraining often in association with other methods. Drugs with mainly anticholinergic effects such as propantheline bromide or oxybutynin can be used (Scott, 1997).

2.2.1.3 Diabetes

Diabetes mellitus is a common disorder in the elderly affecting up to 10% of individuals over 65 years of age. Non-insulin dependent diabetes is the common disorder in the elderly and maybe related to the resistance of the action of insulin in facilitating glucose disposal (Scott 1997). Factors, which can contribute to the condition, include a genetic predisposition, age-related decrease in lean body mass, physical inactivity, and obesity. A reduction in body weight by reducing total energy intake is generally recommended, as this will enhance insulin sensitivity. When dietary control proves inadequate in the control of hyperglycaemia, oral hypoglycaemic agents can be used. In the case of the elderly the primary objectives are to keep the patient asymptomatic

2.2.2 DISORDERS WHICH PRESENT ATYPICALLY IN THE ELDERLY

The characteristic signs and symptoms of many disorders are frequently absent in old age. They are often replaced with non-specific signs, e.g. refusal to eat or drink, falling, incontinence, dizziness, acute confusion, increasing dementia, weight loss and failure to thrive. Depression is common, but more so than in younger people. The patient is, however, more at risk of committing suicide (Osman, 1996).

The review by Osman (1998) has listed the following as disorders with unusual presentations in the elderly:

- Pneumonia
- Malignant disease
- Acute abdomen
- Pulmonary embolism
- Affective disorders
- Paranoid states
- Drug intoxication
- Alcoholism
- Myocardial infarction
- Thyrotoxicosis
- Organic psychoses.

2.3 DRUG-RELATED PROBLEMS IN GERIATRICS

When appropriately used drugs may enhance quality of life of elderly patients. Conversely, inappropriate prescribing and usage may cause great harm (Salom and Davis, 1995) and can lead to DRPs.

2.3.1 DRUG-RELATED PROBLEMS

A drug-related problem is defined as " an undesirable event, a patient experience that involves, or is suspected to involve drug therapy, and that actually or potentially, interferes with a desired patient outcome." (Strand *et al.*, 1990).

The great magnitude of use of medication by elderly patients predisposes them to experience drug-related adverse symtomatology. This symptomatology may or may not be "organic" (as opposed to "functional"), but can influence medical outcomes in either case. Concern about symptoms from drugs is especially appropriate for the elderly, who tend to take multiple medications concurrently (both prescription and OTC), are limited also in their knowledge about the purpose and function of their medications, and are also pharmacokineticly and pharmacodynamicly different from the young (Klein *et al*, 1984).

The major difficulty in identifying DRPs is whether a particular symptom in a given elderly patient is the result of a specific medication or part of the patient's underlying disease conditions (Rogers *et al*, 1988). The problem is further complicated by the fact that most elderly patients who experience DRPs often receive many medications and frequently have several underlying illnesses that might account for the particular symptom. Moreover, many of the symptomatic complaints often attributed to medications – excessive somnolence or wakefulness, disorientation, headache and nausea for example, exist in many elderly patients who are not taking drugs. These manifestations also appear as first symptoms in developing adverse drug reactions (Levensen and Hall, 1981; Portnoi, 1981). There is also an increase of medication problems as the elderly become cognitively more impaired.

2.3.1.1 The primary components of a drug-related problem

* The patient experiences an undesirable event or incurs a risk. It can take the form of a medical complaint, symptom, diagnosis, disease, impairment, disability, or syndrome and can result from physiologic, social, or even economic conditions.

* Some relationship must exist (or be suspected to exist) between the undesirable event and drug therapy. The nature of the relationship will depend upon the specific drug-related problem, but common relationships between an undesirable event and drug therapy are:

- the event is the *result* of drug therapy, and
- the event *requires* drug therapy (Hepler and Strand, 1990)

2.3.1.2 Elderly patients are "at-risk" of developing DRPs

Elderly patients often have physical impairments or disabilities (loss of vision, poor hearing); debilitating diseases like arthritis or Parkinson and cognitive function (memory) decline and are therefore, at risk of developing DRPs. Risk is defined by the extent of danger to the patient and the rate at which the problem can harm the patient (Hepler and Strand, 1990). Elderly patients are further at risk if they belong to any of the following at-risk groups (Table 2.5) devised by Rupp (1992).

Table 2.5 Patient "at-risk" groups and associated codes

CODE	Patient "at-risk" groups
A	Asthmatic
C	Cardiovascular disease, including cardiac failure, hypertension, clotting disorders
D	Diabetic
F	Fits, epileptic
H	Hepatic impairment
I	Immuno-suppressed
M	Mentally ill, psychiatric
O	Opthalmic disorders, e.g., glaucoma
P	Parkinson's disease
R	Renal impairment
S	Skin diseases
T	Thyroid patients
P	Peptic ulcer
N	Not listed above, miscellaneous

2.3.2 CATEGORIES OF DRUG-RELATED PROBLEMS

The eight major categories of DRPs are listed in Section 1.1. Each of these eight DRPs will be discussed in detail below.

2.3.2.1 MEDICAL INDICATIONS FOR DRUG THERAPY

A number of common circumstances develop where the patient is in need of drug therapy but is not receiving it. For example, a patient is being appropriately treated for peripheral vascular disease but is not receiving treatment for a developing anaemia. Here, the focus of treatment is on the primary condition and the new problem has not been identified or treated.

In a more sociologic vein, one could find a patient who has been transferred from one hospital to another, from one physician to another, or who has changed pharmacies. Thus, the continuity of drug therapy has been interrupted. Those conditions in which the patient is in need of prophylaxis or premeditation are additional examples of this particular type of DRP. Moreover, in some cases, patients need a synergistic or potentiation effect from a drug, which defines the need for additional drug therapy. For example, cancer chemotherapy often uses combination therapy to effect a greater cell kill than could be achieved with monotherapy. Similarly, at least two antibiotics are always necessary to eradicate active tuberculosis because of the rapid emergence of resistance associated with single-drug therapy.

2.3.2.2. USE OF WRONG DRUG

Sometimes the drug therapy used to treat a patient's medical condition is determined to be ineffective, or a drug therapy likely to be more effective exists but is not being used. Additionally, some patients receive a particular drug therapy in the presence of an allergy to that drug, or receive drug therapy when contraindications exist. Other obvious situations present themselves to the clinician. For example, if an effective drug is being used to treat a patient's medical condition but there is an equally effective but less expensive drug available, then it could be argued that the wrong drug is being used. Here the consensual theme of patient involvement is central to the decision-making process. The burdens-to-benefits calculation would be considered if, for example, there exists an equally effective, safer drug than that presently being used. If a patient is receiving combination therapy when a single drug would be expected to be equally effective, then the patient has a DRP requiring attention.

Some patients have multiple disease states and thus may be at risk from drug therapy for more than one reason. For example, an epileptic patient with a prosthetic heart valve, who receives warfarin, phenobarbitone and phenytoin, is at considerable risk from multiple drug interactions. If this patient is also hypertensive, then non-prescription systemic sympathomimetics are contraindicated (Rupp *et al*, 1992).

Intervention is warranted when a prescription contains clinical errors, for example contraindications. Problems exist both with contraindicated prescription medicines such as propranolol, and non-prescription medicines, such as ibuprofen, either of which may induce bronchospasm (SAMF, 1997).

Choosing an inappropriate drug for a patient based on the patient's medical condition can have serious consequences. Prescriptions of contraindicated drugs are potentially dangerous and some are likely to lead to an exacerbation of the patient's illness. For some of the common contra-indications of drugs in patients refer to 'Prescribing guidelines for geriatrics' (Appendix 4).

2.3.2.3 TOO LITTLE OF THE CORRECT DRUG

Although it may be a fundamental, positive tenet of homeopathic medicine, too little (suboptimal) drug may be classified as a DRP when the desired outcome for a patient is not being realized (i.e. infection is not responding to suboptimal antibiotic treatment).

In essence, if drug dose is not individualized for a specific patient, taking into consideration all of the appropriate drug, disease, and patient-specific information, then the dose may be deemed less than optimal. In addition, if a desired serum drug concentration was calculated appropriately and not achieved (along with all the appropriate clinical signs/symptoms) then it might be argued that this type of DRP is present.

There are other parameters, which, if not attended to, would lead to suboptimal therapeutics. A patient who is receiving an inappropriate dosing interval or a regimen not continued long enough could result in too little drug being available to the patient. For example, only the Kapseal formulation of Dilantin is labeled as "extended" and provides the support for once-daily dosing. Use of more rapidly absorbed phenytoin preparations on a once-daily basis may lead to widely fluctuating serum concentrations and potential loss of seizure control in a patient.

It is also important to note that calculations based on varying bioavailabilities and conversions to different formulations of a drug therapy may lead to suboptimal treatment. For example, when switching from phenytoin suspension to capsules, one must take into that the capsules are formulated with phenytoin sodium, which contains only 92 percent phenytoin base. Therefore, a slightly larger dose will be required when using the capsule. The importance of applying pharmacokinetic principles as a means to help resolve the problem of suboptimal concentrations must be emphasised (Strand *et al.*, 1990).

2.3.2.3.1 Undermedication

Overmedication is often seen, as the major drug misuse problem plaguing the non-institutionalized elderly, but undermedication may be an equally serious and frequently overlooked phenomenon. Chronic illnesses afflicting the elderly – depression, arthritis, diabetes mellitus, and osteoporosis – may be untreated by physicians. Physicians may fail to prescribe needed drugs or may prescribe them in less than adequate amounts for a less than adequate period.

One condition in which undermedication is apparent and potentially serious is in the treatment of depression. Physicians may fail to treat depression in elderly patients because it can exhibit atypical symptoms (e.g. mental confusion). When it is correctly identified, it may not be treated at all, for physicians may consider depression an inherent part of the aging process. Even when antidepressant drug therapy is initiated, dosages may be too low because physicians either are overly cautious or are unaware of the availability of a variety of antidepressant drugs with differing side-effect profiles.

Another instance of undermedication can be observed in the use of chemotherapeutic agents for cancer. Geriatric patients often are omitted from chemotherapeutic treatment for fear that they will develop life-threatening toxicities. When they are placed on chemotherapeutic treatment, clinicians may assume that the dosages of these drugs should be reduced because of the potential for serious adverse drug reactions. In fact, recent evidence suggests that in order to produce any therapeutic effect in older adults, these agents must be given in full dosages. (Lipton and Lee, 1988).

2.3.2.4 TOO MUCH OF THE CORRECT DRUG

Another instance of a DRP is where a patient's dose is increased rapidly and the rate of increase itself may cause complications. For example, rapid escalation of nicotinic acid doses is very often associated with severe cutaneous reactions. It is also possible for drugs to accumulate over a long period and produce toxic complications. For example, patients with compromised renal function will accumulate *N*-acetylprocainamide (NAPA), the active metabolite of procainamide. Therefore, if a patient has the potential to, or actually experiences adverse effects, then the dose and dosing interval must be adjusted according to the level of accumulation. Preparations of the same drug (e.g. digoxin, levothyroxine) are not absorbed uniformly and the change from one brand to another can produce unpredictable differences in absorption rate, thereby causing a drug-induced illness. This problem frequently occurs in the nursing home or psychiatric hospital where the excessive use of antipsychotics, sedatives, and hypnotics is prevalent. In practice, patients who experience or have the potential to experience toxicity brought about by too many drugs are a common problem encountered. The value of pharmacokinetic monitoring and dosage adjustment cannot be overemphasized in correcting or preventing this DRP.

2.3.2.5 ADVERSE DRUG REACTIONS (ADRs)

An adverse drug reaction can be defined simply as an action of a drug, which is in effect noxious or annoying and which results in an unintended side for the patient. ADRs can be minor annoyances or life threatening, even to the point leading to death of the patient (Fincham, 1991). However, in this study the terms 'ADRs' and 'side effects' will be used interchangeably.

2.3.2.5.1 Characteristics of an adverse drug reaction

- It is adverse – noxious, untoward, or pathological.
- It is unintended and not a goal of treatment.
- It results from the administration of a normal dosage of a legally available drug
- prescribed for an appropriate medical indication.
- It is not mild or trivial in degree.

2.3.2.5.2 General types of adverse drug reactions

Three general types of ADRs have been identified as follows:

(1) Side effects, which occur quite predictably (e.g. constipation is often a side effect of morphine given to control severe pain);

(2) Hypersensitivity or allergic reactions, which occur only in persons allergic to a particular drug and which may be mild (e.g. itching of the skin), very severe (anaphylactic reaction), or even fatal;

(3) Toxic reactions, which usually result from drug overdose or poisoning, but may occur in the elderly because of increased sensitivity to a normal dose due to diminished kidney function, decreased body water, or other biological changes in accompanying age.

Rawlins has categorized adverse events as type A or type B (Rawlins, 1981). Type A reactions are consistent with the pharmacological actions of the drug, occur commonly, are usually dose-dependent and are predictable. Type B reactions represent allergic and idiosyncratic reactions that are independent of drug pharmacology. These are rare, not dose-related, and cannot be predicted. Only those that are idiosyncratic should cause the patient and pharmacist significant problems. Through the introduction of a unique knowledge the pharmacist can, at the very least, minimize the consequences of ADRs, and at best, eliminate them through effective therapeutic monitoring. It should be emphasized that when a particular ADR is unavoidable, as in the case of many antihypertensives drugs where at least a minor adverse reaction or inconvenience is to be expected, or with oral contraceptives where fluid retention is frequently experienced, patient preferences and the burdens-to-benefits calculation should be considered an essential part of clinical decision making.

This is particularly important when there is some degree of "trade-off" involved and a patient may have to select discomfort or inconvenience from a range of possibilities (Strand *et al.*, 1990).

.3.2.5.3 Adverse Drug Reactions in the Elderly

Although drugs in general are remarkably nontoxic, the elderly are more likely to suffer adverse drug reactions than are patients under 65 years of age. Elderly patient's susceptibility to ADRs may be enhanced due to:

- Biological changes with aging affect the individual's response to drugs: reduced protein binding, reduced biotransformation, diminished renal elimination, changes in receptor density or affinity, diminished receptor adaptability, and/or the aging process itself (Merck Manual, 1992 ; Roberts and Turner, 1988);
- The burden of chronic illness, multiple disorders and severe morbidity (Gurwitz, 1991; Nolan and O'Malley, 1988) results in multiple drug therapies, particularly in hospitals and nursing homes;
- Psychological and social factors (e.g. depression, social isolation) affecting use of and response to drugs may make the elderly more prone to medication errors than are younger patients (Lipton and Lee, 1988).

Although older patients are not considered to be at greater risk of non dose-related (idiosyncratic) adverse effects, there are notable exceptions; for instance, older patients are at greater risk of antibiotic-associated colitis (Hudson and Boyter, 1997).

ADRs are more likely to occur in the elderly not only because of the elderly patients altered response to drugs but also because of reduction in the efficiency of the homeostatic mechanisms of the body. For example, impaired baroceptor function makes the elderly more liable to drug-induced postural hypotension, while the reduced capacity of temperature-regulating mechanisms may result in drug-induced hypothermia. Other areas of homeostatic function may also be impaired with aging and create a greater likelihood of adverse drug reactions. It is difficult to detect adverse drug reactions in the elderly because many common symptoms associated with chronic illness and functional disability in old age can be drug induced.

2.3.2.5 Classes of drugs associated with efficacy and safety problems in the elderly

Although a wide variety of drugs may cause adverse reactions, the following groups of drugs, commonly used in the elderly, are associated with safety and efficacy problems and must be used with special caution: antihypertensives, cardiac glycosides, diuretics, alpha-blockers, oral anticoagulants, antiparkinsonian drugs, antidepressants, psychotropic agents, neuroleptics, NSAIDs, analgesics and laxatives. (Narcotics, morphine and analgesics with potential for dependence are also included). Antibiotics, because of their widespread overuse, are also likely to present problems in the elderly.

The following are some of the classes of drugs associated with adverse effects in the elderly.

- ***Antihypertensives***

The most commonly used antihypertensives in geriatrics are the angiotensin Converting Enzyme (ACE) inhibitors and the calcium channel blockers.

The ***ACE inhibitor*** group of drugs can cause an exaggerated hypotensive effect with the first few doses resulting in dizziness and fainting. In the elderly patient, the treatment should be started with low doses to avoid falls following dizziness after dosing. ACE inhibitors can cause hyperkalaemia and this occurs mainly in patients with severe renal failure, sodium depletion, or if they are concurrently taking potassium supplements, potassium-sparing diuretics, or non-steriodal anti-inflammatory agents (NSAIDs). ACE inhibitors can cause accumulation of bradykinin and this has been associated with the side effect of angio-oedema, which can result in the obstruction, and closing of the airways. Cough may be tolerated in some patients but in some elderly patients with co-existing respiratory problem, it may necessitate a change to another group of antihypertensive drugs. ACE inhibitors have no effect on glucose or lipid metabolism and as a group appears less likely to cause depression or reduced alertness (SAMF, 1997; Scott, 1997).

Calcium channel blockers are generally well tolerated and are useful when other conditions such as angina and arrhythmia co-exist. Agents such as diltiazem and verapamil which have cardiac effect are more likely to slow the heart rate and more likely to precipitate congestive heart failure and bradyarrhythmias in susceptible patients. All calcium channel blockers can cause constipation although verapamil appears to be the worst culprit. In the elderly patient where gut motility is already reduced, this may cause problems. The simultaneous administration of nifedipine, diltiazem or verapamil can reduce the clearance of digoxin and increase the plasma digoxin levels. This can precipitate digoxin toxicity, which can result in serious arrhythmia. Patients on this combination need to be checked for symptoms of digoxin overdosage and have digoxin levels carefully monitored, especially in the first six weeks of treatment. An early sign of digoxin toxicity is nausea and this symptom should be used as an alert in all patients taking cardiac glycosides. Any worsening signs of heart failure including fatigue, difficulty in breathing, wheezing, or a heart rate slower than 50 beats per minute should be referred immediately to the patient's general practitioner. The cardiac glycoside dose should be reduced taking account of the plasma digoxin concentration (Scott, 1997).

- ***Cardiac glycosides***

Digitalis is one of those agents that have a narrow therapeutic index and this should always be borne in mind. The serum levels should be monitored but even this is no guarantee that the drug is not causing the problem. The symptoms of toxicity may be atypical but may include amongst others confusion, bad dreams, hallucinations, nervousness, fatigue, loss of appetite, and visual disturbances (Merck Manual, 1992).

- ***Diuretics***

Both thiazides and loop diuretics when given alone can cause hypokalaemia, which may result in cardiac arrhythmia, especially in patients taking digoxin concurrently. On the other hand, patients whose serum potassium levels remain normal during diuretic therapy may develop hyperkalaemia and this can cause serious arrhythmia.

Elderly patients tend to have a tendency to develop hyperkalaemia because of reduction in the activity of aldosterone, which in part controls potassium excretion (Merck Manual, 1992;).

Patients beginning on diuretic therapy should be monitored with potassium levels being determined before starting therapy, then monthly for several months, and then at extended periods thereafter. The elderly patient who is at risk should be monitored for signs of hypokalaemia including confusion, disorientation, mood changes, thirst, muscle cramps, muscle weakness, and fatigue. Mild increases in blood sugar can occur with the thiazide and loop diuretics two to four weeks after initiation of therapy. This may cause problems in the diabetic patient and this should be monitored. The use of diuretic agents has also been associated with an increase in uric acid levels (SAMF, 1997). This may only present a problem in those patients who have raised uric acid levels or a family history of gout as the use of diuretics in this group can precipitate a gout attack. There is a high incidence of bladder dysfunction in the elderly patient, this can be exacerbated by the use of diuretics and this could lead to non-compliance.

Metalozone as with all diuretics may lead to an increase in blood uric acid levels. This may precipitate attacks of gout. In the event, treatment with diuretic should be stopped. Special precaution is advised for use in patients with gout (MDR, 1999).

- ***Alpha-blockers***

Alpha-blockers such as terazosin and doxazosin are used for the treatment of benign prostatic hypertrophy. Therefore, these agents have a tendency to cause postural hypotension with dizziness and fainting (SAMF, 1997). This occurs at the onset of therapy or with increased dosing. It may result in possible falls in the elderly with risk of fracture. Where patients have been taken off the drug for more than three days, reintroduction should be carefully monitored using lower doses than usual.

- ***Oral anticoagulants***

The elderly patients usually require a reduced dosage of warfarin as they have decreased binding of warfarin. Drugs such as aspirin, amiodorone and NSAIDs can alter warfarin levels and dosages should be adjusted accordingly.

- ***Antidepressants***

The use of tricyclic antidepressants in the elderly is not recommended because of the anti-cholinergic side effects. Dry mouth, confusion, sedation, postural hypotension, visual inacuity and urinary retention, particularly in males, are reason enough to preclude the use. A very similar spectrum of problems can occur with the classical antihistamines.

The newer selective serotonin re-uptake inhibitors (SSRIs) are better tolerated although they can cause effects such as hyponatraemia and gastro-intestinal disturbances. Nausea is often reported, while side effects include headache, insomnia, and anxiety.

- ***Psychotropic agents***

Psychotropic medications in the elderly should be used with caution. The use of benzodiazepines as hypnotic may be useful in the short term but rebound or withdrawal effects may occur. The short to intermediate acting benzodiazepines is preferred and these should be used at the lowest possible dose. The use of hypnotic in the elderly is associated with falls, confusion, dementia, amnesia, paradoxical ataxia, agitation, hallucinations and nightmares.

- ***Neuroleptics***

The traditional doses of the neuroleptic agents used in the elderly patient may be too high and should be reduced. With haloperidol, for example, doses as low as 0.5 mg may be effective in some patients. Phenothiazines are excreted via the hepatic system and this is reduced in the elderly. Parkinsonlan side effects (rigidity, dystonias, and tremors) are more frequently seen in the elderly. These agents can cause postural hypotension due to the alpha-blocking effect and this can cause problems such as falls. Anti-psychotic drugs such as thioridazine commonly cause anti-cholinergic side effects including dry mouth, confusion, urinary retention, as well as sedation and orthostasis (Merck Maual, 1992; SAMF, 1997).

- ***Non-steriodal anti-inflammatory drugs (NSAIDs)***

Non-steriodal anti-inflammatory agents are frequently prescribed in the elderly and are potentially very problematic, via a variety of mechanisms. The elderly are more susceptible to the adverse effects, which can be divided into gastric, cardiac and renal effects as well as CNS effects.

-*Gastrointestinal repercussions* to NSAIDs are common: dyspepsia, which may progress to frank peptic ulcer and they also markedly, worsens reflux oesophagitis. Gastric or intestinal bleeding or ulcerations/perforations can occur at any time during treatment, with or without warning symptoms or a previous history. The risk of gastric bleeding and perforation is increased in the elderly and they must receive close monitoring. Dosage may have to be reduced in the elderly and it is recommended that the lowest effective dosage be used in elderly patients.

-The control of *CVS disorders* is upset, particularly in patients with CCF, hypertension, angina, or poor renal function.

-*Renal adverse effects* include hyperkalaemia, hypertension, and resistance to the hypertensive effect of diuretics, interstitial nephritis, acute tubular nephrosis, nephrotic syndrome, papillary necrosis, and vasculitis. Patients with congestive heart failure, cirrhosis, diuretic-induced volume depletion, or renal insufficiency require local synthesis of vasodilating prostaglandins to maintain renal perfusion, and therefore these patients are at greater risk of developing renal dysfunction due to NSAID-induced inhibition of renal prostaglandin synthesis (MDR, 1999 ; Sause, 1996).

-The *CNS is* also much at risk: confusion, lethargy, even frank psychosis (especially Indomethacin) is not uncommon problems.

Further education and rationalising the prescription of NSAIDs to elderly patients is an important public health target for primary care drug therapy (Mallet, 1996).

- ***Analgesics***

Large proportions of analgesics are purchased as over-the-counter items and the prescriber or dispenser has no knowledge of this. The most common analgesic is paracetamol, which is generally well tolerated by geriatrics. However, patients should be cautioned against combining paracetamol with other analgesic products that contain paracetamol as well. Codeine is the narcotic used in combinations with aspirin e.g. Codis® and paracetamol e.g. Syndol®.

- ***Laxatives***

The use of laxatives should only be considered necessary when the non-pharmacological measures such as hydration, exercise and dietary fibre have not improved the condition. The choice of laxative should depend on the safety, efficacy, and cost. Preparations containing Psyllium may be recommended. Such bulk laxatives may be unpalatable and difficult for the patient to take. They need to be taken with adequate amounts of fluid and may cause bloating and flatulence. Lactulose appears to be safe in long term use and is an agent of choice for elderly patients. The only common adverse effects are bloating and flatulence. If these laxatives are unsuccessful, bisacodyl or coloxyl and senna may be added. Glycerin suppositories are useful for those patients that have problems with straining (Scott, 1997).

A summary of the drugs regularly detected as causing adverse reactions in the elderly appears in the 'Prescribing guidelines for geriatrics' (Appendix 4).

Drug-induced admissions to the hospital have also been found among the elderly who use the anticoagulant warfarin, the cardiac drug digoxin, the diuretics furosemide and hydrochlorthiazide, the anticancer drug vincristine, the corticosteriod prednisone, and aspirin. Serious adverse reactions may occur when:

- a drug is used frequently (e.g., hydrochlorthiazide and the nonsteriodal anti-inflammatory drugs, including aspirin);
- the balance between a toxic and a therapeutic dose is narrow (e.g. digoxin);
- or when the drug is toxic even at doses required to produce clinical benefits (e.g. many anticancer drugs).

Other drugs causing severe or unusual side effects, such as barbiturates and the anti-inflammatory drug phenylbutazone, should also be avoided (World Health Organisation, 1985).

The incidence of ADRs increases exponentially with increases in the number of drugs taken by the patient. In the elderly patient, ADRs may present with different symptoms to what they do in younger patients. A number of studies have shown that hospital admission due to ADRs increase considerably in-patients aged 60 years and over. This is likely to be associated with multiple pathology and poly-pharmacy. The elderly are also more likely to make mistakes in taking prescribed medication and may be responsible for serious complications in some patients. (Scott, 1997).

Discerning the difference between normal ageing, disease progression, and the effect of an adverse drug reaction can be challenging and frustrating. Both the co-morbidity and polypharmacy that are prevalent in geriatric medicine complicate the detection of adverse effects in the elderly. Unwanted drug effects may add to the co-morbidity of age and co-existing disease may mask the prescence of underlying drug- related clinical effects. Co-morbidity and polypharmacy therefore make detection of adverse drug effects more difficult Adverse drug reactions sometimes go unnoticed in the elderly, as the patient may presume that the reaction is merely a sign of getting older. Compounding the problem further is, the tendency to overprescribe in the elderly may result in the appropriate use of one drug to treat the adverse effects of another. In practice, expedients aimed at reducing the number of prescribed medications in an elderly population can reduce the number of ADRs (Hudson and Boyter, 1997).

2.3.2.5.5 Surveillance and reporting of ADRs

Pharmacists must ensure that any suspected adverse reactions are formally reported. The day to day assessment, identification and prevention of adverse drug effects still depend on the subjective judgements and experience of each clinician. It is well known that physician's under-report adverse drug event (Rogers *et al.*, 1988). Inman (1980) has attributed this to complacency about drug safety, fear of involvement in litigation, guilt due to patient harm, difference about reporting mere suspicions, and lethargy.

2.3.2.6 DRUG INTERACTIONS

These drug interactions may be drug-drug, drug-food, drug-laboratory, drug-disease, drug-age and drug-alcohol interactions.

Indeed, the possibility of a patient experiencing an adverse event resulting from physical/chemical interaction between a particular drug and food consumed is always present. For example, milk will inhibit the absorption of oral iron preparations. Food can delay, decrease or enhance the absorption of a drug, and can affect the bioavailability, metabolism and excretion. The elderly are at a greater risk of drug-food interactions because there are often changes in food and fluid intake with old age. Laboratory tests administered for further diagnosis and monitoring are also possible causes of interactions with drugs. Ascorbic acid, beta-lactam antibiotics, levodopa, and salicylates have all been well documented to interfere with urine glucose testing, thereby interfering with collection of valid patient data. In addition, enzymatic inhibition or induction often changes the characteristics of a drug's absorption, distribution, metabolism, and/or elimination. Enzyme inducers such as carbamazepine and rifampicin potentiate the hepatic metabolism of warfarin. In most patients, the drug interaction results in the inhibition of the hypoprothrombinemic response and a lowering of the prothrombin time. Displacement of a drug from protein binding sites may result in an interactive problem requiring attention. For example, high doses of salicylates may displace first-generation oral hypoglycemic agents from protein binding sites and may potentiate hypoglycemia in a patient

Drug-drug interactions are the most common of the interactions and there are many circumstances in which this type of DRP is found (Lipton and Lee 1988). Although adverse drug reactions may occur with a single drug, they may also occur as a result of drug-drug interactions. Elderly patients are at greater risk for drug-drug interactions because they often have more than one chronic condition and thus take multiple drugs. They may also be using prescription and nonprescription drugs simultaneously. The drugs that are most likely to produce clinically significant drug-drug interactions include anticoagulants, cardiac drugs (e.g. digoxin), NSAIDs, alcohol and the drugs affecting liver microsomal enzymes e.g. phenytoin (anticonvulsant), cimetidine (histamine antagonist) and erythromycin (antibiotic) (Merck Manual, 1992; Stockley, 1996).

2.3.2.6.1 Clinical characteristics of drug-drug interactions

The clinical characteristics of drug-drug interactions and may be summarised as follows:

- Drug-drug reactions exhibit high interpatient variability.
- They are difficult to detect.
- They seldom represent a contraindication to continued use but might require adjustments in the dosage or dosage timing.
- Most such interactions are dose related.
- The adverse effects are seldom immediate.
- They may be caused because individual drugs within a drug class may not interact in a homogeneous manner with other drugs.

2.3.2.6.2 Drug-drug interactions of clinical significance

A table of drug-drug interactions causing a clinical effect appears in the 'Prescribing guidelines for geriatrics' (Appendix 4). Some of the clinically significant drug-drug interactions will be discussed next:

- **Digoxin**

The simultaneous administration of nifedipine, diltiazem or verapamil and digoxin can lead to reduced digoxin clearance and hence an increase in the plasma digoxin levels. The patient should therefore be checked for symptoms of digoxin overdose as a precaution and, if necessary, the glycoside dose should be reduced taking account of the plasma digoxin concentration (SAMF, 1997).

- **Theophylline**

- An increased plasma theophylline concentration occurs with the simultaneous administration of cimetidine, allopurinol, propranolol, nifedipine, ranitidine and verapamil.
- A decreased plasma theophylline concentration occurs with carbamazepine, felodipine, phenobarbital, phenytoin and rifampicin.
- Theophylline, which is a Xanthine, may potentiate hypokalaemia resulting from

concomitant treatment with β_2 agonists, steroids or diuretics. Particular caution is advised in severe asthma. It is recommended that serum potassium levels be monitored in such cases.

- Theophylline should be used with caution in patients with peptic ulceration; hyperthyroidism, hypertension, cardiac arrhythmias or other cardiovascular diseases as these conditions may be exacerbated (MDR, 1999; SAMF, 1997).

- **Diuretics**

- *Hydrochlorthiazide* interacts with alcohol, barbiturates, and narcotics aggravating orthostatic hypotension. It also potentiates action of other antihypertensives; possible dose adjustment of antidiabetic agents may be required. Electrolyte depletion especially hypokalemia occurs with corticosteriods. Hydrochlorthiazide also interacts with NSAIDs causing possibly reduced diuretic, natriuretic and antihypertensive effect.
- *Spironolactone* should not be given in renal insufficiency, rapidly progressing impairment of renal function, anuria or hyperkalaemia. Administration is not recommended in the prescence of raised serum potassium and the concomitant use of triamterene or amiloride (potassium sparing) should be avoided as hyperkalemia may be induced. The use of potassium supplements is also not recommended for the same reason except in cases of initial potassium depletion (Merck Manual, 1992; MDR, 1999).

- **NSAIDs**

Most of the drug interactions between NSAIDs and other drugs are primarily pharmacokinetic in nature since changes are produced in the rate or extent of absorption, the characteristics of distribution or the rate of elimination of at least one of the interacting drugs. However, it is the pharmacodynamic results, which have more importance in the clinical context. Such interactions produce changes in the relationship between the magnitude of response to the drug affected and concentration at the receptor site (Sause, 1996).

Tables on pharmacological drug-drug interaction cases and drug interactions of moderate clinical significance appear in the 'Prescribing guidelines for geriatrics' (Appendix 4).

2.3.4.6.3 Drug- alcohol interaction

Elderly patients are more susceptible to the effects of alcohol because with ageing, there is a decrease in lean body mass, an increase in body fat, and a reduction in total body water. Alcohol, being water soluble, is distributed in total body water. With a smaller volume of distribution, a higher blood alcohol concentration is likely in an older individual (Haddad and Wegner, 1999).

When alcohol and drugs are taken together, numerous interactions can occur between the two, resulting in increases or decreases in the effect of either agent. Alcohol intake by the elderly may complicate the use of both prescription and nonprescription drugs. Several problems may arise: the synergistic effect of alcohol and drugs, increased adverse drug reactions due to drug-alcohol interaction, and the well-documented effect of alcohol on drug metabolism. Synergistic effects with alcohol are found most commonly with depressants drugs, such as sedatives, tranquilizers and narcotic analgesics (Lipton and Lee, 1988).
Reactive pharmacist intervention is required when a potential drug interaction is identified between prescribed and/or non-prescribed medicines.

2.3.2.7 PATIENT NOT RECEIVING THE PRESCRIBED DRUG

Patients do not receive the intended drug for a number of reasons, those within the patient's control and those outside of it. Non-compliance with a drug regimen occurs for reasons that fall into both of these categories depending upon the nature of the cause. Poverty, beyond the individual's control, often precludes compliance. Not taking the drug for reasons such as indolence or apathy are within the patient's control. In all cases, the pharmacist must work to understand the cause so that behaviour may be changed to achieve the desired pharmacotherapeutic outcome.

A drug distribution or administration system that fails the patient will precipitate this category of DRP. For example, if the wrong drug is dispensed; if a health practitioner (or other caregiver) fails to administer the drug; or if a technical device such as an insulin pump is not functioning, then the patient will not receive the correct drug.

In addition, there may be formulation problems with the drug product itself that do not allow the active ingredient to be absorbed or metabolised by the patient. For instance, chlorazepate must be hydrolyzed in an acidic media to yield the active diazepam derivative, *N* – desmethyldiazepam. Patients with conditions resulting in elevated gastric pH may experience therapeutic failure due to an inability to convert chlorazepate to its active form.

2.3.2.8 NO VALID MEDICAL INDICATION

The category tends to be far too frequently overlooked as a DRP. This is possibly because self-treatment, substance abuse, and the like are major factors in defining the situation. Tobacco, alcohol, and coffee consumption, for example, can and do lead to this type of problem. Narcotic abuse is, of course, the extreme form of drug misadventure with no legitimate medical indication, although the patient may very well insist that the drug abuse is a valid solution to a pain problem.

A significant cause of this type of DRP is unnecessary drug therapy. One common example is the concurrent use of antiparkinson drugs with antipsychotics without documented extrapyramidal symptoms experienced by the patient (Strand *et al.*, 1990).

2.3.3 NUTRITIONAL DRUG-RELATED PROBLEMS

These are problems caused by drugs affecting the patient's nutritional status. These DRPs include weight loss, weight gain, chronic infection, anemia, tetracyclines with calcium-containing foods and inability or unwillingness to eat or a poor appetite. Poor nutrition and/or long term usage of certain medicines may result in vitamin and mineral deficiencies in the elderly. The patient may be advised that, in most cases, a normal balanced vitamin and mineral preparation is adequate. Fat-soluble vitamins must be taken with caution.

Most geriatric patients have more than one drug-related problem, some quite simple and straightforward and some complex and time-consuming. Recognition and identification of drug-related problems require comprehensive information, careful observation, unbiased judgement and collaboration with the patient/family, physician, nurse, pharmacist, social worker and other care providers. It is also a process where temporal occurrence of events and their relationships must be carefully monitored and examined (Tesfa, 1989).

2.4 POLYPHARMACY IN THE ELDERLY

Polypharmacy refers to the use of too many medicines by an individual at any one time. It is the unnecessary, incorrect, or excessive use of medication.

2.4.1 Factors contributing to polypharmacy

- **Patient related factors**

Advancing age; polypathologies; poly-diseases; poly-susceptibilities; multiple symptoms; OTC remedies - many polycomponent; poor nutrition; poor organ function; forgetfulness; loss of lean body mass; unsteadiness; subliminal dysfunctions - especially psychoneurological; poverty; disablement; neglect; hypochondriasis; and many more factors may contribute to polypharmacy. Thus, largely, but by no means entirely due to their often chronic polypathologies, we find the elderly receiving a grossly disproportionate excess of medications. The bottom line is that the risk of adverse events increases dramatically with the number of drugs administered.

- **Medicament related factors**

Medicament-related risks include: poly-drugs, especially polycomponent; dose too large, and too often; the medication may be entirely inappropriate; but even if appropriate it may also be dementing, constipating, urine-retaining, mineral losing, diabetogenic, psychoneurologically decompensating, sodium and water retaining, broncho-constricting, allergenic, etc. These side effects may then be treated. The Medical Model influence healthcare providers to regard every sign or symptom of a disease as a medical problem to be controlled or cured - usually with medications. Healthcare providers believe not only that "there is a pill for every ill," but that "every ill deserves a pill!" (Mallet, 1996). Thus, poly-pharmacy in the care of the elderly continues to increase.

Poly-pharmacy is also due to copious prescribing, multiple prescribers, lack of a primary provider to coordinate drug therapy, the use of multiple pharmacies, drug regimen changes, hoarding of medications, and self-treatment. OTC medications are full of potential problems and surprises. Users do not regard many as medicines, so that unless specific enquiry is made, it may seem that there are no OTC's in use. Many of the OTC medicines are also poly-constituent. Too many medications means more medications to treat adverse effects, which give more adverse effects, and a vicious cycle is so easily established (Mallet, 1996).

Pressures for increased drug use in the elderly will continue to mount with improved diagnosis of disease and marketing of drugs to treat symptoms and diseases. Although many authors condemn multiple drug use in the elderly, more and more recommendations for preventive drug therapy are published. Calcium and estrogen have been recommended for prevention of osteoporosis, hypercholesterolemic agents have been suggested to prevent coronary artery disease in a large percentage of the elderly, and daily aspirin therapy to prevent myocardial infarcts has been suggested for a large segment of the population.

If one considers the prevalence of potentially treatable disease in the elderly, it can be concluded that multiple drug therapy will be the rule, not an exception. Although pressures to increase drug use in the elderly will continue to rise, several factors may mitigate against multiple drug use in this population. These factors include:

- the development of drugs with more precise mechanisms of action,
- increased education for physicians who prescribe for the elderly people, and
- development of computer software to assist in selection of more appropriate drugs and to screen for drug-disease and drug-drug interactions.

Currently few available drugs have precise and specific mechanisms of action. Amitriptyline is useful for alleviating depression in the elderly but it has anti-cholinergic, arrhythmogenic, and alpha-adrenergic blocking effects that may aggravate diseases commonly present in this age group (Merck Manual, 1992). Drugs likely will be developed in the future with more precise actions and fewer adverse effects. New drugs will be marketed that can cause a specific receptor to control illness rather than affecting multiple receptor types throughout the body.

In the past, two or three drugs were often necessary to effectively treat hypertension, congestive heart failure, or peptic ulcer disease but in the future more potent drugs will be available. This will allow physicians to prescribe one drug to treat a disease that required multiple drug therapy a decade ago. For example, ten years ago patients with peptic ulcer disease would be treated with multiple daily doses of antacids and anticholinergics, but today single-drug therapy with histamine^2-receptor blocking drugs may be sufficient.

Greater emphasis on geriatric education has already occurred in medical curricula and even more emphasis is needed for the future. Increased education is needed to prepare physicians to deal with special psychosocial needs of the elderly and to assess the benefit-to-risk ratio of drug therapy. Physicians need to be aware of the multiple disease states present in older people and the problems resulting from polypharmacy. Current prescribing practices of a "pill for every ill" need to be modified to a careful assessment of the potential benefits of prescribing a medication with the possible adverse effects (Mallet, 1996). A greater reliance of non-drug therapies such as diet modification, exercise, and counseling will be needed to decrease the problem of multiple drug use in the elderly.

Elderly people should also be educated about the benefits and risks of prescribed and nonprescribed medication. Patients often state that they take many medications because doctors prescribed them, whereas physicians state they prescribe many drugs because patients demand them. Education should be directed at patients who consume drugs and physicians who prescribe them.

Physicians cannot be expected to remember the adverse effects, drug-drug, drug-disease, and drug-diet interactions of hundreds of drugs used by elderly patients. However, this information can be readily categorized and stored in a computer and used to aid physicians in their attempt to prescribe safer, more effective, and less costly drugs for the elderly. Pharmacists who monitor drug therapy of elderly patients can also use computers. Implementing these types of software programs in physicians' offices and in pharmacies would have a major impact on identifying therapeutic duplication and antagonism and reducing the number of medications used by older people. Computer software development to perform the above functions should be a high priority of federal agencies concerned with geriatric care.

The trend of multiple drugs usage will likely increase in the future as a result of an increasing burden of chronic disease and success of researchers who develop new drugs. Increased educational efforts concerning the hazards of multiple drug therapy should be directed to physicians who prescribe drugs for the elderly and to consumers who use drugs. A high priority should be placed on the development of computer systems to aid physicians in prescribing more appropriately for older people and to aid pharmacists who monitor drug therapy of their patients (Stewart, 1990).

Often, the result is that similar compounds are used simultaneously, for example two or more benzodiazepines or antipsychotics: or drugs with similar properties are used concurrently, for example a number of drugs with anti-cholinergic properties. Polypharmacy increases the risk of prescribing errors and needs to be addressed (Burgess, 1997). Studies have shown that on average elderly people took three to four different medications (both prescribed and OTC) (FIP Lisbon Congress, 1994).

2.4.2 Dangers of Polypharmacy

Polypharmacy can take many forms. The problem can involve misuse of nonprescription drugs, of prescription drugs, or both. Polypharmacy can be defined so that it can apply to specific problems:

- Use of medications that have no apparent indication (e.g. prolonged and/or irregular use of sedative–hypnotics for insomnia even though these drugs are frequently ineffective and can potentially exacerbate the insomnia).
- Use of duplicate medications i.e. simultaneous use of different brand-name drugs with similar or identical pharmacological effects (e.g., use of two different sedative-hypnotic prescribed by two different physicians, producing oversedation, or a "hangover" effect).
- Concurrent use of drugs that can result in a drug interaction (e.g., use of antacids with digoxin, thus decreasing absorption of digoxin, use of diuretics with digoxin, causing hypokalemia or low potassium which, if untreated, leads to digoxin toxicity) (SAMF, 1997).

- Use of contraindicated drugs i.e. prescribing of medications that are inappropriate for a particular condition (e.g. use of a beta-blocker such as propranolol for patients with heart failure, which can worsen the condition; use of anticoagulants in patients with active peptic ulcer disease).
- Use of inappropriate dosages (e.g., excessive doses of the more potent diuretics, which can produce postural hypotension and precipitate falls in the elderly).
- Use of drugs to treat adverse drug reactions, thus exacerbating the polypharmacy spiral (e.g., use of levodopa to treat Parkinson's-like side effects produced by major tranquilizers) (Lipton and Lee, 1988).

Multiple drug use in the elderly results in iatrogenic illness, drug-drug interactions, and decreased medication compliance. Although warnings concerning the use of multiple medications in the elderly are sounded frequently, pressures to prescribe even more drugs will continue in the future. This is expected because research will enhance the physician's ability to identify diseases in the elderly and expand the physician's armamentarium of therapeutic modalities. A constant concerted effort by physicians and other health care professionals caring for the elderly will be essential to restrict the number of medications prescribed. It will be necessary to develop medications with more precise mechanisms of action, consider whether a drug is necessary and employ more careful assessment of benefit-to-risk ratios when prescribing drugs in order to partly offset the increased use of medication in the elderly.

Four of every five elderly people have at least one chronic illness (Stewart, 1990). In the future new advances in diagnostic techniques will enhance our abilities to identify disease in the elderly. Disease that would have gone unrecognized several years ago could now be detected through innovative diagnostic techniques such as magnetic resonance imaging, position emission tomography, radioimmunoassay, and monoclonal antibody labeling. In the future, the percentage of elderly people with diagnosed illness will increase and physicians will feel impelled to treat many of those chronic conditions with medication.

In 1965, clinicians treating patients with hypertension had only a limited supply of

drugs, such as reserpine, hydralazine, and guanethidine at their disposal to treat this condition. Today there is an impressive array of agents available to control hypertension such as diuretics, beta-blockers, calcium-channel blockers, adrenergic blockers, and angiotensin-converting enzyme inhibitors (SAMF, 1997). In addition, there are many other drugs awaiting approval by the Food and Drug Administration, of the USA. Twenty-five years ago there was no effective treatment for Parkinson's disease; today we have levodopa, amantadine and bromocriptine, which are useful for controlling this condition. Many similar examples could be cited (Stewart, 1990).
Thus the number of drugs used would be likely to increase because of an increase in the number of diseases, better diagnostic skills, improved health screening and better drug development. On the other hand, drug use would decrease because of the introduction of "better" drugs, more preventative therapy, better computing technology to prevent duplication of medication, along with education and monitoring by pharmacists. Health professionals need to appreciate that "life is a terminal condition" and those in our care, need to accept the inevitabilities of advancing years with wisdom and compassion, rather than with inappropriate medications and technologies (Mallet, 1996).

Pharmacists take a drug history related to the diagnosis and are cautious if a patient indicated that all drugs they had tried had failed. Non-drug alternatives should be considered and drugs to treat ADRs should be avoided. Using a drug that could treat more than one disease and avoiding multiple ingredient preparations should be considered. Use of single daily dosage regimens and limiting the use of "as required" medications could also be advised (FIP Lisbon Congress, 1994).

A focused systematic intervention by the primary care physician can often remedy the problem of polypharmacy in older patients. Such an approach includes medication disclosure, drug identification, side effect recognition, treatment review, and a thoughtful, well-monitored reduction in the numbers and doses of medicines. By developing skillful prescribing habits, the physician can resolve drug side effects, prevent future adverse reactions, reduce pharmacy expenditures, and improve medication compliance. The poly-pharmacy situation in the management of elderly patients is gloomy, but it can be vastly improved through prudent prescribing.

Guidelines to simplify a drug regimen appears in the 'Prescribing guidelines for geriatrics' (Appendix 4).

Multiple disease states frequently require additional medication. This can generally be monitored by the prescriber and the pharmacist, but the situation is complicated when the patient buys or is given non-prescription medication for minor ailments, or when the patient attends hospital out-patient clinics as well as seeing his or her doctor. One solution to the problem is to educate the patient or a caregiver about the importance of maintaining a medication record card, which the patient should show to the health care worker at every visit (Osman, 1996).

2.5 NONCOMPLIANCE IN THE ELDERLY

Noncompliance is the inability or unwillingness of a patient to take medication correctly and is highest among the elderly. Poor compliance is one of the most common causes of non-response to medication and may result in increased number of drugs per patient, unnecessarily high doses, increased hospitalisation costs and increased morbidity and mortality. Improved compliance ensures optimal drug therapy substantially reduces the total cost of healthcare.

In particular, the elderly are more likely to develop chronic diseases and hence require long-term therapy. According to Miot, the rate of noncompliance in the general population for long-term therapy is approximately 50% after one year, which has been shown to deteriorate even further over time. Noncompliance rates in the elderly vary from 40% to as high as 75%. The factors causing noncompliance in the elderly are varied and range from socioeconomic to physical (Miot, 1998).

2.5.1 Factors relating to Noncompliance in the Elderly

- **Cognitive decline**

As one age, one's memory and mental ability may deteriorate, depression may manifest as apathy and confusion may occur, sometimes because of physical conditions and other times due to medication.

- **Physical disability**

Diminished strength affects compliance in the elderly. Sometimes people find medication labels difficult to read. Poor vision may result in mistakes when trying to read tiny print. Others, knowing that they will not be able to read the label, may rely on their memories or common sense when deciding on doses and dosage intervals. Lack of manual dexterity, particularly when due to arthritis, may make it too difficult for elderly patients to open containers particularly child resistant ones or to break tablets in half. This may result in the patient leaving the cap off the container or removing the medicine from the original packaging, both of which compromise the stability of the medication. Dysphagia may also affect compliance. Signs of problems with swallowing that the pharmacist should be made aware of include:

-Breaking enteric coated or slow-release preparations;

-Opening of capsules to swallow only the contents;

-Spacing a stat dose of a number of tablets (e.g. prednisone);

-Swallowing tablets with beverages or other drinks;

-Choking.

These physical disabilities result in medication not being taken or being taken incorrectly (Osman, 1996; Miot, 1998).

- **Communication**

The usual barriers to communication experienced by younger people continue to exist, but are intensified by hearing and visual impairment. With impaired hearing, elderly patients may be too embarrassed to ask a pharmacist or physician to repeat instructions and thus misunderstand their drug regimens. This could be exacerbated by vague instructions such as "take as directed". Impaired vision may cause problems with matching the arrows on childproof containers, the identification of tablets and the reading of fine print labels. Larger labels with bold print may be an invaluable aid to our older patients. The elderly patient may misinterpret instructions, and take a "three times daily" dosage at each meal rather than 8-hourly, with a resultant sub-therapeutic level at night. Drawing a clock face for day and night and circling the times to take medication may be beneficial. Ensure that the patient understand the method of taking the medication, such as the correct use of effervescent tablets, sublingual tablets or suppositories (Kairuz *et al.*, 1998).

- **Complex dosage regimens**

The more complicated the drug regime, the less likely the patient is to be compliant.

- **Polypharmacy**
- **Adverse drug reactions**
- **Altered pharmacokinetics**
- **Social isolation/lack of support system**
- **Inability to read labels or instructions**
- **Diminished finances**

Lack of finances may be a stumbling block to regular and correct drug use, as the patient may not be able to afford to fill the prescription at the required time interval.

2.5.2 Strategies to improve compliance

The pharmacist plays a vital role in addressing the issues of noncompliance in the elderly. By improving compliance through careful management of these factors, the pharmacist should be able to substantially improve the health and quality of life of elderly patients. Compliance can be improved in a number of ways:

- **Written information**

Increased delivery of written communication such as patient information leaflets, package inserts and patient specific instructions has certainly increased patient's knowledge of their conditions and medicines, however it does not appear to have much impact on compliance. In addition to this, there are a large number of patients who are illiterate or are unable to understand the labels or instructions. Despite these limitations, written information still plays a role improving compliance, especially in re-inforcing verbal communication with written reminders.

- **Verbal communication**

Verbal communication in the form of face-to-face interaction is critical in improving compliance. This includes listening to the patient and understanding their needs and capabilities as well as talking to them. It is important that the patient feels that they are taking an active part in their health care. Elderly patients should be motivated and encouraged to make decisions regarding their medicine regimes according to their needs rather than just being told to take their medicines by the pharmacist. The following suggestions are important in verbal communication:

- Ensure that the patient understands and accepts the diagnosis and need for medication and taking the medicine as directed.
- Spend time explaining the need for the medication and what side effects may be expected.
- Explain to the patient what action to take if side effects are experienced.
- Tactfully explore whether the patient has the ability to remember to take the medication and ways to improve the patient's memory to take the medication.

Strategies can be used for remembering to take drugs. The pharmacist can enquire about daily routines and tie in doses accordingly.

- **Understanding changes in health in the elderly**

It is important for the pharmacist to understand the physiological changes (Section 2.1.2) that take place in the elderly and apply the appropriate management procedures. For example, digestive difficulties and intestinal upsets are a problem in the elderly and they are often exacerbated by the medication they are taking, thereby reducing compliance. The most commonly purchased OTC medications in the elderly are laxatives and analgesics/anti-inflammatories, both of which affect the gastrointestinal system. Elderly patients should be advised to take their medication with plenty of water and if necessary with food. Drinking lots of fluids also prevents constipation, which is a common problem in the elderly. Because of delayed transit time, the patient should remain upright at 5-10 minutes in order to allow the passage of the drug. For those patients on chronic medication, the dangers of discontinuing medication must be made apparent.

- **Visual aids**

For patients who are hard of hearing, the use of visual aids can also be used to re-inforce discussions on medication. An example of a visual aid might be calendar charts (daily; breakfast, lunch dinner, etc.) with each drug represented as a different colour. A common mistake is to assume that a hearing-impaired patient is also mentally impaired. If a patient, especially an elderly patient feels that they are being patronised, they are less likely to take into account what the pharmacists is saying and compliance will deteriorate.

- **Optimise Drug/Dosage Regimens**

Adverse drug reactions are often the cause of non-compliance. As patients get older, pharmacokinetic parameters such as renal clearance and hepatic function are altered resulting in increased drug concentrations. This may lead to increased side effects or require a decrease in dosage. Polypharmacy can also lead to increased incidence of adverse drug reactions and iatrogenic disease. The pharmacist is in a position of knowing which medicines the patient has been prescribed as well as which OTC medicines they are taking. Steps can be taken to ensure that side effects are kept to a minimum by correcting dosing, preventing drug interactions and simplifying drug regimens as much as possible.

* *As a rule:* Use the fewest number of drugs or drug products with the fewest number of doses per day whenever possible, to reduce the incidence of noncompliance.

- **Assessing patient capabilities**

Patients who suffer from arthritis, tremor or other motor disorder may have problems with opening containers, pouring liquids, breaking tablets, using inhalers, etc. Pharmacist should ask the patient to demonstrate that they can perform the appropriate action required, as elderly patients may be unwilling to tell that they cannot manage these tasks anymore. Dosage regimens should be structured to minimise these tasks.

The following should help the elderly with the administration of their medicines:

- Ensure that the container in which the medication is dispensed is adequately labelled with bold instructions and the reason for taking the medication, to improve patient understanding.
- Ensure that the container is not too difficult for the patient or caregiver to open as is many of the children resistant containers.
- Unit dose packaging can be used to improve the ease of taking the medication and reduce forgetfulness. Such packaging lists the day and time at which the medication in the unit dose must be taken.

- **Regular Support**

Many elderly people live alone and do not have anyone to check if they are taking their medication correctly and regularly. They may also forget which medicines to take at particular times; therefore, regular re-enforcement of medication instructions is essential in improving compliance. Patient memory aids may assist patients to remember to take their medicine (Table 2.6). In community pharmacies a monthly follow-up programme involving a phone call, reminder postcard etc) has been shown to be a useful tool in ensuring repeat prescriptions are filled for elderly patients on chronic medication. A patient's circumstances may have changed during the month; therefore, the pharmacist should always ask questions to determine that the patient is still following the same regimen.

Table 2.6 Patient memory aid

MEDICINES		MON	TUES	WED	THUR	FRI	SAT	SUN
Eltroxin	7am	✓						
Lasix	7am	✓						
	2pm	✓						
Premarin	8pm	✓						

While the elderly patient may form only a small percentage (10-15%) of the total population, they consume a far greater proportion of the overall medicine expenditure. So by improving compliance in the elderly it is possible to reduce unnecessary healthcare costs as well as improve their quality of life (Miot, 1998).

Pharmacists have an opportunity to educate patients about their condition, their medication and how to cope with both. Pharmacists and other health professionals must move from the concept of patient compliance to patient concordance, where increasing attention is placed on gaining patient participation in drug therapy and taking time to negotiate with ways of improving treatment outcomes. Patients' appreciation of the benefits as well as the risks of medication is necessary for them to take part in the decision to add or discontinue treatments (Hudson, 1997). With a combination of empathy, professional expertise and time, pharmacists may improve the compliance, bioavailability and ultimately, assist the geriatric patient to attain the best quality of life that their medication regimen can give them.

2.6 PRESCRIBING ERRORS IN THE ELDERLY

2.6.1 DELIVERY OF PRESCRIPTION PHARMACEUTICAL CARE

There is a saying that *a chain is only as strong as its weakest link*; that is true for the dispensing "chain". Errors at any point endanger public health (AphA Policy Committee on Public Affairs) (Rupp, 1988). The dispensing "chain" may be conceptualized as a sequence of interrelated, interdependent, and at least historically, interdisciplinary activities that result in the delivery of the prescription drug and appropriate drug-use information to the patient. This process would include examination and evaluation, diagnosis, prescribing, and dispensing.

Pharmacists review prescriptions for errors, possible allergic reactions, or potential adverse interactions with other prescription or over-the-counter drugs the patient may be using. The identification and correction of prescribing errors are central to the checks and balances that pharmacists perform during dispensing. Most pharmacists would agree that screening prescription orders for errors, irregularities, and inadequacies is a routine part of the dispensing process. *In practice, of course, pharmacists frequently do not conduct such reviews* (Rupp, 1988).

The problem of medication errors is both multidimensional and interdisciplinary in nature. Each of the three professions typically involved in delivering pharmaceutical care in the hospital makes its own characteristic errors (Francke, 1967). Medication errors occur in all areas of patient care, and can involve medical practitioners in prescribing, pharmacists in dispensing, nurses in administering medication or a combination of these. They can arise for simple reasons such as the illegibility of a script or for more complex reasons such as a lack of understanding of the consequences of drug combinations.

In the three decades since Franke's observations (1967) were published, hospital and other institutional providers have introduced a wide range of interdisciplinary measures intended to avoid medication errors. Hospital pharmacists have been especially active in developing strategies to monitor, identify, classify, document and ultimately avoid medication errors (Betz, 1985).

There is increasingly a wide range of medicines available to alleviate symptoms and treat diseases. While prescribers and patients welcome this alike, the potential dangers in the prescribing process increase.

2.6.2 COMMON CAUSES OF PRESCRIBING ERRORS

2.6.2.1 CARELESSNESS

Carelessness, whether by the prescriber or the dispenser, is responsible for many prescribing errors, and is one of the causes that can be addressed most easily. Occasionally the wrong drug or the wrong dose of drug is dispensed.

2.6.2.2 ILLEGIBILITY

While it seems obvious that prescribers should write scripts legibly, errors still occur because of illegible handwriting. This can result in the wrong drug being dispensed. For example the proton-pump inhibitor Losec® (omeprazole) being prescribed or dispensed instead of the loop diuretic Lasix (frusemide), probably due to a misinterpretation of handwriting or quinidine salts being prescribed in place of quinine salts. Another example discovered by Rupp (1988) included a patient suffering from angina that required isosorbide dinitrate, but was prescribed the anti-tubercular drug isoniazid in error. Also the prescribing of the tri-cyclic antidepressant clomipramine instead of the H_1-receptor antagonist chlorpheniramine. Another example where a patient could have been at risk, through a handwriting error, was the prescribing of the anti-thyroid drug carbimazole when the anti-epileptic carbamazepine was required. To overcome this problem the hospital should have a policy regarding prescribing only by generic name rather than by either the generic or trade name.

There is a risk of serious error when the same drug is prescribed generically in addition to a prescription by proprietary name. This was discovered in a survey conducted by Rupp (1992). In the first example, Univer® and Verapamil were prescribed together when a doctor switched to generic prescribing without removing the proprietary product from the patient's current record. This error could have caused severe hypotension, heart block or even accidental death through ventricular fibrillation. In the second example, Malarial® and thioridazine were co-prescribed (Rupp, 1992).

A similar problem involving legibility involves the use of decimal points (the problem of trailing zeros). For example, a prescription for warfarin 2mg daily, but written as 2.0mg daily. If the decimal point were illegible or unnoticed, the prescription would be dispensed as 20mg with resultant severe retroperitoneal haemorrhage. Problems of this sort can be easily prevented. There is no need to add a decimal point and a zero after a whole number. In this particular case the pharmacist could perhaps also be faulted in that he or she should have realized that warfarin 20mg is an unusually high dose and checked the dose with the prescriber. An added zero is, however, appropriate if placed before a decimal point, such as digoxin 0.125mg or 0.0625mg.

2.6.2.3 INADEQUATE LABELING

Prescribing errors can also result from inadequate labeling, particularly when directions for using the medicine lack specificity. For example, patients may be unsure how frequently to use a ' when required' medicine, which may result in under- or over-treatment.

2.6.2.4 INAPPROPRIATE PHYSICIAN PRESCRIBING

2.6.2.4.1 Dangers of Inappropriate Physician Prescribing

Less than optimal physician prescribing can result in hospitalization for the elderly. Drugs most frequently implicated in such admissions include anticonvulsant, antidiabetics, antihypertensives, anti-parkinsonian agents, corticosteroids, cardiovascular agents, and tranquilizers. Not all drug-related hospitalizations are preventable. Some are unavoidable reactions produced by the prescribing of necessary drugs in appropriate dosages. However, hospitalisations that result from inappropriate dosages, avoidable drug-drug interactions, or physicians' lack of awareness of the increased toxicity of many drugs in the elderly, are preventable.

In analysing research relating to drug use among hospitalised patients there was ample evidence of inappropriate prescribing:

- Use of potentially toxic drug when one with less risk of toxicity would work as well (e.g. the use of phenylbutazone in-patients with osteoarthritis or rheumatoid arthritis when other nonsteriodal anti-inflammatory drugs would be less hazardous).
- Use of the wrong drug for a given indication e.g. phenobarbital for disturbances of sleep in a patient who is a heavy drinker.
- Concurrent administration of an excessive number of drugs, which increases the possibility of interaction, effects (a special risk for the elderly, many of whom suffer from multiple chronic illnesses).
- Excessive doses, especially for elderly patients (e.g. digoxin).
- Continued use of a drug after evidence becomes available concerning major toxic or even lethal side effects (e.g. chloramphenicol).

The most serious consequence of inappropriate prescribing in hospitals is an increase in the number and severity of adverse reactions. The morbidity and mortality caused by physicians' failure to provide effective drugs for treatable diseases may be avoidable. In addition to direct medical consequences, inappropriate drug prescribing in hospitals results in major unnecessary costs. Limited healthcare resources are wasted when expensive drugs are used if less costly products would be equally effective, when unnecessary drugs are prescribed, or when medications are continued beyond pharmacological need.

Inappropriate drug prescribing is most likely to occur when physicians fail to review medication orders frequently and critically and when they are unable to keep abreast of rapid developments in pharmacology and therapeutics. Lack of communication between pharmacist and physician can further aggravate the problem. (Lipton and Lee, 1988).

The frequency with which elderly patients suffer adverse drug reactions (ADRs) has been extensively investigated and has caused considerable concern. Many reasons have been suggested for their special vulnerability; changes in pharmacokinetics and pharmacodynamics, the problems of multiple prescribing due to multiple pathology, and problems of compliance. However inappropriate prescriptions is indeed a major cause of ADRs in the elderly population (Lindley *et al.*, 1992).

Because practitioners frequently prescribe at the end of a consultation, they often do it quickly, perhaps not giving the process their full attention. Patients may feel rushed, and thus may not fully understand the basic aims of therapy or when or how they should take their medication. This may result in either under- or over-treatment. In order to minimise the risk of prescribing errors; the prescribers need to apply the same analytical principles to the choice of medicines as those applied to establishing a diagnosis in individual patients.

2.6.2.4.2 Inappropriate prescribing in elderly patients

Elderly patients receive more drugs than other sections of the population and, consequently, experience more adverse drug reactions. Prescription errors and adverse drug reactions would decrease if inappropriate drugs were not prescribed. Lindley *et al.* (1992) noted that in a sample of 416 consecutive admissions, to general medical wards and care-for-the-elderly wards, 48 patients were taking 51 drugs, which were absolutely contraindicated. About 175 unnecessary drugs were discontinued in 113 of these patients on admission to the hospital. Of those admitted because of an adverse drug reaction, 50% were due to inappropriate prescriptions.

Great care is obviously required in prescribing for elderly patients. Lists of drugs that are contraindicated in such patients should be made available to general practitioners, who are the greatest prescribers for this age group.

2.6.2.4.3 Incorrect Diagnosis

It is essential that a working diagnosis or a differential diagnosis be made before choosing a particular drug. This implies that a complete medical history, including drug history, is taken to assess whether there are any contraindications to the use of a particular group of drugs.

If an incorrect diagnosis is made then patients may very well be given incorrect treatment. An example would be the patient with asthma who wakes frequently at night with what is diagnosed as asthma, but what turns out to be reflux due to theophylline. A careful history and knowledge of an action of a drug will usually lead to the correct diagnosis.

2.6.2.4.4 Inappropriate prescribing of antibiotics

Inappropriate prescribing of antibiotics is reported frequently both in primary and secondary care. In general, these agents are over-prescribed and on occasion, particularly in hospital, the wrong choice of drug may not offer the patient any benefit. Devising adequate guidelines can be difficult, but in hospital it should be addressed by the use of formularies and in general practice a clear reason for the use of an antibiotic is required (Lipton and Lee, 1988).

2.6.2.4.5 Inappropriate Dose

The choice of a dose of a particular drug, particular in older individuals, can be difficult. There is a tendency to give one tablet daily or the lowest dose possible but this may lead to an inadequate response. Although it may be wise to start with a small dose, it is essential to assess the response at a follow-up visit. As there is variation in response to drugs (this is more marked in older individuals), titration of a drug dose and individualization of therapy is important, particularly in cases where a drug will be taken for a long period of time. The prescribers, therefore, ought to have some idea of what end-points they are going to assess response.

2.6.2.4.6 Long-term prescription

There is a tendency for long-term prescriptions, including those for anxiolytics and sedatives to remain at a set dose for many years. Other agents such as digoxin, may be started in a patient with atria fibrillation during an acute illness, and be continued although the patient has returned to sinus rhythm. Many such patients would not require prolonged treatment with digoxin.

Similarly, some patients may be treated with prolonged courses of oral corticosteroids for rather dubious reasons. The long-term risk to the patient is not inconsiderable, particularly regarding the development of osteoporosis or glucose intolerance. These latter factors should be considered very carefully, particularly in-patients with irreversible airway disease. Where long-term steroids are to be used, every effort should be made to define the benefit that should be made to define the benefit that should ensue before beginning long-term therapy. For those individuals who require long-term treatment, careful follow-up is required to determine their ongoing needs and dose of medication (Lipton and Lee, 1988).

The Royal College of Physicians (RCP) has identified the following as causes of sub-optimal prescribing in elderly patients.

2.6.2.4.7 Causes of sub-optimal prescribing in elderly patients identified by the RCP

- Inadequate clinical assessment leading to incorrect diagnosis.
- Failure to record current medication, including OTCs.
- Failure to monitor response to treatment.
- Failure to monitor response to treatment.
- Failure to document previous DRPs.
- Excessive prescribing.
- Inappropriate prescribing.
- Failure to review repeat medication.
- Failure to take account of altered pharmacokinetics and pharmacodynamics.

The following are examples of inappropriate prescribing cited by the RCP.

2.6.2.4.8 Examples of inappropriate prescribing cited by the RCP

- Phenothiazines for dizziness due to postural hypotension.
- Major tranquillisers for acute confusional states.
- Antibiotics for viral upper respiratory tract infections.
- L-dopa for non-Parkinsonian tremor.
- Antibiotics for viral upper respiratory tract infections.
- L-dopa for phenothiazine or metoclopramide induced Parkinsonism.
- Benzodiazepines for insomnia due o depression.
- Loop diuretics for dependent oedema.

(Hudson and Boyter, 1997).

2.6.2.4.8 Hospitals

Some of the prescribing errors appear to arise from inadequate training of health professionals and excessive workloads.

2.6.3 OVERCOMING PRESCRIBING ERRORS

In the prevention of geriatric drug misuse, the physician, the pharmacist and the patient each play an important role. Effective prescription drug therapy depends on rational prescribing by physicians and compliance with drug regimens by patients. Too often, one or both of these critical elements are absent in the care of the elderly. A useful distinction has been made between drug misuse involving errors made by physicians who prescribe, pharmacists who dispense, or nurses who administer prescription drugs inappropriately, and drug misuse involving overuse or underuse of medications, commonly referred to as noncompliance.

Numerous factors contribute to the problem of geriatric drug misuse. The most serious of these is inappropriate physician prescribing caused at least in part by an unsatisfactory physician-patient relationship. Like the physician, the pharmacist plays an essential role in assuring appropriate use of prescription and nonprescription drugs by the elderly. However, in the minds of many, pharmacists' activities are still limited to "counting and pouring, licking and sticking." Many health professionals and consumers are unaware of ways in which pharmacists can help ensure safe and effective drug use while simultaneously containing drug costs (Lipton and Lee, 1988).

The varying impact of different morbidity with age means that chronological age alone forms an unreliable basis for prescribing decisions. Patients should be assessed as individuals while at the same time encouraged to be involved actively in decision making about their own drug therapy. Greater involvement relies on the patient's understanding of their disease and knowledge of their drug therapy (Hudson, 1997).

Some successful interventions to overcome prescribing errors include:

- The development of treatment protocols based on consultation and consensus
- Face-to-face education
- Audit of case problems
- The use of preferred medicine lists or formularies (Burgess, 1997).

2.7 PRESCRIPTION MONITORING FOR ELDERLY PATIENTS

The presence of multiple pathologies, an ever-expanding range of medicines and increasing emphasis on preventative prescribing all contribute to elderly patients being prescribed three times more medicines than younger patients (Chrischilles, 1992). Although the elderly population are a heterogeneous group with wide variation in physical and cognitive function, a number of trends are seen: falls and cognitive impairment occur more frequently with increasing age, drug clearance decreases and the incidence and severity of adverse drug reactions increases (Walker, 1994). Up to 80 percent of elderly people receive inappropriate therapy, including overtreatment (increasing the risk of adverse drug reactions) and undertreatment (Lunn, 1997).

These simple, prescription-based monitoring techniques can be used as prompts to investigate the appropriateness of prescribing and to optimize pharmacotherapy for elderly patients in both the primary and secondary care settings. Areas of prescribing where there is evidence of suboptimal performance at present are included.

Evidence-based prescribing seeks to match drug treatments to patients with proven indications for those treatments. It encompasses both the avoidance of treatments with no proven benefit, no indication or with a contraindication, and the initiation of treatments where proven indications do exist. This has led to the concept of appropriateness of prescribing.

2.7.1 PRESCRIPTION MONITORING USING PRESCRIBING INFORMATION ALONE

Principles of appropriate prescribing applicable to patients of all ages include minimisation of therapeutic duplication, avoidance of therapeutic antagonism and provision of sufficient information on the prescription to ensure patient safety. Long acting oral hypoglycaemics are not indicated in elderly patients in view of the excess prevalence of hypoglycaemia compared with shorter acting hypoglycaemics. Other drugs e.g. methyldopa, have been suggested to be contraindicated in elderly patients. Individual patients' clinical information is required to assess appropriateness of prescribing as discussed in the following examples:

2.7.1.1 Assessing appropriateness of prescribing

- **Appropriate steroid prescription in airway obstruction**

The British Thoracic Society has recently updated guidelines for the treatment of asthma (Working party report, 1997). These emphasize the benefit of steroids in asthmatic patients using β_2 agonizes more than once daily and careful monitoring of response to steroids. Oral and inhaled steroids are associated with significant adverse effects yet are prescribed in chronic airways disease (in which the benefits of steriods are unclear) without monitoring the patient's response (Osborne, 1997). They are even prescribed to patients documented, not to improve with steroids. Using prescriptions for bronchodilators to identify elderly patients with airways obstruction, pharmacists can reduce unnecessary steroid adverse effects by ensuring the patient's response has been assessed or is being monitored objectively (e.g. peak expiratory flow rate, spirometry, walking distance) and by recommending stopping steroids in non-responders.

- **Stroke prophylaxis: Antithrombotics in atrial fibrillation**

Atrial fibrillation (AF) is a known risk factor for stroke and this risk is greater in elderly patients. Aspirin 325 mg daily and warfarin reduce the risk of stroke in AF but aspirin 75 to 150 mg has not been proven to be effective (Albers, 1994). Antithrombotics are underused in elderly patients with AF. Digoxin (and, to a lesser extent, amiodarone) prescriptions should trigger pharmacists to ascertain a diagnosis of AF, exclude contraindications to antithrombotics such as peptic ulcer, hemorrhage and clotting disorder, and to suggest antithrombotics are initiated in these patients. In addition, pharmacists should suggest that aspirin doses lower than 300mg for patients in AF are reviewed in view of the lack of evidence for effectiveness (Albers, 1994).

- **Aspirin in ischaemic heart disease**

Aspirin is recommended to reduce the risk of myocardial infarction in all patients with coronary heart disease who do not have contraindications (Anonymous, 1994). Prescriptions for nitrates, particularly glyceryl trinitrates, can be used to identify patients with ischaemic heart disease. Suggesting aspirin in the correct dose, in the absence of contraindications, such as peptic ulcer, allergy or use of another antithrombotic, is a simple way of promoting appropriate prescribing in elderly patients.

- **Angiotensin converting enzyme inhibitor with potassium-sparing diuretics or potassium supplements (ACEIK)**

It has been suggested that ACEIK co-prescription be contraindicated because of AECI potassium sparing ability. However, audit of this co-prescribing in elderly inpatients found that the potassium levels were frequently within the therapeutic range. When ACE inhibitors are initiated, potassium-sparing diuretics can usually be withdrawn and reintroduced only if hypokalemia develops.

If an ACEIK combination is prescribed, pharmacists have an important role in ensuring serum potassium levels is checked at appropriate intervals and is within the normal range. Such information is readily available to hospital pharmacists and community pharmacists can remind practitioners and nursing personnel of the need for monitoring.

- **Appropriate benzodiazepine prescribing**

Studies have suggested that benzodiazepine use in elderly patients are often unnecessary and are associated with cognitive impairment falls and hospitalization. A prescription for benzodiazepines in older patients should trigger pharmacists to assess contraindications (e.g. history of falls, confusion, and daytime drowsiness) and to suggest alternative strategies, including controlled withdrawal, in-patients in whom benzodiazepines are inappropriate.

2.7.2 PRESCRIPTION MONITORING CRITERIA

Evidence-based prescription monitoring criteria for elderly patients is listed in the 'Prescribing guidelines for geriatric patients' (Appendix 4).

2.8 MONITORING GERIATRIC DRUG THERAPY

The elderly receive more than one third of all prescribed drugs, perhaps because of multiple pathology and doctors' wishes to help. Adverse reactions are common, 66 percent being caused by drugs acting on the central nervous system and cardiovascular system. More than 80 percent of those over 65 years old take daily medication, averaging more than three drugs. Many live alone and have complex drug regimes. Side effects increase with more drugs, and are made worse by inadequate labeling, loss of manual dexterity, confusion and poor vision (Jenner, 1993).

Careful clinical assessment is essential to avoid inappropriate prescribing – such as diuretics for ankle oedema not caused by cardiac failure, with resultant incontinence, postural hypotension and dehydration; or prochlorperazine for 'giddiness', making it worse. Prescriptions should not be repeated without reviewing previous treatment and patient's condition. Doses may have to be reduced because of changes in drug absorption, such as less gastric acid, reduced renal and hepatic elimination and increased cerebral sensitivity.

It is important to take into account the physiological effects of aging (Section 2.1.1.) when monitoring drug therapy for geriatrics in order to maximise the therapeutic effects and minimise the adverse effects. This is especially important in the case of drugs that have narrow therapeutic indices such as digoxin, phenytoin, theophylline, and warfarin).

Death is not of 'old age', but of multiple pathology, declining mental function and acute illness, often sudden and severe. Cardiovascular diseases, malignancy, neurological disorders and obstructive airway disease are prominent. Treatment and resuscitation decisions must depend on medical factors, not on age (Jenner, 1993).

2.8.1 Practical considerations in monitoring geriatric drug therapy

The patient history is important, particularly in the case of the geriatric, and patient notes should be used effectively to monitor the patient on issues such as adverse drug reactions, compliance, dose alterations, " problem" medicines. It should be borne in mind that minor ailments in the elderly might be symptoms of a more serious disease, or adverse reactions to other drugs already prescribed. It is advisable to check the patient's medication profile before initiating or recommending medication. The side effect of one drug should never be treated with another drug.

The following practical pointers should be borne in mind:

- Keep drug regimens as simple as possible.
- Use a reduced dosage to cope with age-related changes.
- Monitor more frequently, especially for drugs with a low therapeutic index.
- Package drugs sensibly and label clearly.
- Provide clear, simple information to the patient.
- Take time to explain the treatment.

There should be a conservative approach to drug management in this group of patients. A thorough knowledge of physiological changes that occur with aging in combination with clear understanding of the pharmacological profile of the drugs being prescribed can significantly improve drug therapy. The treatment regimens should be reviewed regularly and where necessary alternative medication should be considered and discussed with the prescriber (Scott, 1997).

- **Self Care**

This is made up of the attitudes and behaviour of elderly people regarding their health and lifestyle and is characterized by self-reliance and independence. This is evident in self-medication of the elderly. Self–medication may enhance the physical and emotional well being of elderly patients, but may also lead to serious adverse effects. The elderly more often than not take over-the-counter (OTC) medicines, such as analgesics and laxatives, without being in a position to appreciate what effect this will have on their other medication. The OTC analgesics (aspirin, paracetamol, and ibuprofen) are usually the first-line agents employed for the management of mild-to-moderate pain in the elderly. When the elderly seek pain relief, the use of some OTC pain relievers, even in the usual adult doses, can result in serious adverse effects). These patients may not mention that they are taking these medicines and this stresses the importance of the pharmacist taking a careful medication history and the role of the caregiver in monitoring their drug therapy. Also, the elderly patients themselves may be empowered to take responsibility for their health by counseling and education in the administering of drugs and in the use of OTC medicines (Jenner, 1993; Sause, 1996).

- **The role of the carer**

Informal carers are mainly spouses, daughters, and other relatives. The period before death in many elderly patients is marked by dependency on caregivers. This may be due to immobility, incontinence, impaired cognition, or a combination of these problems. Adequate community supervision of patient and carer is essential and should include training. The elderly use more 'over-the-counter' remedies, possibly 40 per cent of all daily drugs. They take seven times the quantity of such drugs as other people, especially laxatives and painkillers (Jenner, 1993). Therefore, the caregiver has an important role to play in monitoring medication use in the elderly.

- **Quality of life**

A challenge to primary care is to recognize acute illness in the elderly with multiple pathology, and manage these complex patients well. These patients have low expectancy that treatment will be helpful or beneficial. Restoring a disabled old person to a stable health state enabling good quality of life in the community is extremely satisfying (Jenner, 1993).

2.9 PHARMACEUTICAL CARE OF THE ELDERLY

Solving and preventing actual or potential DRPs in the elderly depends on the nature of the problem. This may involve discontinuing the existing regimen, supplying the appropriate medication, or dose, or dose form (in collaboration with other health care professionals where necessary), educating the patient or the patient's caregiver.

2.9.1 THE PHARMACEUTICAL CARE APPROACH TO MEDICATION IN ELDERLY PATIENTS

Providing pharmaceutical care to elderly patients presents a special challenge to pharmacists. At this stage in their lives, patients will probably need more medicines than they have ever needed before, and will be less likely to be able to control them effectively. Poor hearing may prevent them from following instructions, and physiological changes may bring accompanying changes in pharmacokinetics. Multiple ailments require polypharmacy, which in turn increases the risk of drug interactions (Osman, 1996). By identifying and meeting the special counseling-related-needs of the rapidly growing population of elderly patients, pharmacists can improve the quality of pharmaceutical care and enhance their patients' quality of life (Mallet, 1996).

2.9.1.1 The pharmaceutical care concept

Pharmaceutical care is what an individual pharmacist implements when he or she:

- evaluates a patient's drug-related needs,
- determines whether the patient has one or more potential drug-related problems, and then
- works with the patient and other professionals to design implement, and monitor a pharmacotherapeutic plan that will resolve the drug-related problem.

2.9.1.2 Goals of pharmaceutical care

Goals of pharmaceutical care in specific cases are to establish that:

- the patient is receiving the appropriate medication for each definitely diagnosed condition or disorder he or she is experiencing,
- the patient is receiving the appropriate dose of each drug and at the appropriate time and interval, and
- the patient is free from adverse drug reactions, side effects and drug interactions.

Although the goals for all age groups were the same, specific health-related quality of life considerations for the elderly should focus on the following:

- Improvement in physical functioning (e.g., activities of daily life)
- Improvement in psychological functioning (e.g. cognition, depression)
- Improvement in social functioning (e.g., social activities and support systems)
- Improvement in overall health (e.g., general health perception)

(FIP Lisbon Congress, 1994).

Formularies often limit the therapeutic alternatives available to practitioners who are taking care of specific patients. The limitation often confuses the pharmacist, because in the pharmaceutical care of the individuals, patients' drug effectiveness and safety always takes precedence over cost.

2.9.2 THE ESSENTIAL DRUGS CONCEPT

Effective health care requires a judicious balance of preventative and curative services. A crucial and often deficient element in curative services is an adequate supply of appropriate medicines. In South Africa, the government clearly outlines its commitment to ensuring availability and accessibility of drug treatment for all people in the health objectives of the National Drug Policy, which are as follows:

- to ensure the availability and accessibility of essential drugs to all citizens;
- to ensure the safety, efficacy and quality of drugs;
- to ensure good prescribing and dispensing practice;
- to promote the rational use of drugs by prescribers, dispensers and patients

through provision of the necessary training, education and information;

- to promote the concept of individual responsibility for health, preventative care and informed decision-making.

The EDL is a cornerstone of the NDP and is one comprehensive strategy in the transformation of Pharmaceutical Services in South Africa. The implementation of an Essentials Drugs Programme (EDP) forms an integral part of the strategy to improve supply and distribution of medicines, with rationalisation of the variety of medicines available in the public sector. (Standard treatment guidelines and EDL for South Africa)

To all intent and purposes, the EDL is enabling and facilitative towards the attainment of equity in health care. Although it is not intended to be restrictive or prescriptive, it does limit the prescribing for all patients. This is likely to have the greatest impact on the geriatric patients, who for the reasons outlined in (Section 2.5.1) are less likely to adjust to these changes in their drug treatment. Elderly patients on chronic treatment become accustomed to their medicines. Therefore, changing their therapy in order to conform to STGs can be a traumatic experience. However, if accompanied by adequate counseling, this may drastically improve the patients understanding of the change in therapy. Although the EDL involves rational drug use and drug, cost consciousness, the health and wellbeing of patients in particular the elderly patients should not be compromised. However on a positive note, the EDL will facilitate the development of rational prescribing and dispensing, eliminate medicine wastage, encourage research and critical evaluation of drug regimens, which will be of immense benefit to elderly patients.

2.9.3 CHOOSING THE MOST APPROPRIATE DRUG TREATMENT FOR ELDERLY PATIENTS

The two variables that place a drug on the pharmacist's list of feasible alternatives are:

1. The probability that the drug will resolve or prevent the patient's drug-related problem.
2. The drug's safety for use in that specific patient.

Variables that will work to eliminate an alternative from selected as the "best" solution appear in the "Prescribing guidelines for geriatric" (Appendix 4).

The preparation of a comprehensive list of feasible alternatives for resolving or preventing a specific drug-related problem in a specific patient requires the pharmacist's access to references and other drug-information sources, to colleagues, and in some cases to pharmacotherapeutic specialists.

The patient's participation in decisions can also avert some potential problems later in care, such as failure to comply with therapeutic or monitoring directions.

Pharmaceutical care is not simply a collection of clinical pharmacy services. Rather, it represents a systematic process designed to identify and resolve drug-related problems and determine what medications, services, and advice an individual patient needs. Moreover, unlike most existing pharmaceutical services, the pharmaceutical-care process dictates that a written document be generated to record the drug-related problems, the recommended solutions, and the patient-specific outcomes that actually result from the individualized pharmacotherapy.

Only through the coordinated efforts of pharmacy practitioners and managers will our future patients fully realize the benefits of the pharmaceutical-care process and be free from drug-related problems.

2.9.4 PHARMACEUTICAL CARE PROCESS FOR THE ELDERLY

The process of pharmaceutical care begins with taking a comprehensive medical and medication history. With elderly patients, there might be a number of potential problems such as communication, under reporting of events and reliance on caregivers for history.

Pharmacists must develop systems for identifying those most at risk of medication-related problems. Systematic approaches to delivering pharmaceutical care requires individual patient assessment to identify subgroups of patients with defined needs and risk factors that might compromise therapeutic success. Regular monitoring of treatment where possible by direct contact with the patient is required to ensure concordance and appropriate periodic review. To assess whether there were factors, which might increase an elderly patient's risk of experiencing DRPs, a drug regimen review should be conducted. This could be accomplished using a variety of instruments one of, which is the Medication Appropriateness Index refer to ' Prescribing guidelines for geriatric patients' (Appendix 4).

Maintenance of effective patient records is needed to ensure continuity of care over long-term treatment and during shared care between primary and secondary teams. Information about any functional restrictions affecting sight, hearing, manual dexterity, mobility, memory, comprehension and communication need to be included in the pharmacy record alongside the patient's social circumstances and the availability of domestic support. The medication history is important to ensure continuity of care, avoidance of therapeutic duplication and the prevention of the prescription of drugs, which have previously caused problems.

Pharmaceutical care plans should involve community and hospital pharmacists working to stated goals of symptom control and periods of review. The frequent contact of pharmacists with older patients on long-term medication provides the opportunity for medication review. The purpose of a medication review is to identify any medication-related problems, to ensure that all necessary medicines are taken. The review enables the pharmacist to provide patient education and to make recommendations to the prescriber where there is an opportunity to rationalise or reduce the number of medicines the patient is required to take. The idea of inviting patients to bring a "brown bag" of their medicines into the pharmacy allows the pharmacist to relate the medications the patient has at home to those they should be taking. Rationalisation therefore also involves the pharmacist helping to encourage patients not to hoard medicines and ensuring safe disposal.

The active participation of patients in drug therapy decisions is increasingly being sought. The prescence of multiple chronic disease states in the older patient complicates that decision making process. The patient must be helped to understand what is possible from their drug therapy and to appreciate the limitations on their own rehabilitation and quality of life. The complexity of disease may confuse the assignment of particular symptoms to any one condition. The complexity of polypharmacy may be a further confounding factor. Drug therapy that has been prescribed in the past but not recently reviewed may be necessary. Non-pharmacological methods may offer alternative ways of reducing medication and helping to simplify prescribed drug regimens.

The best choice of drug for a particular patient may not be the formulary preferred agent but a second line product with, for example, less dependence on renal elimination, a longer dose interval to enable once or twice daily dosing, perhaps a different colour to enable the patient to differentiate it, or a different form of packaging or administration device that the older patient may seem better to handle.

A period of monitoring may lead to doses being questioned. Perhaps a previously effective dose is now excessive and can be reduced without jeopardising the control of the condition. Treatment failure may be due to the patient not taking their medication within the correct schedule. To "please the doctor", patients often say that they are taking their therapy as prescribed, where it is later revealed they are dutifully collecting repeat prescriptions but hoarding the medication at home.

A continuous record of care makes it possible for the pharmacist to identify change in the level of control of a condition or to recognize DRPs early. Good records are necessary for the delivery of a coherent package of care over a sequence of contacts with the patient and for signs or symptoms in the patient to be linked to medication recently started. A record of the elderly patient's weight and renal function is useful for long-term monitoring and periodic review.

Periodic review of long-term medication in older patients is necessary to confirm satisfactory progress or to reassess need. Monitoring of treatment requires regular inquiry and reassurance to identify any medication-related problems to confirm progress. The inquiry and testing that may be involved in monitoring may be inconvenient or disturbing, particularly too older patients. It is necessary to arrive at a suitable compromise to provide the necessary reassurance to the patient, the pharmacist and the prescriber. Long term care is about helping patients to maintain their quality of life as they grow older and as they acquire more threats and limitations to their health (Hudson and Boyter, 1997).

Inappropriate medication dosage is one of the most important prescribing problems found with the elderly. This is due to a lack of attention to age-related changes in drug pharmacokinetics and pharmacodynamics, along with the effects of diseases and diminished homeostatic mechanisms on medications (Section 2.1.2.1). Once the drug regimen review is complete, it is important to document the DRPs, develop a therapeutic plan to resolve them, and to establish reasonable therapeutic ends. In some cases, it would be necessary to consult with the elderly patient's physician.

Factors to enhance compliance should be considered when dispensing to elderly patients. Modification of medication schedules to fit in with a patient's lifestyle, easy-to-open caps, easy-to-swallow dosage forms and larger typeface for labels could all be considered. Use compliance aids if available and ensure that suitable containers are marked with clearly legible instructions. Colour coding may be useful.

Guidelines for the delivering of prescription pharmaceutical care in elderly patients appear in the ' Prescribing guidelines for geriatrics' (Appendix 4). To complete the pharmaceutical care process, interventions should be documented and the patient's progress monitored (FIP Lisbon Congress, 1994).

2.10 INTERVENTION STRATEGIES TO OVERCOME AND OR MINIMISE DRUG-RELATED PROBLEMS IN GERIATRICS

2.10.1 Monitoring adverse drug reactions in elderly patients

Pharmacists could also monitor the effects of non-steriodal anti-inflammatory drugs in elderly arthritic patients. Gastric bleeding and ulcers were associated with NSAID therapy. Elderly people had a four-fold increased risk of bleeding compared with younger people and their risk of death increased five-fold. Pharmacists could look for symptoms of anaemia by asking patients how fatigued they felt. Cardiovascular and renal problems associated with NSAID therapy might be monitored by looking at weight gain, oedema and breathing. Central nervous system side effects of NSAIDs were unique to the elderly population. Pharmacists could monitor for dizziness, ringing in the ears and changes in mental status.

The haematological problems associated with some drugs used in arthritis might be more difficult to monitor. However, pharmacists could ask patients if they were bruising more easily or whether they had a fever or sore throat. It is important that pharmacists discussed symptoms with the patient (FIP Lisbon Congress, 1994).

2.10.1.1 Adverse Drug Reaction Reporting

Pharmacists practicing in hospitals and nursing homes are in an important position to impact positively upon proper drug utilization. One component of proper utilization is the monitoring and reporting of adverse drug reactions (ADRs). This institutionally based postmarketing surveillance is a necessity since clinical trials do not provide adequate information about the side effect profile of marketed drugs. In the hospital setting, pharmacists have devised in-house ADR reporting systems having attributes useful in monitoring drug use in the hospital.

The following reflects a breakdown of three ADR classification definitions used in the study:

Study definitions of types of ADRs

- A Fatal ADR results in the death of a patient.
- A Severe ADR results in an extended hospital stay or treatment.
- A Moderate ADR results in the discontinuance of a drug after mild symptoms.

The underreporting of ADRs is rampant throughout the health care delivery system, including areas impacted upon by pharmacists. The reporting of simple and/or well-known minor ADRs need not necessarily be reported. However, unique reactions with drugs that have been on the market a long time should be reported (Fincham, 1990).

It then becomes crucial to carefully analyze geriatric patients to continuously monitor the appropriateness of therapeutic interventions, both type (class of drug) as well as intensity (dosage strength) All professionals involved in the delivery of health care must take an active role in monitoring geriatric drug therapy for potential benefits and risks. It is especially imperative for professionals providing services for elderly patients to monitor for and report ADRs occurring in this subpopulation. However, it is not always possible to assign causality to a specific drug as the offending agent. Reported ADRs should be seen as warning signals and not as definitive proof that a particular drug caused a particular reaction.

It is vitally important for ADRs occurring in the elderly to be reported and the data shared with other clinicians. Through the collation and dissemination of ADR information relative to elderly patients, advances in the appropriate pharmacotherapy of the elderly can be a more readily achieved outcome of drug therapy.

Caregivers need to be aware of the potential of drugs to cause ADRs. Providers of services need to closely evaluate patients and their therapy so as to be alert to changes in behaviour or functioning which may be a signal of an ADR (Fincham, 1991).

2.10.2 Maintaining patient records

Patient medication records ensure that patients do not receive medication when it is contraindicated or inappropriate; for example, a non-cardioselective beta-blocker may induce bronchospasm in an asthmatic patient. Similarly, it may be inappropriate to supply certain non-prescription medicines to patients suffering from certain medical conditions; for example, sympathomimetic decongestants may be hazardous in-patients with cardiovascular disease.

2.10.3 Educating elderly patients

Pharmacists are in a good position to educate elderly patients about insomnia. There was often no need to treat insomnia with drug therapy. Advising patients to set a regular bedtime and waking time and to take daily exercise was important. Exercise should not be too vigorous or too close to bedtime.

Simple measures such as guarding against any interruptions during the night and making sure that the bedroom was quiet and at the right temperature were also important. Excessive hunger or feeling "too full" could also affect sleep. Patients should be advised to avoid caffeine, excessive fluid intake and excessive alcohol. Pharmacists could help patients arrange their medication schedule so those drugs with sedative effects were taken in the evening.

The lowest dose of a benzodiazepine should be used in elderly patients and the therapy should be monitored. Medication, which caused drowsiness as a side effect, such as antihistamine drugs, should be avoided, as there were few data on their use as sedatives.
Adverse effects such as daytime sleepiness, cognitive dysfunction, ataxia, rebound insomnia and falling should be recorded as part of the monitoring process. Long acting benzodiazepines should be avoided in elderly patients and patients should be treated for two or three nights a week only. If a benzodiazepine drug was used each night, patients would become tolerant and the number of unwanted side effects would increase.

2.10.4 Communication regarding the discharge medicines of elderly patients

Patients discharged home from hospital have a poor understanding of their new medicines. Several studies have indicated that issues associated with continuity of drug treatment for elderly patients discharged from hospital need to be addressed. They call for improved communication between providers and patients. Also carers must be involved in the discharge process and be given information about the discharge medicines.

2.10.5 Clinical Pharmacist Interventions

The clinical pharmacist in a regional hospital has a great opportunity to significantly contribute to an improvement in the quality of health care through the provision of advice on the appropriate and safe use of drugs. In these hospitals it is essential that the pharmacists' role be comprehensive, in order to minimise errors in drug prescription and administration. There is always a chance of prescribing errors occurring, with a consequent need for pharmacists to intervene to ensure that the patient receives optimum drug therapy. There is also an important role for pharmacists to further develop: advising and educating medical staff on drug usage.

Rupp described the purpose of the traditional collaboration between physician and pharmacist in the delivery of care as being " to combine the unique knowledge and competencies of each to achieve optimal outcomes in, and for, the patient" (Rupp, 1988).

Prescription interventions are defined as " any action taken to clarify or change a prescription to optimise the patient's drug therapy and /or minimise the risk of harmful effects". Instrumental work in this area has been published by Rupp *et al.* (1992). Categories of problems included missing or incorrect information, clarifications with prescriber, omissions, prescribing errors, non-compliance, side effects and drug-drug interactions. One common feature of published intervention research is the use of recording forms for each prescription-related problem. The Rupps' Prescription Intervention Form has been used in some studies (Hulls and

Emmerton, 1996).

Thus, the traditional functions of pharmacists have broadened to include many patient-oriented clinical services. Pharmacists must become involved in these nondistributive functions, including drug therapy monitoring, prevention of duplications drug therapy, prevention of polypharmacy, co-ordination of multiple prescribers, adverse drug reaction and interactions, and dispensing errors surveillance, modification of drug therapy, patient counseling to improve compliance, participation in gerontology, nutritional support and multidisciplinary teams, provision of drug information and education of other health professionals, provision of drug utilisation reviews and insuring cost-effectiveness. Appropriate pharmacist-physician and pharmacist-patient communications are crucial to ensure appropriate drug therapy outcomes in each elderly patient (Adamcik and Rhodes, 1993) and to prevent or minimse DRPs.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 STUDY DESIGN

A descriptive, analytical approach was utilised in order to address the objectives of this geriatric study. In practice one has to consider limitations of resources related to time, finance personnel when conducting any research. This study was conducted using the survey research design as:

- it was most appropriate to achieve the objectives of this study,
- it involved studying the elderly population based on data gathered from them,
- it combined flexibility of content with elements of precision and control,
- it may be used to gather information from a large number of geriatric subjects,
- it was less time consuming and less expensive,
- it was simple to evaluate,
- further advantages included the use of a patient profile and analysis using a computer.

(Wilson, 1993; Katzenellenbogen *et al*., 1997).

In the first phase of the study, prescriptions were perused and patients were interviewed to establish prevalence of DRPs. Analysis of data collected attempted to identify drug-related problems experienced by geriatrics. The second phase, based on the findings of the first phase, aimed to implement suitable intervention strategies to minimise or prevent these DRPs.

PHASE 1: IDENTIFICATION OF DRUG - RELATED PROBLEMS

3.2 STUDY POPULATION AND SAMPLING

3.2.1 SITE OF THE STUDY

This study was conducted over an eight-week period in the 668-bed public sector hospital in the central region district viz. The Addington Hospital of the KwaZulu Natal Department of Health, Durban. As a designated regional (secondary level) hospital most of the care at Addington Hospital is at this level, using the expertise of general specialist-led teams. This includes general surgery, orthopaedics, general medicine, obstetrics and gynaecology, radiology and anaesthetics. Although Addington Hospital mainly provides services at a secondary level, primary or level 1 care is also provided at the on-site Primary Health Care Clinic. Some tertiary or level 3 services, for example Radiotherapy and Oncology, Renal transplantation and a Neonatal Special Care Service are also provided. Access to health services at Addington Hospital is in keeping with the National Department of Health's policy on the District Health System with health services being provided at different levels of care according to the seriousness of the health problem

The large outpatients' attendance, with diversity in socio-economic characteristics together with the following made Addington Hospital a suitable site for the study:

- convenience in terms of transportation,
- easy accessibility to patient records,
- permission to personally oversee data collection and intervention strategies,

3.2.2 THE STUDY POPULATION

Elderly patients, over the age of 65 years attending the general medical clinics at Addington Hospital were recruited for this study. Those patients who have chronic medical conditions visit the outpatient clinic every six months. Most often, the same physician attends them to, if available. Geriatric patients were eligible for the study if the prescriber had seen them at one of the medical clinics and provided they were currently on chronic medication for at least six months.

To ensure that all the study results were accurate and reliable, a statistician was consulted for determination of the required sample size, before the actual study was undertaken. The pilot study completed on 13 geriatric patients enabled determination of the sample size of the study, on the basis of the incidence of DRPs (Section 4.1). A 95% confidence interval of ± 5% was considered statistically correct. A sample size of 280 was considered sufficient to ensure 5% tolerated error for this population size (Connelly, 1997). The final selection of 281 geriatric patients was made according to the inclusion criteria listed in Section 3.2.3. A larger sample size would yield a result that is much more stable and reliable. This sample of 281 was representative of the study population, and therefore one could generalize sample results to the geriatric outpatients population at Addington Hospital.

3.2.3 SAMPLE SELECTION AND SAMPLING TECHNIQUE

Data collection took place between March and April 1998 at the pharmacy outpatient departments at Addington Hospital. Specific medical specialties admitting patients over 65 years of age were included in the study.

According to Mallet (1996), the elderly patient should in general be considered a potential candidate for DRPs counseling if any of the following criteria are present:

- three or more chronic conditions,
- four or more chronic medications in the current regimen,
- 12 or more medication dosages per day,
- medication regimen changed four or more times during the past four months,
- three or more physicians or prescribers,

- significant physical or cognitive disability or dysfunction,
- reliance on a caregiver,
- low literacy,
- demonstrated poor compliance.

Other patients at risk of developing DRPs are those patients with certain illnesses, e.g. dementia, and those starting new medicines (FIP Lisbon Congress, 1994).

Although Mallet (1996) lists 7 criteria to establish potential for DRPs in geriatrics, in the present geriatric study patients at high risk of developing drug-related problems were targeted. The patients were selected if they met one or more of the following inclusion criteria:

- prescribed at least 3 chronic medicines
- taking narrow therapeutic range drugs (problematic classes of drugs) such as anti-depressants, anti-arrhythmics, digoxin, anti-coagulants, salicylates or theophylline.
- known for poor compliance (not keeping clinic appointments or collecting medicines)

A systematic random sampling technique was employed in selecting the subjects since it was quick and easy and a much more convenient method of sampling, than other methods. Systematic sampling is particularly practical if a sample of patient records has to be selected, as is the case in this geriatric study. Computer printouts of patients scheduled for appointments for specific clinics were obtained prior to the allocated clinic appointment date. Preliminary screening of patient's medical files helped to establish the geriatric attendance at the various clinics and allowed for sample selection.

The geriatric patients were selected from the following clinics listed below:

- Maxilla-facial, gastro-intestinal, surgical, neurology, endocrine and vascular clinics.
- General medical, dermatology, ischaemic heart disease (I.H.D), P.I. (Prothrombin Index) and I.N.R (warfarin anti-coagulant treatment) and rheumatology clinics.

- Diabetic, hypertension, renal, lipid, haematology, HIV, asthma, thyroid and cystic fibrosis clinics.

Geriatric patients often have multiple pathology and may attend more than one clinic at the same hospital. Once a geriatric patient was selected for the study, this patient was omitted from future selections of the study. This overcame the possibility of choosing the same patient, with multiple diseases attending many clinics during the study period.

After preliminary screening of patient's medical notes and records to identify patients meeting one or more of the chosen inclusion criteria, geriatric patients were selected by systematic sampling. For example if in a single day 100 geriatric patients met the inclusion criteria (population size), the sampling interval is 100/20 = 5, that is every fifth geriatric patient would be selected giving a systematic sample of 20 patients who were interviewed in a day. The random starting point was determined by selecting a random number within the first sampling interval, in this case between 1 and 5. Results of the initial pilot study assisted in determining sample size (Section 4.1). Thereafter, a 20% systematic sample of medical records (every fifth medical record) of geriatric patients attending outpatient clinics was selected for the period of March and April 1998. Certain clinics were held only on specific days and sometimes at specific times and in this way, bias due to day of the, or time of the day variations was minimised.

Because patients were selected a day in advance, not all the patients may have come for their appointment or to collect their medicines from the dispensary. Therefore not all patients selected for a particular day were interviewed. In practice, within the constraints of time, an average of fifteen patients was interviewed in a single day.

Data collection was both retrospective and prospective for each patient. Retrospective observations were from data recorded in historical medical records during patient visits that took place in the past, preferably over a one-year period to control for seasonal variations in the geriatric patients health. The patient's medical records provide certain essential elements that were recorded before the patient interview. The major weakness of retrospective data is that they were often incomplete. Therefore data collection was also conducted prospectively by interviewing the patient, after the patient consulted with the prescriber and whilst waiting for their medicines to be dispensed.

3.3 DATA COLLECTION AND MEASUREMENT

3.3.1 RESEARCH INSTRUMENTS

The type of measurement instrument used depends on the population under investigation, the nature of information required, the environment of data collection, the observer /interviewer, time, money and human resources available. In this study two research instruments were designed and developed. These are:

1. A Patient Profile (Appendix 1)
2. A Prescription Intervention Form (Appendix 2)

3.3.1.1 THE PATIENT PROFILE FORM

A documentation system was designed and formulated for recording, relevant information from the medical notes and the patient interview. Development of the structured patient profile form was based on a collaborative effort involving an extensive computerized literature search on geropharmacology and the prevalence of DRPs among geriatrics using several online databases. Information was also obtained from similar past studies and local advice from other health professionals. A patient profile is particularly valuable as an aid to managing the elderly patient. Using the patient profile as an assessment tool, the pharmacist can then "prescreen" patients to identify those who are at risk of developing DRPs and may need special counseling.

3.3.1.1.1 Elements of a patient profile

Typical elements of a patient profile utilised in a study by Mallet (1996).

Table 3.1 Elements of an elderly patient profile

Elements of an Elderly Patient Profile
1. Name, address, and telephone number of the patient.
2. Date of birth
3. Sex, race, weight, height.
4. Allergies or presence of any adverse reactions to medications.
5. Use of alcohol or tobacco.
6. Driving activities.
7. Special diet.
8. List of diagnoses or disease states.
9. Prescribed medications: name, strength, directions, suggested schedule, number of refills, name of physicians.
10. Name of over-the-counter medications and natural products regularly taken.
11. Name of primary physician.
12. Name of other prescribers
13. Presence of hearing aid, visual aids wheelchair, walker, etc.
14. Problem with reading skills.
15. Use of special counseling device.
16. Name and telephone number of caregiver.
17. Use of child-resistant container.

(Mallet, 1996).

Modifications were made to the above elements to construct a profile for each patient to meet the needs of this study. Patient, disease and drug use information were collected to determine whether the patient had any drug-related problems.

Standardized patient profile forms (Appendix 1) were used, and information gathered from an observational analytical study of the patients' medical notes, medication charts, and patient or caregiver interview. From the outset, it was important to ascertain who was responsible for medication administration: the patient, the caregiver, or both. This situation should then be considered at the interview and in all future counseling encounters.

3.3.1.1.2 Design of the patient profile form

The following variables helped in assessing and identifying DRPs in the elderly. These were:

- identification;
- attributes of the patient;
- past medical history;
- diagnosis leading to a recent prescription;
- drugs;
- events and
- the clinician's comments.

Identification of patients included demographic information such as:

- name,
- addresses
- telephone numbers and
- hospital number.

Age, gender, and weight were some of the patient's attributes.

Past medical history related to diverse factors such as:

- previous diseases,
- known allergies,
- surgical and accident history,
- previously used medications and
- drug toxicity.

Drugs included medications the patient received while being monitored. The dosage, frequency, and duration of administration were also included. An event referred to any untoward or undesirable happening experienced by the patient either generally or in the context of his/her disease and/or drug therapy.

Drug incompatibility was diagnosed by identifying five variables:

- the patient;
- the suspected drug;
- drugs that may interact with the suspected drug;
- the patient's diet and
- the environment.

3.3.1.1.3 Data collection to delineate DRPs:

- An initial accurate and complete assessment of each patient's medical condition, including the mental, physical, and psycho-social-economic and the patients environment.
- A complete medical history, including relevant previous diseases/illnesses, accidents, surgery, sensory-perceptual functions, and nutritional status.
- A thorough medication history was obtained from the patients' medical notes and by interviewing the patient. Prescribed and over-the-counter (OTC) drug use, alcohol consumption, known allergies, adverse or toxic effects, home remedies, drug taking habits and economic situations was documented.
- Current illnesses/diseases and overall conditions of the patient were determined. Presenting signs and symptoms, precipitating factors, the disease state; risk factors such as nutritional deficiencies, dehydration, fever, arrhythmia; and secondary conditions simultaneously diagnosed in the patient were identified from the patient's medical notes and by interviewing the patient.
- The drugs being administered were noted. The purpose for the prescription, the expected therapeutic outcome and side effects; whether the drug has been previously used and its effectiveness were determined. Possible interacting drugs were identified.
- The patient's needs were prioritized, including quality of life.
- The patient and/ or caregiver was counseled about the medication, including measures to prevent or minimise drug-related problems.

At some time, during the examination or dispensing process, details about the medication prescribed were explained to the patient. Ideally, this explanation included the reasons why the medication was being given, how each drug should be used, as well as information about precautions and possible side effects. Because most of these factors are difficult to measure, patients were evaluated on their knowledge of when, how and in what quantity each drug should be taken. This was evaluated for each medication actually dispensed to the patient. Failure to know any of these three points (when, how, quantity) about any of the drugs dispensed resulted in patient knowledge being scored as inadequate (Klein et *al.*, 1984).

Information regarding medication side effects were elicited by asking the elderly patients whether their medications had caused them mood or sleep disturbances, gastrointestinal tract difficulties, equilibrium problems, head or chest discomfort, muscular aches, incontinence or excessive urination, sexual dysfunction, skin eruptions or pruritis, or other problems. Affirmative responses resulted in additional questioning related to the ADRs.

Each subject's medical records were reviewed to provide information on prescribers and diagnoses, as well as to establish the identity of medications.

The necessary data about the patient was grouped into three sections:

(a) the general characteristics of the patient (socio-demographic factors)
(b) the patient's diseases, complaints, or symptoms and
(c) the medications or other drugs the patient may be taking and drug problems or difficulties concerning treatment,

One of the major DRPs is compliance, which is very difficult to measure, and is very subjective. Patient noncompliance is usually expressed as a percentage of patients who did not follow the therapeutic regimen. There are many methods of measuring patient noncompliance. Direct measures are considered superior to indirect methods but are expensive and time consuming. Indirect methods are both subjective and less accurate, subject to patient falsification, or, in the case of therapeutic outcome, do not necessarily measure compliance (Palane, 1995).

Measures of compliance employed in this study were percentage of geriatric patients reporting forgetfulness in taking prescribed medications and percentage of subjects reporting that they took more or less of a medication than prescribed within the six months prior to the interview. Compliance was also established by investigating attendance of clinic appointments and collection of medicines, including the monthly repeat medicines for chronic conditions. Although some underreporting of noncompliance was expected, prior work by several investigators suggested that interviews would be a useful means of eliciting compliance data from outpatients. Furthermore, the evidence available suggested that cognitively unimpaired older subjects would provide interview data equally reliable as that provided by younger subjects (Klein *et al.*, 1984).

3.3.1.1.4 The structured interview

The patient profile was used during the structured interview of the geriatric patients. Individual interviews allow for personal contact with subjects and this can facilitate response and quality information. Another advantage of interviews is that it can be done when respondents have low literacy and cannot fill in self-administered forms. When a language barrier existed, the assistance of an interpreter was sought and their co-operation was acknowledged. The same health worker was used as an interpreter, in order to ensure that translation was standardised during the interviews. Questions were asked in the same way, with similar probes and clarification, while recording was uniform. The reliability of the information obtained increased with objectivity and standardization of the interview. This type of interview structure yields further information which is easily quantified, ensures comparability of questions across respondents and makes certain that the necessary topics are included (Breakwell *et al* ., 1998). Each patient interview and counseling session lasted approximately 30 minutes, allowing for an average of fifteen patients being interviewed in a single day. To ensure uniformity of approach, a single investigator collected the data over the two months.

The patient profile has been outlined (Appendix 1) made possible to identify inappropriate prescriptions (unnecessary drugs and those with absolute contra-indications (CI), interacting drugs of clinical relevance) and ADRs. Prescriptions were assessed using drug monographs in the *South African Medicines Formulary* (SAMF, 1997). For the purposes of this study, clinical drug interactions would be considered.

- Drugs with absolute CIs were those that, for an individual patient, should not be used.
- Drugs with relative CIs were those that, for an individual patient, require intensive monitoring because of an increased risk of ADRs.

To assess the presence of ADRs, presenting complaints were matched against the known adverse effects of the prescribed drugs. The main sources to identify ADRs were the SAMF and The Merck Manual.

3.3.1.2 THE PRESCRIPTION INTERVENTION FORM (PIF)

3.3.1.2.1 Design of the prescription intervention form

Details of the DRP were recorded on a Prescription Intervention Form (PIF)(Appendix 2) adapted from Rupp *et al.*, (1992).

The prescription intervention form contained:

- Patient details,
- Reason for intervention (prescribing omission, prescribing error, drug interaction, drug therapy monitoring),
- Drugs involved,
- Action taken by pharmacist,
- Outcome of intervention.

3.3.1.2.2 Identification of drug-related problems

Different categories of DRP were identified, based on literature review. Each category was further defined in detail, with inclusion and exclusion criteria. Assessing the indication, effectiveness, safety and compliance of drug therapy identified DRPs with prescribed and other medication. The guidelines in Table 3.2 assisted in the detection of actual or potential DRPs in the sample geriatric patients, and the associated drugs involved.

Table 3.2 Identification of drug related problems

ASSESSMENT	PROBLEM IDENTIFIED
INDICATION	UNNECESSARY DRUG THERAPY ❑ No medical indication ❑ Addiction/recreational use ❑ Non-drug therapy more appropriate ❑ Duplicate therapy ❑ Treating avoidable adverse reaction NEEDS ADDITIONAL THERAPY ❑ Untreated indication ❑ Synergistic/potentiating therapy ❑ Prophylactic/preventative therapy
EFFECTIVENESS	WRONG DRUG ❑ Dosage form inappropriate ❑ Contraindication present ❑ Condition refractory to drug ❑ Drug not indicated for condition ❑ More effective drug available DOSAGE TOO LOW ❑ Wrong dose ❑ Frequency/duration inappropriate ❑ Wrong route ❑ Drug interaction
SAFETY	ADVERSE DRUG REACTION ❑ Not safest therapy ❑ Allergic reaction ❑ Incorrect administration ❑ Drug interaction ❑ Dosage change too rapid ❑ Undesired effect DOSAGE TOO HIGH ❑ Incorrect dose ❑ Frequency/ duration inappropriate ❑ Drug interaction
COMPLIANCE	COMPLIANCE ❑ Drug product not available ❑ Cannot afford therapy ❑ Cannot swallow, tolerate or admin drug ❑ Patient prefers not to take drug ❑ Does not understand instructions ❑ Drug/dosing regimen too complex ❑ Other reasons

The eight DRPs by Strand *et al.* (1990) aided in the identification of DRPs in the sample population.

- Drug indication involved accessible, affordable and acceptable treatment.
- Unnecessary drug use investigated rational treatment
- Wrong drug or dosage too low, looked at the effectiveness of the treatment.
- To determine if the drug treatment was safe: ADRs, drug interaction and too high a dose were considered.
- Noncompliance checked the patient's adherence to treatment.

Identification of a DRP resulted in an intervention by the researcher. The physician concerned was consulted to review or modify the patient's treatment, to overcome or minimise the DRPs.

3.3.2 PILOT STUDY

In the early stages of developing the patient profile and PIF, rudimentary questions were asked of health professionals in order to investigate the wording and clarity of the research instruments. Obvious problems were detected and overcome at this stage.

A pilot-study, which checked the methods and obtained data to assist in sample size estimation and / or test the adequacy of field training, was performed. The purpose of pre-testing the draft patient profile and the PIF was to see if the questions met the desired objectives and estimate the time taken to interview each patient. Thirteen geriatric patients (similar to the target population)) were chosen by systematic random sampling and interviewed in a single day, twelve (92%) of whom experienced DRPs. A statistician was consulted to calculate the formula- based sample size. Assuming for example, a prevalence of 75% of DRPs was expected in the actual study, and to be 95% sure that the sample estimate is within 5% of the population value, a sample of 280 geriatric patients is needed to give meaningful results.

The advantage of conducting the pilot study was that it allowed for the refinement of the instrument and improvement of the quality of the instrument. During the pilot study, the interviewer recorded words and sentences that were not understood and questions that required prompting or explanation (Section 4.1). Any problems e.g. ambiguity, omissions and incorrect phrasing of questions were noted. Problems were identified during the pilot study and the layout and content of the patient profile were amended appropriately. Final amendments were made to both research instruments after which the survey was carried out on the chosen sample of geriatrics at the selected institution.

3.3.3 ETHICAL CLEARANCE

The ethics committee at University of Durban-Westville approved the investigative study protocol. Permission was obtained from the Department of Health, KwaZulu Natal and the Medical Superintendent of Addington Hospital to conduct the survey at Addington Hospital.

Before interviewing the geriatric patients selected, it was important to seek their co-operation, trust, and permission to be interviewed, after an adequate explanation briefly outlining the purpose of the study and assuring the research participants confidentiality and anonymity. This informed consent (Appendix 1) was required to protect the identity and safeguard the rights and welfare of the geriatric participants.

The confidentiality of the geriatric patients and health professionals at the facility would always be maintained and their co-operation acknowledged. All information collected would be used for research purposes only and the anonymity of the participants protected.

3.4DATA PRESENTATION, ANALYSIS AND INTERPRETATION

A statistician was consulted on the processing and analysis of data, as well as the presentation and interpretation of results.

3.4.1 VARIABLES

Variables are the characteristics that one measures, and about which data are collected. Two types of variables were used in this study viz. categorical and numerical. **Categorical** variables specify which category an observation falls into. Quantitative variables are called **numerical** since the allocated numbers have intrinsic quantitative meaning. The choice of the appropriate method of statistical analysis depended on the types of variables under investigation in this study.

3.4.2 DATA CHECKING BEFORE ANALYSIS

The data collected from the research instruments were coded, captured and analyzed by computer, since this was by far the quickest and most accurate way of interpreting results, than manual analysis. Computer processing will ensure highly reliable and valid data. Coding questions to responses in preparation of the data for computerization was important and specific procedures were adhered to. A computerized spreadsheet using Microsoft Excel™ package was used to capture the data from each patient profile and PIF, consolidate the results and prepare reports. The database was constructed to facilitate data manipulation. All medications were recorded using its generic name, except proprietary combination products with no generic equivalents.

Before any analysis was done, the data set was carefully checked to identify strange values (outliers) and errors. Such errors can strongly influence and bias the results, by yielding incorrect summarised results, and was therefore detected and corrected before the data was analysed. Errors could occur when data were coded on the patient profile and the PIF or transcribed from the geriatric patient files. It was therefore important to check the patient profile regularly during the data collection phase so that any queries were followed up, ideally while still on the site of the study. Errors may also have occurred when data was entered onto the computer. The data checking outlined below is done after computerization, but before analysis.

Table 3.3 lists suggested data checking procedures. For these procedures, a computer listing of the values of all variables, as well as the interrelationship of variables were required. When any strange values were found, a list of the patient profile numbers of those cases was made. Any queries resulting from the data checking procedure were investigated by going back to the raw data (the patient profile and PIF). Some queries were easy to solve, for example, a 1 might be captured as a 7, and others were more difficult.

Table 3.3 Suggested data checking procedure

Suggested data checking procedures
One variable at a time
Categorical variables
• Check that all the categories on the computer listing are plausible codes e.g. for the variable sex M = Male, F = Female, X =? Z =?
• Check missing values
Numerical values
• Check that the values fall in plausible range. Are the extremes possible? e.g. Number of DRPs = 6, Number of DRPs = 600.
• Are values of 0 really zero or do they indicate missing values? (IF the latter, then o must be made missing).
• Are missing values really missing or do they indicate 0. E.g. a missing value for the number of hospitalisations of the geriatric patients may indicate non-hospitalisation and the missing value should be made 0.
• Check the missing values
Cross-checking of variables
• If information is asked in more than question, do the answers agree: e.g. question 6.6.1 of the patient profile: " Do you require any educational effort or compliance aids?" if the response was "No" then the response for following question 6.6.2 " If, yes, specify type of compliance aid" should be 0.
• Do related questions give plausible results?
• Sex = M and Hormone replacement therapy = Yes
• "Do you have someone who takes care of you?" = No (refer to question 2.8.1 of PF).
• "If YES, specify who takes care of you:" = family (refer to question 2.8.2 of PF). This response does not correlate with the above "No" response.

(Katzenellenbogen *et al.*, 1997, Pg102)

3.4.3 EXPLORATORY DATA ANALYSIS

Before any formal statistical analysis was done, the data (especially numerical variables) were explored through graphical display (also known as exploratory data analysis).

4.4.3.1 Graphical display of variables

The aim of displaying a numerical variable is to investigate certain characteristics of the data and this is essential before formal statistical analysis is done. Graphical displays of categorical variables are primarily used to present the results of the geriatric study. Bar graphs and pie charts will be used to represent categorical variables. The height of the bar in a bar graph (or the size of the slice in a pie chart) can represent either the number of observations in a given category of the variable, or the percentage of all observations that fall in a given category. Graphical representation of results was accomplished using the Microsoft Excel™ presentation program.

3.4.4 SUMMARIZING THE SAMPLE DATA

By examining the graphical display of the data the researcher decided which measures should be used to summarize the data of the geriatric study. Summary statistics, also known as descriptive statistics, were used to summarize and describe the data in a concise form.

Categorical variables can be summarised by the number and percentage of geriatric patients (study subjects) who are classified into a given category. For example in this study, the sample of 281 geriatric patients contains 103 males (36.7%) and 178 females (63.3%), (Section 4.2.1.2).

A numerical variable on the other hand, indicates where the central location of the data lies, as well as what the variability of the data was (that is, what the spread of the data was). The most commonly used measure of the central location was the **arithmetic mean** or the average (denoted by $\overline{x}$).

Measures of variability

The variability of a data set is the degree to which observations in the data set vary from each other with respect to a particular characteristic. The **range** is a measure of variability. A commonly used measure of variation is the **standard deviation**, which gives an indication of the average distance from the mean.

3.4.5 ESTIMATING THE POPULATION PARAMETERS

Confidence intervals

For this geriatric study a 95% confidence interval was calculated and this means that, in a series of identical studies based on different samples from the same population, 95% of the 95% confidence intervals calculated from these studies will include the true population parameter.

Hypothesis (significance) testing

The p-value is thus the probability of finding an association or a difference, if there is in reality no association or no difference. An arbitrary cut-off point of the p-value, namely 0.05, was chosen in this study. This cut-off value is called the **significance level** of the test, and refers to the probability of rejecting the null hypothesis if it is in fact true (the Type 1 error). In this study *p*-values were classified as 'significant' if $p<0.05$ and 'non-significant' if $p>0.05$. Exact p-values will be given in the results but only statistically significant differences and correlations will be referred to. Significance testing can indicate whether there is a statistically significant difference between two groups, or a statistically significant association between two variables (Katzenellenbogen *et al.,* 1997).

Outline of statistical analysis

The data were transferred to the statistics program SPSS-PC+® for statistical analysis as follows:

1) Summary statistics:

- Categorical: Frequencies (%)
- Numeric: means ± SD (Standard deviation)

2) Comparative statistics (between 2 groups for example males and females):

- Comparison of the means of two groups using: 1) *t*-test
  2) Analysis of variance (ANOVA)
- Comparison of frequencies (%): chi-square

Quantitative data were statistically analyzed using frequency distribution, percentage distribution and chi-square. The desired level of significance in this study is 0.05. A p-value of 0.05 or less was considered statistically significant, using the chi-square-test (un-corrected). The Pearson's correlation matrix (r-value) was also used.

3.4.6 ANALYSIS OF PRESCRIPTION INTERVENTIONS

The data on the PIF was analysed as for the patient profile. However, the actual prescription interventions were further classified into categories, types and significance, which will be discussed next.

3.4.6.1 DRPs warranting prescription interventions

In analysing the intervention data to present the results in the most meaningful way, several classification systems were investigated. Those that were potentially useful were modified to form a comprehensive categorization system. The classification in Table 3.4.7 was found useful, as it best illustrated the professional expertise from which the patients benefited. Pharmacist recommendations (or pharmacist-initiated interventions) and prescribing errors, were used as the basis for the analysis.

Table 3.4 DRPs warranting prescription interventions

DRPs WARRANTING PRESCRIPTION INTERVENTIONS
1. PRESCRIPTION INFORMATION OMISSION • Drug omitted / not specified • No strength specified where multiple strengths available • Dose or dosage regimen is not specified • Dosage form not specified / unavailable • Quantity to dispense/ duration of therapy not specified • Vague / Incomplete directions for use • Prescription order is illegible • Violates legal requirements -Unsigned by prescriber - Undated
2. PRESCRIBING ERROR • Inappropriate / incorrect drug or medical indication • Inappropriate dose /dosage regimen/strength - extra or wrong dose - subtherapeutic dose - potentially toxic dose • Inappropriate dosage form / route of administration • Inappropriate quantity / duration of therapy • Inappropriate dosage interval • Incorrect patient name on prescription • Policy infraction – non-coded item -Item restricted to specialist use -Item restricted to certain specialists only - > five items on prescription • Drug is out of stock • Less costly medicine available • Other
3. DRUG INTERACTIONS • Drug - drug • Drug – OTC drug • Drug – disease • Drug – food • Drug - allergy / sensitivity • Drug – age • Drug – lifestyle • Other
4. DRUG THERAPY MONITORING • Allergy / sensitivity / contra-indication • Side effects / toxicity / suspected adverse reaction • Duplication of drug therapy • Overutilization – overuse of drug • Underutilization – underuse of drug • Patient concern / question

(Rupp, 1991 Pg.76).

3.4.6.2 Significance of documented interventions

The researcher subjectively categorized the significance of each intervention into one of five categories from intervention is " not significant" to intervention is "potentially life-saving." (Eadon, 1992).

Interventions classified as significant but not improving patient care included clarification (rather than correction) of drug strength, quantity and dosage form. Examples of "significant" improvement in patient care were correction of doses and instructions where an error was evident, duplication of therapy and compliance problems, while "very significant" interventions were predominantly major dose corrections, which in the pharmacist's opinion would have caused serious harm to the patient.

Table 3.5 Subjective significance of documented interventions

Subjective significance of documented interventions
Intervention is of *no significance* to patient care e.g. undated Rx
Intervention is of *low significance* but does not result in an improvement in patient care – informational only
Intervention is *significant* and results in an improvement in patient care (benefit could affect patient quality of life)
Intervention is *very significant* and prevents major organ damage or an adverse reaction of similar importance (averted potential major trauma / dysfunction)
Intervention is *extremely significant* – potentially lifesaving

3.4.6.3 Categories of prescription interventions

According to Eadon (1992) prescription interventions may be classified into the following categories based on the pharmacist's knowledge in specific areas:

(A) Clinical pharmacy: recommendations based on drugs, doses and factors specific to individual patients.

- **Pharmacokinetic:** Dose or frequency
  Dose changed based on renal function
  Dose changed based on hepatic function
  Drug assays

- **Drug interactions**
- **Inadvisable choice of drug:** Hypersensitivity or intolerance

  Patient factors or medical conditions (e.g. ß-blockers in asthma)

  Recommendations to cease due to adverse effects

(B) Pharmaceutical: (i.e. Product-orientated advice)

Advice to alter drugs or dose due to product knowledge (e.g. temazepam 5-10mg). Also advice to obtain approval to use restricted drugs or other advice related to hospital policy or legal matters. These interventions include knowledge of drug names, dose forms, standard dosages and dose intervals frequently allows the clinical pharmacist to identify any simple errors, which occur in prescribing. The following are example of product-orientated interventions.

- Drug name errors
- Transcription errors
- Omissions
- Duplications
- Pharmacological duplications
- Legal problems (unsigned prescriptions)
- Non-compliance with hospital policy (e.g. coding)
- Allergy documentation incomplete
- Incorrect doses

Pharmacological duplications included orders for two drugs in the same pharmacological class or having very similar pharmacological activity.

(C) Therapeutic: Advice to initiate a drug or change therapy based on the pharmacist's observation of medication charts, notes, results of tests or discussions with the patient, the patient's condition and alternative therapeutic avenues (e.g. suggesting a more appropriate antibiotic). Common therapeutic consultation interventions consisted of advising the physician about a drug for symptom control such as ordering pain relief or alternative analgesics.

(D) Cost minimisation: These interventions included advice to cease unnecessary drugs or change a route or drug to a cheaper alternative. These were interventions, in which the impact was largely on reducing potential expenditure, although therapeutic benefits may also be achieved. Discontinuation of drug therapy that was inappropriate or no longer required constituted the largest category of interventions (Bebee, 1990).

(E) Other relevant recommendations of the pharmacist:

The following are some recommendations or suggestion from pharmacists from other published studies on DRPs.

- Discontinue a drug
- Order blood test
- Increase, decrease or withhold a dose
- Increase or decrease dose intervals
- Change scheduling of medications or advice on dosage scheduling
- Initiate a drug
- Change dosage form
- Change drug or dose where pharmacist has identified drug interactions
- Discontinue order for serum drug concentrations
- Change drugs within a pharmacological class

3.4.6.4 Types of Prescription Interventions

In analysing the intervention data to present the results in the most meaningful way, several classification systems were investigated. Those that were potentially useful were modified to form a comprehensive categorization system. The categorisation was found useful, as it best illustrated the professional expertise from which the patients benefited. Pharmacist recommendations (or pharmacist-initiated interventions) and prescribing errors, were used as the basis for the analysis.

Two major types for the analysis of the pharmacist interventions were used:

1. Pharmacist-initiated interventions
2. Prescribing errors

Pharmacist-initiated interventions were suggested by the pharmacist to improve the monitoring and appropriateness of the patient's drug therapy, such as a request to discontinue a drug and advice on dosage scheduling. Prescribing errors (errors of commission) included wrong drug; doses outside the recommended range and failure to indicate required drug the strength.

3.4.6.5 Preventability of DRPs

Many DRPs should be avoidable due to their predictability, and it is reported in previous studies that around half are preventable. The DRPs identified were categorised into therapeutic groups responsible, or other specific problems, and the circumstances surrounding the problem examined. Health care professional's responsible examined aspects of management of the patient's drug therapy in the community to assess the preventablity of the identified DRPs for the patient's drug therapy. This included the possibility of the pharmacist's contribution in the prevention of DRPs identified in the elderly patients, rather than concentrating mainly on the role of the prescriber. The assessment was based on previously documented criteria for preventability, which were further expanded and categorised in relation to each specific drug group or problem category identified in the present study.

The categorisation of DRPs identified is illustrated using the therapeutic group non-steriodal anti-inflammatory drugs (NSAIDs) as an example. Similar categorisation was used for other drug groups (Cunningham, 1997). The assessment was based on previously documented criteria for preventability (Hallas, 1990).

(A) **Definitely preventable**: the DRP was due to a drug treatment inconsistent with present-day knowledge of accepted medical practice or was clearly unrealistic, considering the known circumstances. (No valid indication for prescription, prescription to patients with a past history of ADRs to NSAIDs, more than one NSAID prescribed concurrently, unreasonable dose for an elderly patient, NSAID inappropriate due to a contra-indication, unsuitable choice of NSAID for an elderly patient, NSAID prescribed to patient with past history of peptic ulcer). If it was considered that the patient had received sub-standard care, the DRP was categorised as preventable.

(B) **Possibly preventable**: the prescription was not erroneous, but the DRP could have been avoided by appropriate measures taken by the prescribing physician or pharmacist over and above the obligatory requirements. (If any of the following possible solutions could have been applied- Co-prescription of an H_2- receptor antagonist or Misoprostol to those patients at high risk of side effects of NSAIDs, counseling of patients by the prescriber and pharmacist on possible side effects of therapy and action to be taken should they occur, Patient Medication Records (PMRs) with information held on OTC medicines and disease states as well as prescribed medication.)

(C) **Not preventable**: the DRP could not have been avoided by any reasonable means or was an unpredictable event in the course of treatment fully in accordance with accepted medical or pharmaceutical practice e.g. the patient was using the drug for an inappropriate indication which could not have been known by the prescriber or pharmacist by reasonable means.

PHASE 2: INTERVENTION STRATEGIES

After the drug related problems were identified from the study in March and April 1998, intervention strategies were devised to try to minimize or overcome the common DRPs.

I. Patient counselling leaflet

II. Prescribing guidelines for geriatric patients

III. Counselling of in-patients

3.5.1 PATIENT COUNSELLING LEAFLET

3.5.1.1 DESIGN OF THE PATIENT COUNSELLING LEAFLET

A patient counselling leaflet was compiled after a comprehensive literature review on compliance and patient counseling. The leaflet was compiled in English and Zulu to accommodate the predominate languages the geriatric patients attending this hospital were literate in (Section 4.2.2.2). The leaflet was devised as a reminder to those geriatrics who already knew the instructions and informational to those who did not know the instructions or content. The leaflet explained what compliance was, what it comprises and its importance in the well being of geriatric patients. In addition the leaflet also informs the geriatrics patients of things they should do or not do with their medication and importance of understanding their medical condition. It also tells them to enquire about aspects they do not understand about their medicine. In addition, of importance was informing the practitioner of any other medicines they are taking or using, other than those currently prescribe. It gives them useful hints on how to remember to take their medication (Appendix 3.1). A short questionnaire was devised to assess the leaflet (Appendix 3.2).

3.5.1.2 ASSESSMENT OF THE PATIENT COUNSELLING LEAFLET

- **PILOT STUDY**

The leaflet and questionnaire were tested in a pilot study conducted on a single day in May 1999 on thirty geriatric outpatients that were waiting to collect their medicine at the dispensary. The pilot study was conducted to allow for the refinement of the research instruments viz. the patient information leaflet and the questionnaire. Problems were identified with the wording and clarity of the leaflet and the self-administered questionnaire, and these were amended. After finalizing the research instruments, they were distributed to geriatric outpatients in the actual study.

- **ACTUAL STUDY**

These geriatric outpatients were randomly selected whilst they were waiting to collect their medicines at the dispensary. Unlike the geriatric patients in phase 1 of the study, it was not feasible or necessary to apply the inclusion criteria listed in 3.2.3 to this sample population. The only inclusion criteria was that the patients had to be 65 years and over and this was verified by checking their receipts, which had their dates of birth. After explaining to the patients selected the purpose of the study, consent to take part in the study was obtained from them.

This study was conducted over a period of 2 days in June 1999 at the pharmacy outpatient's department of Addington hospital. 175 geriatric out- patients were selected randomly. Those who consented to take part in the study were given the leaflet, allowed 10 to 15 minutes to read it and were then asked to complete the short questionnaire.

3.5.2 PRESCRIBING GUIDELINES FOR GERIATRIC PATIENTS

It was considered that an educational intervention to improve prescribing in geriatric patients could potentially lead to fewer DRPs and drug-related admissions.

A guideline on prescribing for the elderly was compiled using the reference books e.g. South African Medicines Formulary (SAMF), SA Essential Drug List (EDL), Basic and Clinical Pharmacology, Drug Interactions, Journal articles etc. The guideline in the form of a booklet comprises of the clinical drug interactions that were found to be the most common and implicated to cause undesirable effects in geriatrics. The prescribers were also advised on how to minimize the possibilities of adverse drug effect when treating geriatrics. (Appendix 4).

3.5.3 COUNSELLING OF DISCHARGE PATIENTS

The importance and benefits of counselling was established in phase 1 of this study. Ideally, one of the most important intervention strategies would be to institute routine counseling of all patients at the hospital on their medicines. However, with the limitations of time, resources, staff and money in the public sector this is not practical or feasible. From previous literature and other studies, it was established that many hospital admissions of geriatric patients were due to DRPs, the greatest being non-compliance. Therefore, it was decided to implement counseling of in-patients in one of the medical wards as a pilot study. This was done according to the protocol on patient counseling of in-patients (Appendix 5).

Also supplying patients with a written counselling information at discharge is a further means of overcoming DRPs like compliance (Appendix 5).

3.5.3.1 Discharge counselling information

Of concern is the low level of counselling of relatives, many of whom are involved in medication management in the home. The written patient-counselling discharge information can, therefore also serve as a source of information for caregivers. The patient-counseling leaflet provided written information on the new and current medicines to be read, once at home, by patients and by their relatives who helped with their medicines (Appendix 5).

In an intervention study by Woffindon in 1994, the importance of individualising the information provision to ensure that it is acceptable to the patient and appropriate to their needs and capabilities was emphasised. In addition, the information which patients wish to be given about their medicines must be considered. Information on side effects, how to use the medicine and the use of the medicine with other medicines are among those aspects most highly rated.

General advice on prescription and medication management was given and prescribed medication was listed with full administration details. In addition, information on medication changes made in hospital, future medication needs and drug allergies were included. Finally, any problems in opening containers, measuring liquids and details of compliance aids used were noted.

3.5.4 DEVISING OF DRPs REPORTING SYSTEMS

One of the most common and potentially harmful or fatal DRPs is adverse drug reaction. This was a very common DRP in Phase 1 of the study. Documentation of ADRs should be according to the guidelines recommended by the national adverse drug event-monitoring centre (Appendix 6). However, in-house DRPs monitoring systems may be devised to monitor drug usage at a particular health institution, in this instance Addington hospital. A number of reporting systems are available. Using these an ADR reporting system was devised (Appendix 6). A medication error report (Appendix 7) was also devised for surveillance of errors in dispensing.

CHAPTER 4

RESULTS AND DISCUSSIONS

This chapter presents all results and discussions related to the pilot study, general characteristics, disease process (es), pharmacotherapy, drug-related problems, adverse drug reactions, medication compliance and prescription interventions of the geriatric patients, as well as the developed intervention strategies.

4.1 PILOT STUDY

A pilot study (Section 3.3.2) was conducted on a single day in February 1998 for pre-testing the research instruments (Section 3.3.1.1 and Section 3.3.1.2)) before carrying out the survey on the chosen sample of geriatrics at the selected institution. The pilot study tested the understanding of the questions and the answer alternatives in the patient profile and helped to determine the sample size for the final study. It also helped to determine the period required interviewing the patients.

Thirteen geriatric patients were chosen according to the sampling procedure outlined in section 3.2.3. Problems were identified with the patient profile (Appendix 1) for example: with question 6.5 the elderly patients understood the question: "Did you ever not keep a clinic appointment or collect your medicines?" as medicines to be collected on the current prescription from the prescriber after their clinic appointment. However, the intention of the researcher was to also check compliance of repeat chronic medications. The question was extended to read: "Did you ever not keep a clinic appointment or collect your medicines, including your monthly repeat medicines?" Question 4.3 patients were asked: "Are you taking any other prescribed medication?" was mistaken for medication taken orally. It did not include topical preparations and was therefore changed to: "Are you taking or using any other prescribed medication?" Other similar problems were identified and rectified. Elimination of problems identified in the pilot study allowed for refinement of the instruments and enhanced the quality of the patient profile and the PIF.

The average time taken to interview and counsell a patient on their medication was 30 minutes. This time however, was increased if the patient required a prescription intervention. Determination of the time taken to interview the patients helped to establish an average of 15 patients being interviewed by a single researcher per day.

Drug related problems were identified in twelve of the elderly patients (92%) interviewed in the pilot study. Of the thirteen patients interviewed four cases (30.8%) warranted prescription intervention. The PIFs were completed for these patients and involved a clinical drug-drug interaction, prescribing error (restricted item), prescribing omission (unsigned by prescriber) and a dispensing error. The other eight DRPs were mainly on non-compliance (not keeping clinic appointments or collecting repeat medicines or not taking the medicine as prescribed), inadequate knowledge of their drug treatment and adverse drug reactions. The DRPs of the pilot study will not be discussed in detail, as this was not the purpose of the pilot study.

The results of the prevalence of DRPs in the pilot study assisted with the statistical determination of sample size. From the 92% prevalence of DRPs in the pilot study, a 75% proportion of DRPs was estimated in the actual study. Therefore with a sample size of 280 geriatric patients one can estimate the proportion of DRPs to within ± 5% with a 95% confidence interval (Connelly, 1998).

The final geriatric study was conducted over an eight-week period in April and May 1998, during which 281 patients who met the inclusion criteria listed in Section 3.2.3 were interviewed.

A p-value of 0.05 or less was considered statistically significant, using the chi-square-test (un-corrected). Only statistically significant differences and correlation will be referred to in the results to follow. Also, when reference is made to "elderly patients" in the results and discussion, this refers to the 281 geriatric patients who were interviewed and constituted the study population.

4.2 GENERAL CHARACTERISTICS OF THE GERIATRIC PATIENTS

In this section data of patient demographics, socio-economic status and patient habits will be discussed.

4.2.1 PATIENT DEMOGRAPHICS

The data on age, gender and race of the geriatric patients has been outlined for comparison purposes.

Table 4.1 Comparison of age, gender and race of the elderly patients

		Asian	Black	Coloured	White	Total
Age (years)	**Mean ± SD (range)**					
65-70	67.7 ± 1.7	45 (16.0%)	14 (5.0%)	14 (5.0%)	44 (15.7%)	117 (41.6%)
71-75	72.8 ± 1.2	24 (8.5%)	7 (2.5%)	10 (3.6%)	35 (12.5%)	76 (27.0%)
76-80	77.6 ± 1.2	16 (5.7%)	2 (0.7%)	2 (1.1%)	37 (13.2%)	58 (20.6%)
>80	84.9 ± 3.2	5 (1.8%)	0 (0.0%)	3 (1.1%)	22 (7.8%)	30 (10.7%)
TOTAL	73.0 ± 5.8	90 (32.0%)	23 (8.2%)	30 (10.7%)	138 (49.1%)	281 (100%)
Gender						
FEMALE		47 (16.7%)	14 (5.0%)	27 (9.6%)	90 (32.0%)	178 (63.3%)
MALE		43 (15.3%)	9 (3.2%)	3 (1.1%)	48 (17.1%)	103 (36.7%)
TOTAL		90 (32%)	23 (8.2%)	30 (10.7%)	138 (49.1%)	281 (100%)

4.2.1.1 AGE OF THE ELDERLY PATIENTS

The mean age of the study sample was 73.0 ± 5.8 years (range 65 to 93 years) (Table 4.1). 68.6% (193) of the patients were below 75 years compared to 88 patients (31.4%) who were aged over 75 years. Figure 1 represents the distribution of patients in the different age groups. Majority of the patients (41.6%) were aged between 65 and 70 years.

4.2.1.2 GENDER OF THE ELDERLY PATIENTS

There were 178 females (63.3%) and 103 males (36.7%) in the 281-sample population (Table 4.1). 24.5 % of the men and 44.1% of the women were aged less than 75 years, while 19.2% of the women and 12.1 % of the men were aged above 75 years (Figure 2). There was no statistically significant difference (p=0.1342) between the gender and the age of the population. With the Coloured race group, the distribution of gender had more females than males (ratio 9: 1).

4.2.1.3 RACE OF THE ELDERLY PATIENTS

The majority of the patients (49.1%) were white, presumably because Addington Hospital was a white hospital, historically. In addition, Addington Hospital is situated in central Durban an urban area, where the majority of the people are White and the minority group is Black.

There was a statistically significant difference (p =0.009) between the age of the patients in the different race groups. In the 65-70 age group, the majority of the patients were 45 Asians (16.0%) and 44 Whites (15.7%) (Table 4.1).

There was a statistically significant difference (p = 0.0026) with the race of the geriatric patients and their gender. The majority (32.0%) of the patients was White; females as compared to 1.1% Coloured male patients, because Coloureds are a minority group in Durban.

A summary of the distribution of elderly patients according to race is illustrated in Figure 3.

FIGURE 1 : AGE OF ELDERLY PATIENTS

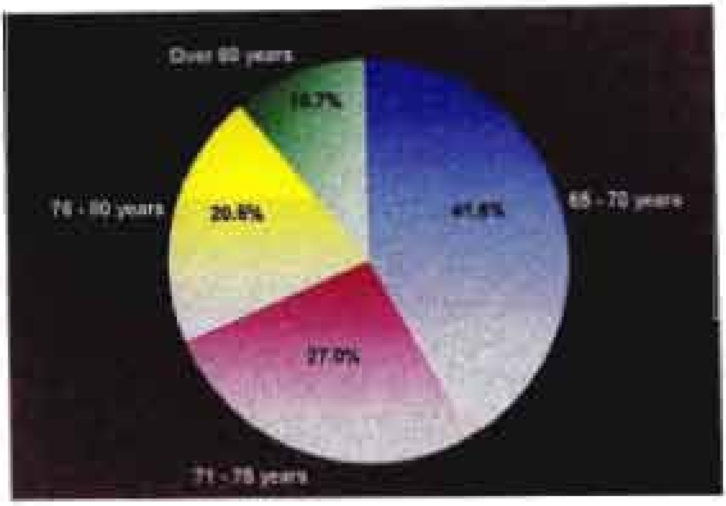


FIGURE 2 : GENDER OF ELDERLY PATIENTS

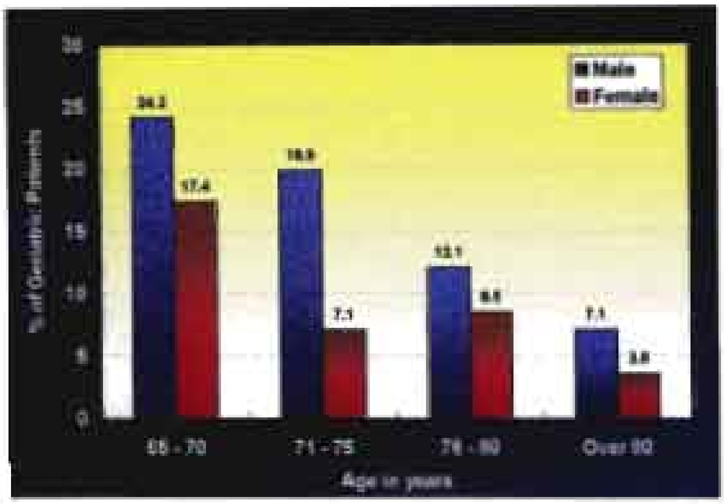
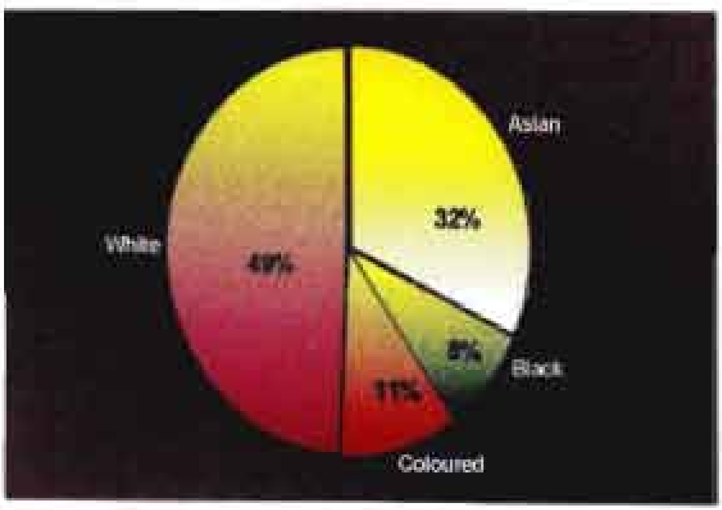


FIGURE 3 : RACE OF THE ELDERLY PATIENTS



4.2.2 GERIATRIC PATIENT'S BACKGROUND AND SOCIO-ECONOMIC STATUS

Results of the elderly patient's level of education, literacy, employment status, marital status, home circumstances, place of residence and attendance at the hospital is discussed in this section.

4.2.2.1 LEVEL OF EDUCATION OF THE ELDERLY PATIENTS

The educational level of the elderly patients helped to determine the level of literacy of the population.

Table 4.2 Level of education of the elderly patients

Level of education	Frequency (281)	Percent (100)
Primary	60	21.4%
Secondary	175	62.3%
Tertiary	19	6.8%
No formal education	26	9.3%
Other (e.g. Technical skills)	1	0.4%

Table 4.2 indicates that only 26 geriatric patients (9.3%) did not receive any formal education and this may account for many patients who experienced reading and writing difficulties. Those patients who are educated are more likely to have a better understanding of their drug treatment, and this could influence compliance.

4.2.2.2 LITERACY OF THE ELDERLY PATIENTS

The following table illustrates the results of the elderly patients' ability to read, write and speak their first language.

Table 4.3 Elderly patients' ability to read, write and speak

First Language/s	Ability to read(%)	Ability to write(%)	Ability to speak(%)
English	197 (70.1%)	193 (68.7%)	206 (73.3%)
Afrikaans	10 (3.6%)	10 (3.6%)	12 (4.3%)
English & Afrikaans	6 (2.1%)	6 (2.1%)	6 (2.1%)
Zulu/Xhosa	20 (7.1%)	18 (6.4%)	22 (7.8%)
Other	18 (6.4%)	16 (5.7%)	34 (12.1%)
No language	29 (10.3%)	37 (13.2%)	0 (0.0%)

Approximately 70% of the patients had the ability to read English (Table 4.3), which was their first language. For those patients who experienced difficulties in reading, writing or speaking English there was a great potential for misunderstanding their diagnosed medical condition, drug therapy and directions on how to take their medicines correctly. The accumulated number of elderly patients who could not read, write or speak English was 16 (5.7%) and this was one of the reasons for them not taking their medicines correctly as prescribed. Low literacy resulted in some patients not being able to understand verbal instructions and in their inability to read directions on the labels, as English is the language of use in the detailing process. When these patients have to rely on their memory to take their medicines as directed, this leads to a number of DRPs.

Table 4.4 Problems with reading and/ or writing

PROBLEM	YES	NO
Reading	45 (16.0%)	236 (84%)
Writing	58 (20.6%)	223 (79.4%)

Forty-five elderly patients (16.0%) in the sample experienced problems in reading, whilst 236 (84%) of them did not experience any problems in reading (Table 4.4). Fifty-eight of the geriatric patients (20.6%) had trouble in writing, whilst 223 (79.4%) had no such problems. Difficulty in writing was due mainly to the problem of illiteracy. Many of the patients, who had writing difficulties, also had reading problems. However, a few patients were fully literate but experienced problems in writing related to debilitating diseases such as arthritis and Parkinson disease where there is a loss of manual dexterity. For 26.7% elderly patients who could not speak English, the assistance of an interpretor facilitated the interview process or the caregiver was interviewed if one accompanied the patient.

4.2.2.3 EMPLOYMENT STATUS OF THE ELDERLY PATIENTS

Table 4.5 Employment status of the elderly patients

Employment status	Number of patients	Percent
Retired	175	62.3%
Housewives	103	36.7%
Full-time employment	2	0.7%
Part-time employment	1	0.3%

In the study population: 175 of the patients (62.3%) were retired, 103 were housewives (36.7%), two patients (0.7%) were still in full-time employment and one 78 year old, White female patient (0.3%) was in part-time employment (Table 4.5).

4.2.2.4 MARITAL STATUS OF THE ELDERLY PATIENTS

Table 4.6 Marital status of the elderly patients

Marital status	Number of patients	Percent (%)
Single	16	5.7%
Married	121	43.1%
Widowed	127	45.2%
Divorced	12	4.3%
Separated	5	1.8%

The findings in Table 4.6 indicate that 43.1% of the patients were married, implying that they had the companionship and support of their spouses, while 56.9% of the patients were without this support either because they had never married, were divorced, widowed or separated from their spouses.

4.2.2.5 CARE-GIVER SUPPORT

Table 4.7 Home circumstances

Home circumstances	YES	NO
Lives alone	63 (22.4%)	218 (77.6%)
Caregiver support	152 (54.1%)	129 (45.9%)

Table 4.7 indicates that 63 patients (22.4%) lived alone, while 218 (77.6%) lived with someone. One hundred and fifty two (54.1%) of the patients had a caregiver who helped to care for them, while 129 (45.9%) of the elderly patients had to take care of themselves. 153 of the geriatric patients (54.4%) did receive support from caregivers while attending the hospital. One hundred and twenty eight of the geriatric patients (45.6%) in the sample population were not assisted by a caregiver when attending the hospital. Caregivers play an important role in the supervision and administration of the elderly patients' medicines (Section 4.7.2). Thus patients, who have assistance with their medicine administration, are more likely to comply with their drug treatment than those who do not.

Of those patients who had the assistance of a caregiver, the caregivers are listed in Table 4.8

Table 4.8 Caregivers of the elderly patients

Care-giver	Frequency	Percent
Nurse/nursing assistant	16	5.7%
Immediate family	130	46.3%
Friend	7	2.5%
Home help/care-taker	6	2.1%
Minister	1	0.4%

The findings in Table 4.8 reveal that the majority of the caregivers of the elderly patients were immediate family members (46.3%) and friends (5.7%).

4.2.2.6 PLACE OF RESIDENCE OF THE ELDERLY PATIENTS

Table 4.9 Place of residence of the elderly patients

Place of residence	Number of patients	Percent of patients
Retirement village	25	8.9%
Old age home	148	52.7%
Own/rent house or Flat	15	5.3%
Family or relatives home	84	29.9%
Friends place	1	0.4%
Boarding	6	2.1%
Shelter	1	0.4%
Squatter camp	1	0.4%

The majority of the patients (52.7%) lived in an old age home and 8.9% in a retirement village (Table 4.9). 29.9% lived at family or relatives home. Only 5.3% of the elderly patients lived in their own house or flat.

4.2.2.7 PERIOD OF ATTENDING ADDINGTON HOSPITAL (YEARS)

Table 4.10 Period of attending Addington Hospital (Years)

Period (Years)	Frequency	Percent
1-5	132	47.3%
6-10	70	25.1%
11-15	38	13.6%
16-20	26	9.3%
Over 20 Years	13	4.3%
Did not know	2	0.4%

The majority of the patients (47.3%) were attending the hospital for a period of one to five years (Table 4.10). The period of attendance at the hospital was determined by questioning the patients, and then verified from the patient's medical records and computer database at the hospital. Over 72% of the sample had been patients at Addington Hospital over the last 10 years.

4.2.3 ELDERLY PATIENTS LIFESTYLE OR ACTIVITIES

Changes in lifestyle patterns (e.g. increased use of alcohol, smoking, alterations of daily living like difficult in sleeping) may diminish compliance and efficacy of treatment. Therefore, it is helpful to evaluate elderly patient's lifestyle or activities (Salom and Davis, 1995).

Table 4.11 Elderly patients' lifestyle or activities (habits)

Lifestyle or activities	Yes	No
Consumption of alcohol	86 (30.6%)	195 (69.4%)
Smoking cigarettes/tobacco	35 (12.5%)	246 (87.5%)
Consumption of caffeine beverages	269 (95.7%)	12 (4.3%)
Sleeping difficulties	175 (62.3%)	106 (37.7%)
Exercise	118(42.0%)	162 (57.7%)

30.6% of the elderly patients did consume alcohol (Table 4.11), but very few admitted to consuming alcohol on a daily basis. There is a tendency of patients to under-report alcohol use (Haddad and Wegner, 1999). Those patients, who admitted to drinking alcohol, indicated that they consumed alcohol on a few occasions and/or in small quantities. This was a subjective assessment of the alcohol consumed based on the patients' or caregivers' response and could not be verified. Alcohol has the potential to interact with the patients' medicines and cause severe adverse effects, including CNS depression. This may also lead to many DRPs, because the elderly patient's ability to manage his or her medicines correctly gradually deteriorates as the brain becomes progressively more disorganised with alcohol consumption (Stockley, 1996). Elderly patients should be advised that alcohol might exacerbate certain medical conditions for which they may be taking chronic medications. Such conditions include diabetes, hypertension, congestive heart failure, gout, peptic ulcer disease, gastroesophageal reflux disease, gastritis, osteoporosis, depression, and Alzheimer's disease. Alcohol may contribute to hypertension, produce arrhythmia, or mask angina in patients with IHD. Heavy drinkers may present with symptoms of anxiety, depression, confusion, dementia, or insomnia (Haddad and Wegner, 1999).

Cigarette smoking was reported by 12.5% of the geriatric patients (Table 4.11). Patients who smoked and had co-existing cardiovascular disease was at risk of myocardial infarcts and in patients with COAD, an exacerbation of the condition occurs. Smoking can stimulate drug-metabolizing enzymes thereby reducing the concentration of the drug in the blood (Kairuz *et al.*, 1998) and this can lead to subtherapeutic effects.

A great majority of the elderly patients (62.3%) experienced sleeping difficulties, which was mainly insomnia and this is to be expected in geriatric patients (Table 4.11). 7.5% of the elderly patients were diagnosed as suffering from chronic insomnia (Figure 4) and in many patients the 27 tranquilisers, hypnotics and sedatives prescribed in the total sample population, were often prescribed to treat the insomnia (Table 4.32).

4.3 DISEASE PROCESS (ES) OF THE ELDERLY PATIENTS

This section discusses results obtained from geriatric patients on their present medical conditions, physical impairments and cognitive function (memory) and past medical history.

4.3.1 PRESENT MEDICAL CONDITIONS IN ELDERLY PATIENTS

4.3.1.1 NUMBER OF MEDICAL CONDITIONS IN ELDERLY PATIENTS

The range of the number of medical conditions in these elderly patients was from 1 to 9. Another study reported that 40% of ambulatory elderly patients had between 4 and 7 disease states (Hale *et al.*, 1986). In the present study, the mean number of medical conditions in the 193 patients aged 75 and under was 3.1 ± 1.1 and this was slightly higher than with the 88 patients aged greater than 75 (2.9 ± 1.1). However, there was no significant difference in the number of diagnoses for patient's aged less than 75 and 76 and over ($p = 0.202$).

4.3.1.1.1 Comparison of the number of diagnoses with age

Table 4.12 Comparison of the number of medical conditions with age, gender and race in the total population

	Number of patients with 1-3 Medical Conditions	Number of patients with 4 or more medical conditions	Total number of patients
Age Group (Years)			
65-70	87 (31.0%)	30 (10.7%)	117 (41.6)
71-75	51 (18.1%)	25 (8.9%)	76 (27.0%)
76-80	40 (14.2%)	18 (6.4%)	58 (20.6%)
>80	21 (7.5%)	9 (3.2%)	30 (10.7%)
TOTAL	199 (70.8%)	82 (29.2%)	281 (100%)
GENDER			
Female	133 (47.3%)	45 (16.0%)	178 (63.3%)
Male	66 (23.5%)	37 (13.2%)	103 (36.7%)
TOTAL	199 (70.8%)	82 (29.2%)	281 (100%)
RACE			
Asian	57 (28.6%)	33 (40.2%)	90 (32.0%)
Black	21 (10.6%)	2 (2.4%)	23 (8.2%)
Coloured	26 (13.1%)	4 (4.9%)	29 (10.7%)
White	95 (47.7%)	43 (52.4%)	138 (49.1%)
TOTAL	199 (100%)	82 (100%)	281 (100%)

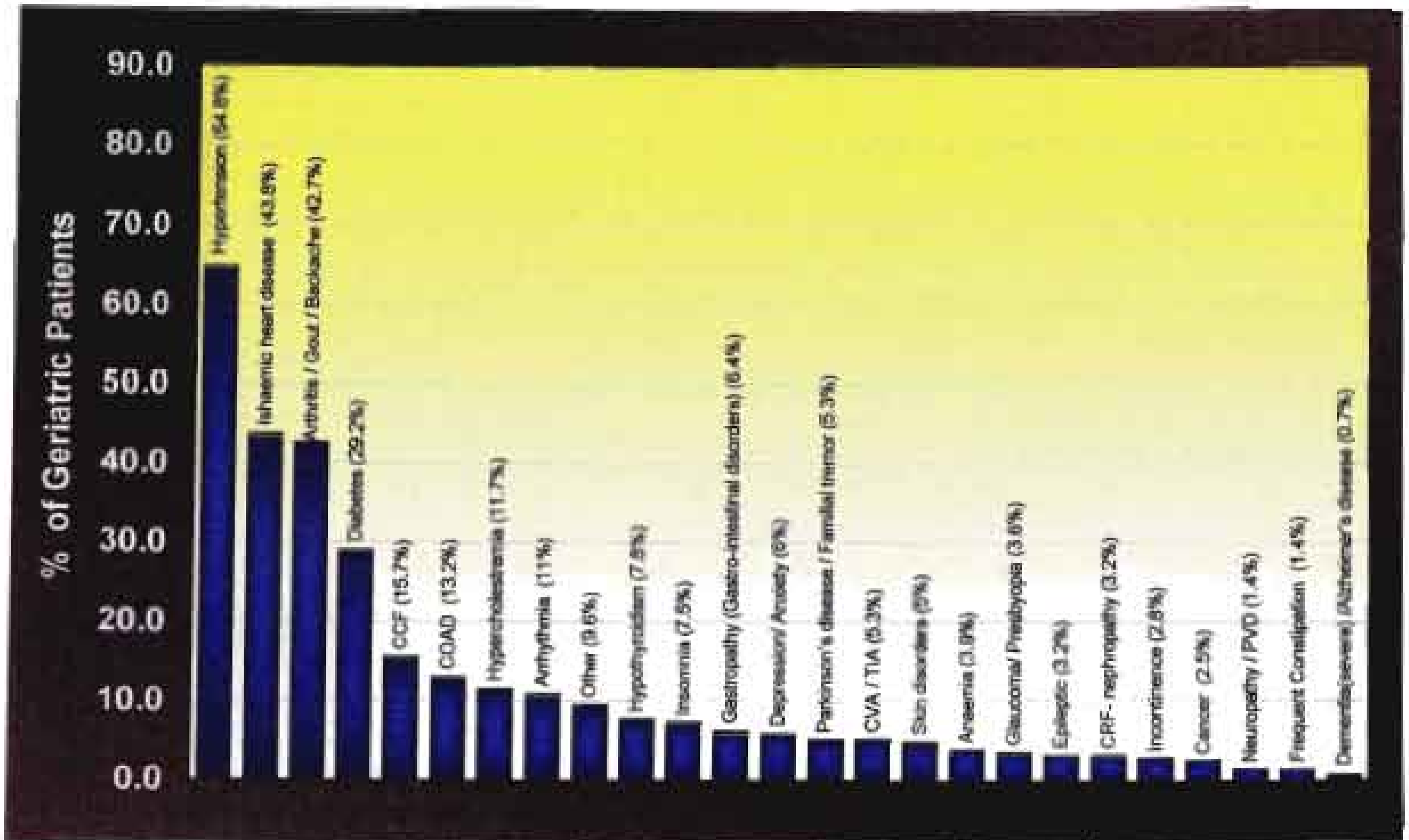
- The maximum number of diagnoses was nine in patient EH (69 years). 199 patients (70.8 %) experienced from one to three conditions and the remaining 82 (29.2%) patients had four or more medical conditions (Table 4.12). 31.0% of the patients between the 65-70 years, age group had 1-3 medical conditions and only 10.7% had four or more medical conditions. For patients over 80 years, there was a higher proportion (7.5%) who had 1-3 medical conditions as opposed to the 3.2 % of the patients who had 4 or more diagnoses.

- The comparison of gender with the number of medical conditions is not statistically significant (p=0.0586). There were more females experiencing 1-3 medical conditions (47.3%) as opposed to the 23.5% males (Table 4.12). This was the same for patients with 4 or medical conditions, 16.0% females and 13.2% males. This may be due to more females in the total sample population.

- There was a statistically significant difference (p=0.0116) in the number of diagnoses in the different race groups. This may also be attributed to the number of patients of the different race groups in the total sample population of 281 elderly patients (Table 4.1). Of the 199 patients experiencing 1-3 medical conditions there were 47.7%, white patients and only 10.6% black patients. A similar trend was observed for those patients that had 4 or more medical conditions (52.4% white patients; 2.4% black patients) (Table 4.12). This is to be expected as there were more white patients (49.1%) in the sample population as opposed to black patients (8.2%) (Table 4.1).

In all the race groups, more elderly patients experienced 1-3 medical conditions than 4 or more medical conditions.

FIGURE 4 : PREVALENCE OF CHRONIC DISEASE IN THE ELDERLY



4.3.1.2 PREVALENCE OF CHRONIC MEDICAL CONDITIONS IN THE ELDERLY

Figure 4 shows the prevalence of several common chronic conditions in elderly patients in order of frequency. Prevalence of disease or symptom in the elderly patients, is a percentage of the total sample population (281).

Most geriatric subjects suffered from multiple, chronic conditions. Figure 4 shows that the most common chronic conditions experienced by these elderly patients were hypertension (64.8%) followed by ischaemic heart disease (43.8%), Musculoskeletal disorders (arthritis or gout) (42.7%), diabetes (Diet controlled, IDDM and NIDDM) (29.2%), chronic obstructive airways disease (13.2%), hypercholesteremia (11.7%) and arrhythmia (i.e. atrial fibrillation) (11.0%). These results correlate with some of most common medical disorders experienced by elderly patients as reviewed by Osman (1996), e.g. constipation, arthritis (Section 2.2.1). The main types of cancers experienced by these patients were breast, kidney and prostate. Only 0.7% of the elderly patients were reported to suffer from severe dementia or Alzheimer's disease, although this is a common condition that elderly patients experience (Osman, 1996). In addition, the common chronic conditions experienced accounts for the significantly higher proportion of patients admitted to hospital for some of the above conditions (Table 4.20).

The following Tables 4.13 to 4.17 give the prevalence of disease within the broad classification of chronic disease in Figure 4.

Table 4.13 Chronic obstructive airways disease (COAD)

COAD	Disease Prevalence	Percentage
Asthma	30 (83.8%)	11%
Bronchitis	1 (2.7%)	0.4%
Bronchiectasis	1 (2.7%)	0.4%
Emphysema	4 (10.8%)	1.4%
TOTAL	37 (100%)	13.2%

Asthma (83.8%) was the most common COAD and was experienced by 11% of the total geriatric population of 281 patients.

Table 4.14 Diabetes

Diabetes Type	Disease Prevalence	Percentage
IDDM	13 (15.9%)	4.6%
NIDDM	69 (84.1%)	24.6%
TOTAL	82 (100%)	29.2%

NIDDM was more common (84.1%) of the 82 patients who had diabetes, than the 15.9% who had insulin dependent diabetes NIDDM. One of the NIDDM patients was controlled on diet alone

Table 4.15 Gastropathy (Gastro-intestinal disorders)

Gastropathy	Disease Prevalence	Percentage
Duodenal ulcer	2 (15.8%)	1.1%
Peptic ulcer	3 (21%)	1.4%
Gastric ulcer	1 (5.3%)	0.4%
Hiatus hernia	4 (26.3%)	1.8%
Oesophagitis	1 (5.3%)	0.4%
Gastritis	2 (10.5%)	0.7%
Diarrhoea	1 (5.3%)	0.4%
Irritable Bowel Syndrome	1 (5.3%)	0.4%
Spastic Colon	1 (5.3%)	0.4%
TOTAL	19 (100%)	6.8%

The common medical conditions affecting the GIT were mainly ulceration, hiatus hernia and gastritis (Table 4.15). One patient had both a spastic colon and irritable bowel syndrome.

Table 4.16 Skin disorders

Skin disorders	Disease Prevalence	Percentage
Psoriasis	4 (35.7%)	1.8%
Solar Keratosis	4 (28.6%)	1.4%
Eczema	1 (7.1%)	0.4%
Other miscellaneous	4 (28.5%)	1.4%
TOTAL	14 (100%)	5.0%

Psoriasis and solar keratosis were the main skin disorders present in elderly patients. Other miscellaneous skin disorders included dermatitis.

Table 4.17 Other Less Common Chronic Conditions

Other Chronic conditions	Disease Prevalence	Percentage
Multiple sclerosis	2	0.7%
Post herpetic pain	1	0.4%
Myasthenia Gravis	1	0.4%
Prostatic Hypertrophy	4	1.4%
Pain	5	1.8%
Headaches	2	0.7%
Chronic sinusitis (Post nasal drip)	2	0.7%
Haemorrhoids	3	1.1%
Claudication	1	0.4%
Carotid artery stenosis	2	0.7%
Coin lesion of the lung	1	0.4%
Aortic artery aneurysm	1	0.4%
Cardiomyopathy (CMO)	1	0.4%
Deep Vein Thromosis (DVT)	1	0.4%
TOTAL	27	9.6%

Table 4.17 lists the prevalence of chronic disease present in less than 2% of the elderly patients. These less common chronic medical conditions occurred in 9.6% of the total elderly population and were conditions like pain, prostatic hypertrophy, haemorrhoids, multiple sclerosis and chronic sinusitis.

4.3.2 PHYSICAL IMPAIRMENTS OR DISABILITIES AND COGNITIVE FUNCTION

Elderly patients require periodic assessment of cognition; hearing and visual acuity, as the abilities to hear, comprehend, read and follow directions are important components of drug compliance.

Table 4.18 Impairments / disabilities experienced by elderly patients

	SEVERITY OF IMPAIRMENT		
Impairments	GOOD	FAIR	POOR
Vision	41 (14.6%)	7 (2.5%)	233 (82.9%)
Hearing	136 (48.4%)	3 (1.1%)	142 (50.5%)
Mobility	113 (40.2%)	2 (0.7%)	166 (59.1%)
Speech	266 (94.75)	2 (0.7%)	13 (4.6%)

The results in Table 4.18 is a subjective assessment of severity of elderly patients vision, hearing, mobility and speech impairment, based on the patient or care-givers response and the researcher's assessment. In the classification of the severity of the impairment: 'good' was when the patient had no difficulties, 'fair' was when the patient had slight difficulty and 'poor' was when the patient was dependent on aids to assist them. Poor vision (where the patient required spectacles to correct for refractory problems) was experienced by 82.9% of the geriatric patients and this is to be expected from this group of the population. Poor hearing (could not hear and required hearing aids) was experienced by 50.5% of the elderly patients and impaired mobility (required the use of crutches or wheelchair) by 59.1%. Only 4.6% of the patients reported poor speech problems, and this was sometimes due to disease conditions like Parkinson's disease or a previous CVA.

4.3.2.1 VISION PROBLEMS

Three patients had problems with poor vision and were referred to the optometrist for spectacles. Poor vision may precipitate problems of poor compliance. This may be result in non-adherence to prescribed dosing regimens, because patients are unable to read the directions, or recognise their medicines.

4.3.2.2 MEMORY

Table 4.19 Elderly Patients Memory

Patient Forgets	Prevalence	Percent of Population
Often	70	25.0%
Sometimes	147	52.3%
Rarely	63	22.4%
Never	1	0.4%

Assessment of the patient's memory was also subjective and there was no way of verifying the patient's response, except for the 54.4% patients who were accompanied by caregivers (Section 4.2.2.5). In the classification 'often' was if the patient forgets almost every day, 'sometimes' was when the patients memory failed every once in a while, like every two weeks, 'rarely' was forgetting on a few occasions and 'never' is if the patient could always remember. In these patients, the caregiver was asked to verify the patient's response. Majority of the patients (52.3%) admitted to being forgetful sometimes. These findings are to be expected, because as one age one tends to become more cognitively impaired.

4.3.2.3 DIFFICULTY IN SWALLOWING (DYSPHAGIA)

Twenty-nine (10.3%) of the elderly patients had trouble in swallowing, mainly due to past operations, previous CVA or disease conditions (Parkinson's disease). The majority of the patients 252 (89.7%) experienced no difficulties.

4.3.3 PAST MEDICAL HISTORY

4.3.3.1 HOSPITALISATION OF ELDERLY PATIENTS

4.3.3.1.1 Previous hospitalization of elderly patients

Findings of this study, revealed that 259 of the elderly patients (92.2%) in the sample population had been hospitalised previously, while only 22 (7.8%) had not been hospitalised. Of those patients that were hospitalised, the same patient may have been hospitalised on more than one occasion either for the same problem or for different problems.

4.3.3.1.2 Number of hospitalisations of elderly patients

Table 4.20 Number of hospitalisations of elderly patients

Number of hospitalisation	Frequency	Percent
0	22	7.8%
1	84	29.9%
2	40	14.2%
3	18	6.4%
4	3	1.1%
5	4	1.4%
6	2	0.7%
7	1	0.4%
Surgical procedures	107	38.4%
TOTAL	281	100%

Table 4.20 displays the number of hospitalisations of patients for medical reasons like

diabetes, uncontrolled hypertension, etc and those admitted for surgical procedures. Surgical procedures: included operational procedures like a hysterectomy. Those patients that were admitted to hospital only for surgical procedures may have had more than one procedure done on different occasions. The following table lists the medical reasons for the patient's admission to hospital.

4.3.3.1.3 Reasons for hospital admissions

Table 4.21 Reasons for hospital admissions

Reason for admission	Frequency	Percent
Arrhythmia	11	3.9%
COAD	15	5.3%
CCF	25	8.9%
CRF	3	1.1%
CVA	17	6.0%
Diabetes	21	7.5%
Epilepsy	3	1.1%
Fracture / Dislocation	11	3.9%
Gastropathy	9	3.2%
Hypertension	16	5.7%
IHD	43	15.3%
MI	34	12.1%
Neuropathy	5	1.8%
Pulmonary embolism	1	0.4%
Transient ischaemic attack	1	0.4%
Pneumonia	10	4.0%
Hyperkalaemia	1	0.4%
Pernicious anaemia	1	0.4%
Parkinson disease	2	0.8%
Anaemia	3	1.2%
Cancer	2	0.8%
Cellulitis	2	0.8%
Claudication	1	0.4%
Constipation	2	0.8%
DVT	1	0.4%
Hyperkalemia	1	0.4%
Myasthenia Gravis	1	0.4%
Urethral stricture	1	0.4%
UTI	1	0.4%

Table 4.21 reflects the incidence of previous hospitalisations in the total sample population of 281 geriatric patients. One patient may have been admitted for different reasons at the same time or on different occasions. The greatest proportion of the patients (15.3%) were admitted for ischaemic heart disease (angina), followed by

12.1% for myocardial infarction, 8.9% for congestive cardiac failure (CCF), 7.5% for diabetes and 5.7% for hypertension. This high incidence of hospital admissions is also a reflection that the patient's medical condition or symptoms are **not** completely controlled on their drug treatment. Unfortunately, the number of hospital admissions due to DRPs could not be established either from the patient or from the patient's medical notes and was beyond the scope of this study. Hospital admissions due to DRPs are a recommendation for a future study (Section 6.3).

4.3.3.2 PAST OPERATIONS OR SURGICAL PROCEDURES

Table 4.22 Past operations or surgical procedures in elderly patients

Operations/surgical procedures	Frequency	Percent
Bladder operation	8	2.8%
Cataract removal	37	13.2%
Transurethral resection of prostate and Or bladder (TURB)†	12	4.3%
Haemorroidectomy	14	5.0%
Heart Bypass/ Aortic valve replacement	12	4.3%
Hip/ knee replacement/repair	8	2.9%
Hysterectomy	70	24.9%
IOL (Insertion of Lens)	5	1.8%
Neuronplasty*	3	1.1%
Sinus operation	1	0.4%
Aortic artery aneurysm	2	0.7%
Pacemaker Insertion	1	0.4%
Laminectomy	1	0.4%
Nephrectomy	1	0.4%
Gastrectomy	1	0.4%
Thyroidectomy	5	1.8%
Femoral Bypass	1	0.7%
Cholestectomy	8	2.9%
Hernia repair	6	2.1%
Osteomy	1	0.4%

† Transurethral resection of prostate and bladder (TURB) – procedure performed when patient has an enlarged prostate.

*Neuronplasty (circulatory problem, reconstructive surgery for damaged or severed peripheral nerves, post-CVA, aortic iliac disease)

Table 4.22 gives an indication of the operations and surgical procedures the elderly patients had undergone. The surgical procedures that the patients have undergone sometimes affect the patient's medical condition and drug therapy. For example, the 24.9% of the patient's (70) who had undergone a hysterectomy are candidates for hormone replacement therapy (HRT). However, from results of the patient's pharmacotherapy (Table 4.33) only 15 patients were on estrogen replacement. The remaining 55 patients who need HRT but are not receiving it are at risk of CVD and osteoporosis.

4.3.3.3 SUMMARY OF THE PILOT STUDY, GENERAL CHARACTERISTICS AND DISEASE PROCESS RESULTS

The discussions thus far were of the pilot study, general characteristics and disease process results. A sample size of 281 geriatric patients was determined as being statistically significant for this study. The mean age of the geriatric population was 73.0 ± 5.8 years (range 65 to 93) with the majority of the patients (41.6%) aged between 65 and 70 years. Majority of the patients were female (63.3%) and 49.1% of the patients were white in the total sample population. Results of the study indicated that 62.3%of the patients were retired and 36.7% were housewives.

Most of the patients (90.7%) did receive some form of education. However 16.0% and 20.6% did have problems in reading and writing respectively. This illiteracy may have been one of the reasons for non-compliance with their drug treatment. Lack of caregiver support in 45.9% of the patients may also have affected compliance.

30.6% and 12.5% of the elderly patients indicated that they did consume alcohol and smoked cigarettes respectively. As was expected 62.3% of the elderly patients experienced sleeping difficulties.

The range of medical conditions in the elderly patients was from 1 to 9. The most common conditions were hypertension (64.8%), ischaemic heart disease (43.8%), musculoskeletal disorders (42.7%) and diabetes (29.2%). Some of the impairments or disabilities of the elderly patients were as follows: poor vision (82.9%), poor hearing (50.5%), poor mobility (59.1%) and poor speech (4.6%). Findings of this study revealed that 92.2% of the patients had been hospitalised previously with ischaemic heart disease (15.3%) and myocardial infarct (12.1%) being the most common medical reasons for hospital admission.

4.4. PHARMACOTHERAPY OF THE GERIATRIC PATIENTS

Geriatrics forms a large portion of the patients on chronic medication, as they are more susceptible to a number of medical conditions (Figure 4). They often have multiple disease states and multiphysician prescribing as can be seen from the results below. In this section, the total number of medicines taken by the elderly patients, currently prescribed medicines, principal classes of drugs prescribed and OTC medicine use by the elderly will be discussed.

4.4.1 OVERALL PRESCRIBING

The 281 patients were taking 1730 drugs, with a median of 6.2 prescribed drugs per patient (range 3 to 15 drugs) (Figure 5). These are the medicines prescribed on a current prescription and on other valid repeat medication, which the patient may also be taking. It excludes other prescribed medication from private physicians, because this could not be verified and in some instances, the patient did not know what the other prescribed medication was.

4.4.2 NUMBER OF PRESCRIBED DRUGS PER ELDERLY PATIENT

Table 4.23 and Figure 5 shows the number of elderly patients taking one to three drugs and four to six drugs and seven to nine drugs and ten to fifteen drugs by age and sex. There were no significant differences between males and females or between those aged less than 75 or 75 years or more.

FIGURE 5 : NUMBER OF PRESCRIBED DRUGS PER GERIATRIC PATIENTS

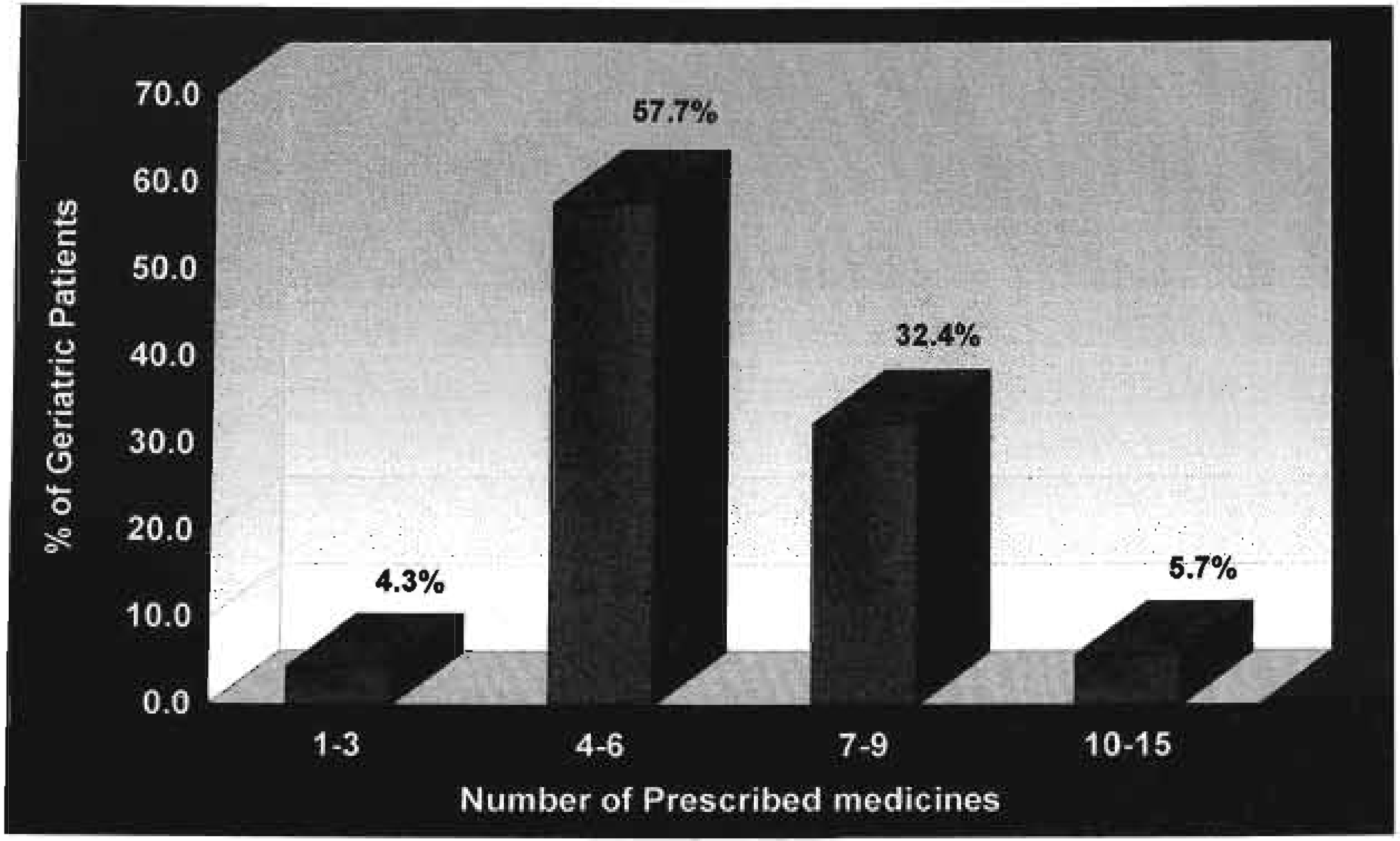


Table 4.23 Number of prescribed drugs per geriatric patient

	Age (years)		
	Under 75	75 and over	Totals
Men			
1 to 3 drugs	3 (2.9%)	3 (2.9%)	6 (5.8%)
4 to 6 drugs	41 (39.8%)	19 (18.4%)	60 (58.3%)
7 to 9 drugs	21 (20.4%)	11 (10.7%)	32 (31.1%)
10 to 15 drugs	4 (3.9%)	1 (1.0%)	5 (4.9%)
Totals	69 (67%)	34 (33.0%)	103 (100%)
Women			
1 to 3 drugs	5 (2.8%)	1 (0.6%)	6 (3.4%)
4 to 6 drugs	73 (41.0%)	29 (16.3%)	102 (33.1%)
7 to 9 drugs	40 (22.5%)	19 (10.7%)	59 (33.1%)
10 to 15 drugs	6 (3.4%)	5 (2.8%)	11 (6.2%)
Totals	124 (69.7%)	54 (30.3%)	178 (100%)
TOTALS			
1 to 3 drugs	6 (2.1%)	6 (2.1%)	12 (4.3%)
4 to 6 drugs	114(40.6%)	48 (17.1%)	162 (57.7%)
7 to 9 drugs	61 (21.7%)	30 (10.7%)	91 (32.4%)
10 to 15 drugs	10 (3.6%)	6 (2.1%)	16 (5.7%)
Totals	**191 (68.0%)**	**90 (32.0%)**	**281 (100%)**

Table 4.23 shows how easily multiple drugs use occurs in older people when chronic conditions are treated with medication and drugs are used to prevent common disease. Polypharmacy was evident in these results of the medication profiles studied. 5 men and 11 women were receiving from 10 to 15 prescribed medicines. Of the 5.7% of patients prescribed 10 to 15 medicines, 3.6% were under 75 years and 2.1 % were 75 years and over. Thus, there was no statistically significant difference in the number of prescribed drugs for patients below 75 years and those over 75 years.

Findings of this study revealed that the elderly are prescribed between 3 and 15 drugs concurrently and this polypharmacy was also reported by Shaw (1982) were he reported that the elderly patients are frequently prescribed between 3 and 12 drugs concurrently. With the increase in numbers of drugs prescribed and used by the elderly population, it is clear that a significant need exists for pharmacists to take a more active role in monitoring all medications used by older patients (Adamcik and Rhodes, 1993).

4.4.3 PRINCIPAL DRUG GROUPS PRESCRIBED

The classification of principal drug groups is according to the EDL in South Africa (1998). The main drug groups are listed in Table 4.24 are in order of classification and not frequency (highest to lowest). Unless, otherwise specified most of the drug products were in oral dosage forms (mainly tablets or capsules, or liquids). The other routes of administration were sublingually (glyceryl trinitrate), inhalation, rectal (suppositories), subcutaneous injection (insulin) and intramuscular injection (diclophenac).

Table 4.24 Principal drug groups prescribed

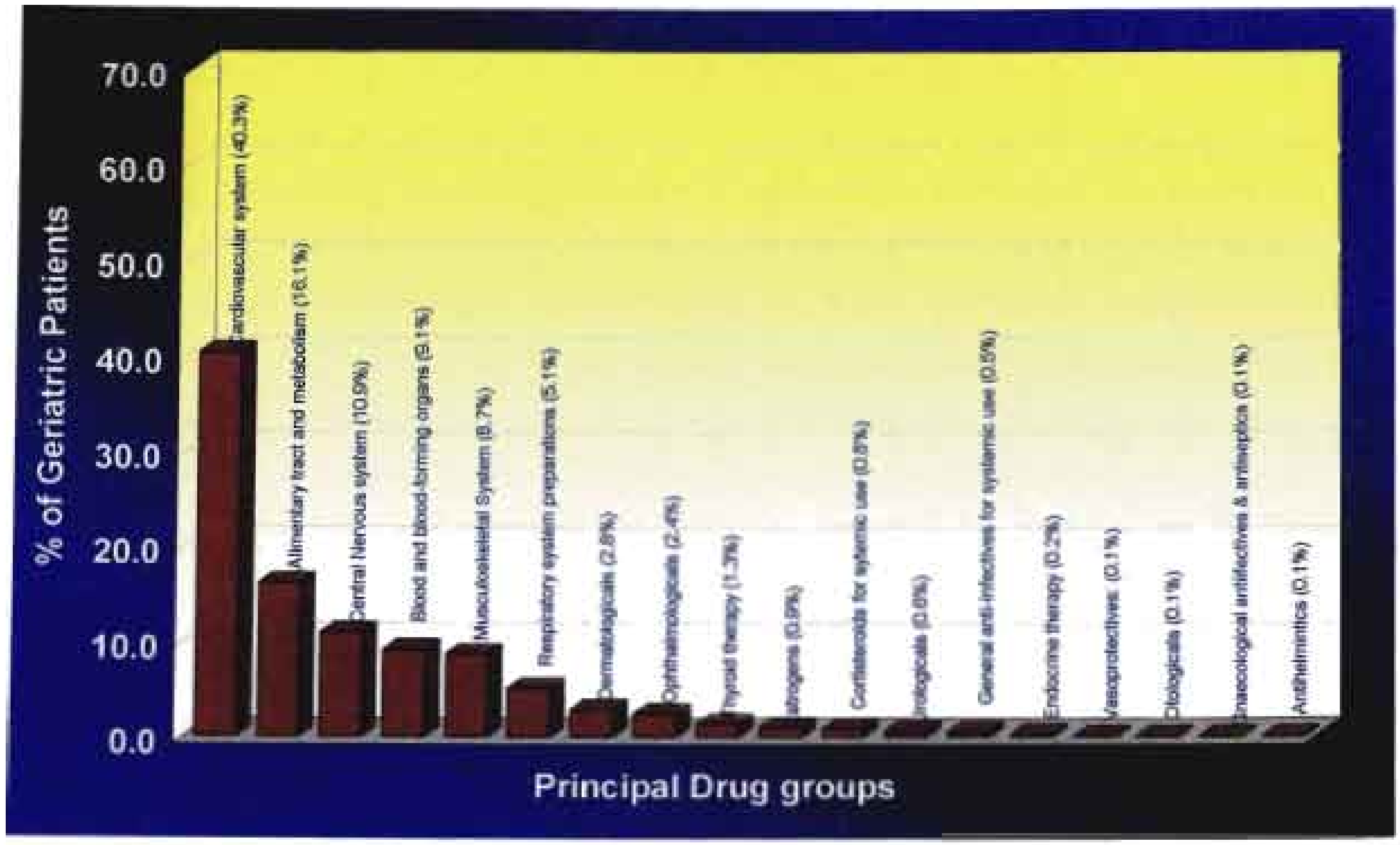
Principal Drug Groups Prescribed	NUMBER	TOTAL	PERCENT
Alimentary tract and metabolism Drugs used in diabetes Potassium supplements	108 (6.3%) 93 (5.4%) 78 (4.5%)	279	16.1%
Blood and blood-forming organs Anti-thrombotic agents Antianaemic Preparations Cholesterol and Triglyceride Reducers Haematological Products: Pentoxifylline	107 (6.2%) 18 (1.0%) 31 (1.8%) 1 (0.1%)	157	9.1%
Cardiovascular system Cardiac Glycosides:Digoxin Coronary vasodilators Antihypertensives Diuretics Beta Blocking Agents	45 (2.6%) 158 (9.1%) 274 (15.9%) 157 (9.1%) 62 (3.6%)	696	40.3%
Vasoprotectives: Topical Antihaemorrhoidals: Anusol supps		2	0.1%
Dermatologicals		48	2.8%
Gnaecological antiifectives and antiseptics		1	0.06%
Estrogens		15	0.9%
Urologicals		11	0.6%
Cortisteroids for sytemic use		14	0.8%
Thyroid therapy		23	1.3%
General anti-infectives for systemic use		8	0.5%
Endocrine therapy		3	0.2%
Musculoskeletal System Antiiflammatory & antirrheumatic products Antigout preparations	119 (6.8%) 31 (1.8%)	150	8.7%
Central Nervous system Analgesics Anti-epileptics Anti-parkinsonian agents Psycholeptics Psychoanaleptics	70 (4.1%) 20 (1.2%) 23 (1.3%) 31 (1.8%) 45 (2.6%)	189	10.9%
Antihelmintics: Biltricide		1	0.06%
Respiratory system preparations		88	5.1%
Opthalmologicals		41	2.4%
Otologicals		2	0.1%
TOTAL		1728	100%

Percentages (in parentheses) are of the total numbers of prescribed drugs.

From Table 4.24 it can be seen that the antihypertensives (15.9%) were easily, the most widely prescribed drugs followed by medicines acting on CNS (10.9%), coronary vasodilators (9.1%), diuretics (9.1%) and medicines on the musculoskeletal system (8.7%). In Table 4.24, the corticosteriods used by the patients were mainly: prednisone (12), dexamethasone (1) and hydrocortisone (1). Two of the three patients on endocrine therapy were on tamoxifen and the other patient was given aminoglutethimide.

The principal groups of drugs prescribed for this sample population are shown in Figure. 6 (X = Number of drugs Vs Y= Drug Type (Cardiovascular = Diuretics, GTN (sublingual), Calcium antagonists, Beta-blockers), CNS, Respiratory, Gastro-intestinal, Endocrine, Nutrition/blood, Musculoskeletal, Eyedrops, Antibiotics, Others).

FIGURE 6 : PRINCIPAL DRUG GROUPS PRESCRIBED



The following tables (Table 4.25 to Table 4.34) gives some of the drugs within some of the principal groups listed above.

Table 4.25 Alimentary tract and metabolism

4.4.3 (A) ALIMENTARY TRACT AND METABOLISM	Number	Total Drugs
Stomatological preparations: Thymol Glycerine compound	1	1 (0.4%)
Antacids		22 (7.9%)
Magnesium Trisilicate Mixture	18	
Magnesium Trisilicate Co Tablets (Gelusil)	2	
Calcium carbonate and Glycine Tablets (®)	2	
Drugs for treatment of peptic ulcer and flatulence		15 (5.4%)
H2 Receptor Antagonists: Ranitidine	1	
Benzimidazole : Omeprazole (7) Pantaprazole (7)	14	
Antispasmodics and anticholinergic agents and propulsives		20 (7.2%)
Synthetic Antispasmodics: Metoclopramide	2	
Anti-cholinergic Esters: Mebeverine HCL	1	
Cisapride	3	
Anti-emetics and Antinauseants: Cinnarizine	13	
Cyclizine	1	
Laxatives		19 (6.8%)
Softeners and Emollients:Liquid Paraffin	1	
Contact laxatives: Senna Standardised tablets (S)	4	
Metamucil Regular Laxative Powder	8	
Sorbitol	4	
Enemas: Microlax	1	
Basically suppositories	1	
Antidiarrhoeals, Intestinal anti-inflammatory/ anti-infective agents		4 (1.4%)
Antidiarrhoeals: Lomotil and Loperamide	2	
Intestinal Anti-inflammatory Agents: Sulphasalazine	2	
Drugs used in diabetes		93 (33.3%)
1.Insulins	20	
Short Acting	5	
Intermediate to Long Acting	12	
Biphasic Insulins	3	
2.Oral Antidiabetics	73	
Biguanides: Metformin	24	
Sulfonamides: Glibencamide	29	
Glicazide	15	
Glipizide	3	
Tolbutamide	2	
Vitamins		9 (3.2%)
Vitamin D and Analogues : Ergocalciferol	2	
Alfacalcidol	3	
Vitamin C (Ascorbic acid) (C)	4	
Mineral Supplements		96 (34.4%)
Calcium supplement	16	
Potassium supplement	78	
Magnesium supplement	2	
TOTAL		279 (100%)

Alimentary tract and metabolism drugs represented 16.1% of the total prescribed medicines. The antidiabetic medicines constituted 33.3% of the total prescribed medicines for the alimentary tract and metabolism and 5.4% of the total prescribed medicines (Table 4.25). Potassium supplements were prescribed in 78 patients and this represented 4.5% of the total prescribed medicines in the sample population.

Table 4.26 Blood and blood forming organs

4.4.3 (B) BLOOD AND BLOOD-FORMING ORGANS	Number	Total drugs
Anti-thrombotic agents		107 (68.1%)
Aspirin	96	
Warfarin	11	
Anti-anaemic Preparations		18 (11.4%)
Ferrous sulphate	8	
Folic acid	3	
Iron in combination with Folic Acid :Pregamal ®	4	
Vitamin B12	3	
Cholesterol and Triglyceride Reducers: Bezafibrate Retard ®		31 (19.7%)
Fluvastatin	2	
Simvastatin	13	
	16	
Haematological Products: Pentoxifylline	1	1 (0.64%)
TOTAL		157 (100%)

There was 157 blood and blood-forming organ drugs prescribed (9.1%) of the total prescribed drugs (Table 4.26). The antithrombotic agents represented 68.1% of the total medicines under the blood and blood-forming organ class and 6.2% of the total prescribed medicines.

Table 4.27 Cardiovascular system

4.4.3 (C) CARDIOVASCULAR SYSTEM	NUMBER	Number	Total Drugs
			203 (29.2%)
Cardiac therapy			
Cardiac Glycosides: Digoxin		45	
Coronary vasodilators:		158	
Glyceryl Trinitrate	57		
Isosorbide Dinitrate	45		
Isosorbide-5-Mononitrate	56		
Antihypertensives			274 (39.4%)
Antiadrenergics, Centrally Acting:		35	
®	14		
Reserpine	1		
Methyldopa	20		
Antiadrenergics, Peripherally Acting:		9	
Prazosin			
Agents acting on Arteriolar Smooth Muscle: Hydralazine		3	
Calcium channel blockers :			
Amlodipine		95	
Diltiazem	21		
Isradipine	24		
Nifedipine	24		
Verapamil	14		
Non-Thiazide Sulphonamides : Indapamide Agents	12		
Acting on Renin-Angiotensin System:		30	
Captopril		102	
Enalapril	39		
Perindopril	14		
Quinapril	28		
Ramipril	3		
	18		
Diuretics			157 (22.6%)
Low ceiling diuretics: Thiazides		11	
Hydrochorthiazide	9		
Metolazone	2		
High ceiling diuretics Sulphonamides: Frusemide		106	
Potassium-sparing agents:		40	
Spironolactone	7		
Amiloride/Hydrochlorthiazide (Moduretic®)	14		
Triamterene/ Hydrochlorthiazide (Diazide ®)	19		
Beta Blocking Agents			62 (8.9%)
Non-selective Beta Blocking Agents: Propranolol		8	
Cardioselective Beta Blocking Agents:		53	
Acebutolol	34		
Atenolol	19		
Beta Blocking Agents and Thiazides: Secadrex®		1	
TOTAL			696 (100%)

Cardiovascular drugs were by far the most common (40.2%) of all prescribed drugs (Table 4.27). Of the 696 cardiovascular drugs, antihypertensives were the most frequently prescribed (15.8% of all prescribed drugs and 39.4% of cardiovascular drugs). As found in other studies, diuretics were also prescribed often (157) of the total prescribed drugs.

Table 4.28 Dermatologicals

4.4.3 (D) DERMATOLOGICALS	Number	Total Drugs
Topical Antifungals		7 (14.6%)
Nystatin cream and ointment	2	
Clotrimazole cream 1%	2	
Benzoic Acid compound ointment	2	
Tolnaftate solution 1%	1	
Emollients and protectants		10 (20.8%)
Castellani's Paint	1	
Zinc & castor Oil Ointment	1	
Emollient lotion	5	
Ung. Emusificans aqueous	2	
Drawing ointment ®	1	
Antipruritics and topical anaesthetics		2 (4.2%)
Lignocaine Jelly 2 %		
Antipsoriatics		9 (18.8%)
Coal tar solution	2	
Calcipotriol ointment	2	
Diprosalic	2	
Salicyclic acid in white paraffin	3	
Corticosteriods dermatological preps.		13 (27.1%)
Antiseptics and Disinfectants		5 (10.4%)
Mupirocin topical ointment	4	
Povidone iodine cream	1	
Other dermatological: Tretinoin cream		2 (4.2%)
TOTAL		48 (100%)

The total number of dermatologicals prescribed was 48 (Table 4.28) and constituted a small percentage (2.8%) of the total number of prescribed drugs Figure 6).

Table 4.29 Urologicals

4.4.3 (E) UROLOGICALS	Number	Percent
Pyridone derivatives: Nalidixic acid	1	9.0%
Nitrofurantoin	1	9.0%
Combinations with Sulphonamides: Nicene	1	9.0%
Antispasmodics: Oxybutynin	8	72.7%
TOTAL	11	100%

Table 4.29 shows that there were only 11 urological drugs that were prescribed. Oxybutynin was the most commonly prescribed urological (8) and was used as an antispasmodic for urinary incontinence.

Table 4.30 Anti-infectives for systemic use

4.4.3 (F) ANTI-INFECTIVES FOR SYSTEMIC USE		Number	Percent
Antibacterials for systemic use		7	87.5%
Amoxycillin + clavulanic acid	**2**		
Cefuroxime	**2**		
Erythromycin	**1**		
Penicillin	**1**		
Ketoconazole	**1**		
Antimycobacterials: Isoniazid		1	12.5%
TOTAL		8	100%

Anti-infectives were prescribed only in 8 instances (Table 4.30) and only represented a small percentage (0.5%) of the total prescribed medicines (Figure 6).

Table 4.31 Musculoskeletal system

4.4.3 (G) MUSCULOSKELETAL SYSTEM	Number	Total Drugs
Anti-inflammatory & anti-rheumatic products		119 (79.3%)
Diclophenac oral + injection	36 + 8	
Indomethacin oral + suppositories	27+ 3	
Ibuprofen	34	
Methyl salicylate topical	10	
Piroxicam	1	
Antigout preparations		31 (20.7%)
Allopurinol	29	
Colchicine	2	
TOTAL		150 (100%)

The anti-inflammatory and anti-rheumatic products were prescribed in 119 instances (Table 4.31). They constituted 79.3% of the total drugs acting on the musculoskeletal system and 6.8% (Figure 6) of the total prescribed drugs. Aside from the anti-inflammatories, Allopurinol was the main drug prescribed for gout in 29 geriatric patients.

Table 4.32 Central nervous system

4.4.3 (H) CENTRAL NERVOUS SYSTEM		Number	Percent	TOTAL
				70 (37%)
ANALGESICS				
Paracetamol		23	32.9%	
Paracetamol & Codeine		30	42.9%	
Paracetamol/codeine/caffeine/Meprobamate		8	11.4%	
Carbazemazepine		8	11.4%	
Antimigraine: Ergot alkaloid ®		1	1.4%	
ANTI-EPILEPTICS				20 (10.6%)
Carbamazepine		4	19%	
Phenobarbital		4	19%	
Phenytoin		5	23.8%	
Valproate sodium		2	9.5%	
Clonazepam		3	14.3%	
Diazepam		1	4.8%	
Gabapentin		1	4.8%	
ANTI-PARKINSONIAN AGENTS				23 (12.2%)
Benzhexol		3	13.0%	
Biperiden		1	4.3%	
Bromocriptine		1	4.3%	
Levodopa/carbidopa		11	47.8%	
Levodopa / benzerazide		2	8.7%	
Selegiline		5	21.7%	
PSYCHOLEPTICS				31 (16.4%)
Neuroleptics		4	12.9%	
Haloperidol	1			
Sulpiride	3			
Tranquillisers		27	87.1%	
Buspirone	1			
Diazepam	2			
Hydroxyzine	9			
Lorazepam	5			
Oxazepam	1			
Hypnotics and Sedatives:				
Nitrazepam	1			
Temazepam	7			
Zopiclone	1			
PSYCHOANALEPTICS: Antidepressants		36		45 (23.8%)
Tricyclic Derivatives:			(80%)	
Amitriptiline	25			
Dothiepine	2			
Imipramine	9			
Bicyclic Derivatives:		2	(4.4%)	
Citalopram	1			
Fluoxetine	1			
Tetracyclic Derivatives: Mianserin		7	(15.5%)	
TOTAL				189 (100%)

Drugs acting on the CNS constituted 10.9% of the total prescribed medicines (Figure 6). Analgesics were the most commonly prescribed (37%), followed by the psychoanaleptics (23.8%) (Table 4.32).

Table 4.33 Respiratory System

4.4.3. (I) RESPIRATORY SYSTEM			Number	PERCENT
Nasal preparations Oxymetalozine			1	1.1%
Anti-asthmatic agents			70	79.5%
Selective Beta-2- Adrenoceptor agonists		27		
Fenoterol	3			
Hexoprenaline	2			
Salbutamol	21			
Salmeterol	1			
Anticholinergics:		9		
Fenoterol and Ipratropium Bromide	8			
Ipratopium Bromide	1			
Glucocorticoids		17		
Beclomethasone	16			
Budesonide	1			
Xanthines: Theophylline		16		
Antiallergic agents: Sodium Cromoglycate		1		
Antihistamines for systemic use			7	8.0%
Chlorpheniramine	6			
Promethazine	1			
Cough and cold preparations			10	11.4%
Mucolytic: Carbocysteine	3			
Antitussives & Expectorant combinations:DPH	3			
Cold preparations: Common cold tablets	4			
TOTAL			88	(100%)

5.1% of the total prescribed drugs were those acting on the respiratory system Figure 6). 79.5% of the respiratory drugs were anti-asthmatics (Table 4.33). Most of the anti-asthmatic agents were either inhalers or unit dose vials, with exception of the Hexoprenaline, Salbutamol and Theophylline, which were available as oral preparations. Salbutamol was mainly used as the inhalant, except for one patient who was on the tablets.

Table 4.34 Sensory Organs

4.4.3 (J) SENSORY ORGANS		Number	Percent
Opthalmologicals		41	95.3%
Antiinfectives used in Opthamology:		8	
Antibiotics:			
Ciprofloxacin	1		
Chloramphenicol	2		
Oxytetracycline	1		
Fusidic Acid	2		
Terramycin ®	1		
Sulphonamides: Sulphacetamide	1		
Corticosteroids:		1	
Dexamethasone and Neomycin (Maxitrol®)	1		
Glaucoma Preparations		22	
Adrenaline	1		
Betaxolol	4		
Dorzolamide	4		
Levobunolol	4		
Pilocarpine	6		
Timolol	3		
Other opthmalogicals:		10	
Artificial tears	7		
Antazoline and Tetrazoline (Spersallerg ®)	3		
Otologicals		2	4.7%
Locacorten Vioform	1		
Dioctyl Sodium Sulphosuccinate (Waxsol ®)	1		
TOTAL		43	100%

Drugs acting on the sensory organs comprised of only 2.5% of the total prescribed drugs (Figure 6). The majority of the sensory organ drugs were opthalmologicals (95.3%) (Table 4.34). Most of the opthalmogical preparations were in the form of eye drops and eye ointments.

The findings of this study revealed that the 281 geriatric patients were prescribed 1723 medicines in total. Salom and Davis (1995) also reported that geriatric patient's use more drugs than the population at large and they tend to use them in combination. Because drug regimens can pose potential risks for older patients, it is important to know why a particular drug is prescribed and that the medication is safe and efficacious, to minimise the risk of DRPs.

4.4.4 USE OF MEDICATIONS OR SUPPLEMENTS OTHER THAN THOSE PRESCRIBED AT ADDINGTON HOSPITAL

These are medications or supplements other than those currently prescribed at Addington Hospital. This study and the report by Williamson and Chopin in 1980 indicated that the data for non-prescribed drugs were very difficult to obtain and the results were unreliable.

Table 4.35 Use of other medicines or supplements

Medicines / Supplements	Yes	No
Prescription medicines	87 (31.0%)	194 (69.0%)
OTC medicines	148 (52.7%)	133 (47.3%)
Vitamins or Minerals	81 (28.8%)	200 (71.2%)
Herbal/Home remedies/Traditional medicines	49 (17.4%)	232 (82.6%)

Table 4.35 shows that 31.0% of the patients were taking other prescribed medicines by physicians outside the hospital. 52.7% of the elderly patients made use of over-the-counter preparations (OTC's), mainly laxatives, antacids, analgesics and antihistamines. 49% of the elderly patients used home remedies and herbal products. Thus, it is important to monitor potential interactions of OTC preparations with prescribed medication.

4.4.5 TOTAL NUMBER OF MEDICINES PER GERIATRIC PATIENT

Table 4.36 Total number of medicines per geriatric patient

Total number of medicines	Number of patients	Percent
3 Medicines	7	2.5%
4 to 6	117	41.6%
7 to 9	128	45.6%
10 to 15	29	10.3%
TOTAL	281	100%

41.6% of the patients were taking or using 4 to 6 medicines, and an astounding 45.6% of the total geriatric patients were taking or using between 7 to 9 medicines and 10.3% were taking or using between 10 to 15 medicines.

From the results in Table 4.36, it is clear that polypharmacy among geriatric patients is prevalent, and these findings confirm literature findings on polypharmacy among the elderly (Section 2.6). Table 4.45 indicates the total number of medicines being used or taken by the geriatric patients. These are the currently prescribed medicines at the hospital as well as other prescribed medicines from local clinics or private practitioners and non-prescription (OTC) medicines purchased from community pharmacies, supermarkets etc.

4.4.6 TOTAL NUMBER OF OTC MEDICINES USED BY GERIATRIC PATIENTS

Table 4.37 Total number of OTC medicines used by geriatric patients

OTC medicines	Number of patients	Percent
Paracetamol	58	20.6%
Aspirin	12	4.3%
Other analgesics	17	6.1%
NSAIDs	23	8.2%
Cough remedies	22	7.8%
Cold and flu preparations	10	3.6%
Laxatives	13	4.6%
Antacids	6	2.1%
Antidiarrhoeals	2	0.7%
Antinauseant and anti-spasmodic	2	0.7%
Urinary alkanisers	2	0.7%
Sedatives	3	1.1%
Eardrops	2	0.7%
TOTAL	172	61.2%

Table 4.37 shows that 61.2 % of the elderly patients were currently on OTC medication. The most frequently used OTC medicine was the analgesic paracetamol (20.6%). 87% of the patients were taking either paracetamol or another analgesic including aspirin. Aspirin was taken as an analgesic or as an anti-thrombotic. NSAIDs purchased OTC were used by 8.2% of the population. This study and other studies of drug use by the elderly indicate that OTC analgesics were the most commonly used drug for self-treatment. Self-medication with OTC analgesics may enhance the physical, emotional and social well being of the elderly by reducing pain and discomfort. However, they need to be used with caution because of the physiological changes (Section 2.3) with ageing that increase the risk of analgesic

toxicity (Sause, 1996). The other commonly used OTC medicines were laxatives (4.6%), cough remedies (7.6%) and cold and flu preparations (3.6%). Pharmacists should discuss product selection with the following elderly patients having the greatest risk for developing problems with OTC analgesics: elderly living alone, those with chronic illnesses, disabilities, generally poorer health, multiple drug use, generally higher anxiety or those who have difficulty in reading labels (Sause, 1996). In addition, there is always the danger that the elderly patient may purchase medicines over the counter which are contra-indicated with other prescription medicines he or she is taking (PPAC, 1995).

4.4.7 DISCUSSION OF DRUG THERAPY IN THE ELDERLY

Two thirds of older people receive regular medication and this commonly includes cardiovascular agents, antihypertensives, analgesics and anti-inflammatories, sedatives and gastrointestinal medicines. Patients in residential and nursing homes tend to receive laxatives, analgesics, major tranquillisers and benzodiazepines (Hudson and Boyter, 1997). These commonly prescribed medicines were also evident in the current geriatric study.

4.5 DRUG RELATED PROBLEMS IN THE GERIATRIC PATIENTS

The elderly are especially liable to drug related problems for a variety of reasons:

(a) their increasing numbers in the population;

(b) their liability to have multiple illnesses;

(c) their liability to have multiple problems such as low income, loneliness, widow-hood and poor housing (these stresses often may be converted into somatic or mental symptoms);

(d) their reduced capacity to metabolize and excrete many drugs

(e) Increased target tissue sensitivity to drug action in old age (Williamson, 1980).

In this section, the results of the incidence of DRPs, and the identified DRPs in the elderly patients will be discussed.

4.5.1 INCIDENCE OF DRPs IN GERIATRIC PATIENTS

The results of the total number of DRPs, the actual DRPs, potential DRPs and previous DRPs experienced by the elderly patients will be discussed.

4.5.1.1 TOTAL NUMBER OF DRPs EXPERIENCED

The total number of DRPs includes current DRPs, previous DRPs and potential DRPs.

Table 4.38 Total number of DRPs experienced by geriatric patients

Total number of DRPs	Frequency	Percent
0	3	1.1%
1	14	5.0%
2	38	13.5%
3	53	18.9%
4	46	16.4%
5	36	12.8%
6	39	13.9%
7	19	6.8%
8	14	5.0%
9	12	4.3%
10	4	1.4%
11	3	1.1%
TOTAL	281	100%

Only three patients did not experience any DRPs either with their past or current medication and they did not have any potential DRPs. Potential DRPs are problems like drug-drug or drug-disease interactions that are present in the patients current treatment regimen, but have no clinical adverse effect at the moment. However, it has the potential to cause an adverse effect e.g. a patient on digoxin and frusemide with no potassium supplements. The potassium levels could be normal, but there exists a risk of the potassium level changing and causing hypokalemia i.e. a potential DRP. The remaining 278 elderly patients (98.9%) experienced 1273 DRPs in total. This total includes previous and potential DRPs.

4.5.1.2 ACTUAL NUMBER OF DRPs EXPERIENCED BY GERIATRIC PATIENTS

Figure 7 illustrates the number of actual DRPs that the patient experienced on their currently prescribed medicines. Only 19 patients (6.8%) did not experience any problems related to the medication they were taking presently. The remaining 262 patients (93.2%) experienced from 1 to 11 DRPs with 856 DRPs in total. 82.9% of the elderly patients experienced from 1 to 5 actual DRPs. Only 10.4% of the elderly patients experienced more than five actual DRPs.

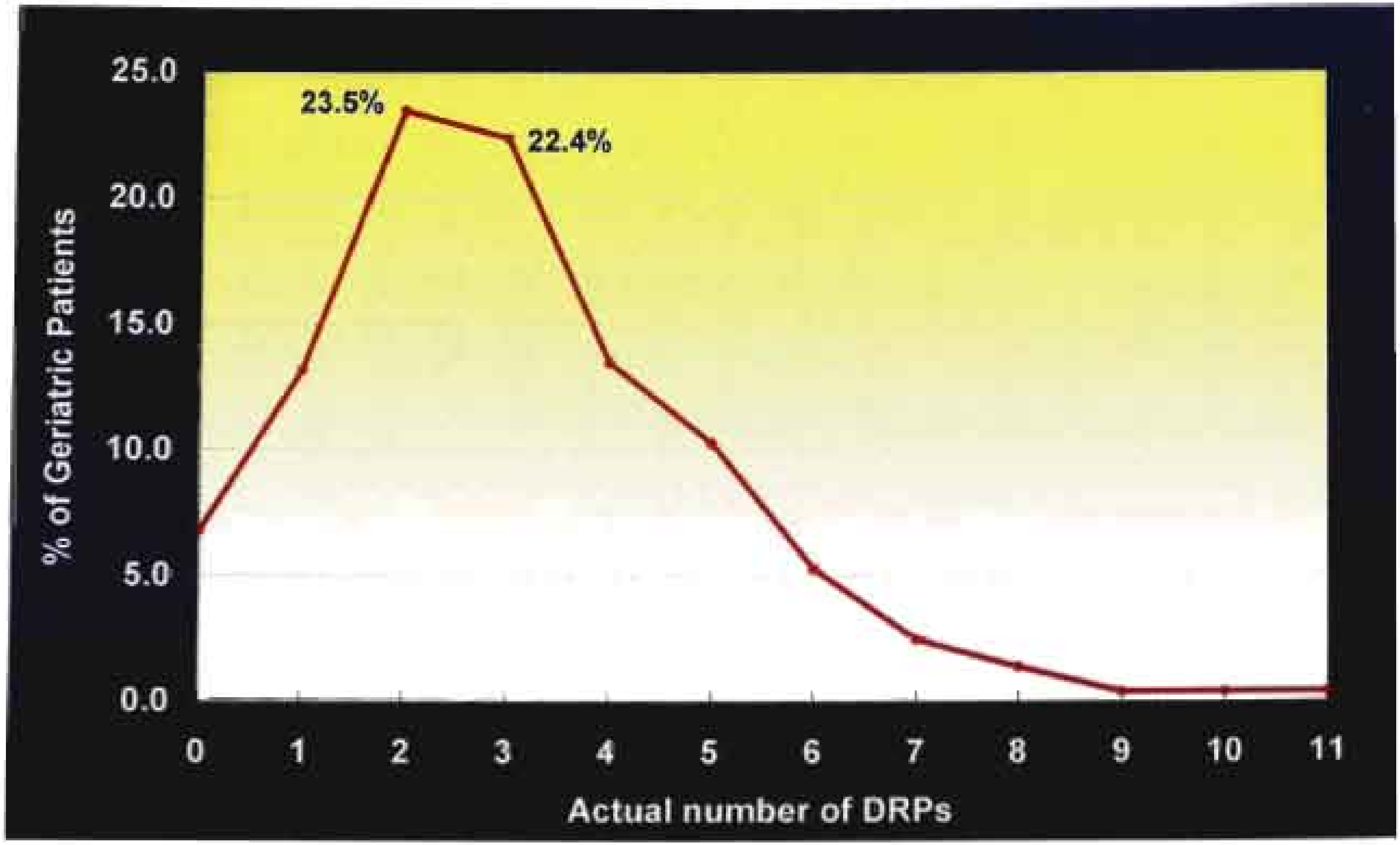
4.5.1.2.1 Comparison of age and gender with the number of actual DRPs experienced

The mean age of patients with DRPs (72.85 ± 5.91 years) was slightly lower than that of patients without DRPs (74.42 ± 4.63 years.).

The mean number of DRPs for the 193 patients aged 75 and less was 4.6 ± 2.2, as compared to the 88 patients aged over 75 years (4.5 ± 2.5). In the present study, there was no increase in prevalence of DRPs in patients aged 75 or more. Presumably this is because, since all the patients were 'geriatric' the 'chronological' effect was submerged under the 'pathological'.

The number of women in the study identified as having a DRP was not significantly greater than the number of men. No significant difference was found in marital status or home circumstances.

FIGURE 7 : NUMBER OF ACTUAL DRPS EXPERIENCED BY GERIATRIC PATIENTS



4.5.1.2.2 Comparison of the number of prescribed drugs to actual DRPs experienced

The results of the comparison of the number of prescribed drugs to actual DRPs experienced was highly significant (r = 0.2992; $p = 0.000$) for the sample size of 281 geriatric patients. In this correlation, the greater the number of prescribed drugs the greater the actual DRPs experienced by geriatric patients. This is an expected result and is in keeping with literature findings that indicate that the greater the number of drugs a patient is prescribed, the greater the potential for drug-interaction, adverse drug reactions, prescribing errors and non-compliance.

4.5.1.3 POTENTIAL DRPs EXPERIENCED BY GERIATRIC PATIENTS

Table 4.39 Potential DRPs experienced by geriatric patients

Potential number of DRPs	Frequency	Percent
0	128	45.6%
1	77	27.4%
2	52	18.5%
3	17	6.0%
4	5	1.8%
5	2	0.7%
TOTAL	281	100%

On the currently prescribed medication, only 128 patients (45.6%) had no potential DRPs. The prescriptions of the remaining 153 patients (54.4%) had the potential to cause from 1 to 5 DRPs on their current treatment.

4.5.1.3.1 Comparison of the number of prescribed drugs to potential DRPs

As with the correlation for actual DRPs, the results of the comparison of the number of prescribed drugs to potential DRPs (r = 0.3886; p=0.000) was statistically significant. The greater the number of prescribed medicines, the greater the chances for potential DRPs like drug interactions and adverse drug reactions occurring.

Table 4.40 Previous DRPs experienced by geriatric patients

Previous number of DRPs	Frequency	Percent
0	172	61.2%
1	81	28.8%
2	21	7.5%
3	6	2.1%
4	1	0.4%
TOTAL	281	100%

172 patients (61.2%) did not experience problems with their medicines in the past, but 109 patients (38.8%) did experience from 1 to 4 DRPs with their previous medications. Previous DRPs were mainly reported adverse drug reactions with past drug treatment and non-compliance.

Nine patients experienced theoretical DRPs as depicted under the eight major categories of DRPs (Section 1.1.1), but these were not actual or potential problems in practice. Theoretical DRPs that were included here were geriatric patients taking a NSAID or sedative when necessary, with relief of symptoms. Though too little of the correct drug is taken, there is no actual problem as the patient has symptom control.

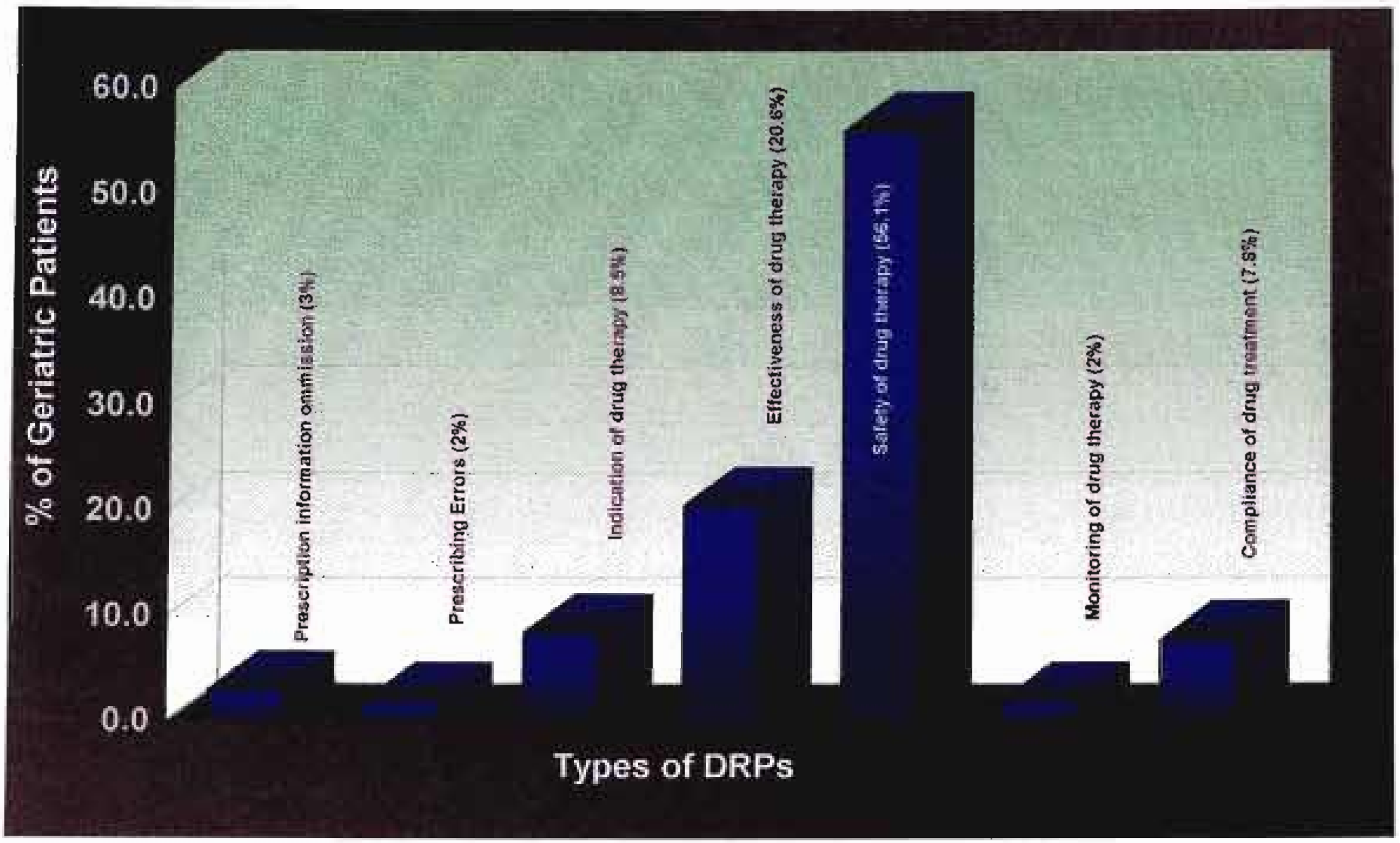
The total DRPs identified in Table 4.41 (954) does not correlate to the 1273 DRPs in section 4.5.1.1. The reason for this is that in the 1273 DRPs, if a prescription was omitted, the individual drugs were regarded as individual DRPs. This was done to establish individual DRPs and the prescribed offending drugs involved. Also, inadequate knowledge of drug treatment was regarded as a DRP, but in the results to follow, the specific problems on not taking medicines as directed would be discussed.

4.5.2 TYPES OF DRUG RELATED PROBLEMS

Table 4.41 Types of drug related problems

TYPES OF DRPs	Frequency	%
1. PRESCRIPTION INFORMATION OMISSION	29	3.0%
Drug omitted / not specified	28	
Vague / Incomplete directions for use	1	
2. PRESCRIBING ERROR	19	2.0%
Inappropriate or incorrect dose	6	
Inappropriate strength	2	
Inappropriate quantity / duration of therapy	4	
Inappropriate or incorrect dosing interval	7	
3. INDICATION OF DRUG THERAPY	81	8.5%
1. UNNECESSARY DRUG THERAPY		
No valid medical indication	3	
Inappropriate or incorrect drug or medical indication	3	
Addiction potential	1	
Pharmacological duplications of drug therapy	20 + 9	
2. NEEDS ADDITIONAL THERAPY:		
Untreated indication	27	
Uncontrolled medical condition	18	
4. EFFECTIVENESS OF DRUG THERAPY	197	23.1%
Drug not indicated for condition		
More effective drug available	9	
Underutilization – underuse of drug	180	
Supplied less quantity of medicines	6	
Not tolerating prescribed medicine or nutritional supplement	2	
5. SAFETY OF DRUG THERAPY	535	56.1%
Adverse drug reaction	223	
Effect on nutritional status	13	
Drug interactions		
Drug – drug	169	
Drug – disease	81	
Drug – age	15	
Drug—alcohol	1	
Overutilization – overuse of drug		
Extra quantity of medicines supplied	30	
Borrowing medicine	1	
Continuing with previously discontinued drugs	1	
	1	
6, MONITORING OF DRUG THERAPY	19	2.0%
Monitor K levels	18	
Monitor Thyroxine levels	1	
7. COMPLIANCE OF DRUG TREATMENT	74	7.8%
Not taking or using the prescribed medication	33	
Taking or using medication at inappropriate or incorrect dosage interval	14	
Inappropriate or incorrect time of taking or using medicines	25	
Unaware to collect repeat medicines	2	
TOTAL	954	100%

FIGURE 8 : TYPES OF DRPS EXPERIENCED BY THE GERIATRIC PATIENTS



From Figure 8, one can see the most common DRPs identified according to Table 4.41. 278 geriatric patient experienced 954 DRPs. The most common DRPs were those involved in drug safety (56.1%) and effectiveness of drug therapy (23.1%).

The results of the individual drugs involved in each DRP listed in Table 4.41 will be discussed next. The DRPs were categorised as follows:

- Prescription information omission
- Prescribing error
- Indication of drug therapy
- Effectiveness of drug therapy
- Safety of drug therapy
- Monitoring drug therapy
- Compliance of drug treatment

The interventions on policy infractions and failure to comply with writing of prescriptions (e.g. undated prescriptions) were not included as DRPs, but were included as prescription interventions (Section 4.8.1).

4.5.2.1 PRESCRIPTION INFORMATION OMISSION

The following are the 3.0% DRPs involving omissions of medicines on a prescription.

Table 4.42 Drug omitted or not specified

Drugs involved	Frequency	Percent
Alfacalcidiol	1	3.6%
Aspirin	7	25%
Calcium gluconate	1	3.6%
Emmolient	1	3.6%
Frusemide	2	7.1%
Glibencamide	1	3.6%
Imipramine	1	3.6%
Isosorbide mononitrate	2	7.1%
Isradipine	1	3.6%
Methyl salicylate	1	3.6%
Paracetamol	1	3.6%
Paracetamol and codeine	1	3.6%
Perindopril	2	7.1%
Simvastatin	2	7.1%
Theophylline	1	3.6%
Glyceryl Trinitrate	1	3.6%
Potassium Chloride	1	3.6%
Ramipril	1	3.6%
TOTAL	28	100%

In Table 4.42, the individual drugs that were omitted in error by the prescriber are listed. Aspirin (7) was the most frequently omitted medicine on a prescription. This was probably because its medical indication was mistaken for the analgesic effect and not the anti-thrombotic effect, which was its real indication.

Patient PB, who was treated for hypertension, hypercholesteremia and angina, had no medication prescribed for these conditions. The drugs involved were Aspirin, Simvastatin, Isosorbide mononitrate, Isradipine, Perindopril and Frusemide. This intervention was extremely significant, had the pharmacist not detected the error, the patient would not have known that these medicines were omitted in error and not discontinued therapeutically by the prescriber. After the intervention, the practitioner concerned then prescribed the medicines. The four instances involving the emollient lotion, perindopril, paracetamol+codeine and imipramine were dispensing omissions and these medicines were supplied after the researcher intervened. The emollient lotion, paracetamol+codeine and methylsalicylate were restricted because of cost implications and these omissions were regarded as possibly preventable DRPs. All the other drug omissions in Table 4.42 were regarded as definitely preventable through more careful prescribing, dispensing and monitoring of patients. The outcomes of the remaining drug omissions were as follows: in five instances the prescription was changed by the prescriber and then dispensed and in thirteen instances the omitted medicines were prescribed and then dispensed.

4.5.2.1.2 Vague or Incomplete directions for use

This problem occurred in one patient. The prescription for patient LB had vague directions for the dose of Glibencamide. The prescription was written as " Daonil® (Glibencamide) 5mg mane, 2½mg nocte. This dose at night was not clear and was initially interpreted by the pharmacist as 2½ tablets because the "mg" was illegible. Upon conferring with the prescriber, the prescription was clarified and the dose at night was actually 2.5mg. Illegible or vague prescriptions have the potential to cause serious problems as can be seen from this instance where the patient could have received 12.5mg Glibencamide at night instead of 2.5mg which could have resulted in hypoglycemia with potentially fatal consequences.

4.5.2.2 PRESCRIBING ERROR

4.5.2.2.1 Inappropriate or incorrect dose

The following six medicines were prescribed at the incorrect dose:

- Diclophenac 25mg twice daily
- Frusemide 60mg twice daily
- Glibencamide 20mg daily
- Imipramine 75mg nocte
- Propranolol 20mg daily
- Thyroxine 0.1mg daily

In total, the doses of medicines were considered inappropriate or incorrect in six instances. These DRPs were as follows:

- Patient AE was on a Glibencamide dose of 20mg a day (a potentially toxic dose). The maximum allowable daily dose is 15mg (MDR, 1999). A PIF was sent to the prescriber to decrease the dose of Glibencamide to 15mg and add Metformin, if necessary, to control the diabetes. The prescriber rejected this recommendation with the reason being that: 20mg of Glibencamide could be prescribed only by the specialist diabetic clinic, according to the Addington Hospital protocol. It would have been prudent to investigate the control of the diabetes in this patient on a short course of Glibencamide 15 mg and Metformin 250 mg daily, with a follow up after two to four weeks.
- A neurologist prescribed Patient LM Propranolol 20 mg tds for essential tremor. On a follow up visit, another physician prescribed 20mg daily, which is a subtherapeutic dose for this patient. This problem was rectified.
- Patient HB was experiencing weight gain with Thyroxine. A blood test was done to check Thyroxine levels. This was found to be low (subtherapeutic) and the dose of the Thyroxine was increased from 0.1mg to 0.15 mg.
- Patient EG (69 years) was prescribed: Imipramine 75 mg nocte (bedtime) and another tri-cyclic anti-depressant, Amitriptiline 25 mg at 6pm daily for depression. The maximum allowable maintenance dose of Imipramine in elderly patients is

30-50 mg/day (MDR, 1999). The amitriptiline has a high anticholingeric and sedative potential and could lead to adverse symptoms in this patient, which may not be tolerated. A PIF was sent to prescriber to consider having the dose of the TCAs reduced, but the request was rejected because the patient's depression was controlled on this dose.

- Patient EH was on a dose of Frusemide 60 mg daily but was increased on current prescription 60 mg twice daily, with no evident indication for the increase. In addition, the patient was not in heart failure and had no oedema. The pharmacist requested confirmation of the increase in dose. This was a prescribing error and the dose was decreased to the original dose of 60 mg daily. The high dose of Frusemide could have caused hypokalemia and heart failure.
- Patient AG was prescribed Diclophenac 25 mg twice daily for the first time on this current prescription. It was recommended that the NSAID be decreased to one tablet daily. This recommendation was accepted and the dose of the Diclophenac was decreased. This may have prevented possible heartburn or the common problem of GI erosion in this geriatric patient. Normally treatment of NSAID should be initiated with the lowest possible effective dose (Section 2.4.9).

All six of these DRPs were regarded as definitely preventable.

4.5.2.2.2 Inappropriate strength of drug

The incorrect strength of drug was prescribed for two patients. Patient MS (Section 4.2.2.2.4) was on Mianserin 25 mg twice daily instead of 40 mg at night and patient AK was prescribed Diclophenac 200 mg tds instead of 25 mg tds. The Diclophenac dose of 200 mg is a toxic dose with potentially fatal gastric ulcer generation. Both these prescription errors were rectified by the prescriber and were regarded as definitely preventable.

4.5.2.2.3 Inappropriate duration of therapy

The following four drugs were prescribed for an inappropriate duration of therapy.

- Amoxycillin+Clavulanic acid
- Ciprofloxacin
- Mupirocin
- Prednisone & Indomethacin

The duration of drug treatment were considered inappropriate in the following five instances:

- The long-term (longer than a year) use of Indomethacin and Prednisone may cause a gastric ulcer. It was recommended to consider a combination of Misoprostol with a NSAID and the dose of prednisone be reduced or discontinued because of the side effects of corticosteriods. The recommendation of Misoprostil was rejected because of the cost implications and the prednisone was not changed for alternative arthritic medicines. The prescription was dispensed as written and the patient was counselled about the potential side effects to be expected and to report such adverse effects to the prescriber should they occur.

- Patient JH was prescribed Amoxycillin and Clavulanic acid combination (Augmentin®): one tablet daily for a month and the treatment to be repeated for six months for Bronchiectasis (widening of the bronchi or their branches, pus may form in the widened bronchus so that the patient coughs up purulent sputum, which may contain blood). This chronic antibiotic treatment is not warranted because of the potential of antibiotic resistance. The patient was referred back to the prescriber and the Augmentin® was not dispensed. The same patient was also prescribed Ciprofloxacin 500 mg twice daily for a month, by another prescriber at a different clinic for the same condition. The patient was referred back to the prescriber. The Ciprofloxacin was not dispensed, as it is ant item designated for specialist prescribing and for the unwarranted and incorrect duration of therapy. This patient had multiphysician prescribing and the bronchiectasis was not treated properly or controlled. The pharmacist referred the patient to a specialist and recommended a sputum microbiological test with drug therapy adjusted according to the results of the sensitivity tests. The organism isolated was *Klebsiella pneumonia* (gram negative), resistant to Amoxycillin and clavulanic acid (Appendix 8), but sensitive to Tetracycline, Gentamicin, Netilmicin, Amikacin and Cefotaxime. This patient could have been treated with oral tetracycline with a good prognosis, and this was recommended to the prescriber. The irrational prescribing of antibiotics resulted in resistance in the patient and incurred unnecessary costs of expensive medicines, increasing the burden of the already strained financial resources in the public sector hospitals. This DRP was extremely significant and definitely preventable, by more appropriate physician prescribing.

- A diabetic patient was on Mupirocin topical treatment for several months. The Mupirocin was used to treat a leg ulcer that failed to heal. The pharmacist recommended that the patient be referred to the specialist ulcer clinic for treatment and to have blood glucose levels monitored. The outcome was that the patient made an appointment at the ulcer clinic and the researcher's recommendations were followed, with a better prognosis.

4.5.2.2.4 Inappropriate or incorrect dosage interval

The following seven drugs were prescribed at inappropriate or incorrect dosage intervals.

- Acebutolol
- Allopurinol
- Mianserin
- Nicene®
- Penicillin
- Phenobarbitone
- Prednisone

Nicene® is Nitroxoline 80mg, sulphamethizole 80mg, Vit B_6 40mg. For the purposes of this study wherever the above combination was used, the product will be referred to as Nicene®.

Seven patients had inappropriate or incorrect dosing intervals prescribed, as follows:

- Patient TJ felt that the dose of Prednisone 30mg daily for three days when needed (56 tablets) was not relieving his symptoms of asthma. The patient had reported this to the prescriber at the consult and the dose was changed to Prednisone 10 mg daily for one month.

- Patient LG was on twice daily Phenobarbitone dose. A PIF was sent to the prescriber and a single daily dose at night was recommended because of long half-life ($t_{½}$) of Phenobarbitone. The prescriber accepted this suggestion.

- Patient AW was prescribed the incorrect dose and duration of Nicene (treatment for UTI). The patient was prescribed: Nicene 2 tds for 5 days and was changed to the recommended dose of: 2 tablets with breakfast, 1 tablet with lunch and 2 tablets with the evening meal for 7 days (normally 14 days for severe UTI). This prescribing error was definitely preventable.

- Patient MS was prescribed the wrong dose of Mianserin and Allopurinol. The dose of Mianserin prescribed was 25 mg twice daily, but the previous treatment was 40 mg nocte. Moreover, there was no indication that warranted this change. In addition, Allopurinol was given 100 mg tds and the pharmacist recommended the dose be changed to 300 mg daily as before. These prescribing errors, which were definitely preventable, were noted by the practitioner concerned and were rectified.

- Patient KN was prescribed the wrong dose of Acebutolol. The patient was prescribed Acebutolol 200 mg daily. This was chronic treatment and the dose had been Acebutolol 200 mg twice daily on the previous prescription. The reduced dose was queried with the prescriber. It was established that this was a prescribing error, which was subsequently rectified.

- Patient EH was prescribed, Penicillin 250 mg at an incorrect dosing interval of three times daily for a chest infection, The recommended interval is four times daily. This prescribing error was rectified via a PIF. This DRP was definitely preventable

4.5.2.3 INDICATION OF DRUG THERAPY

4.5.2.3 (A) Unnecessary drug therapy

4.5.2.3. (A) 1. No valid medical indication

There were three instances where medication was prescribed with no valid medical indication, or the conditions or symptoms the medicines were prescribed for initially, no longer existed in the patient. These were as follows:

- Patient ST (90 year old, white male) was prescribed Hexoprenaline. He was not taking the medicine because he did not require it. There was no medical indication for its use. He was prescribed Hexoprenaline (a selective β_2 – adrenoceptor stimulant which is advocated to be used 'as required' as there is evidence that control of symptoms is improved with this method) (SAMF, 1997), over a year ago for a tight chest, which was well treated. However, he had not experienced tightness of the chest for over six months, but was continuously prescribed Hexoprenaline as a chronic medicine. The patient's chronic medical conditions are hypertension, anaemia and Parkinson's disease. A PIF was sent to the prescriber. The prescription for Hexoprenaline was deemed unnecessary and was not dispensed.

- Patient IB (66 year old, white male) was not taking the prescribed Carbamazepine, because it was not effective in treating the headaches for which it was originally prescribed, over a year ago. Carbamazepine, while not primarily an analgesic, may be of benefit in the management of pain problems such as trigeminal neuralgia, the neuralgic states associated with multiple sclerosis and nerve trauma, and diabetic and post-herpetic neuralgia (SAMF, 1997). It is not advocated as the drug of choice in the treatment of chronic headaches. This patient treated his headaches by taking an OTC analgesic called Grandpa® on a 'as required' for pain basis, with effective control and relieve of pain symptoms. A PIF was sent to the prescriber to review the patient's therapy and to discontinue the Carbamazepine for reasons stated above. The patient was happy to continue with his OTC analgesic. The prescriber did not wish to discontinue treatment because he was not responsible for initiating the treatment. The patient may stop taking medicine if he wishes to do so. On the follow up appointment, six months later the prescriber would review the use of the carbamazepine.

- Patient AG was on Triamterene + Hydrochlorthiazide diuretic, which is potassium sparing and the patient, was on Potassium supplements, which is not necessary. No urea and electrolyte tests were done. A PIF was sent to prescriber to monitor potassium levels and discontinue potassium supplements if levels are normal. The prescriber agreed to do this, but only on the patient's next visit and the potassium chloride was continued.

All three of these problems were regarded as definitely preventable

4.5.2.3 (A) 2. ***Inappropriate or incorrect drug or medical indication***

The following three medicines were prescribed incorrectly:

- Betamethasone (topical)
- Isradipine
- Medicines for Parkinson disease

In three instances, patients had the incorrect medicine being prescribed as follows:

- Patient OC (72 years) was prescribed incorrect medicines for Parkinson disease (did not know the name of the medicines). The medicines were not indicated for Parkinson's disease and were prescribed by a different practitioner, to the patient's regular practitioner. This was verified by the patient's daughter and had also been documented in the patient's medical notes. This resulted in the disease not being controlled and side effects were experienced with the incorrect medicines. These medicines were subsequently discontinued when the patient reported the problem on his next clinic appointment, to his regular prescriber. If this report by the patient is correct, then this problem was due to misdiagnosis of the patient's medical condition. The prescriber taking a more careful medical and drug treatment history of the patient could have prevented this.

- Betamethasone cream was prescribed for a diabetic patient who had a raw wound. This was an inappropriate choice as the area could be already infected, and could lead to serious complications in this diabetic patient. An antiseptic or antibiotic cream would have been more appropriate. The pharmacist recommended the medication be changed. The prescriber rejected the suggestion and the medicine had to be dispensed as written.

- A patient was not taking the Isradipine prescribed because he could not swallow the capsules. The prescription was changed to Nifedipine (chewable tablet), which was also prescribed previously with good control of his ischaemic heart disease (IHD) and hypertension.

These three DRPs were regarded as definitely preventable.

4.5.2.3 (A) 3. Addiction potential

Patient RH was on Zopiclone (sedative, hypnotic) long-term treatment (over a year) for insomnia. Zopiclone has addictive potential. It was restricted to the psychiatry clinic only, but was being prescribed by a neurologist. This was an infraction of hospital policy. Zopiclone a cyclopyrrolone, the barbiturates and benzodiazepines have enhanced effects in the elderly due to the increased volume of distribution of lipid soluble drugs leading to a marked prolongation of half-life. The result may be an increase in the "hangover" effect of these drugs. Zopiclone is normally indicated for short-term treatment of insomnia. The prescriber was made aware that the Zopiclone should have been prescribed for a finite period, but treatment was continued in patient RH to avoid withdrawal symptoms. It was recommended that the dose of Zopiclone for this patient be decreased initially, with a view to the cyclopyrrolone being withdrawn slowly over several months and then gradually discontinued. Long term repeated use of Zopiclone, results in loss of efficacy and may mask symptoms of depression. This DRP was regarded as definitely preventable through more careful prescribing. Unfortunately, a follow up of the outcome of this prescription intervention was not done due to time constraints.

4.5.2.4 (A) Pharmacological duplications of drug therapy

The following drugs or drug groups were duplicated either on the current prescription or from different clinics.

- Amitriptyline
- Amitriptyline & Imipramine (Tricyclic Antidepressants (TCAs))
- Calcium Carbonate
- Carbocysteine & Diphenydramine (Cough mixtures)
- Diclophenac injection
- Felodipine & Isradipine (Calcium antagonists)
- Frusemide & Aldactone (diuretics)
- Frusemide & Metalozone (diuretics)
- Ibuprofen
- Ibuprofen & Paracetamol+codeine (anti-inflammatory and analgesic combination)
- Indomethacin suppository
- Indomethacin & Paracetamol+codeine (anti-inflammatory and analgesic combination).
- Isradipine & Nifedipine(Calcium antagonists)
- Isosorbide mononitrate
- Loperamide & Diphenoxylate (anti-diarrhoeals)
- Metalozone & Indapamide (diuretics)
- Oxybutynin
- Paracetamol
- Paracetamol & codeine
- Prazosin

There were 20 instances where 15 patients had duplication of individual drug therapy (e.g. Amitriptiline was duplicated from two different clinics) or duplication within a pharmacological class of drugs (Felodipine and Isradipine are both Calcium channel antagonists). The incidence of drug or drug group duplication was once for each of the above.

Some errors in drug duplication and drug interaction were the result of the patient receiving prescription orders from multiple prescribers. Thus, while prescribers on average made errors, no single prescriber may have been directly responsible. It is therefore important for the prescriber to determine from the patient as well as from the patient's medical records, all the different clinics the patient was attending and other current medication the patient was taking.

Nine patients had duplicate prescriptions from different clinics or two valid repeat prescriptions for the same medicines. In these cases, one of the scripts was cancelled and the prescriber was informed of this duplication.

Irrational drug duplication may be due to:

- Use of a drug for no established diagnosis
- Multiple drug orders for symptoms such as pain / agitation / restlessness / nervousness
- Convenience to suit needs of physician / pharmacist / nurse

4.5.2.3 (B) Needs Additional therapy

Table 4.43 Untreated medical indication

Untreated indication	Number of patients	Percent
Cramps	3	11.1%
Muscular aches and pain	3	11.1%
Anaemia	1	3.7%
Insomnia	2	7.4%
Urinary tract infection(UTI)	1	3.7%
Infection (finger)	1	3.7%
Mouth Ulcers	1	3.7%
Arthritis	4	14.8%
Nasal Congestion	1	3.7%
Constipation	1	3.7%
Eye problems	2	7.4%
Rash and itchy skin	2	7.4%
Fungal infection	1	3.7%
Glaucoma	2	7.4%
Diabetes	2	7.4%
TOTAL	27	100%

In thirteen of the cases listed in Table 4.43, the patient was sent back to the prescriber and medication was prescribed to treat the necessary condition. One of two patients requiring treatment for glaucoma had defaulted his eye clinic appointment. He was made to make a new appointment. The other patient with glaucoma was referred to the eye specialist as well as two other patients with eye problems.

The prescriber was requested to do a blood glucose test to monitor one of the patients with untreated diabetes and initiate therapy if necessary and the other patient with untreated diabetes was referred to the diabetic clinic. The patient with the fungal infection was referred to the skin specialist.

In three instances (two patients with skin rash and one patient with arthritis,) the prescriber was unavailable and in two instances, the patient was counselled on non-drug therapy to treat the condition. Patient NB who was experiencing muscular pains in the legs was referred to the prescriber for examination and possible treatment or if necessary, referral. The outcome was that the patient presented with classical history of intermittent claudication and a Doppler study was requested.

One patient, from this group was on a number of prescribed medicines. He was advised by the researcher to purchase the analgesic (Betapyn® = paracetamol + codeine combination) privately to treat muscular aches and pains as was done previously by the patient with good results. He was also counselled on the use of the analgesic.

4.5.2.3 (B) 2. Uncontrolled medical indication

Table 4.44 Uncontrolled medical indication

Uncontrolled condition	Number of patients	Percent
Diabetes	4	22.2%
Gout	1	5.5%
Hypertension	2	11.1%
Insomnia	2	11.1%
Depression	1	5.5%
Epilepsy	1	5.5%
Angina	1	5.5%
Muscular aches and pain/Arthritis	3	16.7%
Constipation	1	5.5%
Parkinsons disease	1	5.5%
Spastic colon	1	5.5%
TOTAL	18	100%

There were eighteen instances where the elderly patients' condition was uncontrolled and the patient had very little or no relief of the symptoms. In nine instances the patients DRPs were regarded as possibly preventable. The remaining seven instances were regarded as definitely preventable. Of these eighteen patients, seven received counseling, one patient had medication prescribed, three patients were referred to specialists, three had no change in drug treatment and one patient had a recommendation for the prescriber to review the drug therapy.

4.5.2.4 EFFECTIVENESS OF DRUG THERAPY

4.5.2.4.1 More effective medicine available

Table 4.45 More effective medicine available

Drugs involved	Frequency	Percent
Betamethasone	1	11.1%
Chlorpheniramine	1	11.1%
Frusemide and Verapamil	1	11.1%
Ibuprofen	1	11.1%
Perindopril	2	22.2%
Paracetamol	2	22.2%
Zinc and castor ointment	1	11.1%
TOTAL	9	100%

In nine patients, there were more effective drugs to treat medical conditions. The cases are as follows:

- One patient was treated for insomnia with Chlorpheniramine 4 mg at night, which was not effective. The patient indicated that Hydroxyzine 25 mg at night had been prescribed previously which helped. However, Hydroxyzine is a restricted item and at the hospital is not indicated for insomnia, although it is often prescribed for this condition. The prescriber changed the prescription to Hydroxyzine.
- One patient had dry scaling dermatitis, which was not healing with Zinc and Castor oil ointment prescribed previously and used for duration of a month. This patient was referred to the specialist skin clinic.
- Patient MH (82 years) was on Frusemide 80 mg twice daily and Verapamil 80 mg three times daily. A PIF was sent to the prescriber recommending that a diuretic with an Ace-inhibitor is a better choice than diuretic (Frusemide) with a calcium channel blocker (Verapamil). Unfortunately, the prescriber was unavailable, and

the prescription was dispensed as written. The problem was noted in the patient's file.

- A patient with severe arthritis was taking paracetamol, which gave no relief to the arthritic pain. The patient was on Propoxyphene previously and had relief of pain, but Propoxyphene is restricted to oncology and pain control clinics. This patient did not qualify for receiving the medicine.
- An asthmatic patient was on Ibuprofen and Theophylline. Theoretically, there is a relative CI for using Ibuprofen and Theophylline. A PIF was sent to prescriber recommending Paracod®, but the prescription was not changed because ® is often in short supply at the hospital and not always dispensed because of pharmacy restrictions.
- An arthritic patient was prescribed Propoxyphene but this item is restricted to certain specialists. The Propoxyphene was changed to paracetamol, but the patient found paracetamol alone ineffective. The pharmacist recommended paracetamol+codeine and this was prescribed and dispensed.
- One patient was prescribed Betamethasone 0.03% cream, a very dilute steriod cream not effective for the skin problem. The prescription was changed to Betamethasone and clioquinol cream.
- Patient BZS (68 years) was prescribed Ibuprofen 400 mg at night and had no relief of muscular pain. The prescription was changed to Diclophenac 50 mg at night, from which the patient had received relief in the past.
- FB a black patient (72 years) had uncontrolled hypertension and was treated with Perindopril 4mg daily. Perindopril, without a renin stimulating diuretic is less effective in black patients because of their inherently low renin status (SAMF, 1997). A PIF was sent to the prescriber recommending the addition of hydrochlorthiazide to the prescription. The prescriber accepted the recommendation that a thiazide diuretic, would be more effective in a black patient as opposed to Furesemide, a loop diuretic (SAMF, 1997), which the patient was currently taking. Hydrochlorthiazide 25 mg daily was added to the treatment regime with the advice to monitor potassium levels in this patient.
- Another black patient HM (66 years) was on Perindopril 8 mg daily and was complaining of coughing due to the medicine. After sending a PIF, the dose of Perindopril was reduced to 6 mg daily and the dose of another antihypertensive

Isradipine was increased from 5 mg daily to 5 mg twice daily. This patient was experiencing joint pains which were being treated on topical methyl salicylate ointment alone. The patient received no relief from this prescription. A PIF was sent to the prescriber and the combination analgesic Paracetamol and codeine was prescribed.

Four of these DRPs were regarded as definitely preventable, while the remaining five were possibly preventable.

4.5.2.4.3 (A) Underutilisation – underuse of drug

These results appear in Table 4.46. 180 drugs were underutilised.

Table 4.46 Underutilisation of medicines

Drug or drug group	Frequency	Percent
Acebutolol	5	2.8%
Allopurinol	3	1.7%
Amiloride+Hydrochlorthiazide	2	1.1%
Amitryptiline	2	1.1%
Aspirin	5	2.8%
Beclomethasone	2	1.1%
Biperidin	1	0.6%
Calcium Gluconate	4	2.2%
Calcium carbonate + Glycine	1	0.6%
Captopril	11	6.1%
Carbamazepine	4	2.2%
Carbidopa: Levodopa	2	1.1%
Chloramphenicol	1	0.6%
Cinnarizine	1	0.6%
Diazepam	1	0.6%
Diclophenac	3	1.7%
Digoxin	1	0.6%
Diltiazem	4	2.2%
Diphenhydramine	1	0.6%
Dorzolamide	1	0.6%
Estrogen	2	1.1%
Fenoterol + Ipratopium Bromide	1	0.6%
Ferrous sulphate	1	0.6%
Flucloxacillin	1	0.6%
Fluoxetine	1	0.6%
Frusemide	24	13.3%
Fusidate + Hydrocortisone	1	0.6%
Glibencamide	3	1.7%
Glicazide	1	0.6%
Glipizide	1	0.6%
Haloperidol	1	0.6%
Hydrallizine	1	0.6%
Hydroxyzine	1	0.6%
Ibuprofen	6	3.3%
Imipramine	1	0.6%
Indomethacin	4	2.2%
Insulin	2	1.1%
Isosorbide dinitrate	15	8.3%
Isosorbide mononitrate	6	3.3%
Isradipine	2	1.1%
Levobunolol(®)	2	1.1%
Lorazepam	2	1.1%
Metformin	3	1.7%
Methyldopa	4	2.2%
Metoclopramide	1	0.6%
Mianserin	1	0.6%
Nifedipine	2	1.1%
Oxybutynin	2	1.1%
Paracetamol and codeine	1	0.6%
Pilocarpine	1	0.6%
Piroxicam	1	0.6%
Potassium Chloride	9	5.0%
Prazosin	1	0.6%
Prednisone	1	0.6%
Pregamal	1	0.6%
Propranolol	1	0.6%
Psyllium hydrophilic mucilloid	2	1.1%
Ramipril	1	0.6%
Reserpine + Hydrochlorthiazide	1	0.6%
Senna	1	0.6%
Sorbitol	1	0.6%
Sulphasalazine	1	0.6%
Sulpiride	1	0.6%
Theophylline	2	1.1%
Triamterene+Hydrochlorthiazide	2	1.1%
Trihexyphenidyl	1	0.6%
Thyroxine	1	0.6%
Temazepam	1	0.6%
Verapamil	2	1.1%

In all instances the patients were counselled on the importance of taking the medicine as prescribed except for the following instances where alternative action was taken:

- Patient OG (71 years) felt light-headed and drowsy with Mianserin 30mg daily and did not report this to the prescriber. He took his own dose of Mianserin (15mg daily) because of the side effect. The recommended dose in the elderly is to commence therapy with 10mg at night and increase the dosage cautiously. (SAMF, 1997). A PIF was sent to the prescriber and the dose of the Mianserin was decreased to 15mg daily.

- Patient EL (66 years) experienced depression with Methyldopa 250mg twice daily, and was therefore taking his own dose of Methyldopa, which was less than that prescribed. The depression was treated with Amitriptiline. The Methyldopa was discontinued. Methyldopa, according to the EDL and National Hypertensive Society guidelines is reserved for Hypertension in pregnancy only (EDL, 1998). Alternative anti-hypertensive medicines were prescribed. The same patient was also taking too little of Diltiazem, because he had been feeling well and felt that he did not require the medicines. In this instance, he was counselled.

- Patient TB was taking too little of Methyldopa because of the depressive side effect which was treated with Amitriptiline and Lorazepam. A PIF was sent to the prescriber and the Methyldopa was changed to Quinapril.

- Patient HB was totally non-compliant and did not take the medicines as prescribed because he believed that all his medicines affected his hiatus hernia. He was counselled that only the Diclophenac prescribed for his arthritis would affect hiatus hernia. The patient was taking too little of the Diclophenac and therefore had no relief for his arthritis. A PIF was sent to the prescriber to change the Diclophenac, but this request was rejected because the patient was not willing to go to the medical superintendent for the authorisation of the new medicines prescribed. This patient was also taking a decreased dose of the prescribed Methyldopa 250mg twice daily, because of the side effects of depression and dizziness (postural hypotension). These ADRs which are common side effects of

Methyldopa in elderly patients. The patient had reported these adverse effects to the prescriber and there had been no change to the hypertensive therapy. The Methyldopa was not prescribed on a current prescription because the patient had surplus medication. An obvious indication of non-compliance. The prescriber informed him to continue taking as prescribed. After interviewing the patient, it was recommended to change the Methyldopa to a Calcium channel blocker or an alternative antihypertensive agent. This request was rejected and the patient was told to continue on Methyldopa and that his therapy would be reassessed on his next visit.

- Patient PM (72 years) was experiencing dizziness with Methyldopa 250mg three times daily and was therefore taking less than the prescribed dose. A PIF was sent to the prescriber and the dose of the Methyldopa was decreased to 250mg twice daily.

- Patient AK was prescribed paracetamol+codeine for arthritis, but had no relief because the codeine was causing constipation and the patient was therefore taking too little. The prescriber was recommended to change the medicine to a NSAID. This suggestion was accepted and the codeine containing analgesic was changed to Diclophenac.

- Patient AM was taking too little of Theophylline. Theophylline is to be used with caution in a hypertensive patient because it interacts with diuretic (patient on Frusemide) and can cause hypokalemia, which requires more careful monitoring of potassium levels. This patient was counselled and a note of caution was sent to the prescriber concerned.

4.5.2.4.3 (B) Supplied less quantity of medicines

Being supplied less than the prescribed amount of medicines also results in underutilisation DRPs. This occurred in the following six instances.

- Two patients were supplied less Hydroxyzine than was prescribed, but this was due to the hospital policy on restricted items.

- A number of patients were supplied less Captopril, Diclophenac, Clotrimoxazole and Magnesium Trisilicate than needed and prescribed. This was corrected to ensure the correct treatment and duration of therapy.

The majority of the underutilisation DRPs group was regarded as definitely preventable.

4.5.2.4.4 Not tolerating prescribed medicine or nutritional supplement

A patient does not tolerate a medicine or nutritional supplement, if the patient experiences side effects or has a dislike for the taste. Patient ZS (67 year old, female) was prescribed a nutritional supplement strawberry flavoured Build Up, but did not like the taste or product. The patient preferred Ensure, vanilla flavoured which she had taken previously and the Build Up was changed. Both these nutritional supplements were supplied at Addington, depending on which product was available at the time.

Another patient could not tolerate Frusemide, but the patient was counselled with an explanation that the diuresis is an expected and necessary effect of the medication.

4.5.2.5 SAFETY OF DRUG THERAPY

4.5.2.5.1 Drugs or drug groups causing adverse drug reactions

Table 4.47 Drugs or drug groups causing adverse drug reactions

Drug causing adverse effect	Frequency	Percent
Ace-inhibitors	42	18.9%
Aluminium Hydroxide	1	0.5%
Amiodarone	1	0.5%
Analgesics	14	6.3%
Anti-asthmatic agents	8	3.6%
Anti-epileptics	3	1.4%
Anti-gout preparations	3	1.4%
Anti-parkinsonian agents	11	4.9%
Aspirin	7	3.1%
ß-blockers	5	1.3%
Calcium channel blockers	11	4.9%
Centrally acting anti-adrenergics	12	5.4%
Cholesterol and triglyceride reducers	2	0.9%
Chlorpheniramine	1	0.5%
Coronary vasodilators	14	6.3%
Dermatologicals	3	1.4%
Digoxin	6	2.7%
Diuretics	25	11.2%
Estrogen	2	0.9%
Ferrous sulphate	1	0.5%
Glaucoma preparations	3	1.4%
NSAIDs	26	11.7%
Oral anti-diabetic agents	6	2.7%
Oxybutynin	2	0.9%
Pholcodeine	1	0.5%
Potassium Chloride	2	0.9%
Prednisone	2	0.9%
Psycholeptics	2	0.9%
Psychoanaleptics	3	1.4%
Sorbitol	1	0.5%
Sulphasalazine	1	0.5%
Thyroxine	1	0.5%
Warfarin	1	0.5%
TOTAL	223	100%

Table 4. 47 shows that a total of 223 ADRs were recorded in 160 elderly patients (56.9%).

- The following ace-inhibitors were responsible for 41 reported adverse effects: Captopril (18), Enalapril (7), Perindopril (7), Quinapril (1) and Ramipril (9). The anti-hypertensive drugs (ACEI, calcium channel blockers and centrally acting anti-adrenergics) accounted for 65 ADRs (29.1%).

- The NSAIDs were responsible for 26 reported adverse effects and were due mainly to the following drugs: Indomethacin (11), Diclophenac (8) and Ibuprofen (5). Two patients experienced ADRs to NSAIDs.
- The 25 diuretic adverse effects were as follows: Frusemide (18), Indapamide (2), Metalozone (3), and Spironolactone (2). 11.1% of the patients interviewed experienced ADRs which were mainly biochemical disturbances associated with diuretics and in most cases the patients were asymptomatic.
- The coronary vasodilators were responsible for 14 reported adverse effects, of which 3 were due to Isosorbide dinitrate and 9 to Isosorbide mononitrate and 2 to Glyceryl trinitrate.
- The 14 analgesic adverse effect was due to aspirin+ codeine (1), paracetamol+ codeine (10), Propoxyphene hydrochloride (Doloxene ®) (2), and Stilpane ® (1).
- Of the 12 centrally acting anti-adrenergic adverse effects 9 were due to Methyldopa and 3 to Brinerdin®. Methyldopa adverse effects were mainly postural hypotension and depression. Methyldopa is not the STG for treating hypertension in the public sector and it is hoped that prescribers will start following these guidelines and stop prescribing Methyldopa in elderly patients, and use the safer alternatives (Section 4.4.2.5.3.3.).
- The 11 adverse effects of the calcium channel blockers were as follows: Amylodipine (3), Diltiazem (1), Felodipine (2), and Nifedipine (5).
- The anti-parkinsonianS were responsible for 11 adverse effects as follows: Carbidopa: levodopa (5), Amantadine, Selegiline, Biperidin and Benzhexol, one each and Trihexyphenidyl (2).
- The 8 anti-asthmatic adverse effects were due to Fenoterol+ ipratropium bromide (1), Beclomethasone (3) and Theophylline (4).
- Oral anti-diabetic agents were responsible for 6 cases of adverse effects as follows: Glibencamide (1), Glicazide (3) and Metformin (2).
- The 5 ß-blockers adverse effects were due to: Acebutolol (3) and Propranolol (2).
- The 3 anti-epileptic side effects were due to Carbamazepine, Phenobarbitone and Sodium valproate.
- The 3 dermatologicals adverse effects: were due to betamethasone, Diprosalic® (Betamethasone+salicylic acid) and Isotretinoin.

- The psychoanaleptics Amitriptiline (2) and Mianserin (1) were responsible for three adverse effects.
- The three anti-gout adverse effects were due to colchicine (2) and allopurinol (1).
- The glaucoma preparations: Pilocarpine, Levobunolol and Timolol were each responsible for three of the adverse effects.
- There were 2 reported adverse effects due to Haloperidol and Hydroxyzine (psycholeptics).
- The 2 adverse effects of the cholesterol reducers were due to Fluvastatin and Simvastatin.

4.5.2.5.2 Discussion of ADRs in the elderly

These findings reveal the drugs that most commonly cause ADRs in the elderly. They are mainly the cardiovascular drugs, which can cause hypotension and bradycardia; NSAIDs, which can lead to peptic ulcer disease; psychotropic drugs, which can result in enhanced sedation, falls and fractures; and antidepressants, which can produce cardiovascular effects.

The elderly patient's susceptibility to ADRs may be enhanced due to multiple drug therapies, coexistence of several disorders, and severe morbidity (Nolan and O' Malley, 1988). These findings also raise important questions regarding the ability of the elderly to recognize the drug side effects or adverse events they experience and to communicate to their providers. Furthermore, these results suggest that if providers are to be successful in identifying all the quality of life impairing drug side effects in their elderly patients, the providers have to be aggressive in seeking out such problems. The alternative approach (i.e., waiting for the elderly to recognize and report drug side effects) may seriously delay initiation of remedial measures by the provider (Klein *et al.* 1984).

Several studies have found that adverse drug reactions are responsible for between 10 and 31% of hospital admissions in older patients (Popplewell and Henschke, 1980; Williamson and Chopin, 1980). An important finding which shows the significance of adverse drug reactions is that 6 to 7% of all adverse reactions in elderly patients contribute directly or indirectly to death (Lamy, 1990). ADRs is one of the major DRPs experienced by elderly patients, and will be discussed in detail in Section 4.6.

4.5.2.5.2 Nutritional drug-related problems

Factors having an impact on drug-nutrition problems include chronic and multiple drug regimens, age-related changes in drug metabolism, and decreased function of vital organs that result in impaired clearance. The nutritional status of the elderly may be disrupted primarily by three mechanisms: suppression or stimulation of appetite, alteration in the metabolism or utilization of a nutrient, and alteration in the excretion of that nutrient (Boyd *et al.*, 1991). In this study 13 (4.6%) of the patients on medication, experienced effects on their nutritional status. 268 elderly patients (95.4%) did not experience any weight loss or gain, loss of appetite with their medication.

4.5.2.5.3 Drug Interactions

4.5.2.5.3.1 Drug-drug interactions

These drug-drug interactions were verified from the drug monographs in the SAMF, (1997) and only the potentially clinically important interactions were considered. A potential drug interaction was defined as a combination of drugs that when taken simultaneously could produce a "pharmacological or clinical response to the administration of a drug combination different from that anticipated from the known effects of the two agents when given alone (Tatro, 1988).

Table 4.48 Drug-drug interactions

DRUG-DRUG INTERACTIONS	Frequency	Percent
Drug-drug interactions affecting diabetic therapy	23	13.6%
Drug-drug interactions affecting potassium levels	68	40.2%
Drug-drug interactions causing enhanced hypotensive effect	9	5.3%
Drug-NSAIDs interactions	42	24.8%
Digoxin-drug interactions	18	10.7%
Theophylline -drug interactions	8	4.7%
Warfarin and aspirin interaction	1	0.6%
TOTAL	169	100%

There were a total of 169 (60.1%) actual or potential drug-drug interactions that were identified in 124 patients (44.1%). These were drug-drug interactions that cause a clinical effect, which is of significance. In an analogous review by Lipton *et al.*,

(1992) of 236 geriatric patients, there was an 88% incidence of clinically significant interactions, and a 22% incidence of potentially serious and life-threatening interactions. The incidence of drug interactions is likely to be higher in the elderly because ageing affects the functioning of the kidneys and the liver. Many drugs are excreted slowly, producing raised blood levels compared to younger patients (Cadieux, 1989; Tinawi, 1992).

In the current study drug-drug interactions affecting potassium levels were the most frequent (40.2%). In these cases the recommendations were routine urea and electrolyte tests to monitor potassium levels. Interactions of NSAIDs with other prescribed medication represented 24.8% of the total drug-drug interactions.
For the moderate non-life threatening interactions the pharmacists have considerable autonomy in problem detection and resolution. Actions in these cases included ascertaining that the drugs are in fact being taken simultaneously and then modifying the time of administration, or warning patients to exercise cautionary procedures.

Table 4.49 Drug-drug interactions affecting diabetic therapy

Affected Drug/drug group	Interacting Drug/drug group	Frequency	Percent
Glibencamide	Aspirin	11	47.8%
Glicazide	Aspirin	7	30.4%
Glipizide	Aspirin	1	4.4%
Tolbutamide	Aspirin	2	8.7%
Tolbutamide	Frusemide	1	4.4%
Glibencamide	Nifedipine	1	4.4%
TOTAL		23	100%

Aspirin was the drug that interacted with oral hypoglycaemics, to cause increased hypoglycaemia. This drug combination was prescribed in 21 elderly patients. Also nifedipine in a diabetic patient requires special precaution. A transient increase in blood glucose has been noted (MDR, 1999). Therefore special care must be taken to monitor diabetic patients taking the above drug combinations.

Table 4.50 Drug-drug interactions affecting potassium levels

Affected Drug/drug group	Interacting Drug/drug group	Frequency	Percent
Captopril	Frusemide	7	10.3%
Captopril	Digoxin &Indapamide &Metalozone	1	1.5%
Enalapril	Frusemide	3	4.4%
Enalapril	Frusemide and Digoxin	1	1.5%
Enalapril & Hydrochlothiazide	Hydrocortisone	1	1.5%
Captopril and Potassium Chloride	Frusemide	10	14.7%
Captopril and Potassium Chloride	Frusemide and Digoxin	4	5.9%
Enalapril and Potassium Chloride	Frusemide and Metolazone	1	1.5%
Perindopril & Potassium Chloride	Frusemide	3	4.4%
Perindopril & Potassium Chloride	Frusemide and Digoxin	2	2.9%
Ramipril & Potassium Chloride	Frusemide and Digoxin	1	1.5%
Ramipril & Potassium Chloride	Digoxin	3	4.4%
Ramipril & Potassium Chloride	Frusemide	1	1.5%
Potassium Chloride	Frusemide and Digoxin	2	2.9%
Potassium Chloride	Indapamide and Digoxin	2	2.9%
Potassium Chloride	Frusemide&Digoxin& Metalozone	1	1.5%
Captopril	Frusemide and Digoxin	4	5.9%
Ramipril	Frusemide	1	1.5%
Ramipril	Hydrochlorthiazide	1	1.5%
Ramipril	Frusemide and Digoxin	2	2.9%
Captopril	Indapamide	3	4.4%
Perindopril	Frusemide	5	7.4%
Perindopril	Triamterene+ Hydrochlorthiazide	1	1.5%
Perindopril	Dioxin & Frusemide & Metolazone	1	1.5%
Perindopril & Hydrochlorthiazide	Indapamide	1	1.5%
Quinapril	Frusemide	1	1.5%
Indapamide	Frusemide	2	2.9%
Spironolactone	Frusemide and Indapamide	1	1.5%
Spironolactone & PotassiumChloride	Frusemide	1	1.5%
Spironolactone & Captopril	Frusemide	2	2.9%
TOTAL		68	100%

It was mainly the ace-inhibitors (Captopril, Enalapril, Perindopril and Quinapril) which when prescribed simultaneously with diuretics like Frusemide, Hydrochlorthiazide, Indapamide and Metalozone caused an effect in potassium levels. This was further complicated when Digoxin, which is potassium depleting, is added to this treatment regimen. Cardiovascular drugs have considerable potential for pharmacodynamic interaction, and has been reflected in the results.

Table 4.51 Drug interactions causing enhanced hypotensive effect

Affected Drug/drug group	Interacting Drug/drug group	Frequency	Percent
Frusemide	Methyldopa	5	55.6%
Atenolol	Methyldopa	1	11.1%
Sotalol	Methyldopa	1	11.1%
Amylodipine	Isosorbide mononitrate	1	11.1%
Nifedipine	Isosorbide mononitrate	1	11.1%
TOTAL		9	100%

Methyldopa, which is contra-indicated in the elderly patients, was responsible for 7 instances of enhanced hypotensive effects when prescribed simultaneously with Frusemide, Atenolol, and the β-blocker, Sotalol.

Table 4.52 NSAIDs-drug interactions

Affected Drug/drug group	Interacting Drug/drug group	Frequency	Percent
Triamterene + Hydrochlorthiazide	Diclophenac	4	9.5%
Triamterene + Hydrochlorthiazide	Ibuprofen	2	4.8%
Frusemide	Diclophenac	5	11.9%
Indapamide	Diclophenac	5	11.9%
Indapamide	Ibuprofen	3	7.1%
Indapamide	Indomethacin	2	4.8%
Frusemide	Ibuprofen	12	26.2%
Frusemide	Indomethacin	5	11.9%
Frusemide and Spironolactone	Indomethacin	1	2.4%
Hydrochlorthiazide	Indomethacin	2	4.8%
Warfarin	Diclophenac	1	2.4%
TOTAL		42	100%

A potential serious drug interaction was recorded for the patient JN who was taking Warfarin and Diclophenac. Elderly patients are more sensitive to the anticoagulant action of Warfarin, added to which there is a potential interaction due to possible protein binding displacement with Diclophenac. In this patient the Diclophenac was changed to another anti-inflammatory, Ibuprofen, which does not increase the anti-coagulant effect of Warfarin. Normally, NSAIDs are not co-administered with Warfarin, and if needed very careful monitoring with dosage adjustments have to be done as NSAIDs can precipitate a gastro-intestinal bleed.

Table 4.53 Digoxin-drug interactions

Affected Drug/drug group	Interacting Drug/drug group	Frequency	Percent
Digoxin	Triamterene + Hydrochlorthiazide	3	16.7%
Digoxin	Frusemide	1	5.6%
Digoxin	Indapamide	1	5.6%
Digoxin	Nifedipine	2	11.1%
Digoxin	Verapamil	4	22.2%
Digoxin	Diltiazem	7	38.9%
TOTAL		18	100%

Digoxin toxicity (manifesting as effects on mood, nausea and diarrhoea) may be precipitated by interaction with Verapamil, Diltiazem, Frusemide and Nifedipine (13 instances). They increase the Digoxin plasma concentrations by reducing the volume of distribution, potassium levels and the clearance of Digoxin from the body. The patient's Digoxin concentration should be measured to avoid Digoxin toxicity. The plasma potassium has to be checked to prevent hypokalaemia and to avoid exacerbation of Digoxin toxicity.

Hudson (1997) reported a case of Digoxin toxicity in a 74-year-old female patient who was taking Digoxin for cardiac failure and atrial fibrillation. She was also receiving Frusemide 80mg daily and Verapamil 40mg three times daily. Normally an active sociable woman, who manages at home independently, she became moody and withdrawn, since hospitalisation. On enquiry she has also complained of poor appetite and loose stools. The patient's Digoxin concentration was measured and was 3.2 nmol/L (reference range 1.3-2.6 nmol/L) and the serum potassium was 2.8mmol/L (reference range 3.5-5.5mmol/L). Subsequently the Digoxin dose was halved and the Frusemide substituted with a potassium-sparing diuretic combination of Frusemide and Amiloride. The patient's mood and appetite improved over the next weeks.

Table 4.54 Theophylline -drug interactions

Affected Drug/drug group	Interacting Drug/drug group	Frequency	Percent
Theophylline	Frusemide	4	50%
Theophylline	Indapamide	1	12.5%
Theophylline	Verapamil	1	12.5%
Theophylline	Phenytoin	1	12.5%
Theophylline	Nifedipine	1	12.5%
TOTAL		8	100%

The interactions of drugs with Theophylline (has a narrow therapeutic window) necessitate monitoring of Theophylline levels to prevent toxicity, manifesting as tachycardia, nervousness and convulsions. These side effects are not conducive to the well being in any patient.

4.5.2.5.3.1 Other drug-drug interactions of clinical significance

There was one serious drug-interaction, where patient SP was prescribed Warfarin by the PI and INR clinic, and aspirin in the general medical clinic. Aspirin enhances the anti-coagulant effect of Warfarin and there is the potential for serious internal bleeding. The prescriber was informed of this and the aspirin was discontinued. This DRP was definitely preventable, if the prescribers had done a complete medical and drug review of patient SP. It would have revealed that the patient was taking the Warfarin for the prevention of thromboembolism in atrial fibrillation, as the patient had been diagnosed with a cardiac arrhythmia cardiac arrhythmia patient and had been admitted to hospital on two occasions for cardiac problems.

4.5.2.5.3.2 Drug- disease interactions

Table 4.55 Drug-disease interactions

Drug or Drug group	Disease	Prevalence	Percent
NSAIDs	Asthma	1	1.2%
Amitriptiline **Imipramine** **Theophylline**	Cardiovascular Cardiovascular Cardiovascular	10 3 1	12.3% 3.7% 1.2%
Paracetamol & codeine	Constipation	1	1.2%
Acebutolol **Atenolol** **Diuretics** **Nifedipine** **Propranolol** **Sotalol**	Diabetes Diabetes Diabetes Diabetes Diabetes Diabetes	7 2 32 3 2 1	8.6% 2.5% 39.5% 3.7% 2.5% 1.2%
Amitriptiline	Glaucoma	4	4.9%
Diuretics	Gout	10	12.3%
Diclophenac	Hiatus hernia	3	3.7%
Indomethacin&Aspirin	Peptic ulcer	1	1.2%
TOTAL		81	100%

Although interacting drug combinations were commonly prescribed, they seem to have produced clinically important adverse effects in only a few cases. However, these patients on drug combinations, which interact with each other, require careful monitoring to detect adverse effects. Use of drugs contra-indicated in geriatrics also produced clinically significant adverse effects, as has been revealed in the drug-age interactions in the section below.

4.5.2.5.3.3 Drug-age interactions

There is a contra-indication to the use of Methyldopa in elderly patients. Twenty patients (Table 4.36) were prescribed Methyldopa on their current drugs (1.2 % of total prescriptions). In 15 of these, the caution was a general warning against use of Methyldopa in elderly patients. In nine cases (not necessarily of the twenty current prescriptions) the cautioned drug did cause a detrimental effect either with the patient's past or current medication. In two of these the drug was considered inappropriate and was discontinued.

This emphasises the importance of prescribers following the STGs in their prescribing for geriatric patients in order to ensure safe and rational drug therapy. Methyldopa is not one of the recommended firstline anti-hypertensives for any patient (except pregnancy induced-hypertension). Safer alternatives like diuretics, ace-inhibitors and calcium channel blockers in a step-care approach should be considered (STGs and EDL, 1998).

4.5.2.5.3.4 Drug-alcohol interaction

30.6% of the patients admitted to consuming alcohol, but this was a subjective assessment (Section 4.2.3). Therefore no actual or potential interactions with their medicines could be confirmed, as the frequency of drinking, type of liquor consumed and quantity consumed at a given could not be verified.

The only verifiable drug-alcohol interaction was patient HM who admitted to consuming alcohol on a regular, daily basis in large quantities and was on Isosorbide mononitrate (coronary vasodilator). The results of a study in 1980 on the combined haemodynamic effects of alcohol and Glycerol trinitrate (0.5mg sublingual), a vasodilator drug like Isosorbide mononitrate (oral) give support to the claim that concurrent use increases the risk of exaggerated hypotension and fainting (Abrams, 1990). Although, Isosorbide mononitrate (Ismo®) 20mg is not taken sublingually and is a longer-acting preparation than Glyceryl trinitrate, it still has similar effects when taken concomitantly with alcohol. It is suggested that increased susceptibility to postural hypotension should not be allowed to stop the patient from using Ismo® if he drinks. But he was warned and told what to do if he felt faint and dizzy. It was not practical or possible to attempt to modify the lifestyle of this elderly patient by convincing him that alcohol is harmful and he should stop consuming it. Rather this patient was effectively counseled not to take the Isosorbide mononitrate simultaneously with alcohol because this could impair his reaction, for example whilst driving in traffic, and he was at a greater risk for impaired balance, falls and confusion. In addition, he should consume alcohol in small amounts (eg. not more than one or two drinks over a period of 1.5 - 2 hours) (Hoddad and Wegner, 1999).

Elderly people are at higher risk for drug-alcohol interactions and should be advised of the possible adverse effects. Many of the medications, taken by geriatrics have the potential to interact with alcohol. Alcohol taken concurrently with drugs can enhance the absorption of drugs in the gut and increase their bioavailabilty. This results in greater blood levels of the drugs, allowing for increased drug activity. The significant adverse effects of drug-alcohol interactions include liver toxicity, gastrointestinal irritation, alterations in drug or alcohol blood levels, sedation and disulfiram-like reactions. Various studies have shown that alcohol consumption is common among elderly people as is concomitant drug and alcohol use. The most common risk may be from the use of over-the-counter pain relievers and alcohol. Pharmacists need to remind elderly patients of prescription and OTC cough and cold products which may contain a high concentration of alcohol. It is important for healthcare professional and patients to have an increased awareness of the potential danger of mixing medications with alcohol (Hoddad and Wegner, 1999).

4.5.2.5.3.5 Discussion of Drug - interactions

In this study, there was a 44.1% incidence of potential drug interactions and 56.9% of ADRs which was higher than the study by Schneider *et al.*, (1997) where potential drug interactions were identified in the records of 143 subjects (31%) of 463 elderly outpatients and 107 documented ADRs were recorded in 97 patients (21%). The higher percentage of ADRs in the current study is expected because both the documented ADRs as well as those reported by the patient at the interview were considered, in contrast to the study by Schneider *et al.*, where only ADRs or relevant patient complaints noted by the physician was reported. Ostrom *et al.* (1985) reported that 27% of community-residing elderly subjects experienced possible drug interactions of moderate or major severity.

These discordant figures on drug interactions need to be put into the context of the under-reporting of adverse effects of any kinds by prescribers, for reasons, which include pressures of work, indifference, indolence and fear of litigation. Both practitioners and elderly patients may not recognise adverse reactions and interactions, and many outpatients simply stop taking their drugs without saying why.

This study and other studies does not give an indication of how frequently drug interactions occur, but it still represents a very considerable number of elderly patients who appears at risk when taking into account the large numbers of drugs prescribed to these patients (Stockley, 1996).

Prescribing for elderly patients often presents considerable difficulties because multiple pathology is the rule rather than the exception, allowing many opportunities for the prescription of drugs with absolute CIs or potential interactions. Age-related changes in pharmacokinetics may make plasma concentrations less predictable. Similar changes in pharmacodynamics may cause a narrower therapeutic window for many drugs and require more precise prescribing. It is apparent from the results of this study, and the review of outpatient drug use by Christensen (1991) that potential drug interactions rarely involved a discontinuation or change in drug therapy, and that the predominant action of pharmacists was to provide some type of counseling to patients and for prescribers to monitor the patients therapy.

4.5.2.5.4 (A) Overutilization – overuse of drug

Table 4.56 Overutilization – overuse of drug

Drug or drug group	Frequency	Percent
Acebutolol	1	3.3%
Allopurinol	1	3.3%
Aspirin	5	16.7%
Dexamethasone	1	3.3%
Digoxin	1	3.3%
Frusemide	2	6.7%
Glibencamide	1	3.3%
Glicazide	1	3.3%
Indomethacin	1	3.3%
Isosorbide dinitrate	1	3.3%
Isosorbide mononitrate	1	3.3%
Isradipine	1	3.3%
Metformin	1	3.3%
Metazolone	2	6.7%
Potassium Chloride	2	6.7%
Prednisone	2	6.7%
Propoxyphene Hydrochloride	1	3.3%
Ramipril	1	3.3%
Theophylline	1	3.3%
Tolbutamide	1	3.3%
Thyroxine	2	6.7%
TOTAL	30	100%

Aspirin (16.6%) was the drug that was most often taken in greater quantities than was required. It was usually prescribed as an anti-thrombotic but due to a lack of counseling, patients still thought that it was prescribed as an analgesic. They therefore took more than the 150mg prescribed for the prophylaxis of thrombus formation.

One patient ZS was taking more than the prescribed dose of Thyroxine. This patient still had signs of hypothyroidism (feels tired). Blood tests to check Thyroxine levels were recommended and for the dose of Thyroxine to be adjusted accordingly. All these patients were counseled on the importance of not taking more medicines than prescribed. These DRPs were regarded as definitely preventable through adequate counseling.

4.5.2.5.4 (B) Extra quantity of medicines supplied

Being supplied more medicine than prescribed, can also result in overuse (taking more than required) of this medication. This occurred only in patient OG who was supplied more (84 tablets) Diclophenac than the prescribed amount of 56, to be taken 25mg twice daily. This dispensing error was rectified and the correct amount was supplied. Supplying an extra quantity of medicine than that required by the patient leads to adverse effects or unnecessary wastage of medicines. In this instance had patient OG taken the extra Diclophenac, it may have potentiated a gastric ulcer.

4.5.2.5.5 Dispensing errors

Besides the dispensing errors when patients were supplied less or more than the prescribed medicines (Sections 4.4.2.4.3 (B) and 4.4.2.4 (B)), there was one error with incorrect label directions, on the use of Hydrallazine. This error was detected and rectified before supplying the patient with the medicine. The error had been detected because the patient was being counseled on the medicines. With the number of prescriptions being dispensed at this hospital each day and pharmacy staff shortages, the chances of these dispensing errors occurring is great. Pharmacists need to be extra careful when dispensing. Dispensing errors often result because patients are not counseled routinely when they receive their medicines. These errors go undetected, unless the patient is aware of the medicines that has been prescribed and brings the error to the attention of the pharmacist.

4.5.2.5.6 Borrowing medicines

Patient KG (79 year old, Asian, female) had borrowed her daughters Stilpane® (a potent prescription combination analgesic). The patient subsequently complained of constipation, which was due to the codeine in the analgesic. The patient was counselled on the dangers of using medicines prescribed for a specific patient and advised to purchase OTC analgesics if required for pain.

4.5.2.5.7 Continuing with previously discontinued medicines

Patient BL (71 year old, white female) was continuing on Nifedipine which was prescribed previously for her hypertension. The patient's blood pressure was still uncontrolled. A PIF was sent to the prescriber detailing the DRP. Because the patient's blood pressure was not controlled, the patient was advised to continue with the Nifedipine, together with Diltiazem and Frusemide prescribed on the current prescription. The patient's blood pressure will be monitored on the follow up visit and the appropriate changes then made to the therapy.

This DRP was due to a lack of communication, between the patient and prescriber. Problems of this type may occur through a lack of patient understanding as well. Therefore, when medicines are being discontinued, or new treatment initiated, patients need to be made aware of these changes through adequate counseling.

4.5.2.6. MONITORING DRUG THERAPY

4.5.2.6.1 Monitoring of blood levels or patients medical condition

Monitoring of blood levels is necessary for certain drugs to prevent toxicity or subtherapeutic dosing. This is necessary for drugs with narrow therapeutic indices, like Phenytoin, Digoxin and Theophylline.

However, certain laboratory tests like monitoring urea and electrolyte levels are necessary and essential to ensure proper dosing of certain medicines. In the study, there were 18 instances in which the prescriber was advised to monitor potassium levels in the elderly patients. Although the patients were on medicines that affected potassium levels, these tests often were not done. This may also have occurred with combination drugs that may affect potassium levels.

One patient was on Thyroxine and was still experiencing symptoms of hypothyroidism. This patient warranted monitoring of her Thyroxine levels with the appropriate dose adjustment.

4.5.2.7 COMPLIANCE OF DRUG TREATMENT

Problems with compliance of medicine regimens accounted for the remaining 7.8% of the DRPs identified, Virtually all patients could be considered deficient to some degree with respect to understanding their drug therapy. To avoid this bias, only results of those patients who maintained an obvious and significant misunderstanding of their drug therapy were considered. These results are on compliance of drug regimens. The results and discussions on compliance of drug treatment (keeping clinic appointments and collecting medicines) will be done in Section 4.7.

4.5.2.7.1 Not taking or using the prescribed medication

Table 4.57 Not taking or using the prescribed medication

Drug or drug group	Frequency	Percent
Acebutolol	2	6.1%
Amylodipine	1	3.0%
Amitriptiline	1	3.0%
Aspirin	4	12.1%
Beclomethasone	1	3.0%
Captopril	2	6.1%
Carbamazepine	1	3.0%
Cinnarizine	2	6.1%
Diclophenac	1	3.0%
Dothiepine	1	3.0%
Frusemide	4	12.1%
Hexoprenaline	1	3.0%
Hydrochlorthiazide	1	3.0%
Indomethacin suppository	1	3.0%
Methyldopa	1	3.0%
Pentoxyfilline	1	3.0%
Phenytoin	1	3.0%
Potassium Chloride	2	6.1%
Ramipril	1	3.0%
Reserpine + Hydrochlorthiazide	1	3.0%
Senna	1	3.0%
Spironolactone	1	3.0%
TOTAL	33	100%

There was a total of 33 cases where the patients were not taking the prescribed medicines. In two instances, the medicines were not dispensed because the patient did not want to continue taking them, in two instances the prescription was changed and in one instance, the medicine was discontinued. In the remaining instances, the patients were counselled on the importance of taking or using the medicines as prescribed.

4.5.2.7.2 Taking or using medication at inappropriate or incorrect dosing intervals

Table 4.58. Inappropriate or incorrect dosage intervals

Drugs involved	Frequency	Percent
Acebutolol	1	7.1^%
Beclomethasone	1	7.1%
Captopril	1	7.1%
Diclophenac	1	7.1%
Frusemide	1	7.1%
Glyceryl Trinitrate	1	7.1%
Ibuprofen	2	14.3%
Indomethacin	1	7.1%
Isosorbide dinitrate	1	7.1%
Isosorbide mononitrate	1	7.1%
Metoclopramide	1	7.1%
Metalozone	1	7.1%
Clotrimoxazole	1	7.1%
TOTAL	14	100%

In 14 instances patients were taking or using their medicines at incorrect dosing intervals. These problems were as follows:

- Patient RT was using Beclomethasone (100mcg) inhaler prn (when required), but was prescribed two puffs three times daily. The recommended dose is <800mcg daily in divided doses (MDR, 1999). The Beclomethasone (corticosteriod) was prescribed for the prophylactic treatment of bronchospasm and not for symptomatic relief. The patient was counseled that the Beclomethasone must be inhaled at regular intervals and at the recommended dosages, for maximum therapeutic effect.
- Patient EN was taking Ibuprofen when necessary for pain, although was prescribed 200mg daily for rheumatoid arthritis. This is not an actual DRP as long as the patient has relief of symptoms with the 'as required dose' dose.
- Patient AH was not aware that the clotrimoxazole cream was to be used twice daily for the fungal skin infection. The patient had been using it once daily and the infection was still not cured.
- Patient NJ was prescribed Indomethacin suppositories 100mg (10) to be used at night (prn) when severe pain is experienced. The patient however was using it on alternate night's even when not required.

- Patient MP was prescribed Ibuprofen 200mg, to be taken three times daily but was taking it prn with no relief of muscular pain.
- Patient LI was taking Isosorbide mononitrate 20mg prn, although prescribed twice daily.
- Patient MS was taking Glycerol trinitrate 0.5mg three times daily sublingually, although prescribed 'as required' for the relief and prophylaxis of angina pectoris.
- Patient SN was taking Isosorbide dinitrate 10mg twice daily orally, although prescribed three times daily.
- Patient IN was taking Acebutolol at noon and at night, was prescribed morning and at night.
- Patient JN was prescribed Captopril (25mg) half a tablet twice daily but was taking one daily, because it was difficult to break the tablet. This patient lived with family and was counselled to seek the assistance of the caregiver to the break tablets, because therapeutic effect may not be optimum at a once daily dose.
- Patient MC was taking Metalozone (2.5mg) every day and was counseled to take the medicines on alternate days as prescribed.
- Patient WB was prescribed Frusemide (40mg); two tablets in the morning but was taking too little Frusemide at irregular dosing intervals.
- Patient MN was complaining of heartburn with Diclophenac (25mg), but was taking too much of Diclophenac because he was unaware that the dose of Diclophenac was decreased from three times a day to twice daily. The patient did not know that Metoclopramide (10mg) was to be taken three times daily and that he was not taking it at this dosing interval. This patient could not speak English and had problems reading directions written in English.

These patients were counseled on their dosing intervals and in thirteen of these cases this DRP was regarded as definitely preventable, except for patient EN who was taking Ibuprofen prn with relief of pain associated with arthritis. Taking medicines at incorrect dosage intervals results in sub-optimal therapeutic effects. The patients were educated on the consequences and dangers of taking the medicines at incorrect dosage intervals.

4.5.2.7.3 Inappropriate or incorrect time of taking or using medicines

Table 4.59 Inappropriate/incorrect times of taking or using medicines

Drugs involved	Frequency	Percent
Allopurinol	2	8.0%
Bromocriptine	2	8.0%
Captopril	2	8.0%
Estrogen	3	12.0%
Fluvastatin	1	4.0%
Frusemide	8	32.0%
Ibuprofen	1	4.0%
Phenobarbitone	1	4.0%
Pantoprazole	1	4.0%
Selegiline	1	4.0%
Simvastatin	1	4.0%
Tears naturale	1	4.0%
Chloromycetin	1	4.0%
TOTAL	25	100%

In total 25 medicines had been taken at the incorrect times. Frusemide was most often taken at night although prescribed at noon (after lunch). This has a number of potential problems because of marked diuresis at night, which often resulted in incontinence; many of these patients were not compliant on their Frusemide.

- Patients MM1, ES, MM2, DS, MS, AM, MC, and AN were taking Frusemide (40mg) at night although it was prescribed to be taken at noon.
- Patients JZ and MT were taking Allopurinol (100mg) in the morning, although it was prescribed to take at night.
- Patient RVW who was taking Pantoprazole (40mg) in the morning and was advised to be taken at night as prescribed.
- Patient MN was taking Phenobarbitone twice daily instead of a single night dose.
- Patient JN was taking Estrogen and Fluvastatin in the morning. The patient was advised to take them at night as directed.
- Patient OC was prescribed Bromocriptine three times a day and the patient did not know at what time to take the tablets.
- PatientsMC and MB were taking Estrogen in the morning, but it was prescribed to be taken at night.
- Patient AS was taking Simvastin in the morning, but was counseled to take it at night as prescribed.
- Patient SDB was using Tears Naturale at night and Chloromycetin was used in the morning, however they were prescribed to be used the other way around.

- Patient GH was supposed to be taking Captopril in the morning and at night, but was taking it in a single daily dose in the morning.
- Patient CM was incorrectly taking Selegiline in the morning and at night, but was prescribed, two tablets at night.

In all 25 instances, the patient was counseled on when to take their medicines and the importance of taking the medicines at the correct times. All 25 of these problems were regarded as definitely preventable with adequate counseling. Taking medicines at incorrect times results in decreased efficacy of the drug.

4.5.2.7.4 Unaware to collect repeat medicines

One patient was not aware that he had to collect repeat medicines each month for his hypercholesteremia. He attended his lipid clinic appointment, collected his month's supply of Fluvastatin and was not informed that the medication will be continued for the next six months. This is a case in point of the poor communication between the patient and the health care provider. This DRP was definitely preventable through adequate counseling. Another patient was also not aware that he was expected to collect repeat medicines.

The Task Force for Medicine Compliance (Van Niekerk, 1994) reported that the most common types of noncompliance by patients were:

- not having the prescription filled
- self discontinuation of acute, short term or chronic medication
- taking an incorrect dose
- taking the medicine at the wrong time
- skipping doses

and these correlate well to those identified in the elderly patients in the current study. 42.0% of the elderly patients did not keep their clinic appointments on one or more occasions and 44.5% failed to collect their repeat chronic medicines at some stage (Section 4.7.1.1).

The results of Section 4.4.2.7 revealed that there were:

- 33 incidences where the patient was not taking the prescribed medicines;
- 14 instances where patients were taking or using their medicines at incorrect dosing intervals and
- 25 medicines were taken at the incorrect times.

Although improving patient compliance is an obvious target, better procurement of safe and effective medicines and improved prescribing also play a major role in minimising DRPs.

Non compliance among these elderly patients is one of the major DRPs and will be discussed in further detail in section 4.7.

4.5.3 Discussion of DRPs among geriatric out-patients

The source of the DRPs in this study, is not necessarily drugs but involves patients and/or health care professionals. Patient involvement as a result of the lack of ability or willingness to follow the treatment regimen, which is the realm of self-care. This results in irrational use of drugs; noncompliance and this can lead to drug-related morbidity and mortality. Also inter-patient variability and idiosyncratic reactions lead to DRPs. Other DRPs occurred when the health professional made an error (judgement) or mistake (careless) in diagnosing, prescribing or dispensing drugs.

The results reveal that there is a high incidence of actual DRPs (93.2%) experienced by this group of elderly patients. These figure correlates closely to the 92% incidence of DRPs that occurred in the pilot study (Section 4.1). Thus, the great number of medication related problems experienced by the elderly results in a substantial impact on the quality and cost of healthcare and medicine expenditure.

Another geriatric study performed in the United States reported the medication problems in "at risk" elderly patients, as documented by 57 community pharmacists in Florida (Berardo, 1994). Inclusion criteria included patients aged at least 60 years (in contrast to the present study where geriatric patients were regarded as patients over 65 years) being prescribed at least four medicines for chronic use with narrow therapeutic indices and/or those with known poor compliance. In total, 631 reports were submitted for 487 patients, 65% of which indicated a drug-related problem. In contrast, the incidence of DRPs in the present study in a public sector hospital indicated 93.2% of actual DRPs on currently prescribed medicines. Non-compliance was the predominant problem in this group of patients in Florida (22% of problems), followed by drug side-effects (17%) and drug-drug interactions (13%). Over one-third (35%) of interventions were initiated with a prescribing physician (Berardo, 1994).

The study by Lindley and Tully (1992) like the present geriatric study, confirmed that both ADRs and inappropriate prescribing are common DRPs among elderly people attending hospitals. However, more important is our observation that a very high proportion of ADRs is associated with inappropriate prescribing, in particular unnecessary or drugs with absolute CIs. A corollary of this is that there are much higher rates of ADRs and drug related admissions associated with inappropriate medication than with medication not considered inappropriate.

Thus, a great proportion of the DRPs experienced by these elderly patients were due to inappropriate prescribing by the physicians. If our findings can be extrapolated to the general population, then the frequency of DRPs in the elderly population could be considerably reduced (perhaps by as much as 50%) if physicians took care to avoid prescribing inappropriate medication or continuing repeat prescriptions of medication without review, that may initially have been indicated but have become unnecessary. Drugs may sometimes cause the very conditions under which they are contra-indicated e.g. beta-blockers may hasten heart failure, potassium-sparing diuretics may cause uraemia and hyperkalaemia. Inappropriate prescriptions account for a disproportionate amount of ADRs. Better prescribing in the elderly could go a long way towards solving the problem and improving elderly patients' quality of life.

The inclusion of pharmacists in the preventability assessment of DRPs in this study has resulted in a greater percentage of problems being classed as preventable than previously. From detailed examination of the DRPs identified in this study, there is clearly room for rationalisation in prescribing for the elderly. Pharmacist involvement in review of medication regimens in elderly patients should identify potential problems of unnecessary and inappropriate medicines and assist in the prevention of drug related admissions (Cunningham, 1997).

Many of these DRPs are due to staff shortages in the public sector hospital, which places a bigger strain on the already overworked health professionals. In attempting to care for the vast majority of the patients visiting the outpatient clinics at Addington Hospital, care is often compromised because practitioners and pharmacists are unable to spend adequate quality time with patients. The implementation of the EDL, placed further responsibilities on the healthcare workers to ensure that guidelines are adhered to. This also resulted in more time being utilised with prescription interventions concerning infraction of hospital policy prescribing, whereas this time may have been spent counseling the patient. If physicians are allowed more consulting time with individual patients, many of these prescribing errors may be minimised.

4.6 ADVERSE DRUG REACTIONS EXPERIENCED BY THE ELDERLY PATIENTS

As a group, persons age 65 and older are the largest consumers of pharmaceuticals accounting for 30% of prescription drugs and 40% of over-the-counter medications. Many elderly patients take multiple medications for a variety of concurrent medical conditions. The use of two or more drugs, combined with widely varying degrees of disease-related and physiologic impairment of function, can lead to unintended adverse effects and even death (Salom and Davis, 1995).

Findings of this study show that the highest incidences of DRPs was adverse drug reaction (223) (Section 4.5.2.5.1). Drugs or drug groups causing adverse drug reactions was discussed in Section 4.5.2.5.1. In this section, the results on the incidence of ADRs, the types of ADRs and the outcome of ADRs will be discussed. The terms 'ADRs' and 'side effects' would be used interchangeably throughout this report.

4.6.1 INCIDENCE OF ADRs FOR BOTH CURRENT AND PAST MEDICINES

159 geriatric patients (56.6%) experienced side effects either with their current or past medicines, while 122 patients (43.4%) did not experience any side effects. Those patients who experienced side effects may have experienced more than one side effect. Patients sometimes indicated that they did not experience any side effects, but reported side effects appeared in their medical notes. Effects like constipation and heartburn were treated as a medical condition but in some instances were the side effect of medicines, but patients were ignorant of this.

The table below illustrates the total number of side effects (both current and past) experienced by the geriatric patients.

4.6.1.1 TOTAL NUMBER OF ADRs EXPERIENCED BY GERIATRIC PATIENTS

Table 4.60 Total number of ADRs experienced by geriatric patients

Number of ADRs	Prevalence	Percentage
0 side effect	122	43.4%
1	118	42.0%
2	32	11.4%
3	5	1.8%
4	3	1.1%
5	1	0.4%
TOTAL	281	100%

The range of side effects was from 1 to 5. Adverse reactions were recorded in 159 (56.6%) patients; in 118 patients (42%) they were due to one drug only and in 32 patients to two drugs. In five patients, three drugs were implicated and in three patients, four drugs were involved. Only one patient experienced five side effects. A total of 214 ADRs were experienced by the 159 patients.

The following table illustrates the adverse drug reactions experienced with current medication the patient was taking.

4.6.1.2 CURRENT ADRs EXPERIENCED BY GERIATRIC PATIENTS

Table 4.61 Current ADRs experienced by geriatric patients

Current side effects	Prevalence	Percentage
0 side effect	159	56.6%
1	94	33.5%
2	20	7.1%
3	8	2.8%
TOTAL	281	100%

The overall prevalence of adverse reactions was a percentage of the number of geriatric patients. Current adverse drug reactions refer to those side effects being experienced on the current prescription or the prescription immediately before current prescription. 56.6% of the patients did not experience any side effects with their current drug therapy as compared to the 43.2% who did not experience side effects to both their current and past drug therapy. This indicates that 13.4 % of the side effects were due to medication the patient was taking in the past. However, the majority 43.1% of the side effects experienced was due to the medication the patient was on currently at the hospital.

122 patients (43.4%) experienced from 1 to 3 side effects on their current drug treatment. 33.5% percent of the subjects identified at least one medication on their current drug treatment as causing an undesirable symptom.

Findings of this study and other reports indicate that the difficulty of estimating prevalence of ADRs in elderly outpatients is compounded by allegations of underreporting by both physicians and elderly outpatients and by the unavoidable subjectivity of assessing the causal relationship between the event and drug therapy (Edlavitch, 1988; Pickles, 1986; Hutchinson and Lane, 1989).

4.6.1.3 EFFECTS OF AGE AND GENDER ON INCIDENCE OF ADRs

The mean age for the 122 elderly patients experiencing ADRs was 73.1 ± 5.9 years and this was not statistically different to the 159 patients who did not experience ADRs (72.8 ± 5.8 years) on their current drug treatment.

Table 4.62 Comparison of means age and incidence of current ADRs

Number of Current ADRs	Mean age (years)	Number
0 ADR	72.8 ± 5.8	159
1 ADR	73.0 ± 6.0	94
2 ADR	72.7 ± 5.6	20
3 ADRs	75.0 ± 5.5	8
TOTAL		281

These results indicate that as the mean age of the elderly patients increased, more ADRs were also experienced.

Table 4.63 Effects of age and gender on incidence of current ADRs

	AGE		GENDER	
Number of Side-effects	**≤ 75 YEARS**	**> 75 YEARS**	**MALE**	**FEMALE**
1	29 (23.8%)	65 (53.3%)	61 (50%)	33 (27.0%)
2	6 (4.9%)	14 (11.5%)	14 (11.5%)	6 (4.9%)
3	5 (4.1%)	3 (2.5%)	6 (4.9%)	2 (1.6%)
TOTAL	40 (32.8%)	82 (67.2%)	81 (66.4%)	41 (33.6)

The percentages in parentheses are of the total current side-effects (122).

(Age: p=0.1795 and Gender p= 0.7878)

97 female patients (34.5%) and 62 male patients (22.1%) of the total sample population did not experience any adverse effects with their current medicines.

The prevalence of adverse reactions was not significantly different in patients 75 years and under and over 75 years (p= 0.1795) and for both males and females (p =0.7878).

For the purposes of this study the total number of side effects (both current and previous) experienced by the elderly patients will be discussed.

4.6.2 ACTUAL ADRs IN RELATION TO NUMBERS OF PRESCRIBED DRUGS

Table 4.64 Comparison of actual ADRs to number of prescribed drugs

	NUMBER OF PRESCRIBED DRUGS				
Actual Side Effects	1-3 Drugs	4-6 Drugs	7-9 Drugs	10-15 Drugs	TOTAL
0	5 (1.8%)	95 (33.8%)	55 (19.6%)	4 (1.4%)	159 (56.6%)
1	7 (2.5%)	51 (18.1%)	26 (9.3%)	10 (3.6%)	94 (33.5%)
2	0 (0.0%)	10 (3.6%)	9 (3.2%)	1 (0.4%)	20 (7.1%)
3	0 (0.0%)	6 (2.1%)	1 (0.4%)	1 (0.4%)	8(2.8%)
TOTAL	12 (4.3%)	162 (57.7%)	91 (32.4%)	16 (5.7%)	281 (100%)

The problem of adverse drug effects is compounded exponentially when elderly patients take more than one medication. The number of drugs administered simultaneously is directly proportional to the chance of experiencing a drug interaction (Krupka and Vener, 1974) and consequently adverse effects.

In support of other studies there was a positive correlation between the number of prescribed drugs and the prevalence of incidence of adverse drug reactions. However, this correlation is not statistically significant (p=0.0859) in the current study. Patients receiving from 4-6 prescribed drugs experienced the greatest number of ADRs (67). There were only 5.7% of the total actual ADRs experienced by the patients receiving 10-15 drugs because only 10.3% of the 281 patients were prescribed 10-15 drugs (Section 4.4.2).

The results of the prevalence of individual adverse drug reactions to prescribed medication will be discussed next.

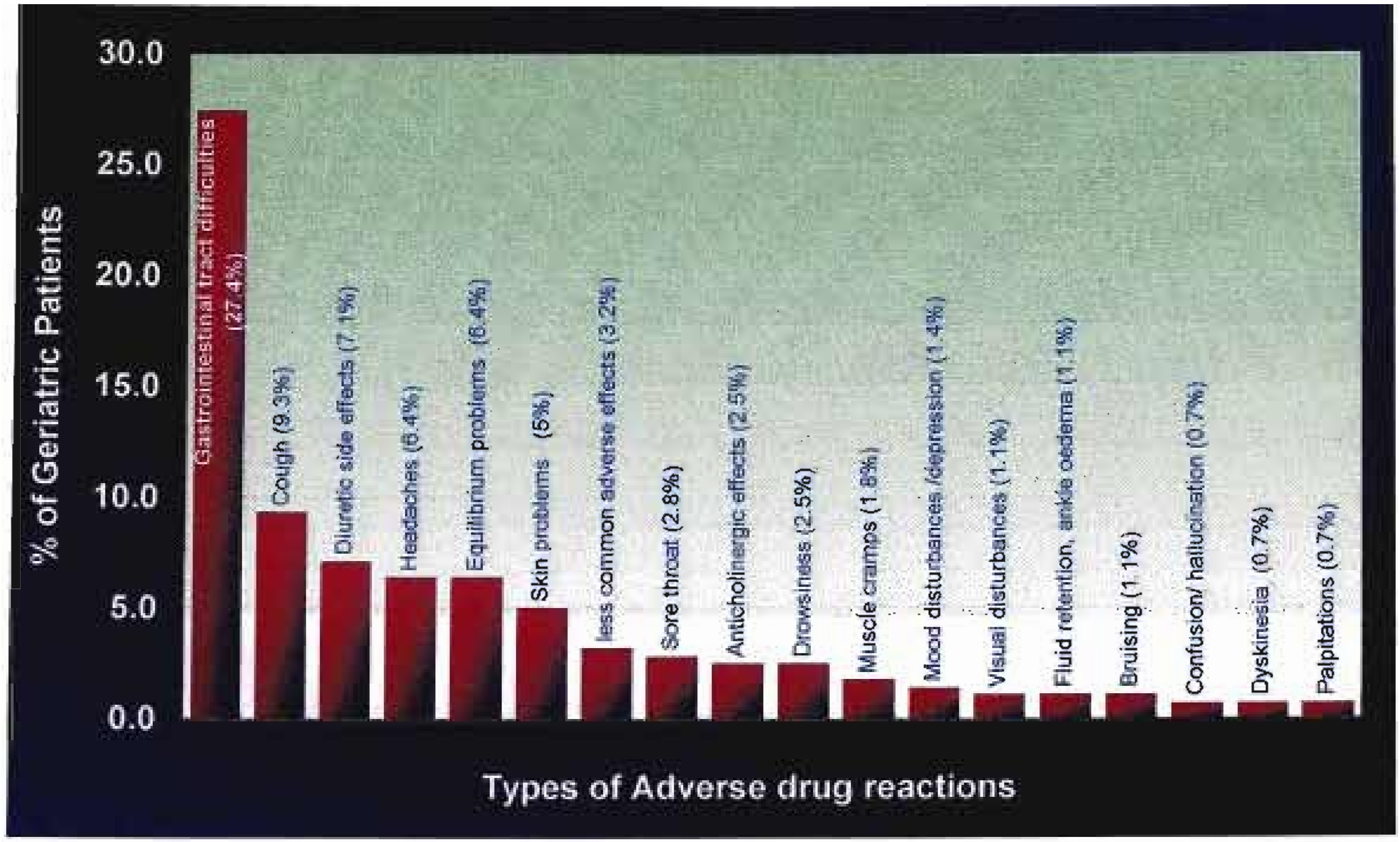
4.6.3 TYPES OF ADRs

Table 4.65 Incidence of adverse effects to prescribed medications

Type of side effect	Incidence	% of patients
Mood disturbances /depression	4	1.4%
Gastrointestinal tract difficulties	(77)	(27.4%)
Disturbances	1	0.4%
Constipation/Faecal impaction	19	8.2%
Nausea	9	3.2 %
GI ulceration/heartburn	31	11.0%
Abdominal pain/cramps/ indigestion	1	0.4%
Diarrhoea	4	1.4%
Vomitting	1	0.4%
Loss of appetite(anorexia)	2	0.7%
Weight gain	4	1.4%
Weight loss	3	1.1%
Taste disturbances	2	0.7%
Headaches	18	6.4%
Confusion/ hallucination	2	0.7%
Insomnia/ Sleep disturbances	1	0.4%
Equilibrium problems	18	6.4 %
Skin problems	14	5.0%
Visual disturbances	3	1.1%
Diuretic side effects	20	7.1%
Fluid retention, ankle oedema	3	1.1%
Sore throat	8	2.8%
Bruising	3	1.1%
Cough	26	9.2%
Anticholinergic effects	7	2.5%
Tremors	1	0.4%
Dyskinesia	2	0.7
Drowsiness	7	2.5%
Increases BP	1	0.4%
Muscular aches/pains	1	0.4%
Photosensitivity	1	0.4%
Muscle cramps	5	1.8%
Palpitations	2	0.7%
Post nasal drip	1	0.4%
Parasthesia	1	0.4%
Haemorrhage/ Internal bleeding	1	0.4%
Mouth ulcers	1	0.4%
TOTAL	**232**	**82.5%**

The number of ADRs in table 4.65 is 232 and is higher than the 223 recorded in table 4.47 The reason being that in table 4.47 if the same drug was causing more than one adverse effect, this was regarded as one DRP, but in this section the individual adverse effects were recorded for each medicine. Of the 82.5% total adverse drug reactions experienced by the geriatric patients, the most common ADRs were as follows: Gastro-intestinal ulceration (11.0%), cough (9.2%), diuretic side effects (7.1%), constipation (6.8%), equilibrium problems (6.4%) and headaches (6.4%). Figure 9 displays the ADRs in order of prevalence.

FIGURE 9 : TYPES OF ADVERSE DRUG REACTIONS EXPERIENCED BY THE GERIATRIC PATIENTS



The following results (Sections 4.6.3.2 to Section 4.6.3.18) illustrate the drugs associated with adverse effects. Only those adverse effects that were validated from monographs in the SAMF (1997) were recorded.

4.6.3.1 MOOD DISTURBANCES /DEPRESSION

Four patients reported experiencing depression while being treated with Methyldopa. Of these, one patient did not inform the prescriber of the adverse effect. Of the three patients who reported the side effect: in one instances the medication was discontinued and alternative medication was prescribed, in one patient medication was prescribed to treat the depression and in one patient the Methyldopa was changed and medication was prescribed to treat the depression. This adverse effect could have definitely being prevented if prescribers were more rational in their prescribing habits, by avoiding drugs that are contra-indicated in the elderly. This is a typical example when treatment protocols are not followed, and the resultant increase in risks of DRPs and cost of treating the ADRs.

4.6.3.2 GASTROINTESTINAL TRACT DIFFICULTIES

4.6.3.2.1 Constipation / Faecal Impaction

Table 4.66 Constipation / Faecal Impaction adverse effect

Drug or drug groups	Number of patients	% of patients
Diclophenac	1 (5.3%)	0.4%
Ferrous sulphate	1 (5.3%)	0.4%
Metazolone & Spironolactone	1 (5.3%)	0.4%
Nifedipine	2 (10.5%)	0.7%
Nifedipine & Frusemide	1 (5.3%)	0.4%
Paracetamol + Codeine	9 (47.4%)	3.2%
Pholcodeine	1 (5.3%)	0.4%
Propranolol	1 (5.3%)	0.4%
Stilpane	1 (5.3%)	0.4%
Trihexyphenidyl	1 (5.3%)	0.4%
TOTAL	19 (100%)	6.8%

44.4% of the incidences of constipation was due to the codeine in the analgesic combination of paracetamol and codeine. Eight patients did not inform the prescriber of the constipation experienced with their medicines. Three patients had their medication discontinued. Two patients had their medicines discontinued and alternative medicines were prescribed. Five patients had medication prescribed for their constipation due to their medicines. This is a classic example of polypharmacy, of the use of one drug to treat the unwanted effects, rather than discontinuing the offending medicines and prescribing alternative therapy. For example the codeine containing analgesics could have been changed to NSAIDs or plain paracetamol. Irrational prescribing like these burdens the already limited drug budget.

4.6.3.2.2 Nausea

Table 4.67 Nausea adverse effect

Drug or drug groups	Number of patients	% of patients
Chlorpheniramine	1 (11.1)	0.4%
Doloxene®	1 (11.1%)	0.4%
Nifedipine	2 (22.2%)	0.7%
Propranolol	1 (11.1%)	0.4%
Ramipril	1 (11.1%)	0.4%
Theophylline	1 (11.1%)	0.4%
Methyldopa & Brinerdin®	1 (11.1%)	0.4%
Digoxin	1 (11.1%)	0.4%
TOTAL	9 (100%)	3.2%

On three occasions, the patient did not inform the prescriber of the nausea experienced. One patient did inform the prescriber of the nausea, but there was no change to the drug therapy. On two occasions the medication that was causing nausea was discontinued, on one occasion, the medicine was discontinued, and alternative medication was prescribed. One patient had medication prescribed for the nausea, but the offending medication was continued. This is another example, of irrational prescribing of unnecessary drugs that leads to polypharmacy. The one patient on Digoxin had the dose of the drug reduced to overcome the nausea.

4.6.3.2.3 GI Ulceration/Heartburn

Table 4.68 GI Ulceration adverse effect

Drug or drug groups	Number of patients	% of patients
Aspirin+codeine	1 (3.2%)	0.4%
Aspirin	4 (10.0%)	1.4%
Aspirin+NSAIDs	1 (3.2%)	0.4%
Diclophenac	5 (16.1%)	1.8%
Doloxene®	1 (3.2%)	0.4%
Frusemide	1 (3.2%)	0.4%
Glicazide	1 (3.2%)	0.4%
Ibuprofen	4 (12.9%)	1.4%
Indomethacin	9 (29.0%)	3.2%
Nifedipine	1 (3.2%)	0.4%
NSAIDs	2 (6.5%)	0.7
NSAIDs+ Amylodipine	1 (3.2%)	0.4%
TOTAL	31 (100%)	11.0%

Indomethacin was responsible for 29.0% of GI ulceration adverse effect. The NSAIDs indicated above were mainly Diclophenac, Ibuprofen, and Indomethacin. 22 patients (71.0%) of the 31 patients who complained of heartburn attributed this side effect to the NSAIDs.

Six of the patients who experienced severe heartburn did not report the adverse effect. Of the 25 patients who informed the prescriber of the adverse effect:

- three patients had no change to their treatment,
- one patient had the medication changed,
- one patient had the medication changed and medication was prescribed for the heartburn,
- four patients had the offending medication discontinued,
- three patients had the medication discontinued and alternative medication was prescribed,
- ten patients were continued on the medication but had the heartburn treated,
- one patient had the dose of the medicine reduced,
- one patient had the dose reduced and the heartburn treated and
- One patient had the offending medicine discontinued and medication prescribed to treat the heartburn.

4.6.3.2.4 Diarrhoea

Table 4.69 Diarrhoea adverse effect

Drug or drug groups	Number of patients	% of patients
Aluminium Hydroxide	1 (25%)	0.4%
Colchicine	2 (50%)	0.7%
Potassium Chloride	1 (25%)	0.4%
TOTAL	4 (100%)	2.4%

Four patients reported experiencing diarrhoea with their medicines.

4.6.3.2.5 Loss of appetite

There were two-reported incidences of loss of appetite with Digoxin. This adverse effects were not reported to the prescriber on one occasion and the dose of Digoxin was reduced in the other patient. Loss of appetite is a sign of Digoxin toxicity, and the recommendation is to monitor Digoxin levels and adjust the dose accordingly.

4.6.3.2.6 Weight Gain

Table 4.70 Weight gain adverse effect

Drug or drug groups	*Number of patients*	*% of patients*
Estrogen	2 (50%)	0.7%
Propranolol	1	0.4%
Thyroxine	1	0.4%
TOTAL	4	1.4%

One patient on did not report the weight gain to the prescriber. Of the three patients who reported the weight gain to the prescriber, two had no change to their therapy and the patient HB (78 years) on Thyroxine had the dose increased from 0.1mg to 0.15mg daily.

4.6.3.2.7 Weight Loss

Table 4.71 Weight loss adverse effect

Drug or drug groups	Number of patients	% of patients
Digoxin	1	0.4%
Metformin	2	0.7%
TOTAL	3	1.1%

Of the three patients experiencing weight loss with the above medicines, one patient had the medicine discontinued, and two patients informed the prescriber but had no change to the drug treatment.

4.6.3.2.8 Taste Disturbances

Taste disturbances were reported on two occasions by patients who were taking Captopril and Glyceryl trinitrate. Both patients who reported this side effect to the prescriber had their medication discontinued.

4.6.3.3 HEADACHES

Table 4.72 Headaches adverse effect

Drug or drug groups	*Number of patients*	*% of patients*
Beclomethasone	1 (5.6%)	0.4%
Glyceryl Trinitrate	1 (5.6%)	0.4%
Isosorbide dinitrate	2 (11.1%)	0.7%
Isosorbide mononitrate	9 (50.0%)	3.2%
Nifedipine	1 (5.6%)	0.4%
Ramipril	1 (5.6%)	0.4%
Timolol&Pilocarpine	1 (5.6%)	0.4%
Trihexyphenidyl&Amantadine	1 (5.6%)	0.4%
TOTAL	18 (100%)	6.4%

66.7% of the headaches reported were due to the nitrates, of which 50% were due to Isosorbide mononitrate (20mg), 11.1% to Isosorbide dinitrate (10mg) and 5.6% to Glyceryl trinitrate (5mg).

Four patients did not report experiencing headaches to the prescriber. Of the 14 patients who did inform the prescriber of the side effect: two patients had no change to their therapy, five patients had the medicine discontinued, 1 had the medicine discontinued and changed to another medicine, five patients had medicine to treat the headaches but therapy was continued, and the patient on Trihexyphenidyl and Amantadine had the dose gradually decreased and the medicines were stopped completely.

4.6.3.4 CONFUSION/ HALLUCINATION

There were two-reported incidence of confusion and hallucination caused by Indomethacin in one patient and Sodium valproate in another patient. In the case of Indomethacin, no change was made to the drug therapy, although the prescriber had been informed of the adverse effect. The confusion and hallucination caused by Sodium Valproate, resulted in a reduction of the dose and vitamin supplements were recommended to the patient.

4.6.3.5 EQUILIBRIUM PROBLEMS

Table 4.73 Equilibrium problems adverse effect

Drug or drug groups	Number of patients	% of patients
Acebutolol	1 (5.9%)	0.4%
Acebutolol & Felodipine	1 (5.9%)	0.4%
Captopril	1 (5.9%)	0.4%
Carbamazepine	1 (5.9%)	0.4%
Glicazide	2 (11.8%)	0.7%
Isosorbide dinitrate	1 (5.9%)	0.4%
Methyldopa	4 (23.5%)	1.4%
Nifedipine	1 (5.9%)	0.4%
Ramipril	3 (17.6%)	17.6%
Trihexyphenidyl	1 (5.9%)	0.4%
Verapamil	1 (5.9%)	0.4%
TOTAL	17 (100%)	6.0%

The equilibrium problems reported were mainly dizziness, light-headedness and postural hypotension. 23.5% of the cases of postural hypotension was due to Methyldopa, followed by 17.6% by Ramipril. Four patients did not inform the prescriber of the postural hypotension being experienced. Two patients did inform the prescriber, but there was no change to their therapy. Six patients had their medication discontinued, two patients had their medicines discontinued and alternative medicines were prescribed. Two patients had medicines prescribed to overcome the dizziness, and one patient had the dose of the medicine reduced.

4.6.3.6 SKIN PROBLEMS

Table 4.74 Skin problems adverse effect

Drug or drug groups	Number of patients	% of patients
Allopurinol	1 (7.1%)	0.4%
Amylodipine	1 (7.1%)	0.4%
Amiodarone	1 (7.1%)	0.4%
Aspirin	1 (7.1%)	0.4%
Betamethsone+Isotretinoin	1 (7.1%)	0.4%
Betamethasone+salicylic acid	1 (7.1%)	0.4%
Captopril	3 (21.4%)	1.1%
Carbamazepine	1 (7.1%)	0.4%
Enalapril	1 (7.1%)	0.4%
Levodopa	1 (7.1%)	0.4%
Simvastatin	1 (7.1%)	0.4%
Sulphasalazine	1 (7.1%)	0.4%
TOTAL	14 (100%)	5%

The skin problems reported were mainly skin eruptions or pruritis (rash), skin discolouration. Captopril was responsible for 21.4 % of the total skin problems.

Two patients did not report the skin problem experienced. Of the 12 patients who informed the prescriber of the skin problem:

- Three patients received no change to their therapy and the same treatment was continued,
- One patient had the treatment changed,
- Three patients had the treatment discontinued and three patients had the treatment discontinued and alternative medicines were prescribed,
- One patient had the medicine discontinued and medication was prescribed to treat the skin problem, and
- One patient had medication to treat the side effect but there was no change to treatment.

4.6.3.7 VISUAL DISTURBANCES

There were three reported incidences of visual disturbances experienced by patients on Captopril, Prednisone and Timolol.

4.6.3.8 DIURETIC SIDE EFFECTS

Table 4.75 Diuretic adverse effect

Drug or drug groups	Number of patients	% of patients
Brinerdin®	1 (5.0%)	0.4%
Frusemide	16 (80.0%)	5.7%
Frusemide & Aldactone	1 (5.0%)	0.4%
Metazolone	1 (5.0%)	0.4%
Metazolone & Indapamide	1 (5.0%)	0.4%
TOTAL	20 (100%)	7.1%

The diuretic side effects were mainly, dehydration, weakness, excessive urination and incontinence. 80.0% of the diuretic adverse effects was due to Frusemide. The majority (14) patients did not inform the prescriber of the adverse effect experienced. Three patients had their dose of the diuretic reduced, while three patients informed the prescriber of the adverse effect, but there was no change to therapy.

4.6.3.9 FLUID RETENTION, ANKLE OEDEMA

There were three reported incidences of fluid retention (ankle oedema) with Amylodipine, Diclophenac and Felodipine. All three patients reported the fluid retention side effect to the prescriber. One patient had the medication changed, one had the medication discontinued and one patient had the dose of the medication reduced.

4.6.3.10 SORE THROAT

There were eight reported incidences of sore throat caused by the ace-inhibitors Captopril and Perindopril. Captopril was the offending drug in 7 instances. This is a common side effect of the Ace-inhibitors. Four of these patients did not report experiencing a sore throat to the prescriber. Of the four patients who did inform the prescriber two had medication prescribed to relieve the sore throat, but the Ace-inhibitor was continued and two patients had the medicine stopped.

4.6.3.11 BRUISING

There were three incidences of bruising with Captopril. Two of the patients did not inform the doctor of the bruising and the other patient informed the prescriber, but had no change to therapy.

4.6.3.12 COUGH

Table 4.76 Cough adverse effect

Drug or drug groups	Number of patients	% of patients
Captopril	7 (26.9%)	2.5%
Diltiazem	1 (3.8%)	0.4%
Enalapril	4 (15.4%)	1.4%
Perindopril	7 (26.9%)	2.5%
Quinapril	1 (3.8%)	0.4%
Ramipril	4 (15.4%)	1.4%
Captopril & Enalapril	2 (7.7%)	0.7%
TOTAL	26 (100%)	9.3%

53.8 % of the coughing was due to Captopril and Perindopril. In 12 patients, the response to the coughing was the prescribing of a cough suppressant. In two cases, the medication was changed and a cough remedy was prescribed. In seven instances, the medication was discontinued and alternative drug therapy was prescribed. In one case the dose of the offending medication was reduced and in four cases there was no change to drug therapy, because the patient had failed to inform the prescriber of the adverse effect.

4.6.3.13 ANTICHOLINERGIC EFFECT

Table 4.77 Anti-cholinergic effect

Drug or drug groups	Number of patients	% of patients
Amitryptiline	2 (29.0%)	0.7%
Brinerdin®	1 (14.3%)	0.4%
Levo-dopa	1 (14.3%)	0.4%
Oxybutynin	2 (29.0%)	0.7%
Methyldopa	1 (14.3%)	0.4%
TOTAL	7 (100%)	2.5%

In response to these anticholinergic effects, the specific offending drug was discontinued and alternative medication was prescribed on three occasions. On one occasion, the dose was reduced and on three occasions, the patient did not inform the prescriber about the adverse effect. Anticholingeric effects can affect diet; mental status changes can influence sleep and cognition; and reactions inhibiting mobility can reduce their ability to perform the activities of daily living.

4.6.3.14 DYSKINESIA

There were two reported incidences of dyskinesia in patients treated with Carbidopa: levodopa. In both patients who experienced dyskinesia with Levodopa, the prescriber was informed but there was no change to drug therapy.

4.6.3.15 DROWSINESS

There was one incidence of drowsiness reported with each of the following seven medicines:

- Digoxin 0.25mg daily
- Haloperidol 0.5mg twice daily
- Hydroxyzine 25mg daily
- Methyldopa 250mg twice daily
- Mianserin 30mg daily
- Phenobarbitone 15mg as required
- Propranolol 40mg twice daily

Drowsiness included complaints of sedation and lethargy. Four of the patients who complained of experiencing drowsiness with their medicine did not report this to the prescriber. Of the three patients who informed the prescriber of this side effect, one patient had the medicine discontinued, one had alternative medicines prescribed and one had medication prescribed to overcome the side effect.

4.6.3.16 MUSCLE CRAMPS

There were five reported incidences of muscle cramps due to hypokalaemia: 4 due to Digoxin and one due to Frusemide. Of these five patients who experienced muscle cramps as a result of the medication they were taking: one patient did not inform the presciber of this side effect and the remaining four patients had a potassium supplement prescribed.

4.6.3.17 PALPITATIONS

Two cases of palpitations were reported with Theophylline tablets and Salbutamol tablets and in both cases, the offending medicines were discontinued and an alternative medicine was prescribed.

Table 4.78 illustrates the less common ADRs. Each of the side- effects was reported once only.

4.6.3.18 DRUGS ASSOCIATED WITH LESS COMMON ADVERSE EFFECTS

The following adverse effects occurred in only 0.4% (one patient) of the total sample of geriatric patient's (281).

Table 4.78 Drugs associated with less common adverse effects

Adverse effects	Drug or drug groups	Action to relieve effect				
		A	B	C	D	E
GI Disturbances	Carbidopa:Levodopa					
Abdominal cramps/ flatulence/ indigestion	Sorbitol		✓	✓		
Vomitting	Theophylline		✓	✓		
Insomnia/sleep disturbances	Theophylline					
Increases BP	NSAIDs			✓		
Tremors	Theophylline					
Muscular aches/pains	Fluvastatin					✓
Photosensitivity	Amiodarone		✓			
Post nasal drip	Beclomethasone					
Parasthesia	Glibencamide			✓		
Haemorrhage/ Internal bleeding	Warfarin		✓			
Mouth ulcers	Beclomethasone					✓

KEY: **A: Reduce the dose**
B: Discontinue drug therapy
C: Change to another drug
D: Prescribe medication
E: No change

The table denotes the appropriate action taken to overcome these effects, for example to overcome the photosensitivity side effect of Amiodarone the action was to discontinue the Amiodarone (Action B). There were twelve cases of these less common ADRs. Where the patient did not report the adverse effect to the prescriber, no action response was recorded in the above table. This applies for the postnasal drip with Beclomethasone, GI disturbances with Carbidopa: Levodopa and tremors due to Theophylline.

One patient (0.4%) experienced each of the above adverse effects. Different patients experienced each of the above adverse effects.

4.6.4 RESPONSE TO ADVERSE SYMPTOMS

Approximately one in ten subjects did not discuss their symptoms with their providers Subjects could take two actions in response to medication-related adverse symptoms:

(1) taking a different amount of medication than providers prescribed and

(2) discussing perceived side effects with providers.

The interviewer then asked the elderly patients when they reported medication-related symptoms and could identify the medication they believed was responsible, if they had discussed their symptoms with their providers. Only 13.5% of elderly patients reported taking more or less medication because of adverse drug symptoms, whereas some patients (Table 4.4.2.7.1) reported stopping medication for this reason.

Their responses are discussed below.

4.6.4.1 REPORTING OF SIDE-EFFECTS TO PRESCRIBER

Overall, of the 159 patients who experienced side effects 30 (10.7%) of patients did not report the side effect, while 124 (44.1%) did inform the doctor concerned. **One** patient informed the prescriber about one side effect, but did not inform the prescriber about the second side effect experienced.

The reasons given by subjects for not discussing perceived side effects with their providers included the following:

- Did not get back to the clinic
- Did not think it was important
- Doctor was unavailable (could not get in touch with the doctor)
- Did not think the doctor would understand
- Did not know

No elderly patients gave as a reason for not discussing symptoms either "feeling embarrassed" or "thinking the doctor couldn't help."

4.6.4.2 TREATMENT OF SIDE EFFECTS

Of the 159 patients who experienced side effects on their current or past drug treatment 46 (28.9%) of these side effects were treated by medicines prescribed by the physician.

4.6.5 DISCUSSION OF ADVERSE DRUG REACTIONS

Most persons taking prescribed medications do so as outpatients. This holds true even for the elderly, 95% of whom are non-institutionalized at any time (Klein, et al., 1984). However, although most medications are used by outpatients, little is known about how often outpatients experience adverse symptoms from their medications or what actions they take in response to these symptoms. Our study provided data on reported medication side effects among a group of chronic medical geriatric outpatients. The data demonstrated that 82.6% of the subjects attributed adverse symptoms to their current or past medication. Subjects described a variety of adverse symptoms with gastrointestinal tract disturbances (27.5%), ace-inhibitor adverse effects (coughing, sore throat and bruising) (13.1%), diuretic effects (7.1%), equilibrium problems (6.4%) and headaches (6.4%) being most commonly mentioned. Subjects were not likely to modify their ongoing medication regimens because of perceived side effects and were moderately likely to discuss symptoms with their providers.

In 1984, Klein et al. surveyed non- acutely ill outpatients in a manner somewhat analogous to this study. In this study, 299 randomly selected medical outpatients were interviewed. Thirty percent of the subjects identified at least one medication as causing an undesirable symptom.

It is possible that the elderly do experience more medication side effects, but are not aware of them. This might occur, for example, if the elderly tend to mistake drug effects for symptoms of chronic conditions. In addition, ADRs in elderly people are often overlooked as their symptoms may be attributable to 'old age' (especially if they are non-specific), to progression of the disease being treated, or to a new disease. These factors, taken with poor compliance, have been used to explain, and to excuse the high rate of ADRs in elderly people.

The most important starting point for prevention of DRPs mentioned in this study and in previous studies is a more careful prescription of drugs. ADR-related hospital admissions is a significant and expensive public health problem. It can be predicted that the importance of this problem will grow due to the ever-increasing elderly population. About 1/3 of these admissions could be avoided, especially if the prescription of contraindicated and unnecessary drugs could be prevented.

With the dawn of the millenium, health care providers need to be taught more about nutritional requirements in the elderly, about health maintenance and about good-lifestyle medicine, to counter the over-enthusiastic application of the Medical Model (Mallet, 1996). Because many of the elderly have chronic disorders, they need to be re-evaluated regularly and to update documentation in their medical files. Their medication charts need to be reviewed on a regular basis, also keeping an eye on their use of OTC medications. This will drastically reduce the incidence of DRPs among the elderly patients.

4.7 MEDICATION COMPLIANCE IN THE ELDERLY PATIENTS

Introduction

Medication compliance is the extent to which the patient's behaviour co-incides with health related advice and includes the ability to take medication as prescribed. The geriatric patient is a candidate for poor compliance as a result of multiple pathology, complicated drug regimens and a concomitant high incidence of confusion and memory impairment (Miot, 1998).

In this section the elderly patients' assessment of compliance, administration of medicines, knowledge of medicines, counseling on drug treatment and reason for non-compliance will be discussed.

4.7.1 COMPLIANCE ASSESSMENT

The three primary indicators of non-compliance were not taking medicines as prescribed not keeping clinic appointments and not collecting medicines including repeat chronic medicines.

4.7.1.1.Patients who defaulted medical treatment

Table 4.79 Defaulting of medical treatment

Default medical treatment	Yes	No
Clinic appointment	118 (42.0%)	163 (58.0%)
Collection of repeat medicines	125 (44.5%)	156 (55.5%)

118 patients indicated that they did not keep their clinic appointments, at least on one occasion. 125 (44.5%) of the patients did not collect their repeat medicines on one or more occasions. Some patients did not keep clinic appointments and did not collect repeat medicines. For those elderly patients who rely on state subsidised medicine, poor access to Addington Hospital may result in indirect costs of transport and combined with the excessive waiting time may be some of the reasons for defaulting medical treatment.

4.7.2 ADMINISTRATION OF MEDICINES

251 (89.4%) of the elderly patients took their medicines on their own, while 30 (10.7%) of the patients received assistance from their caregiver.

4.7.3 ELDERLY PATIENTS KNOWLEDGE OF MEDICINES

The elderly patient's knowledge of medicines was ascertained by asking the patients, or when necessary through an interpretor to explain how they took their medicines. The patient had the medicines of the current prescription in front of them and then they were questioned on how they took their medicines. This method was reliable, because although the patients may not know the names of their medicines, they should be able to recognise them. In this way, the patients could not give a positive response even if they did not know the dose, dosing times and the manner in which the medicines were to be taken or used.

4.7.3.1. Elderly patients knowledge of quantity of medicines to take or use

Table 4.80 Knowledge of quantity of medicines to take or use

	NUMBER OF PRESCRIBED DRUGS				
Did not know quantity of:	**1-3**	**4-6**	**7-9**	**10-15**	**TOTAL**
0 medicine	10 (3.6%)	119 (42.3%)	67(23.8%)	12 (4.3%)	**208 (74.0%)**
1 medicine	2 (0.75%)	30 (10.7%)	10 (3.6%)	2 (0.7%)	**52 (18.5%)**
2 medicines	1 (0.4%)	10 (3.6%)	4 (1.4%)	1 (0.4%)	**16 (5.7%)**
3 medicines	0 (0.0%)	2 (0.7%)	3 (1.1%)	0 (0.0%)	**5 (1.9%)**
TOTAL	13 (4.6%)	161 (57.3%)	91 (32.4%)	16 (5.7%)	**281 (100%)**

73 (27.7%) patients did not know how much of their medicines they were supposed to take or use for between 1 to 3 medicines. There was no statistical significance in the knowledge of the quantity of prescribed medicines to take and the number of prescribed medicines (p=0.9811).

4.7.3.2 Elderly patients knowledge of when to take or use their medicines

Table 4.81 Knowledge of when to take or use their medicines

	NUMBER OF PRESCRIBED DRUGS				
Did not know when to take or use their medicines for:	**1-3**	**4-6**	**7-9**	**10-15**	**TOTAL**
0 medicine	11 (3.9%)	110 (39.1%)	63 (22.4%)	10 (3.6%)	194 (69.0%)
1 medicine	2 (0.7%)	35 (12.5%)	21 (7.5%)	5 (1.85%)	63 (22.4%)
2 medicines	0 (0.0%)	11 (3.9%)	5 (1.8%)	1 (0.4%)	17 (6.0%)
3 medicines	0 (0.0%)	5 (1.8%)	2 (0.7%)	0 (0.0%)	7 (2.5%)
TOTAL	13 (4.6%)	161 (57.3%)	91 (32.4%)	16 (5.7%)	281 (100%)

87 (31.0%) patients did not know when to take or use their medicines for between 1 to 3 medicines (Table 4.81). There was not a statistical significance for the number of medicines the elderly patients did not know when to take or use and the number of prescribed drugs ($p = 0.9434$).

4.7.3.3 Elderly patients knowledge of how to take or use their medicines

Table 4.82 Knowledge of how to take or use their medicines

	NUMBER OF PRESCRIBED DRUGS				
Did not know how to take or use their medicines for:	**1-3**	**4-6**	**7-9**	**10-15**	**TOTAL**
0 medicine	12 (4.3%)	119 (42.3%)	60 (21.4%)	12 (4.3%)	203 (72.2%)
1 medicine	1 (0.4%)	25 (8.9%)	21 (7.5%)	2 (0.7%)	49 (17.4%)
2 medicines	0 (0.0%)	12 (4.3%)	6 (2.1%)	2 (0.7%)	20 (7.1%)
3 medicines	0 (0.0%)	3 (1.1%)	4 (1.4%)	0 (0.0%)	7 (2.5%)
4 medicines	0 (0.0%)	2 (0.7%)	0 (0.0%)	0 (0.0%)	2 (0.7%)
TOTAL	13 (4.6%)	161 (57.3%)	91 (32.4%)	16 (5.7%)	281(100%)

Findings in Table 4.82 indicate that 78 patients (27.85%) did not know how to take or use their medicines for between 1 to 4 of the prescribed medicines. This included knowledge of whether to take the medicines before, after or with meals and for example the use of inhalers. There was no statistically significant results ($p = 0.6455$) in the number of medicines that the 78 patients did not know how to take or use in relation to the number of prescribed medicines.

4.7.3.4 Medicines that were taken or used incorrectly

Table 4.83 Medicines that were taken or used incorrectly

Drug name	Frequency	Percent
Acebutolol	3	4.2%
Allopurinol	1	1.4%
Amiloride + Hydrochlorthiazide	1	1.4%
Aspirin	4	5.6%
Atenolol	2	2.8%
Beclomethasone	2	2.8%
Captopril	4	5.6%
Diclophenac	1	1.4%
Digoxin	5	6.9%
Fenoterol	1	1.4%
Frusemide	8	11.1%
Glibencamide	5	6.95%
Glicazide	4	5.6%
Glyceryl Trinitrate	1	1.4%
Hydrochlorthiazide+Reserpine	3	4.2%
Ibuprofen	1	1.4%
Indapamide	1	1.4%
Indomethacin	1	1.4%
Isosorbide dinitrate	7	9.7%
Isosorbide mononitrate	1	1.4%
Metformin	3	4.2%
Perindopril	2	2.8%
Potassium Chloride	2	2.8%
Ramipril	1	1.4%
Salbutamol	1	1.4%
Thyroxine	4	5.6%
Verapamil	3	4.2%
TOTAL	72	100%

On 72 occasions, patients were not taking the medicine correctly (Table 4.83). These problems refer to taking medicines before, with or after meals and not problems of incorrect quantities or times of dosing discussed previously. For example the above problems of the anti-inflammatories (Diclophenac, Ibuprofen and Indomethacin) were supposed to be taken with or after meals, but were being taken before or without meals. This may cause severe heartburn or gastric ulceration.

On two occasions, the patients were not using the Beclomethasone inhaler correctly with subtherapeutic effects and no relief of symptoms.

In all the above instances, the patient was counselled on how to take the medicines correctly, and these DRPs were regarded as definitely preventable.

To overcome the patient making dosing errors, the practitioner or pharmacist must be sure that the patient knows how to take the medicine. This includes how many and when to take them i.e. before or after meals.

4.7.3.5 Knowledge of medical indication of medicines

Table 4.84 Knowledge of medical indication of medicines

	NUMBER OF PRESCRIBED DRUGS				
Medical indication of drugs	**1-3**	**4-6**	**7-9**	**10-15**	**TOTAL**
Knows indication	3(1.1%)	76 (27.0%)	55 (19.6%)	11 (3.9%)	145 (51.6%)
Did not know indication	10 (3.6%)	85 (30.2%)	36 (12.8%)	5 (1.8%)	136 (48.4%)
TOTAL	13 (4.6%)	161 (57.3%)	91 (32.4%)	16 (5.7%)	281 (100.0%)

Results in Table 4.84 indicate that, 136 (48.4%) of the patients did not know the medical indications for one or more of the medicines that they were currently taking. The comparison of knowledge of the indication of the medicines to the number of prescribed medicines is highly significant (p=0.0169). Thus the greater the number of prescribed medicines, the greater the chance of the patient not knowing the medical indication of one or more medicines and this is an expected correlation.

4.7.3.6 Patients knowledge of their drug therapy

Overall 119 (42.3%) of the patients did not know when, how or in what quantity to take or use at least one of their medicines prescribed currently. 162 (57.7%) of the elderly patients knew how to take their medicines correctly (Figure 10). Patients may have not known the quantity of medicine, time to take medicine and the manner in which to take the medicine either for the same medicine or for different medicines.
Patients were regarded as having inadequate knowledge of their medicines, if they did not know the quantity, when and how to take their medicines as directed and or the medical indication of their current medicines.

FIGURE 10 : GERIATRIC PATIENTS KNOWLEDGE OF THEIR MEDICINES

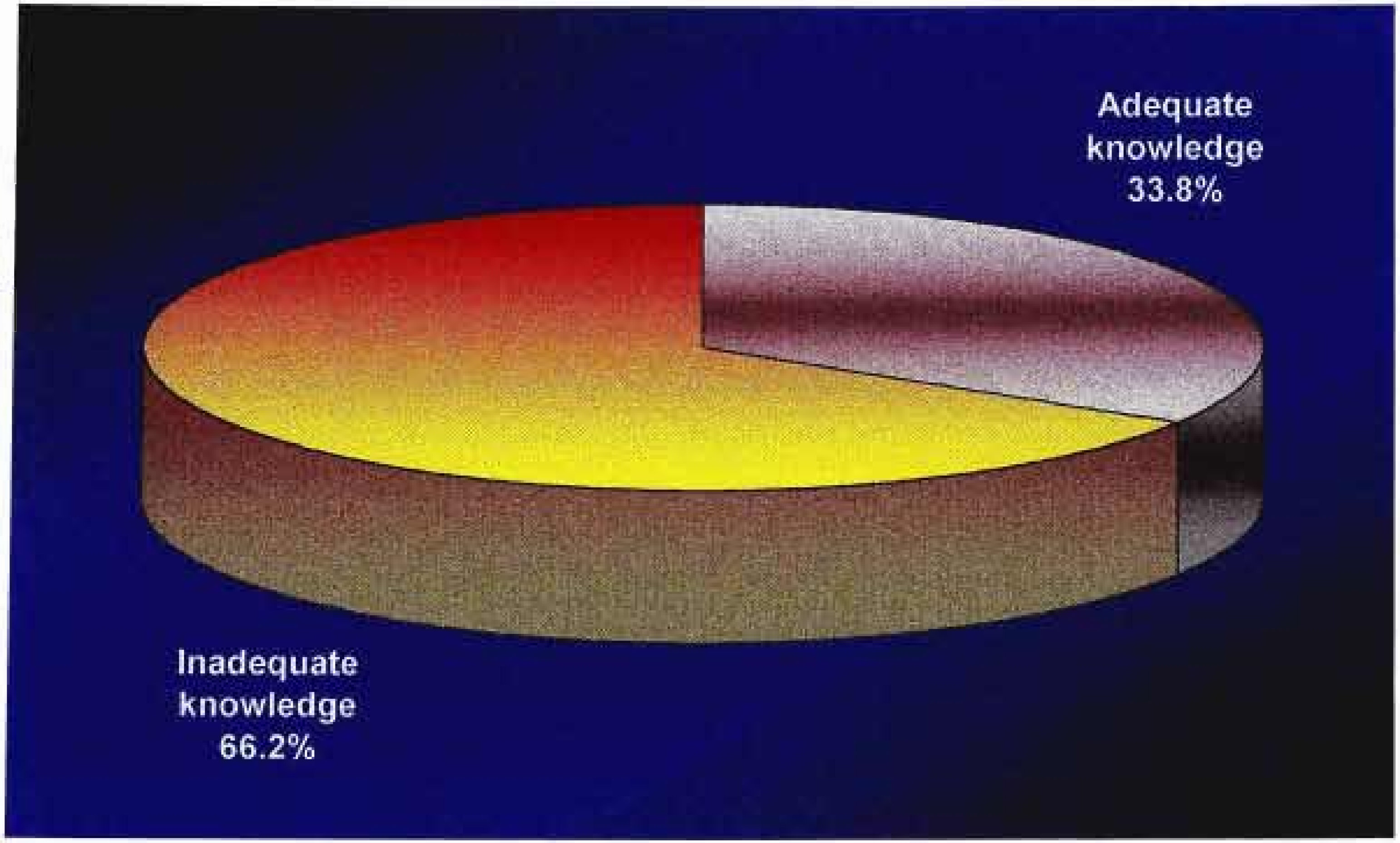


Table 4.85 Comparison of knowledge of drug therapy to number of prescribed medicines

	NUMBER OF PRESCRIBED DRUGS				
Knowledge of medicines	**1-3**	**4-6**	**7-9**	**10-15**	**TOTAL**
Adequate	8 (2.8%)	58 (20.6%)	25 (8.9%)	4 (1.4%)	95 (33.8%)
Inadequate	5 (1.8%)	103 (36.7%)	66 (23.5%)	12 (4.3%)	186 (66.2%)
TOTAL	13 (4.6%)	161 (57.3%)	91 (32.4%)	16 (5.7%)	281 (100%)

66.2% of the patients had an inadequate knowledge of their medicines and this has the potential of leading to a number of DRPs (Table 4.85).

4.7.3.7 Overcoming the problem of inadequate knowledge of medicines in the elderly patients

In all 186 (66.2%) of patients who had an inadequate knowledge of their medicines, this was regarded as definitely preventable through verbal and written counseling and patient memory aids (Table 2.7.2). From the results below it can been seen that the patients' lack of knowledge of their medicines was primarily due to lack of verbal counseling.

4.7.4 REASON (S) FOR NON-COMPLIANCE IN ELDERLY PATIENTS

Table 4.86 Reasons for non-compliance

Reasons for non-compliance	Frequency	Percent
Illiteracy / low literacy	16	5.7%
Was feeling well and had no complaints	6	2.1%
No one to collect medicines/ didn't collect medicines	3	1.1%
Deteriorating vision and or eye problems	5	1.8%
Medicine taken or used when necessary	4	1.4%
Unaware of dose change or directions	4	1.4%
Medicine is not helping medical condition	2	0.7%
Does not know medical indication	3	.1%
Medicine is not necessary	3	1.1%
Inadequate patient counselling	97	34.5%
Does not take medicine when not at home	2	0.7%
Forgetting to take the medicines – forgetfulness	20	7.1%
Did not take or collect medicines when hospitalised	2	0.7%
Unpleasant side effects	38	13.5%
Difficulty in swallowing	2	0.7%
Patient prefers not to or refuses to take or use the medicine	4	1.4%
Other	10	3.6%
TOTAL	221	78.6%

Geriatric patients were asked as to provide reasons for taking more or less of their medications than the provider had prescribed, as well as their reasons for stopping medication. Although the percentage reasons for non-compliance is 78.6%, the same number of patients did not give each of the 221 reasons. One patient may have given more than one reason as was the case in this study. 5.7% indicated that low literacy was the reason for them not taking the medicines as directed.
Thirty-eight patients (13.5%) stopped taking the medicines because of side effects. To minimise this, patients need to be informed of the expected side effects. Two patients indicated that their medicines were not having the anticipated drug effects. These patients were counselled to determine if they were taking their medicines as prescribed and if this was the reason for their prescribed medicines not helping their medical condition. It was discovered that they were taking the medicines incorrectly.

The following were the less common factors / reasons for patients not taking or using their medicines as prescribed or directed:

- Not understanding instructions due to language barrier
- Health condition causing difficulty opening vials / Difficulty in removing protective seals
- Drug Interaction
- Patient feeling unwell
- Too many medicines to take - polypharmacy
- When condition worsens or have a severe attack
- Taking other medicines prescribed for different conditions
- Controlled on that dose

The incidence of the above reasons for non-compliance was once only in the sample geriatric patients

- Illiteracy or low literacy resulted in the elderly patients not understanding instructions and combined with failing memory resulted in them not being able to follow correct directions on the use of the medicines.
- Patients may also be non-compliant when they are prescribed numerous medicines. To overcome this the drug regimen needs to be simplified and the

number of drugs prescribed needs to be reduced (e.g. a single agent may be used to treat hypertension and benign prostatic hypertrophy) (Salom and Davis, 1995).

- Difficulty in removing protective seals: One patient had severe arthritis and loss of dexterity meant that the patient could not use the anti-inflammatory suppositories prescribed for the condition. The patient was non-compliant, but this was beyond his control. It is important to ensure that the patient or caregiver can open the packaging of the medicines.

4.7.5 COUNSELLING OF PATIENTS

4.7.5.1 Counselling of elderly patients on directions and special precautions to follow regarding their drug therapy.

Table 4.87 Counselling of patients

Type of Counselling	Yes		No	
Verbal	4	(2.8%)	273	(97.2%)
Written	279	(99.3%)	2	(0.7%)

The vast majority (97.2%) of the patients did not receive any verbal counselling on their medicines. Lack of counselling was responsible for 97 geriatric patients (34.5%) being non-compliant on their medicine (Table 4.86). The elderly patients regarded the directions on the label of their medicines as written counselling. This accounts for the large proportion (99.3%) of the patients who reported having received written counselling.

According to the labeling of the medication at the hospital, the following were the common precautions:

- Take with/before/after meals
- Avoid driving/operating heavy machinery
- Avoid smoking
- Avoid alcohol

The directions on the labels of medicines are adequate, but the font and the label size may need to be increased to enable the elderly patient, to read the directions clearly. Another suggestion would be to include the indication of the medicine on the label. For example, Captopril may be labeled as for "Blood Pressure". The language must be in simple English, which the patient would understand. This would definitely, improve the patients understanding of their drug therapy, and may lead to improved compliance.

4.7.5.2 Educational efforts or compliance aids for the elderly patients

258 (91.8%) of the elderly patients felt that they required further education on their medicines. 23 (8.2%) felt that they did not need any further help concerning their medicines.

246 (87.6%) felt that they required further verbal counseling on their medicines, and 13 (4.6%) of the geriatric patients wanted written counseling information mainly on the medical indication of their medicines in addition to the verbal counseling.

4.7.5.2 Discussion of Compliance in the elderly

Noncompliance with prescribed medication regimen is thought to be a major cause of treatment failure. The reported incidence of noncompliance ranges from 4% to 92%, with an average noncompliance rate for chronic drug therapy of 50% (Palane, 1995). The figure of noncompliance in South Africa could be much higher than in other first world countries, e.g. The United States of America (Van Niekerk, 1994). Several factors influence a patient's decision not to comply with their drug therapy. These include: fear about taking a 'drug'; unwillingness to accept the label of an illness; perceived stigma attached to an illness; risks perceived as outweighing the benefits of treatment; fear of loss of control to their illness or clinician; adverse effects from the medication; inconvenient regimen; inability to pay for the medication and lack of confidence in the clinician's decision (Britten, 1998; Misselbrook, 1998). Some of these reasons for noncompliance correlate to the findings in the current study.

Findings of this study revealed that relatively few of the elderly patients (2.8%) (Table 4.87) received any professional advice on the prescribed medicines they were taking. Another important feature illustrated in this study is the level of knowledge and understanding of the patient. With the lower levels of literacy and health education in South Africa than most western countries, these patients needed more information. Problems regarding compliance of drug treatment was often the result of inadequate counseling. Errors in this category therefore, were essentially errors or inadequacies of communication by the prescriber or pharmacist. Confusion regarding uses or indications (48.4%) (i.e. patient did not know for which condition the drug was being prescribed) (Section 4.3.5) were the most commonly identified event in this category followed by 42.3% on misunderstandings of dose or dosage regimen (Section 4.7.3.6). Thus the most important factor in improving compliance in the elderly is good communication. This involves establishing a covenatal relationship with patients. Every elderly patient opportunity for the pharmacist and other health care professionals to prevent future DRPs. Talking with and listening to patients allows the pharmacist to devise patient-specific compliance programmes, for example compliance charts. These should be re-inforced with visual aids and written information (Miot, 1998).

Patients also need to be informed of the intended actions and noteworthy side effects of all drugs dispensed to them. Counseling patients about a drug's action and effect can prevent or minimise the severity of ADRs. Not all reactions can be avoided, but when patients are counseled by the dispensing pharmacist about drug actions and their intended effect, they will be better prepared to give feedback when unanticipated effects occur. It is impractical to suggest that the side-effect profile of every drug be explained to every patient. The extent of such counseling to the individual patient must depend on the pharmacist or prescribers professional judgement.

Patient noncompliance is a major issue; therefore, it has been suggested that a new approach of 'concordance' be tried in an attempt to improve patient outcomes. Concordance requires open and honest discussions between the prescriber and the patient, so that they can agree about the nature of the illness and the most appropriate treatment regimen. The concept of concordance suggests that clinician and patient find areas of health belief that are shared and then build on these rather than the clinician trying to impose his/her views on the patient. Both sides will require concessions: with the patient having to take more medication than they initially wanted and the clinician having to accept that the patient is taking, at least initially, less than may be considered medically ideal (Britten, 1998; Misselbrook, 1998).

This study helped to demonstrate the concept of pharmaceutical care, which is the pharmacists' dedication to wellness, and quality of life of patients by assisting them in making the best use of medicines. It is also a commitment to ensure that the use and supply of drugs meets minimum standards of safety and effectiveness and the drug use in the elderly was rational and beneficial to the patient and does more good than harm. The pharmacist can play a critical and essential role in filling the gap of providing necessary information to the patient to ensure patient compliance and to ensure the safe and correct use of medicines and thereby avoiding unnecessary expenditure on medicine utilisation, hospitalisation and lack of productivity. This would improve the health of the geriatric population, as patient compliance is a vital factor in the delivery of health care in South Africa (Van Niekerk, 1994).

4.8 PRESCRIPTION INTERVENTIONS

The results of the number of prescription interventions, DRPs warranting prescription interventions, outcome of the prescription interventions, classification of the prescription interventions, types of interventions and the significance of interventions will be discussed next.

4.8.1 NUMBER OF PRESCRIPTION INTERVENTIONS

The mean number of prescription interventions in the entire sample population of 281 elderly patients was 0.65 ± 1.16. The mean number of interventions in patients less than 75 years (0.66 ± 1.17) was not much different from those patients that were over 75 years (0.64 ± 1.17). A similar trend was noted in the comparison with gender. The mean number of interventions in the female patients were 0.66 ± 1.15 as compared to the male patients (0.64 ± 1.19).

From Figure 11 one can see that there were no prescription interventions in 194 elderly patients (69%) 191 of who had DRPs, not necessarily warranting prescription interventions. 87 patients (30.1%) had from 1 to 4 interventions on their current prescription. The total number of pharmacist-initiated recommendations was 189 over 8 weeks.

Increased pharmacist access to patient records and medical history at the hospital have enhanced the identification and resolution of prescribing problems.

FIGURE 11 : INCIDENCE OF PRESCRIPTION INTERVENTIONS

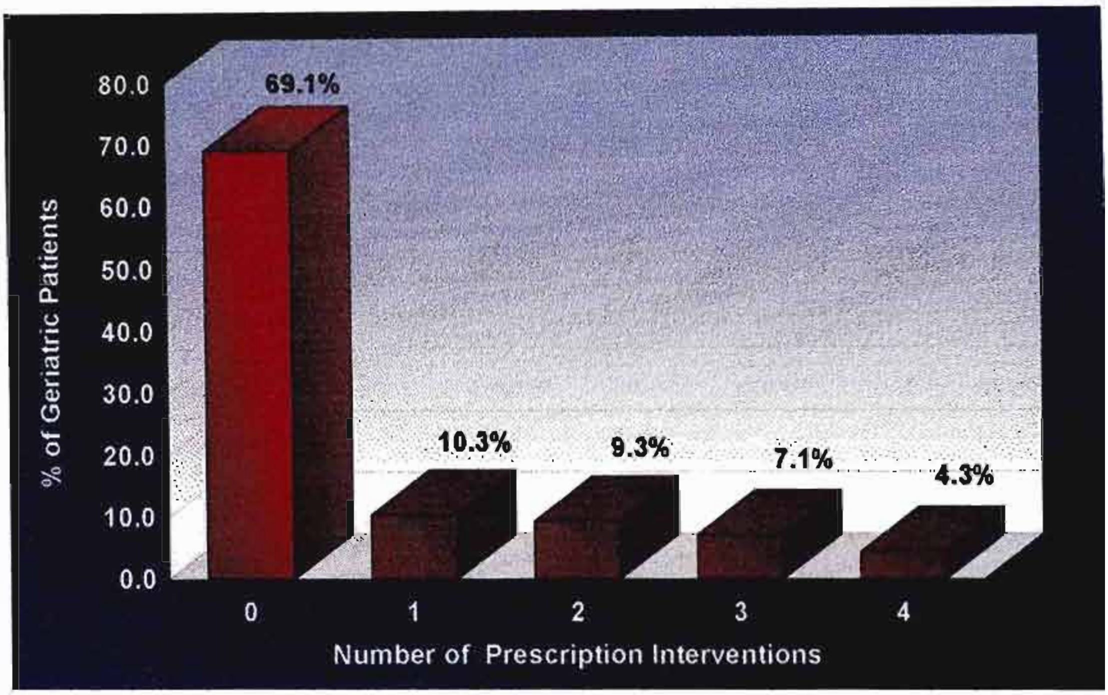
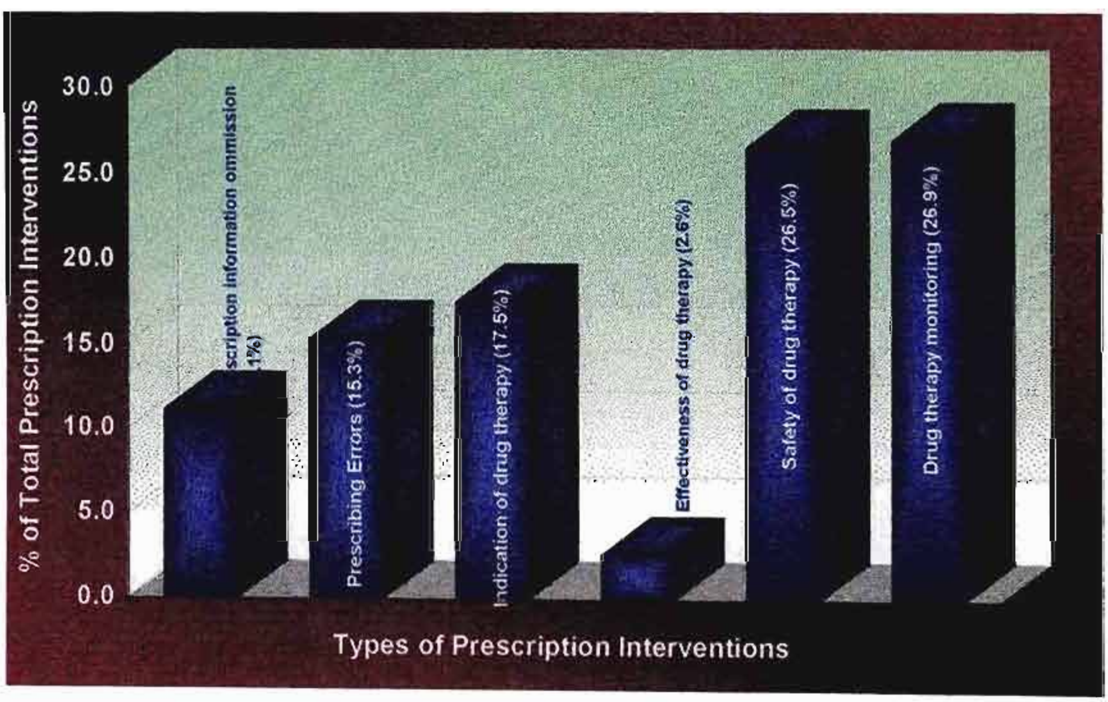


FIGURE 12 : TYPES OF DRPs WARRANTING PRESCRIPTION INTERVENTIONS



4.8.2 DRPs WARRANTING PRESCRIPTION INTERVENTIONS

Figure 12 (on the previous page) illustrates the overall types of prescription interventions in order of prevalence. The following table illustrates the DRPs that warranted reactive pharmacist interventions.

Table 4.88 DRPs warranting prescription interventions

PRESCRIPTION INTERVENTIONS OF DRPs	Number	%
1. PRESCRIPTION INFORMATION OMISSION	21	11.1%
Drug omitted / not specified	17	
Dose or dosage regimen is not specified	1	
Violates legal requirements		
■ Unsigned by prescriber	2	
■ Undated	1	
2. PRESCRIBING ERRORS	29	15.3%
Inappropriate / incorrect drug or medical indication	6	
Inappropriate dose /dosage regimen/strength	5	
- extra or wrong dose	1	
- potentially toxic dose	3	
Inappropriate quantity / duration of therapy	1	
Inappropriate dosage interval	2	
Non-compliance with hospital policy		
Policy infraction – non-coded item	1	
- Item restricted to certain specialists only	8	
- > five items on prescription	2	
3. INDICATION OF DRUG THERAPY	33	17.5%
1. UNNECESSARY DRUG THERAPY		
Drug not indicated for condition	2	
Pharmacological duplications of drug therapy	9	
Patient does not require the medication	1	
2. NEEDS ADDITIONAL THERAPY:		
Untreated indication	19	
Uncontrolled medical condition	2	
4. EFFECTIVENESS OF DRUG THERAPY	5	2.6%
More effective drug available	5	
5. SAFETY OF DRUG THERAPY	50	26.5%
Adverse drug reaction	22	
Drug interactions		
Drug – drug interactions	12	
Drug – disease or age	16	
6. DRUG THERAPY MONITORING	51	26.9%
Monitor patient or blood levels or lab test		
Monitor K levels	28	
Monitor uric acid levels	3	
Monitor Digoxin levels	3	
Monitor blood sugar levels	9	
Monitor Blood pressure	6	
Monitor Thyroxine levels	1	
Microbiological sputum test	1	
TOTAL	189	100%

4.8.2.1 INTERVENTIONS ON PRESCRIPTION INFORMATION OMISSION

These were errors of omissions and were the result of vague, incomplete, illegible, or otherwise inadequately written prescription orders. These were interventions of no or low significance. It only provides necessary information regarding correct writing of prescriptions. This accounted for 11.1% of the total prescription interventions.

Table 4.89 Interventions on prescription omissions

Prescription information omission	Frequency	Percent
Dose or dosage regimen is not specified	1	0.5%
Violates legal requirements:		
Unsigned by prescriber	2	1.1%
Undated	1	0.5%
TOTAL	4	2.1%

No directions were indicated for a patient on Ferrous sulphate. This problem and the other three problems (unsigned and undated prescription) that violated legal requirements were rectified by the prescriber, and then the prescriptions were dispensed. However the 17 interventions regarding omissions of required medication are very significant (Section 4.5.2.1.1). These DRP if undetected would have had serious consequences on drug treatment in these elderly patients.

4.8.2.2 PRESCRIBING ERRORS

On approximately 18 occasions, prescribers specified an incorrect drug, dose, quantity, and strength or dosage interval of a medication (errors of commission).

Table 4.90 Interventions on hospital policy infraction

Policy Infraction		Frequency	Percent
- non-coded item: Theophylline+Diphenhydramine		1	0.5%
-Item restricted to certain specialists only		7	2.5%
Propoxyphene Hydrochloride	2		
Fluvastatin	1		
Omeprazole	1		
Omeprazole and Cisapride	1		
Dexamethasone + Chloramphenicol	1		
Simvastatin	1		
- > five items on prescription		1	0.5%
TOTAL		9	4.8%

Hospital policy infraction (prescribing error) accounted for 4.8% of the total prescription interventions. In four of the above interventions, the prescriptions were clarified by the prescriber (restricted item was signed by consultant or specialist) before being dispensed. The patients on Simvastatin, Dexamethasone and Chloramphenicol eyedrops were referred to the, ishaemic heart disease clinic and specialist eye clinic respectively and the medicines were not dispensed on the current prescriptions. The non-coded item that was prescribed was changed to another cough medicine that was on the hospital code. One of the patients who that was on Propoxyphene HCL went to have the specialist to countersign the script, but the specialist was unavailable. This item could not be dispensed. This was a significant DRP because the patient would have had no relief of arthritic pain.

4.8.2.3 INDICATION OF DRUG THERAPY

There were 33 prescription interventions involving DRPs concerning drug indications (see Table 4.88). 12 involved unnecessary drug therapy and 21 interventions were regarding additional drug therapy.

4.8.2.4 EFFECTIVENESS OF DRUG THERAPY

In five instances, there were recommendations regarding a more effective medicine to treat the elderly patient's medical condition or symptoms.

4.8.2.5 SAFETY OF DRUG THERAPY

There were 50 interventions regarding drug treatment that were considered not safe in the elderly patients. These errors were split between drug interactions or allergies (errors of integration) (28) and ADRs (22). The drug interaction interventions were as follows: drug-drug interaction (12) and drug-disease or age (16). The drug-age interactions were mainly where there was a relative contra-indication of use of medication in elderly patients, for example Methyldopa.

4.8.2.6 DRUG THERAPY MONITORING

These interventions (50) were mainly recommendations to monitor potassium levels, uric acid levels, Digoxin levels, blood sugar levels, blood pressure and Thyroxine levels. In one instance there was an extremely significant intervention for a microbiological sputum test. The remaining interventions were on incorrect or inadequate patient understanding of therapy (errors of communication), which was discussed in section 4.7.

4.8.3 OUTCOMES OF PRESCRIPTION INTERVENTIONS (PIs)

The outcomes of the prescription interventions were categorized according to the number of the pharmacist's recommendations that were accepted or rejected by the prescriber concerned. However the availability of the prescriber and the patients willingness to go back to the prescriber were also taken into consideration.

Figure 13 shows that 76.2% of the pharmacist's suggestions met with the approval of the prescriber. 13.2% of the prescription, interventions were rejected. The prescriber was unavailable in 19 instances and one patient was in a hurry and did not wish to go back to the prescriber with the PIF.

The pharmacist on 87 occasions concerning 189 separate prescription orders contacted the prescriber. In 144 instances the prescription order was either clarified and dispensed, changed and dispensed, or not dispensed at all. The physician rejected pharmacist's recommendation and refused to change the prescription order in 25 instances. These findings tend to emphasize the importance of and need for interdisciplinary communication in identifying and resolving prescribing errors and irregularities. Those prescribers subsequently changed 76.2% of problematic prescription orders identified by the pharmacist supports this need. This underlines the extent to which prescribers require advice to optimize drug therapy. Without these interventions, the therapy in most cases was unsafe and not necessarily effective and certainly not cost effective.

FIGURE 13 : OUTCOME OF THE PRESCRIPTION INTERVENTIONS

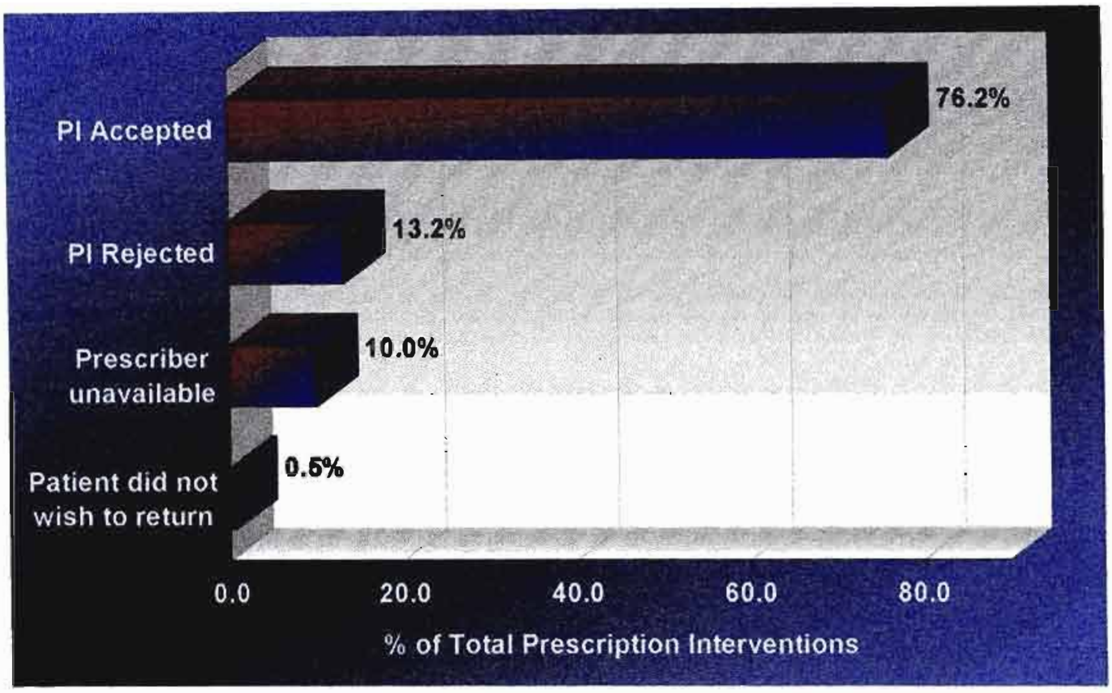
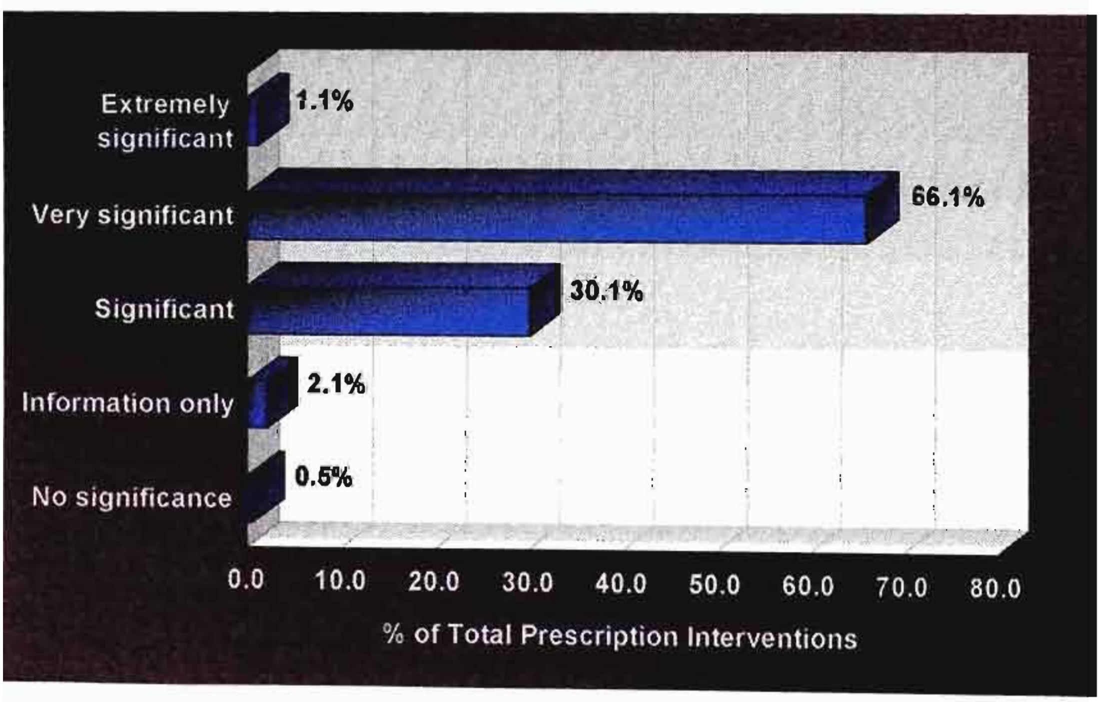


FIGURE 14 : SIGNIFICANCE OF DOCUMENTED PRESCRIPTION INTERVENTIONS



4.8.4 SIGNIFICANCE OF DOCUMENTED PRESCRIPTION INTERVENTIONS

Figure 14, illustrates the subjective classification of documented interventions. 66.7% of the DRPs were regarded as very significant, while only one intervention was regarded of no significance. Two interventions were regarded as extremely significant. These were the interventions in a patient who had his chronic treatment for angina and hypertension omitted and patient JH who had irrational antibiotic prescribing for bronchiectasis.

4.8.5 CATEGORIES OF INTERVENTIONS

Interventions were classified into the following categories according to the procedure outlined in section 3.4.7.2.

Table 4.91 Categories of interventions

CATEGORIES OF INTERVENTION		FREQUENCY	PERCENT
1. Clinical pharmacy:		49	25.9%
Pharmacokinetic: Dose or frequency	12		
Drug interactions	8		
Inadvisable choice of drug:			
Patient factors (e.g. ß-blockers in asthma)	11		
Recommendations to cease due to adverse effects	18		
2. Pharmaceutical: (i.e. Product-orientated advice)		12	6.3%
3.Therapeutic Interventions		124	65.7%
4.Interventions Involving Cost Minimisation		2	1.1%
5. Informational		2	1.1%
TOTAL		189	100%

4.8.5.1 CLINICAL PHARMACY INTERVENTIONS

- **Change in Dose or Dose frequency**

Of the number of phenytoin interventions, two involved changes to the timing and frequency of the dose e.g. 100mg twice daily, changed to 200mg at night

- **Improvement of drug choice**

On a couple of occasions pharmacists intervened to improve drug choice for example recommending a change of anti-hypertensive therapy in patient FB, a black patient who was being treated with Perindopril and changing the NSAID Ibuprofen to Diclophenac in patient BZS (Section 4.5.2.4.1).

4.8.5.2 PHARMACEUTICAL INTERVENTIONS

These pharmaceutical or product-orientated interventions totaled 6.3% of the interventions recorded. Pharmacological duplications included orders for two drugs in the same pharmacological class (eg. Felodipine and Amylodipine are both calcium antagonists) or having very similar pharmacological activity (Ibuprofen and Paracod® both being prescribed for analgesia) (Section 4.5.2.4).

4.8.5.3 THERAPEUTIC INTERVENTIONS

This group of interventions involved advice on therapy and often included advice to initiate a particular drug. Common therapeutic consultation interventions consisted of advising the physician about a drug for symptom control such as ordering pain relief or alternative analgesics.

4.8.5.4 INTERVENTIONS INVOLVING COST MINIMISATION

These were interventions, in which the impact was largely on reducing potential expenditure, although therapeutic benefits may have also been achieved. Discontinuation of drug therapy that was inappropriate or no longer required constituted this category of intervention. Although only 2% of the interventions were classified as interventions involving cost minimisation, a number of the other interventions also reduced cost, but it was more appropriate to classify them under the other categories listed in Table 4.91.

Examples, of cost minimisation interventions in the study conducted by Bebee and Freitag (1990) were: advice to discontinue potassium chloride tablets after Frusemide had already been discontinued; advice to discontinue Probenecid after ß-lactam antibiotics had already been discontinued; advice to discontinue Indomethacin after the acute episode of gout had ceased; advice to discontinue Glibencamide after insulin therapy had started: advice to discontinue Lorazepam which had been continued to be administered after being written up preoperatively.

4.8.6 TYPES OF INTERVENTIONS

According to section 3.4.7.2, the two main types of interventions were:

1. Pharmacist-initiated interventions
2. Prescribing errors

Table 4.92 Types of interventions

TYPES OF INTERVENTIONS	FREQUENCY	PERCENT
Pharmacist-initiated	151	79.9%
Prescribing errors	38	20.1%
TOTAL	189	100%

The majority of the interventions were pharmacist-initiated (79.9%) as compared to the 20.1% that involved prescribing errors (Table 4.92).

4.8.7 DISCUSSION OF PRESCRIPTION INTERVENTIONS

In a unit analysis of 93 consecutive cases seen at four hospitals by the geriatric Unit of the University of Cape Town in 1988, 19 patients were found to have been much improved by the intervention of their treatment. Among these, seven owed their improvement to corrections of their drug therapy. There were two cases of drug-induced thyrotoxicosis, 2 cases of digoxin toxicity, two patients with hypokalaemia precipitated by a combination of diuretics and self-administered laxatives and one patient with severe diuretic induced hyponatraemia (Meiring, 1991).

The results of the current study are consistent with other published findings (Hulls and Emerton, 1996) where prescribing omissions and error, constituted a proportion of prescription interventions. These required consultation with the prescriber or patient to resolve and hence considerable professional time, which might otherwise have been, devoted to more significant patient care activities like counseling. The pharmacist's role as a final check on dispensing was further exemplified by the detection of numerous interactions and compliance problems. Communication with prescriber was identified as a major issue in the resolution of prescription problems and consequently patient welfare. Professional communication between pharmacists and prescribers is paramount in enhancing the perception of pharmacists as drug and therapy experts.

The pharmacists need to become more conscious of the importance of their role, to assure appropriateness of the patient's drug regimen and drug use, and its impact on patients' care. The analysis and quantification of the interventions has made us more aware of those errors that occur frequently. While the number of intervention show how important it is that all patients have the opportunity to benefit from pharmacists' special vigilance in detecting DRPs. The pharmacists' contributions to improved drug use and improved health care is evident.

The magnitude of medication-related illness, the evidence that a significant proportion of it is preventable, and the evidence that preventing it may actually decrease total costs while improving quality of care clearly establishes that more attention needs to be directed toward ensuring safe and effective drug-taking behaviour. The literature on preventable medication-related illness, and the pharmacist's possession of a knowledge base that can help to prevent such illness, will justify pharmacy's claim that its mandate is to protect the patient from pharmaceutical misadventure.

In this study pharmacists have demonstrated that application of their clinical knowledge not only improves patient care but also results in a decrease in expenditure. Christensen (1981) in Washington also illustrated the benefits of outpatient drug use review experiences by pharmacists in a study. Patterns of pharmacist's intervention were observed over 1 year at a large health maintenance organisation. Results indicated that the number of DRPs increased substantially during the months following the introduction of this intervention strategy. During the latter months, the number of prescriptions with problems approximated 4 per 100 dispensed prescriptions. Drug interactions of a moderate nature and drug underuse were the most frequent problems encountered. This is very similar to the results obtained in the current study. The next most frequently occurring type in the study by Christensen (1981) was drug overuse problems, and, after that, problems concerning some aspect of the prescribing decision. In 9% of all problem interventions and in 44 % of prescribing-problem interventions, the outcome of the pharmacist intervention was a change in the drug, the strength or directions for use.

The goal of this professional collaboration between the physician and the pharmacist in the delivery of prescription drugs to patients is to combine the unique knowledge and competencies of both professionals to achieve optimal therapeutic outcomes for the elderly patient (Rupp, 1991).

Attempts must be made to further develop and/or refine existing systematic process to delineate and prevent drug-related health problems. Non-drug form of treatment or use of the fewest possible medications (three or less) must always be considered. The wide variation from one elderly individual to another requires careful individualized monitoring of drug effects on an ongoing basis. Knowledge of geropharmacology and continuous study of new drugs and their effects are essential to recognize actual and potential drug-related problems and promote the health and safety of elderly individuals (Tesfa, 1989).

4.9 INTERVENTION STRATEGIES TO OVERCOME DRPs

Firstly a patient information leaflet was devised and distributed to geriatric out-patients receiving drug therapy at the hospital.

Secondly, a written educational intervention was targeted to all medical practitioners and pharmacists at the hospital.

Thirdly counseling of in-patients on their medicines was implemented as part of the ward pharmacists' duty.

4.9.1 PATIENT INFORMATION LEAFLET

Elderly patients are not well educated about DRPs like adverse effects and compliance and do not see this as significant priority. Minimising these DRPs has potential offers for cost containment and improving patient quality of life. Thus a patient information leaflet was considered an appropriate intervention tool to educate the public.

The draft patient information leaflet was formulated in both English and Zulu from literature review on compliance and counseling and from the advice and suggestions of health professionals. Some of the responses were that the language was complex and a lay man may not understand some of the difficult terms in the leaflet. In addition there was too much information for the geriatric patient to understand and remember at once. Therefore, the leaflet was revised and then tested in a pilot study on a sample of 30 geriatric patients that were randomly selected. Few amendments that were made, were the changing of the leaflet's title from "Good compliance result in better health" to "Taking your medicines correctly, results in better health" Some of the medical terms which were changed to simpler terms are diarrhoea to runny stomach, diabetes to sugar and penicillin to antibiotic.

The results of the actual study were as follows:

4.9.1.1 NUMBER OF RESPONDENTS

175 patients were selected to be part of the study. Of these 175 patients, only 100 elderly patients (57%) agreed to read the leaflet and answer the questionnaire.

The following reasons were presented for non-participation:

- Collecting medicines for someone else
- Did not have their glasses, so they could not read the leaflet
- Could not read- illiterate.
- Not interested.

Although there were only 57% respondents, the sample population of 100 was still sufficient to produce valid results. The following results are of the 100 geriatric patients who participated in the study. All the geriatric patients who participated in the study read the leaflet and answered the questionnaire.

4.9.1.2 AGE OF GERIATRIC PATIENTS

The sample size for the study was patients from the age of sixty-five and above. Largest percentage (61%) of the population was between the age range sixty-five and seventy, 16% between 71-75, 11% between 76-80 years and 12% were over eighty years.

4.9.1.3 HELPFULNESS OF THE LEAFLET

Most patients (98%) found the leaflet helpful even though some already knew what was written in it. The 2% of the patients (age 65-70 years) who did not find the leaflet helpful, responded that was because they were already informed of this information by the prescriber on their initial visit to the hospital.

4.9.1.4 QUERIES/MISUNDERSTANDINGS REGARDING MEDICINES

A large percentage (93%) of the patients had their queries or misunderstanding regarding their medication cleared because the information that was provided on the leaflet answered concerns on the importance on storage, sharing and taking medication correctly.

4.9.1.5 KNOWLEDGE OBTAINED FROM THE LEAFLET

A large percentage (89%) of patients said they did not learn anything new from the leaflet because their doctors informed them of what to do when they experienced side effects, how to handle their medicine and the importance of taking the medicine as directed. Some of the things they may learn included the following:

- Not to share medicine with anyone.
- Take medicine as directed by the doctor.
- Not to mix different medicines in one container.
- Medicine can be harmful if not taken as directed.
- Inform your doctor if you experience any side effects.
- Tell your doctor about all the medicines you are taking.
- Where to store their medicines.
- Do not take their medicines with alcohol.
- Do not use expired medicines.

4.9.2 PRESCRIBING GUIDELINES

DRP priorities are rational, safe and effective prescribing and adherence to protocol. One of the strategies to help attain this was the development of guidelines for prescribing in the elderly patient.

The prescribing guidelines was devised using different reference books e.g. SAMF, Basic Clinical Pharmacology, EDL's, Drug interactions, etc as an educational intervention tool for prescribers and pharmacists. The guidelines were devised in the context of the Essential Drug List, which is the main prescribing guideline in the public sector hospital. Only the common drug-drug interactions, contra-indications and adverse drug reactions as identified in phase 1 of the study were included in the prescribing guidelines. Unfortunately, due to time constraints the prescribing guidelines were not assessed, by means of a questionnaire. This is one of the limitations of the study.

4.9.3 COUNSELLING OF DISCHARGE PATIENTS ON THEIR MEDICINES

The patient counselling was successfully initiated in the medical ward in May 1998. The procedure that was followed (Appendix 5) required some amendments in terms of the times of counselling the patient. The times had to be amended to ensure that the medical practitioner had performed his ward round and discharged the patient, before the pharmacist could counsell the patient. Ensuring that the discharge medicines (TTO's = To Take Out) were ready timeously was also one of the problems encountered.

Pharmacists or pharmacist interns that were allocated this responsibility of counselling the in-patients did so enthusiastically and felt that they were increasing their professional role as clinical pharmacists. On many occasions the pharmacist detected DRPs, where they intervened to overcome them. On average about five patients were counselled per day, time permitting. Each patient required at least 10 minutes for counselling. These patients were selected after consulting with the nursing sister in charge of the ward and according to the inclusion criteria listed in the patient counselling protocol (Appendix 5).

The following case studies of elderly patients counselled at Addington Hospital and those reviewed by Hudson (1997) illustrates the potential for significant intervention by pharmacist, in overcoming DRPs.

Case study 1: Inappropriate prescribing and concordance in elderly patients

Mr TN was a 68-year-old, 70kg patient who has been admitted to hospital for uncontrolled NIDDM (Blood sugar level = 40.3 on admission), fever and vomitting. He was a known diabetic patient who also suffers from recurrent UTI, hypertension and impotence.

On assessment his medical history revealed that he has been poorly treated as NIDDM since 1994 (four years ago) and was on Glibencamide 5mg twice daily and Metformin 500mg twice daily. His diabetes was not controlled, and the patient admitted to not taking his diabetic medicines regularly. Other concurrent OTC and prescribed medicines the patient was taking included Perindopril 2mg daily for the hypertension, Ibuprofen and the analgesic combination: paracetamol and codeine for joint pain.

The patient's diabetic treatment was reviewed, and it was decided to initiate insulin therapy. This change in therapy was successful in reducing his blood sugar to 10.5 at the time of discharge, four days later. On hospital discharge, the patient was maintained on Humulin L 20 units at night and the Metformin 500mg twice daily was continued because of its synergistic effect. The Glibencamide was discontinued. The pharmacist counseled Mr T.N fully on the use of the insulin and on the importance of compliance. Mr TN was receptive of the advice and this was revealed at his follow up at the diabetic clinic where blood sugar testing indicated that his diabetes was still under control.

Inappropriate prescribing and non-compliance to drug therapy leads to hospital admissions and unnecessary health costs. To avoid these, patients treatment needs to be reviewed regularly and the appropriate changes to treatment initiated. Also older patients need help to understand their medication, including the benefits and how to take their medicines.

Case study 2: Uncontrolled medical condition and unnecessary drug treatment

Mr E.G. was a 70-year-old, known ischaemic heart disease and hypertension patient, who was admitted for syncopial attack (dizziness) and to optimize his medical treatment. He had been treated with Frusemide 60mg twice daily, Captopril 6.25mg three times daily, Digoxin 0.25mg and Potassium chloride 600mg each daily, Glyceryl trinitrate SL when necessary and Indomethacin. Urea and electrolytes and Digoxin levels were normal.

The patient's treatment was reviewed and the dose of the Frusemide was increased to 60mg three times daily. On discharge the patient was stabilised. Mr E.G was prescribed Indomethacin 25mg three times daily for a month. On counseling Mr E.G, he indicated that he does not require them, as he no longer has muscular pain for which the Indomethacin was initially prescribed. Also the patient had surplus from the previous prescription, because he had not been taking it. The prescriber was consulted and the Indomethacin was discontinued.

Another observation by the pharmacist was that the patient added his discharge medicines to his previously prescribed medicines with different doses. The old medicines were removed and the patient was advised that he does not require them, and that he was to continue on the current treatment regimen.

This is a typical example of failure to review a patient's condition and for unnecessary medicine prescribing that results in wastage and further depletes the already strained resources in the public sector. This study and in Hudson' s report in 1997 reveals that the purpose of a medication review is to identify any medication-related problems, to ensure that all medicines are needed and that all necessary medicines are taken.

Hudson and Boyter (1997) reported on a case of Digoxin toxicity (Section 4.5.2.5.3). Another case in a 79 year old woman was the drug interaction of Warfarin and Diclophenac and the patient was on Omeprazole 20mg at night to prevent the gastric bleeding which occurs on that combination of drugs.

Thus, patients need to be informed of the intended action and noteworthy side effects of all drugs dispensed to them. Counseling patients about a drug's action and effect can prevent or minimize the severity of adverse drug reactions. Although obtaining all the pertinent information needed to assess the risk of adverse drug reactions is impossible, a reaction to a drug never be ruled out as the cause of an untoward event. Not all reactions can be avoided, but when patients are counseled by the dispensing pharmacist about drug actions and their intended effect, they will be better prepared to give a pharmacist feedback when unanticipated effect occur. It is impractical to suggest that the side effect profile of every drug must be explained to every patient. The extent of such counseling to the individual patient must depend on the pharmacist's professional judgement.

Patient counseling was successfully performed in this medical ward, for several months. The potential beneficial effects were recognised by the patient, pharmacist and the administrators of the hospital. However, a follow-up of this patient counseling in 1999 revealed that this in-patient counseling had ceased due to staff shortages, that did not permit the pharmacist or intern the time to carry out this important task. This did not permit the pharmacist or intern the time to carry out this important task. This is a typical example where standards of care and patient benefits are compromised due to limitation of resources and is something that the administrators of the hospital need to review.

Two dilemmas face the pharmacist in "prescription mill" settings: First, consignment to prescription-processing activities eliminates time otherwise available to nondispensing activities (drug use review), and, second, eventually this restriction erodes the nondispensing skills of pharmacists, making them qualified and competent only for the dispensing role. While limited time and opportunity would appear to exist for exercising quality assurance activities, pharmacists' contribution to improved drug care has not been adequately investigated. There exists a need to maximise the pharmacist's role development, while reflecting real-world constraints of productivity and economics. (Christensen, 1981). Although no direct cost savings could be determined from the prescription intervention data and the intervention strategies implemented, such interventions can and would decrease patient morbidity and mortality, prevent extended hospitalizations, decrease the number of unnecessary medications, or promote the use of less expensive medications or routes of administration and result in cost savings to the hospital

4.10 DRUG-RELATED PROBLEMS SURVEILLANCE SYSTEMS

Two systems were devised. One for the reporting of medication errors, particularly during the dispensing process (Appendix 6) and an ADR reports system (Appendix 7). It is hoped that the health professional will find the time to utilise these forms to help document these problems. Then follow-up measures will be done to determine the cause of the problems and the necessary measures will be take to overcome them.

CHAPTER 5
CONCLUSIONS

A comprehensive analysis of data generated from this study on drug related problems and intervention strategies presented the following conclusions.

- A profile related to the elderly patient's medical history and pharmacotherapy was completed for each of the 281 patients (from the patients medical notes and by interviewing the patient or care-giver) for purposes of establishing whether the geriatric patient experienced, was experiencing or had the potential to experience DRPs. To achieve this objective a patient information profile (Appendix 1) was developed.

- General trends of prescribing patterns, prevalence of DRPs and the prescribed inappropriate medication were established and included the following:

(a) Most of the elderly patients suffered from multiple, chronic conditions and took an approximate of 1728 medicines.

(b) The most common chronic conditions experienced by these elderly patients were hypertension (64.8%) followed by ischaemic heart disease (43.8%), musculoskeletal disorders (arthritis or gout) (42.7%), diabetes (29.2%), chronic obstructive airways disease (13.2%), hypercholesteremia (11.7%) and arrthymias (11.0%).

(c) Only 12% of the elderly patients received from one to three drugs. Polypharmacy was evident in the great number of patients (57.7%) receiving four to six drugs, 32.4% receiving 7 to 9 drugs and 5.7% receiving ten to fifteen drugs.

(d) Anti-hypertensives were by far the most commonly prescribed drugs (15.8%) and for this reason they caused the largest number of adverse reactions (29.1%) of the total ADRs.

(e) A total of 223 ADRs were reported by the elderly patients, either with their currently prescribed medicines or drug treatment for the last six months. The highest incidence of adverse effects was due to the ace-inhibitors (41), NSAIDs (26), and diuretic (25) and vasodilators (14).

(f) Only 19 patients (6.8%) were not experiencing any DRPs related to the medication they were taking presently. The remaining 262 patients (93.2%) experienced from 1 to 11 DRPs. These elderly patients experienced 856 **actual** DRPs in total on their current chronic drug treatment.

(g) In **total** 954 actual, previous and potential DRPs were experienced by these geriatric patients. The most common DRPs were problems on:

- safety of the prescribed medicines (56.6%),
- effectiveness of drug therapy (20.8%),
- compliance (7.8%),
- indication of drug therapy (7.6%).

In addition prescribing information omission accounted for 3.1% of the DRPs followed by 2% each for prescribing errors and problems related to monitoring of drug therapy respectively.

- Interventions of problem prescriptions, based on the newly developed PIF (Appendix 2) reflected that:
  - 31.0% of prescriptions required active pharmacist intervention to correct or resolve a DRP; in total there were 189 prescription interventions.
  - The greatest number of interventions involved monitoring of drug therapy (26.9%), followed by the 26.5% of interventions on safety of prescribed drugs, 17.5% on indication of drug therapy, 15.3% on prescribing errors, 11.1% on prescription information omission and 2.6% of interventions on a more effective medicine being available.
  - The greatest numbers of interventions were associated with products acting on the cardiovascular and central nervous system.

- The development and implementation of suitable intervention strategies to minimise DRPs were as follows:

(1) A compliance information leaflet (Appendix 3) for geriatric patients was designed and distributed to 100 geriatric outpatients. Approximately 98% of the elderly patients found the leaflet helpful with regard to their drug treatment, although 89% did indicate that they knew most of the information in the leaflet. The leaflet

did help re-inforce the importance of compliance and the importance of patients to be well informed of their drug treatment.

(2) An advisory guideline for the health care workers regarding prescribing for the geriatric patients was compiled to assist with rational prescribing and overcoming inappropriate prescribing.

(3) A protocol for counseling in-patients was devised and this was implemented in one of the medical wards at Addington Hospital. The potential benefits of counselling in-patients on their medication have been indicated in section 4.9.2. The preliminary study was done with the purpose of implementing counseling of discharged patients, as part of the ward pharmacist's duty. Unfortunately due to limitations of time and staffing, this was not possible.

The intervention strategies used in the study were demonstrably effective, but a continuous programme of education may be necessary to limit DRPs. These have been discussed in the chapter on recommendations to overcome DRPs.

- A medication error report and an ADR reporting form were devised for surveillance of DRPs at Addington Hospital (Appendix 4).

Finally, the number of geriatric patients included in this study limits generalization of results to all geriatric patients. Clearly, Addington Hospital cannot represent all of the public sector hospitals, nor can a sample of 281 geriatric patients represent all geriatrics. However, the evidence is clear that, at least in this sample, a significant number of geriatric patients experienced DRPs as is consistent in literature findings and although the intervention strategies were demonstrably effective in this study, a need definitely exists to implement these strategies and devise other strategies to minimise or resolve these problems. The results of the study reinforce the need for the pharmacist's contribution during the process of providing pharmaceutical care for elderly patients.

LIMITATIONS OF THE STUDY

- This report refers to a highly selected sample of elderly people who visited selected outpatient departments at Addington Hospital. Despite the obvious bias, these findings yield some indication of prescribing patterns for elderly patients and the associated risk of developing drug related problems.

- There are definite economic benefits of prescription interventions. However, for the scope of this study it was not possible to do a cost analysis of DRPs and cost savings of prescription interventions. This would have yielded important pharmaco-economic information for the health policy makers and can form the basis of a possible future study.

- An assessment of the impact of counseling interventions, in terms of changed compliance rates, was considered beyond the scope of the study and was not assessed. However, the benefits of counselling are known to be effective in improving patient compliance.

- Due to time constraints it was not possible to do a follow up of all the prescription interventions and to assess the therapeutic benefits to the patient. Counseling of discharged patients and the medication error reporting were the only intervention strategies that had a follow-up on its progress. The other strategies did not have a follow up.

- Although, the prescribing guidelines were formulated, due to lack of time and resources it was not possible to disseminate them and assess their effectiveness in minimizing DRPs in geriatrics. However, this may be done in a future study.

CHAPTER 6

RECOMMENDATIONS

6.1 GENERAL RECOMMENDATIONS ON STRATEGIES TO OVERCOME DRPs IN GERIATRICS

As indicated in this study, a number of strategies may be developed to lower the risk of DRPs for the elderly. These include:

- Developing a ***revised patient profile*** based on the outcome of this study to be used routinely for counseling patients who are at risk of DRPs, at Addington hospital or any other institution.

- The comprehensive ***documentation and recording of clinical pharmacist intervention*** is essential, as it is the only record, which describes the input that the clinical pharmacist has to improve the patient's drug therapy and health care. The significant level of pharmacist-initiated interventions, in this study illustrates their professional input as part of the health care team, and shows the value of pharmacists' contribution to the benefit of the elderly patient in overseeing the monitoring of drug therapy. These intervention strategies needs to be further developed and extended to other health institutions. This helps to document the process, measure and evaluate to collect evidence of the value added through pharmaceutical care. Records of interventions may also provide data for quality assurance programs, drug utilisation review, peer activities and educational bulletins.

- ***Improve patient counseling and patient education***. More active pharmacist participation is to listen and explain (educate) more to benefit our patients. Patient counseling leaflets are an important source of drug information to patients. The leaflet utilised in this study, was demonstrably effective but has the potential to be modified in terms of the language and visual presentation, for routine distribution to all first-time patients at Addington Hospital and other health care settings. In addition, if the leaflets were to be distributed in the semi-rural and rural areas the leaflet would need to be written in a simpler, easily understandable language e.g. Zulu accompanied by supporting pictures or diagrams.

- ***Compliance aids*** like a dosing chart must be devised and implemented for patients, especially for geriatric patients, to record after taking medication to avoid repeated dosing of the same medication and forgetting to take the medicines. Currently there are none available at Addington Hospital.

- ***Guidelines on developing prescribing information*** for elderly will result in better physician education on the care of geriatric patients. This will help to reduce inappropriate prescribing and encourage rational and effective prescribing. The prescribing guidelines that were formulated, has the potential to be further developed and distributed routinely to pharmacists and prescribers at Addington Hospital as well as other public sector facilities. A further recommendation is an oral presentation to pharmacists and medical practitioners on the important findings of this study.

- It is clear that healthcare providers get insufficient ***continuing education***, and it seems that the most impactful, is that provided directly or indirectly by the pharmaceutical industry (Mallet, 1996). Regular professional development programmes should be organised with the assistance of the pharmaceutical industry to ensure that pharmacists and prescribers are kept up to date with the latest drug products. This will assist with improved prescribing patterns.

  It is difficult for busy health professionals to keep up with trends in therapeutics and research findings, often published in highly specialised journals. Therefore, as a recommendation to Addington Hospital and to other hospitals, a quarterly bulletin should be established as a source of regular drug information and a means for continuing education, for medical practitioners and pharmacists.

- Healthcare providers need to be better informed about ***supplementary healthcare approaches***, so that they can be discussed intelligently with the patients, and recommended when warranted. In addition, in keeping with the guidelines of the EDL, prescribers should follow the recommendations of non-drug treatment before commencing drug treatment for any medical condition. This will help to decrease the incidence of DRPs.

- Although this study focussed on geriatric patients at a public sector hospital, strategies to overcome DRPs need not be limited to this practice setting only. ***Services can be developed in the community*** to address the DRPs geriatric patient's experience in several ways. These include conducting repeat prescribing medication reviews in the general practitioners surgery, visiting patients at home, providing individual patient care to those in nursing homes, and the introduction of local "brown bag" schemes in the pharmacy, where patients are invited to bring in their medication for systematic pharmacy review (Hudson, 1997). A dedicated community pharmacist may be involved in making sure that geriatric patients take their medication and remember to refill the prescription by paying some regular visits and organizing open days by educating older people about their medicines.

6.2 RECOMMENDATIONS TO ADDINGTON HOSPITAL AND THE PHARMACEUTICAL SERVICES

The findings of this study maybe meaningful for health service providers and planners in their responsibilities to design improve and allocate resources efficiently, for geriatric health care.

Therefore, the following specific recommendations have been proposed:

- ***Counseling of patients on their medicines***

This study revealed that there is a definite lack of counseling of patients on medication use and this is responsible for a number of DRPs. The pharmacy outpatients department at Addington Hospital has now been allocated a patient counseling. This consultation area was developed and used to interview and counsel patients during the study. A recommendation will be forwarded to the administrators of Addington Hospital to allocate resources that will allow these facilities to be used to service patients experiencing DRPs or requiring information on their drug therapy.

This service will help detect and minimise DRPs, and improve the quality of care of patients.

The Heads of Pharmaceutical Services in all provinces would be approached to review the whole procedure of dispensing in the public sector hospitals especially with regard to counseling of patients on their medication: Although, the South African Council (SAPC) has already recognised this shortcoming, they should be involved in more discussions regarding inadequacies in the public sector in the above regard and implement practical protocols regarding counseling in the public sector.

- ***Hospital discharge information***

Hospital pharmacies vary in the type of written information given to patients at discharge. Providing geriatric patients with patient information leaflets or a copy of the discharge prescription and/or a handwritten compliance chart will decrease the incidence of DRPs once the patient leaves the hospital. This was illustrated in a study conducted by Cromarty in 1998. Following a project conducted by Cromarty, the pharmacy information letter used in the controlled trial was modified and is now computer-generated for all patients discharged from care of the elderly wards at Woodend hospital, Aberdeen (Cromarty, 1998). Provision of a computer-generated compliance chart, on discharge will provide pharmaceutical care to the patient or caregiver, efficiently and effectively within the constraints of time and human resources. Athough, this may involve excessive initial costs the long-term benefits in drug therapy and cost savings will be tremendous. The Administrators at Addington Hospital and the Pharmaceutical Services of South Africa need to address this recommendation.

- ***Medication error and ADR reporting***

The study revealed a high incidence of DRPs and medication errors among geriatric patients and this could well be extrapolated to all patients, not only at Addington Hospital but also at other public sector facilities. Addington Hospital has instituted means of reporting these errors and an ADR reporting system has been devised (Appendix 4), which can be implemented at other public sector hospitals. The administrators at Addington Hospital must develop protocols to ensure that these reporting systems are used. The Heads of Pharmaceutical Services in all provinces are urged to review the policy concerning reporting of DRPs and medication errors in hospitals under their control. Most importantly prescribers must report and monitor any uncommon adverse effect, to the therapeutic committee, that is not documented on the package insert. This information needs to then be relayed to the Medicine control council (MCC) via their ADR centre in Cape Town.

The researcher would submit a summary of this study with recommendations for the attention of Addington Hospital, The Pharmaceutical Services of South Africa and SAPC.

6.3 FUTURE RESEARCH

Essential National Health Research (ENHR) will address South Africa's priority health problems by targeting research on local and national health problems of which DRPs, particularly in the elderly, is one of the major ones. ENHR is, in effect, a strategy for setting priorities and managing and developing South Africa's resources for health research. It depends crucially on working partnerships between researchers; health service policy-makers, managers and providers; and communities. The idea is not that priorities will be set purely at national level, but rather that national priorities will be formed from an 'upward synthesis' of local, district and provincial concerns (Katzenellenbogen *et al.*, 1997). With regard to DRPs and the elderly the following are some recommendations for essential future research which will empower public health policy decisions.

- Efforts to investigate the incidence and nature of DRPs among geriatrics in other organized health care settings using comparable methodologies, for example, nursing homes and in community pharmacies. Investigations of DRPs in the community practice setting have been few. It would be useful to know, for example, how the ability of pharmacists to identify and resolve DRPs in the community pharmacy, where pharmacists do not have easy access to more comprehensive decision relevant information such as patient charts, which is easily accessible in hospitals. Also, prescribers are not easily accessible in community practice settings.

- In addition, it will be interesting to conduct a study of DRPs among geriatric in-patients, to determine the incidence of DRPs in elderly patients admitted to hospital. Also to assess the contribution of the DRPs identified to hospital admission and the proportion of DRPs perceived as preventable.

- More drug utilization studies and outcome research programmes in geriatrics need to be done on a larger scale involving a larger sample population from different health settings (private sector versus the public sector). These findings will assist health service policy-makers for improving prescribing guidelines in geriatrics.

- This geriatric study highlighted the good advantages of collaboration between an academic research institution (University of Durban Westville) and a public sector health facility (Addington Hospital), for the benefit of patients and public health policy makers. More research involving closer collaboration and networking between academic institutions and other health care professionals and organisations be encouraged, supported and promoted.

A host of challenges lies ahead for the new generation of public health practitioners and researchers in addressing DRPs among geriatric patients. Also for policy-makers, managers and providers of healthcare to recognise and implement suitable strategies to minimise these DRPs and improve the quality of care that the elderly receive.

CHAPTER 7

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APPENDIX 1

Counselling Procedure
Patient Consent
Patient Profile

THIS INTERVIEW IS CONFIDENTIAL AND ANONYMOUS

Dear Patient,

You have been selected to be part of an intervention study being conducted at the pharmacy outpatients department at Addington Hospital. This will entail being interviewed and counseled on your medication for today only. The purpose of this is to determine whether you are experiencing any problems with your medicines, and to assist you in overcoming any of these problems should they exist.

Your assistance will be appreciated in carrying out the following procedure:

1. After consultation with the doctor, you will proceed to the pharmacy and hand in your medical file at the priority WINDOW 5.
2. You will wait to be interviewed outside Window 5.
3. When your name is called you will be directed to the PATIENT COUNSELING ROOM, where you will be interviewed.
4. While you are waiting your medicines, on the current prescription will be prepared.
5. At the interview you will be counseled and receive your medicines.

All information revealed will be treated in strict confidence and will be used for study purposes only.

Your patience and co-operation will be acknowledged and we hope that you have benefited from being part of this important study

PATIENT CONSENT FORM

I, ____

(Name)

Of____

(Address)

Have had the study explained to me, and hereby give permission to be interviewed and counseled, by the pharmacist.

This is an independent decision made by myself.

SIGNED: ______________________ DATE: ________________

____

WITNESS

PATIENT HOSPITAL NUMBER: ______________________

PATIENT PROFILE

NAME: ______________________ **ADDRESS:** ______________________

UNIT NUMBER: ______________________ ______________________

DATE: ______________________ ______________________

HEIGHT (m): ______________________ **PHONE:** ______________________

SECTION A : GENERAL CHARACTERISTICS

1. PATIENT DEMOGRAPHICS:

1.1 Age:__________________**(years)** **Date of birth:**________________

1.2 Gender:________________

1.3 Race: ____________________

2. PATIENT'S BACKGROUND AND SOCIO-ECONOMIC STATUS

2.1 Is the patient assisted by a caregiver when attending the hospital?

YES	
NO	

2.2 Level of education:____

2.3 Indicate first language:

FIRST LANGUAGE	READ	WRITE	SPEAK
English			
Afrikaans			
Zulu / Xhosa			
Other, specify			

2.4 Do you experience any problems in reading or writing?

PROBLEM	YES	NO
Reading		
Writing		

2.5 Employment Status: ______________________

2.6 Marital Status: ______________________

2.7 FAMILY HISTORY AND LIFE SITUATION

2.7.1 Do you live alone?

YES	
NO	

2.7.2 Where do you live? ______________________

2.8.1 Do you have someone who takes care of you?

YES	
NO	

2.8.2 If YES, specify who takes care of you: ______________________

2.9 LIFESTYLE/ ACTIVITY (HABITS)

HABITS	YES	NO	DESCRIBE/QUANTITY
Alcohol			
Tobacco			
Recreational drug use			
Coffee/tea-caffeine			
Sleeping difficulty			
Exercise			

SECTION B : DISEASE PROCESS (ES)

3.1 Present Medical Problems:

A.CHRONIC CONDITIONS	SEVERITY	PROGNOSIS
B. ACUTE CONDITIONS	**SEVERITY**	**PROGNOSIS**

3.2 Presenting complaints or symptoms: ______________________________

____

____

3.3 Impairments / Disabilities:

IMPAIRMENT	SEVERITY	AIDS/APPLIANCES/PROSTHESIS
Vision		
Hearing		
Mobility		
Speech		
Other (specify)		

3.4 COGNITIVE FUNCTION (MEMORY):
How often does your memory fail you?

Often	
Sometimes	
Rarely	
Never	

3.5 PAST MEDICAL HISTORY

3.5.1 Past medical conditions:

____

____

3.5.2 Past operations or procedures:

____

____

3.5.3 Previous Hospitalization:

YES	
NO	

DETAILS:

____

____

____

3.6 Preventative therapy for medical condition

	DRUG NAME	MEDICAL INDICATION
1		
2		

3.7 NUTRITIONAL STATUS

3.7.1 WEIGHT: __________(kg) NORMAL ☐ GAIN ☐ LOSS ☐

COMMENT (S): ____

3.7.2 DIET: REGULAR ☐ SPECIAL ☐

COMMENT (S): ____

3.8.1Dysphagia (Difficulty swallowing):

YES	
NO	

3.8.2 Is the patient on medication affecting his or her appetite?

YES	
NO	

SECTION C : PHARMACOTHERAPY (CURRENT AND PAST MEDICATION HISTORY)

4.1 PRESENT PHARMACOTHERAPY ⇒ CURRENT PRESCRIPTION

	DRUG PRODUCT NAME, DOSE, ROUTE AND FREQUENCY	COMMENTS Efficacy, adverse effects or compliance
1		
2		
3		
4		
5		
6		
7		
8		
9		

COMMENTS:____

____

____

CLINIC ATTENDED: ________________ FOLLOW UP VISIT: ______________

PRESCRIBER CLASSIFICATION: __________________________

4.2. Other prescribed medication that the patient is taking currently for other medical conditions diagnosed at the hospital:

	DRUG PRODUCT NAME, DOSE, ROUTE AND FREQUENCY	COMMENTS Efficacy, adverse effects or compliance
1		
2		
3		
4		
5		
6		
7		
8		
9		

CLINIC (S) ATTENDED: ____

COMMENTS: ____

____

4.3 OTHER MEDICATIONS AND FORMS OF TREATMENT

4.3.1 Are you taking or using any other prescribed medication?

YES	
NO	

If YES, specify drug-product, indication and source:

1. ____
2. ____

4.3.2Are you taking or using any non-prescription (OTC) drugs other than those prescribed?

YES	
NO	

If YES, specify drug product and indication:

1. ____
2. ____
3. ____

4.3.3 Do you take any vitamins, minerals or other supplements other than those prescribed?

YES	
NO	

If YES, specify product:

1. ______________________________
2. ______________________________

4.3.4 Do you take or use any herbal or home remedies or traditional medicines?

YES	
NO	

If YES, name of remedy:

1. ______________________________
2. ______________________________

4.4 **ALLERGIES / REACTIONS (include food and topical agents as well as medications)**
Indicate agent, reaction and treatment of allergic reaction (s):

____

____

____

5. SIDE-EFFECTS OF DRUG THERAPY

5.1 Have you experienced any bad effects, when taking any of the your medicines (both current and past medicines)?

YES	
NO	

5.2 If YES, specify side effects:

	DRUG PRODUCT (S) NAME	SIDE-EFFECTS	ACTION
1			
2			
3			
4			
5			

5.2 Have you discussed the side effects of your medicines with your doctor?

YES	
NO	

5.3.1 If YES, specify what action was taken to relieve the side effect(s) caused by the medication? Indicate the action taken to relieve side effects in 5.2.

(1) Reduce the dose
(2) Discontinue drug therapy
(3) Change to another drug or brand
(4) Prescribe medication
(5) Other, specify

5.3.2 If , NO indicate reason for not informing the doctor of the bad effect:

____

____

6. MEDICINE KNOWLEDGE AND COMPLIANCE

6.1 Do you take your medicine on your own (self-administer) or do you have a caregiver to help you (assisted)?

SELF-ADMINISTER	
ASSISTED	

6.2 Were you advised to follow certain verbal / written directions or precautions regarding your drug therapy?

COUNSELING	YES	NO
VERBAL		
WRITTEN		

6.3 Do you know when, how and in what quantity each medicine (s) drug should be taken or used?

YES	
NO	

If NO, specify the medicines you do not know how to take:

	DRUG NAME	QUANTITY	WHEN	HOW
1				
2				
3				
4				
5				

COMMENTS:____

____

____

6.4 Have you experienced any of the following problems with your specific medicines?

	DRUG NAME	PROBLEM(S)
1		
2		
3		
4		

A. Not knowing its medical indication
B. Not taking or using the medicine prescribed
C. Taking or using too little of the prescribed medicine
D. Taking or using too much of the prescribed medicine
E. Other, specify

6.5 Did you ever not keep a clinic appointment or collect your medicines, including your monthly repeat medicines?

	YES	NO
Clinic appointment		
Colleet medicines		

REASON (S): ____

____

6.6 What is the reason(s) for the problems you are experiencing with your drug treatment?
REASON (S): ____

____

____

6.7.1 Do you require any educational effort or compliance aids?

YES	
NO	

6.7.2 If YES, specify type of complianee aid:

A	Verhal counseling	
B	Written counseling	
C	Other	

SECTION D : DRUG TREATMENT ANALYSIS

7. **RISK FACTORS FOR A DRUG RELATED PROBLEM:**

8. **IS THERE AN ACTUAL OR POTENTIAL DRUG RELATED PROBLEM?**

YES	
NO	

If YES, EXPLAIN:

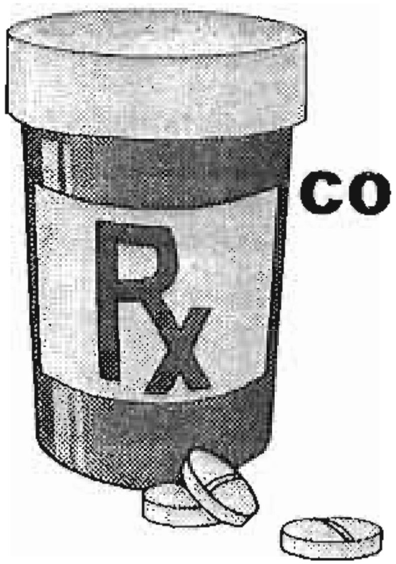
9. **PHARMACIST ACTIONS TO OVERCOME DRUG RELATED PROBLEM(S):**

10. **THERAPEUTIC AND OR ECONOMIC BENEFIT OF INTERVENTION:**

APPENDIX 2

Prescription Intervention Form

Taking your medicine on time and correctly, results in better health



WHAT IS COMPLIANCE?

When you take your medication as directed by your doctor this includes your ability to do the following:

- Attend clinic appointments as you are told by your doctor
- Take medication as prescribed
- Exercise regularly
- Complete recommended investigations eg. blood test

Eventually, it is you the patient who decides on a daily basis whether or not to take any medication as prescribed. Remember those patients who stick to their treatment have better health outcomes than those who don't! Those patients who are not compliant, experience poor health.

SOME DO 'S AND DON'TS ABOUT YOUR MEDICINE

DO

- Tell all the doctors you visit about all medicines you are taking or using. This includes medicines prescribed from other clinics in the hospital, those from a private doctor, and medicines you may have bought over the counter at a retail pharmacy or any household remedies.. This will help prevent duplicate treatment or dangerous interactions of various medicines.
- Make sure that you understand why your doctor has prescribed a particular medicine and what benefits you can expect from the treatment.
- Tell your doctor if you have not taken your medicine for any reason.
- Ask for how long you should continue to take the medicine
- Ask if you should stop taking the medicine if you are feeling better.
- Tell your doctor if you are allergic to any medication (experience a bad reaction eg. rash when taking certain medicines e.g antibiotics)
- Tell your doctor if you have any side effects (Running stomach, vomitting, dizziness, headaches, coughing etc) when taking a particular medicine.

- Check the expiry date on the medicine and hand in expired or unused medicines to the pharmacy
- Keep your medicine container closed at all times and away from children.

DON'TS

- Do not start taking any medicine again after a long time without consulting your doctor. The symptoms may be due to illness entirely different from the one for which the medicine was prescribed.
- Do not keep medicine on your bedside table. There is much risk of taking either the wrong medicine or a overdose of the right one when you are half-asleep.
- Do not share your medicines with someone else or borrow from anybody.
- Do not change the container of your medicine . which you receive them . This will avoid possib confusion with your medicines.
- Do not mix different medicines especially tablets i one container
- Do not store medicines in the bathroom cabinet, but i the cool dry place.
- Do not take medicine with alcohol.

USEFUL HINTS TO HELP YOU REMEMBER TO TAKE YOUR MEDICINE

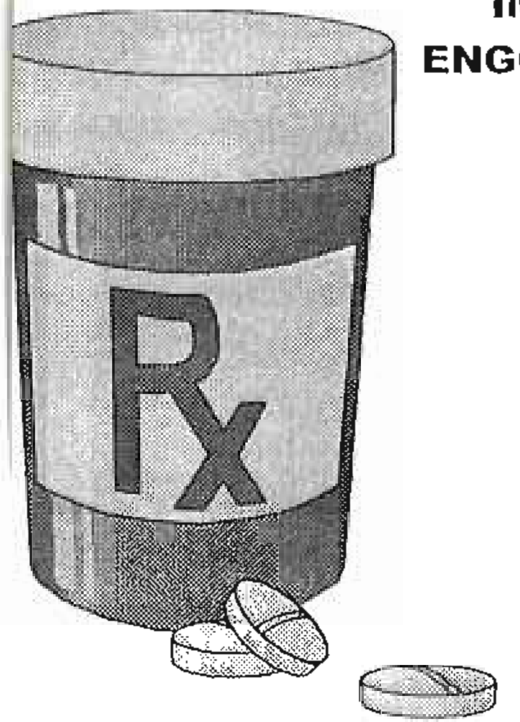
- Use whatever memory aids you find useful to help you remember to take your medicine regularly as prescribed e g you may use a calendar or chart on which you can tick off each dose of every medicine as you take it
- Make sure that all the containers are clearly labelled with the name of the medicine and times of dosing.
- Write the name of the medical condition on the relevant container to avoid confusion if you are taking different medicines for different illnesses e.g diabetes(sugar), high blood pressure.
- It is important to maintain a medication record card, which you should show to the doctor at each visit.

REMEMBER

You should not be shy or afraid to ask your doctor or pharmacist anything about your illness or your medicines. The better informed you are, the better you will feel about your health.

Compiled by Nomawethu & Jabulile UDW Pharmacy

UMPHUMELA WOKUTHATHA UMUTHI WAKHO NGESIKHATHI, IMPILO ENGCONO



KUYINI UKULANDELA IMIGOMO YINIKWE NGUDOKOTELA WAKHO? UMA UTHATHA IMITHI YAKHO NGENDLELA OYIYALELWE NGUDOKOTELA.

lokhu kuhambisane nokwazi ukwenza lokhu okulandelayo

Ukuya emtholampilo njengoba uyalelwe/ ngendlela otshelwe ngayo.

Ukuphuza imithi yakho ngendlela oyalelwe ngudokotela wakho.

Ukwenza ushintsho lwendlela yakho yokuphila njengalokho uyalelwe abazempilo isibonelo kuzilolonga.

- Ukuqedela uphando olwenzayo njengokuhlolwa kwegazi.
- Ekugcineni, nguwe wena ogulayo okumele ukhethe ukuthi uyawathatha amaphilisi noma umuthi wakho noma cha, njengoba uyalelwe ngudokotela wakho. Khumbula yilabo abazibophelelayo ekuthatheni imithi yabo ababa nemiphumela yempilo engcono ngempilo yabo kunalabo abangazibopheli

ONGAKWENZA NOKUNGAMELE UKUKWENZE

ONGAKWENZA

- Tshela bonke odokotela obavakashelayo ngemithi oyisebenzisayo lokhu kuhlanganisa imithi oyithole kudokotela wakho wakwemiye imithola mpilo nezibhedlela, udokotela ozimele , nemithi ozithengele yona kwasokhemisi wakho. Lokho kuzovimbela ukuphindeka kwemithi okungabanga ingozi uma ihlangana neminye imithi
- Tshela udokotela wakho ngemithi engezwani negazi lakho (njengokuthi ikumilisele amaqhuqhuva abangwa yimithi ethile isibonelo ipenicillin)
- Qiniseka ukuthi uyayazi inhloso yokuthatha la maphilisi, nemiphumela yokuthatha lamaphilisi.
- Tshela udokotela wakho uma uhlangabezana nenkinga uma usebenzise imithi yakho (isibonelo ukuhlanza,uhudo, Isiyezi,ukuphathwa yikhanda, ukukhohlela nokunye) uma uthatha loyo muthi.

- Tshela udokotela wakho ngemithi ongayithathanga nezizathu zokungayithathi.
- Buza ukuthi kulungile yini ukuthatha imithi yakho ngesikhathi esisodwa nokudla noma neminye imithi oyisebenzisayo.
- Buza ukuthi kumele uyithathe isikhathi esingakanani imithi yakho, nokuthi kumele uyiyeke yini uma usuzizwa ngcono
- Yazi ilanga umuthi wakho owonakala ngalo, ubuyisele leyo seyonakele kusokhemisi wakho
- Gcina isitsha semithi yakho sivalekile ngaso sonke isikhathi futhi uyigcine ekudeni nezingane.

OKUNGAMELE UKWENZE

- Ungathathi umuthi emva kwesikhathi eside uma ubungasawusebenzisi ngaphandle kokuthintana nodokotela wakho. Izimpawu zokugula kungaba ngezesinye isifo esihlukile kuleso esasikuphethe.
- Ungagcini imithi eduze kombhede wakho kunengozi yokuthi uma usuwozela uthathe umuthi okungawona noma uthathe uze weqise kuloyo okuyiwona
- Ungasebenzisani nomunye umuntu ngemithi yakho noma uboleke umuthi komunye umuntu.
- Ungashintshi isitsha obunikwe ngaso amaphilisi akho ukuze uvimbele ukudideka.
- Ungaxubi amaphilisi ahlukene esitsheni esisodwa.
- Ungagcini amphilisi akho endlini yokugezela futhi ungashiyi isitsha sawo sivuliwe emva kokuwasebenzisa.
- Ungaphuzi utshwala uma usebenzisa umuthi namaphilisi akho.

INDLELA ENGCONO YOKUKHUMBULA UKUTHATHA IMITHI YAKHO

Sebenzisa noma ngabe iyiphi indlela engcono yokukhumbula ukuthatha imithi yakho, isibonelo ungasebenzisa ikhalenda ukuba umakhe amaphilisi osuwathathile.

- Qikelela ukuthi isitsha somuthi sibhalwe amagama emithi yakho nezikhathi nendlela okumele uthathe ngayo amaphilisi akho.
- Bhala igama lesifo esikuphethe esitsheni samaphilisi aso ukuze uvikele ukusebenzisa amaphilisi okungewona esifeni okungesona.
- Kubalulekile ukuthi ugcine ikhadi lakho lemithi ukuze ukhombise udokotela wakho njalo uma umvakashela

KHUMBULA

Akumele ube namahloni noma wesabe ukubuza udokotela noma usokhemisi wakho noma ngabe yini ngesifo sakho, noma ngomuthi wakho.

PATIENT QUESTIONNAIRE

DATE: ______________________

PATIENT NUMBER: ______________________

AGE: ______________________

HOSPITAL NUMBER: ______________________

CLINIC ATTENDING: ______________________

MEDICAL CONDITION: ______________________

1. Did you read, the patient compliance leaflet?

YES		NO	

2. If yes, did you find the leaflet helpful ?

YES		NO	

3. Were all your queries/misunderstandings regarding your medicine answered/cleared?

YES		NO	

4. Did you learn anything from the leaflet?

YES		NO	

5. What did you learn ?

____

____

5. Comments

____

____

____

APPENDIX 4

Prescribing guidelines for geriatric patients

University of Durban Westville

University of Durban Westville

SCHOOL OF PHARMACY AND PHARMACOLOGY

Prescribing Guidelines for Geriatric Patients

PREFACE

Alarming demographic trends are forecast for South Africa and the elderly are going to represent a larger proportion of the population than ever before. The elderly people will be making ever-increasing demands upon our slender health resources. Therefore, everything possible must be done to reduce the load of unnecessary and preventable disability. Better prescribing for elderly patients certainly has the potential to reduce the number of drug-related problems experienced by these patients.

Of all prescription drugs taken by geriatric patients, it has been estimated that 25% may be unnecessary. In addition, most adverse drug effects in the elderly are not idiosyncratic but dose-related. These may be avoidable through careful titration of dosages and consistent monitoring. The suggested guidelines are an education tool to establish prescribing habits that optimise safe and effective use of drugs in the elderly.

PATHMA MOODLEY

MARCH 2000

Suggested guidelines in prescribing for geriatric patients

- Always obtain a comprehensive drug history, looking for prior drug related problems and ineffective drugs. Identify renal or hepatic malfunction and concomitant disease states. Identify drugs prescribed by other doctors and over the counter drug use.

- Identify your therapeutic goal and the anticipated duration of treatment before you prescribe any drug. Assess the necessity for instituting drug therapy.

- Formulate a therapeutic plan that includes the rationale behind the selection of drugs, the initial dose, the dosage titration, indications for adding an additional drug, and monitoring methods.

- When several therapeutic agents of equal efficacy are available choose the one:
  - least likely to cause adverse effects
  - lowest in cost
  - with the most convenient dosing schedule
  - least likely to exacerbate a coexisting disease state

- A number of variables will work to eliminate an alternative from being selected as the "best" solution.
  - allergies or toxicity the patient may have experienced
  - the drug's previous ineffectiveness in the patient,
  - the lack of appropriate monitoring services to ensure that the agent can be administered safely,
  - the patient's preferences or desire for a particular formulation, and
  - the cost of the therapeutic alternative.

- Try to rationalise and simplify therapy before introducing a new drug.
- When there is no urgency, initiate therapy with the lowest recommended dose or half the lowest recommended dose and increase later if necessary.
- Use as few drugs as possible.
- Use the least complicated dosage regimen to increase compliance.
- Make sure that the patient understands the dosage regimen to increase compliance.
- Avoid drugs with very long half-lives.

- When a drug with a low therapeutic index is being used, titrate the dose to pharmacological effect or serum drug level and carefully monitor the patient for signs or symptoms of adverse drug reactions.

- When prescribing a new drug for a patient, who is already on other medication, consider the risk of drug interactions.

- Know how to monitor a patient receiving a potent drug so that adverse effects can be identified early.

- Review the patient's therapy with each visit. Discontinue unnecessary drugs, those that are no longer indicated and drugs that failed to meet the therapeutic goal. Never assume that a drug once started should not be discontinued. If the need arises, do not hesitate to taper and or discontinue all medications and reassess the patient.

- Avoid the premature use in elderly patients of newly approved drugs. Often the clinical trials of these drugs are conducted in a young patient population and adequate information on drug effects in geriatric patients may not be available.

Guidelines to simplify a drug regimen to avoid polypharmacy

- Eliminate pharmacological duplication.
- Guard against prescribing a drug for a sign or symptom that is actually drug induced.
- Avoid combinations that augment side effects.
- Avoid combinations that duplicate therapy.
- Use monotherapy to manage multiple diseases where possible.
- Avoid drugs that can exacerbate the patient's other medical conditions.
- Decrease dose frequency.
- Choose the best medication for the patient, with the least frequent dosing interval.
- Consider sustained-release dosage forms (beware of cost).
- Review drugs regimen regularly and checks that the patient is taking the medication as prescribed.
- Check whether all agents are still needed.
- Check whether the regimen can be simplified.

As a rule: Use the fewest number of drugs or drug products with the fewest number of doses per day whenever possible, to reduce the incidence of noncompliance.

Some common contra-indications of drugs in patients

- NSAID's in gastropathy potentiates ulceration of GIT.
- Potassium supplements or potassium-sparing diuretics in nephropathy.
- Digoxin in heart attack.
- Benzodiazepines or barbiturates in history or evidence of depression.
- Diuretics in diabetes.
- Diuretics in patients with gout-diuretics increase serum uric acid levels, which can precipitate gout.
- Laxatives in intestinal disorders.
- Magnesium-containing antacids in renal impairment.
- Aluminium containing products in constipation.
- Anticholinergic drugs, such as hyoscine in closed angle glaucoma.
- Sympathomimetic decongestants in cardiovascular disease.
- ß- blockers in asthma.
- ß-blockers e.g. propranolol, atenolol in diabetes (Beta-blockers may mask symptoms of hypoglycaemia and may inhibit normal physiological response to hyopglycaemia).
- Amitripytiline in glaucoma.
- Amitriptyline or imipramine in cardiovascular disease (Reduced effect of certain antihypertensive agents. Pressor effect of directly acting sympathomimetics enhancing concomitant anticholinergic

Table 1. Adverse reactions caused by drugs in the elderly

ADRs caused by drugs in the elderly
Confusional States Hypnotics, tranquilizers, antidepressants, antipsychotics, anticholinergics (centrally acting), nonsteriodal antiiflammatory drugs, levodopa, bromocriptine, antidiabetics (hypoglycaemia), corticosteriods, digitalis glycosides, phenytoin, cimetidine
Depression Methyldopa, reserpine, beta-blockers, tranquilizers, levodopa, corticosteriods
Falls Hypnotics, tranquilizers, antidepressants, antipsychotics, antihistamines, carbamazepine, phenytoin, phenobarbital, all drugs liable to produce postural hypotension, glyceryl trinitrate
Postural Hypotension All antihypertensives, diuretics, antianginal drugs, beta-blockers, hypnotics, tranquilizers, antidepressants, antipsychotics, antihistamines, levodopa, bromocriptine.
Constipation Dextropropoxyphene, narcotic analgesics, diuretics, anticholinergics, disopyramide, verapamil, nifedipine, antidepressants, antipsychotics
Urinary Incontinence Diuretics, hypnotics, tranquilizers, antipsychotics, prazosin, labetalol, all drugs liable to produce fecal impaction, beta-blockers
Parkinsonism Antipsychotics, drugs for vertigo, methyldopa, reserpine, metoclopramide

Table 2. Drugs causing adverse drug reactions

Drugs	Common Adverse Drug Reactions
NSAIDs (Aspirin, Ibuprofen, Indomethacin)	Gastrointestinal repercussions to NSAID are common: dyspepsia, which may progress to frank peptic ulcers. They also markedly worsen reflux oesophagitis.
Psychotropic Drugs	The CNS is also much at risk: confusion, lethargy, even frank psychosis, (especially with Indomethacin) is not uncommon problems from the NSAIDs.
Benzodiazepines	They are associated with confusion, falls, ataxia, dementia, amnesia etc.
TCAs(Tricyclic antidepressant drugs)	Provoke excessive sedation, confusion, urinary-retention, postural hypotension, dry mouth, constipation and visual inacuity.
Neuroleptics	Cause dystonia, rigidity and tremors.
Lithium	Weakness, tremor, nausea, delirium.
Diuretics	Cause acute urinary-retention, severe incontinence and postural hypotension.
Calcium channel blockers	Decrease myocardial contractility.
Anticholinergics, Opioids, TCAs	Cause constipation.
Insulin	Hypoglycemia.
Aminophylline	Tachyarrhythmias.

Basic principles to avoid adverse drug reactions in geriatrics

- ***Give only essential drugs***

Examples of drugs that may not be necessary for older patients include: dipyridamole for angina, vitamin B12 for appetite stimulation, lipid -lowering drugs in certain cases, antihypertensives for persons with mild hypertension, and cathartics for bowel irregularity.

- ***Know the toxic interactions of drugs with low safety margins.***

Examples include anticoagulants, cardiac glycosides, antiarhythmics such as phenytoin, and potentially toxic antibiotics such as gentamycin.

- ***Know which drugs frequently interact with other medications.***

If you encounter such a 'trigger' drug in a patient's history or intend to prescribe one, be on the lookout for possible interaction. Trigger drugs include digoxin, hypnotics, lidocaine-like drugs, lithium, quinidine, theophylline, warfarin, and drugs with anticholinergic effects, including antihistamines.

- ***Know the interaction of drugs you commonly use.***

For example when prescribing for allergies, be aware of terfenadine-erythromycin interactions.

- ***Toxic interactions are more common with drugs metabolized in the liver than with those metabolized in the kidneys.***

Among potentially troublesome drugs metabolized by the liver are diazepam, chlordiazepoxide, flurazepam, alprazolam, theophylline and propranolol.

- ***Avoid using drugs with similar toxicity.***

Examples include aspirin with other NSAIDS or concurrent use of negative inotropes, constipating drugs, or psychoactive drugs.

- ***Find out if a drug causes the symptom or sign being treated.***

If this is likely, can you stop using that agent instead of encouraging polypharmacy? For example, nocturia exacerbated by use of a diuretic or patient's gout worsens due to a diuretic.

- ***Try to know all drugs your patient is taking.***

Have the patient bring in all medications. Ask about over-the counter medications and prescriptions by other current or former doctors.

- ***Define your clinical end-point.***

- ***Have you chosen the right clinical goal?*** For example to eradicate recurrent, asymptomatic bacteriuria in elderly women is often futile. Using potentially toxic antibiotics to achieve the goal may be wrong

- ***Remember the patient..*** Before you prescribe a drug, ask yourself if this patient can tolerate potential interactions or adverse effects. Does he have glaucoma or prostatism? Does she have osteoporosis, putting her at risk of a hip fracture in case of a fall?

Table 3. Common Drug-drug interactions causing a clinical effect

Affected Drug	Interacting drug / drug group	Clinical effect
Nifedipine	Isosorbide mononitrate	Enhanced hypotensive effect
Methyldopa	Frusemide and atenolol	Enhanced hypotensive effect
Frusemide	Nitrazepam	Enhanced hypotensive effect
Amitriptyline	Benzhexol	Enhanced anticholinergic effect
Digoxin	Nifedipine, Diltiazem, Verapamil	Digoxin toxicity

Table 4. Pharmacological drug-drug interaction cases

Drug entity	Interacts with
ACE – inhibitors (e.g. captopril)	Potassium sparing diuretics or Supplements
Thiazide diuretics	Potassium depleting agents
Insulin	Propranolol
Theophylline /cimetidine	Erythromycin (exceeding 5 days)
Digoxin	Diuretic (and no potassium Supplement)/ agarol/ quinidine/ Rifampicin/ sotalol/ Amiodarone/verapamil.
Warfarin	Aspirin/ Agarol®/ metronidazole/ Co-trimoxazole/ amiodarone
Potassium supplement	Potassium-sparing diuretic
Amiloride	Spironolacatone
Opioids	Rifampicin
Metronidazole	Alcohol
Oral hypoglycaemics	Nifedipine
Glibencamide, Glicazide, Tolbutamide	Aspirin
Dexamethasone	Rifampicin

Table 5. Drug interactions of moderate clinical significance

Drug entity	Interacts with
Salicylates (Salicylate-containing products)	Ulcerogenics(corticocosteriods, phenylbutazone) Probenecid or sulphinpyrazone
Sugar mellitus (Sugar-containing products)	Products used in diabetes (hypoglycaemics, insulin, urine-testing products)
Antacids (products with multivalent cations, i.e. antacids, sodium bicarbonate	Tetracylines Iron preparations Enteric coated products quinidine
Central nervous system depressants (narcotics, antihistamines, barbiturates, some tranquilizers, tricyclic antidepressants, systemic alcohol-containing products)	Barbiturates Narcotics Antihistamines Some tranquilizers Tricyclic antidepressants
Central nervous system stimulants e.g. Phenylephrine (products containing certain sympathomimetic agents)	Oral hypoglycaemics Monoamine oxidase (MAO) inhibitors Insulin Thyroid Other central nervous system stimulants
Pyridoxine	L-dopa

Table 6. **Management of common drug-drug interactions**

Affected Drug	Interacting Drug	Interaction	Management
Digoxin	ACE Inhibitors (Captopril)	Increase digoxin serum level by about 20-25%	It would be prudent to monitor concurrent use. Enalapril, Ramipril and lisinopril appear to be non-interacting alternatives.
	Diltiazem	An approximately 20% rise in digitoxin level and 20-85% rise in digoxin levels have been seen with use of both the drugs.	All patients on digoxin given diltiazem should be well monitored for the signs of over-digitilization and dose reduction should be made if necessary. Those most at risk are patients with digoxin levels near the top of the range
	Diuretics (potassium depleting) eg Furosemide, thiazides	It is generally believed that the potassium loss caused by the potassium depleting diuretics increases the toxicity of digitalis glycosides.	It is a common practice to give these diuretics with potassium supplement or potassium sparing diuretics.
	Verapamil	Serum digoxin levels are increased about 40% by concurrent use of 160mg verapamil and about 70% by 240mg verapamil or more used daily.	Digoxin toxicity may develop if the dosage is not reduced. Regular monitoring and dosage adjustment would seem necessary.
Nifedipine	Beta-blockers	Excessive hypotension and heart failure have been reported.	Patient should be monitored for any signs of excessive hypotension or cardiac depression.
Captopril	Diuretics(Amiloride)	A few patients may feel dizzy or lightheaded within an hour of taking the first dose and acute hypotension can occur. Hyperkalaemia is possible if potassium sparing diuretics or potassium supplements are used.	Withdrawal of diuretics and reduction in the dosage of captopril may be needed.
Thiazide	Digitalis glycoside	Potassium loss caused by diuretics increases the toxicity of the digitalis glycoside.	Potassium supplement should be given. An alternative is to use potassium-sparing diuretics such as triamterene and spironolactone.
Hypoglycaemics	NSAID's	Aspirin can also reduce insulin requirements of diabetics.	Hypoglycemic develops. Oral hypoglycaemics have to be increased.
	Beta Blockers	Propranolol, a beta adrenergic blocking drug precipitate hypoglycemia in insulin dependent diabetics	Clinicians should be aware of this interaction and warn patient of possibility.
	Diuretics (Furesomide,Thiazide)	They elevate blood sugar level in diabetics and prediabetic. Thiazide and chlorthalidone antagonize action of antidiabetic drugs particularly sulphonylureas.	Monitor patients for possible decreased diabetic control. It's necessary that a less diabetogenic diuretic should be substituted.
	Verapamil	Increased plasma level of glibenclamide.	Caution, avoid toxicity.

Table 7. Drug - alcohol interactions

Drug	Mechanism	Potential
Disulfiram	Inhibition of alcohol metabolism	Flushing, nausea, vomiting, Hypotension
Benzodiazepines (diazepam, chlordiazepoxide, flurazepam, alprazolam)	Decreased clearance	Increased CNS depression, decreased psychomotor skills
Barbiturates/sedatives (phenobarbital, secobarbital)	Inhibition of metabolism	Increased CNS depression
Stimulants (methylphenidate, caffeine, phentermine)		False sense of security
Antidepressants (amitriptiline, doxepin)	Additive	Increased sedation and psychomotor impairment
Aspirin / NSAIDs (Ibuprofen, naproxen)	Additive	Gastric mucosal damage, occult blood loss
Antihistamines (diphenhydramine, promethazinc)	Additive	Increased CNS depression
Narcotic analgesic (morphine, codeine, methadone)	Additive	Increased CNS depression, risk of respiratory depression
Anticoagulants (warfarin)	Decreased metabolism Increased metabolism	Acute intake increases warfarin effect Chronic intake decreases warfarin effect
Oral Hypoglycaemics and Insulin	Inhibition of gluconeogenesis Increased metabolism in chronic intake	Increased hypoglycaemia Decreased hypoglycaemic effect
Anticonvulsants (phenytoin)	Decreased metabolism in acute intake Increased metabolism in chronic	Increased anticonvulsant effect Decreased anticonvulsant effect intake
MAO Inhibitors	Disruption of tyramine metabolism	Increased CNS depression, risk of hypertensive crisis
Vasodilators (nitroglycerines, nitrates)	Additive	Potentiation of orthostatic hypotension

Table 8. Evidence-based prescription monitoring criteria for elderly patients

Rationale	Trigger drugs	Action
Therapeutic duplication	H_2-antagonist with proton pump Inhibitor	Stop one
Therapeutic antagonism	ß-agonist with ß-blocker (including topical ß-blocker)	Rationalise
Presumptively inappropriate drug	Glibencamide, chlorpropamid e	shorter acting hypoglycaemic
Stroke prevention	Digoxin	Aspirin or warfarin if no contraindications
Appropriate steriod use in airways obstruction monitoring	ß2-agonist	Assess steriod responsiveness by airways obstruction
Appropriateness of Benzodiazepine dose reduction.	Benzodiazepine	Consider contraindications e.g. falls. Withdraw or non-benzodiazepine.
Potentially inappropriate combination	ACE inhibitor with potassium sparing diuretics or potassium supplements	Serum potassium monitoring
Aspirin in cardiac Ischaemia	Nitrates (particularly Glyceryl trinitate)	Aspirin if no contraindications

MEDICATION APPROPRIATENESS INDEX

1. Is there an indication for the drug?
2. Is the medication effective for the condition?
3. Is the dosage correct?
4. Are the directions correct?
5. Are the directions practical?
6. Are there clinically significant drug-drug interactions?
7. Are there clinically significant drug-disease/condition interactions?
8. Is there unnecessary duplication with other drug(s)?
9. Is the duration of therapy acceptable?
10. Is the drug the least expensive alternative compared with others of equal utility?

APPENDIX 5

Counselling of in-patients on discharge medications

PROTOCOL: COUNSELLING OF IN-PATIENTS ON DISCHARGE MEDICATION

MOTIVATION

A study of drug related problems (DRPs) among geriatric outpatients conducted in March and April 1998 at Addington Hospital revealed that these DRPs might result in hospital admissions. Some of the common DRPs identified were inappropriate prescribing and poor compliance, which affects the clinical outcome of patients.

Pharmacists may contribute to general clinical outcome of the patient by ensuring successful drug therapy. The pharmacist can apply unique knowledge, skills, and tools to determine if a patient is experiencing potential or actual DRPs. The importance of the pharmacist involvement, functioning independently as well as collaborating with physicians, in DRP monitoring cannot be understated in the rising prevalence of iatrogenic disorders (i.e., adverse reactions to medications). When the pharmacist proceeds to resolve any actual DRPs, very specific, desired pharmacotherapeutic outcomes are identified for each patient's problems.

As an intervention strategy it was decided to implement counselling of in-patients on their medication to help minimise or reduce the incidence of DRPs.

OBJECTIVES

1. To initiate counselling of in-patients on their discharge medications.

2. To implement patient counselling as part of the ward pharmacists duty.

METHODOLOGY

Counselling of in-patients on their medicines has commenced as a preliminary study in 12B a medical ward. This pilot study allowed for refinement of the procedure and for initiation of medicine counselling as a duty for the ward pharmacists.

Patient counselling will ensure drug therapy monitoring, compliance and for reactive pharmacist intervention. The procedure to be followed:

- The pharmacist or pharmacist intern allocated to do the ward round will conduct the patient counseling. This will ensure monitoring of drug therapy during the patient's stay in the hospital.
- The pharmacist will collaborate with the sister-in-charge to establish which patients have been discharged and require counseling. NB. Patients will only be counseled once their discharge (TTO's) are ready and in the ward.
- Where there is a number of discharge patients priority will be given to those patients who have been admitted to hospital on a number of occasions, those with polypharmacy, drugs with narrow therapeutic indices e.g. digoxin, phenytoin, warfarin, and non-compliant patients.
- A patient profile (revised from the Geriatric study) has been devised, to assist and provide guidelines on counselling.
- Data can be obtained from in-patient and outpatient notes, references books and during the interview of the patient.
- Counselling should include directions, special precautions, and side effects. It is useful to supply the patient with written counseling information as well.
- Those patients that have been counselled will have their files labeled " patient counselled" to enable follow up as outpatients.
- The pharmacist must sign the register for counselling in the ward.

P.Moodley 23.05.99

PATIENT PROFILE

NAME: ____________________ **UNIT NUMBER:** ______________ **DATE:** _________

AGE: ____________________ **GENDER:** ____________________ **WEIGHT:** ______

DATE OF ADMISSION: ________________ **DATE OF DISCHARGE:** ____________________

DIAGNOSIS: ____

REASON (S) FOR ADMISSION: ____
____

HISTORY (MEDICAL AND SOCIAL): ____

ALLERGIES: ____

LAB TEST RESULTS: ____

COMPLIANCE ASSESSMENT: ____

CONCURRENT OTC AND OTHER PRESCRIBED MEDICATION: ________________________
____
____

INTERVENTION DETAILS: ____
____
____
____

COMMENTS: ____

FOLLOW UP: ____

DATE: ____________________ **WARD PHARMACIST:** ____________________

DRUG TREATMENT			
DRUG NAME	SIDE-EFFECTS	DRUG INTERACTIONS	SPECIAL PRECAUTIONS

PHARMACY INTERVENTION SHEET

TO: Dr. ________________________ **DATE:** ______________

FROM: Ward Pharmacist: ________________________

PHARMACY DEPARTMENT ADDINGTON HOSPITAL Ext. No. 241 or 413

WARD: ____________________

PATIENT NAME: ____________________ **HOSPITAL NUMBER:** __________

NATURE OF QUERY/REQUEST:

____

____

____

OUTCOME OF QUERY/REQUEST:

____

____

____

PATIENT COUNSELLING DISCHARGE LEAFLET

PATIENT'S NAME: ______________________ **UNIT NUMBER:** ____________

DISCHARGE MEDICATIONS:

APPENDIX 6

Medication error report

PHARMACY DEPARTMENT - ADDINGTON HOSPITAL

DISPENSING ERROR REPORT

TO BE COMPLETED BY THE PHARMACIST IN CHARGE OF THE OUT-PATIENTS DEPARTMENT OR DOCTOR / NURSING SISTER TO WHOM THE INCIDENT WAS REPORTED.
FORWARD THE COMPLETED FORM TO THE CHIEF PHARMACIST.

Date of report: .... Date of incident: ....

Name of patient: .... Hospital No. ....

<u>Nature of Error:</u>

Wrong item dispensed	☐	Item missing	☐
Wrong dose on label	☐	Items handed to wrong patient	☐
Wrong prescription dispensed	☐	Other	☐

If "other", please furnish details

....

....

....

Was any other patient affected? Yes / No. If yes, enter details below.
Name of patient: .... Hospital No. ....

<u>Outcome of error:</u>

....

....

....

....

<u>Remedial action:</u>

....

....

....

....

Chief Pharmacist: .... Date: ....

Delegated to: ....

<u>Resolution/Review:</u> by Chief Medical Superintendent

....

....

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APPENDIX 7

Report of a suspected adverse drug reaction

REPORT OF A SUSPECTED ADVERSE DRUG REACTION

As required by the Joint Commission on Accreditation of Hospitals, the Pharmacy and Therapeutics Committee maintains an adverse drug reaction review program Please complete this form and forward it to Pharmacy Service, if there is an unexpected adverse finding which possibly could be related to any medication the patient has received.

NOTE: ALL REPORTS WILL REMAIN CONFIDENTIAL FOR COMMITTEE AND QUALITY ASSURANCE REVIEW ONLY.

To be completed by the physician, or nurse, or pharmacist who suspects a drug reaction.

PATIENT'S NAME: ____________________ DIAGNOSIS: ____________________

LOCATION: ____________________ DATE OF ADMISSION: ____________

DATE OF POSSIBLE REACTION: ____________________

1. Brief description of suspected reaction: ____________________

____

____

____

2. Drug(s) suspected of causing reaction: ____________________

____

____

____

3. Did the ADR require any specific treatment? YES ☐ NO ☐
If YES, describe: ____

____

____

3. Did the reaction prolong he patients inpatient stay? YES ☐ NO ☐

If YES, describe: ____

____

4. Is there any residue consequences due to the reaction? YES ☐ NO ☐

If YES, describe: ____

____

____

____________________ Signature

____________ Date

APPENDIX 8

Microbiological test result

[redacted] 74
OPDC FEMALE
WHITE
DUTY DOCTOR

FOR ALL ENQUIRIES & FOLLOW-UP TESTS ON THIS PATIENT,QUOTE UNIT NO: 023440

98:MR000714R - 425258 COMP COLL: 98/03/16 1305 RECD: 98/03/16 1349 VAN DELLE
SOURCE: SPUTUM
COMMENT: CLINICAL INDICATION.BRONCHIECTASIS
WHICH ANTIBIOTICS ? AUGMENTIN
ORDERED: RESPIRATORY:MCS

RESPIRATORY:GRAM STAIN

FINAL:	Pus cells	:	(+++)
	Epithelial cells	:	(SCANTY)
	Gram negative bacilli	:	(++)
	Mixed oropharyngeal flora	:	(SCANTY)

AEROBIC CULTURE
FINAL: Klebsiella pneumoniae
BACTERIAL GROWTH: (++)

	K. pneumo.
	GRAM NEG S
Ampicillin	R
Tetracycl.	S
Cephradine	R
Chloramph.	R
Cotrimoxa.	R
Gentamicin	S
Cefuroxime	S
Cephamand.	R
Netilmicin	S
Augmentin	R
Amikacin	S
Cefotaxime	S

APPENDIX 9

Customised patient counselling leaflet

TAKING YOUR MEDICINES CORRECTLY RESULTS IN IMPROVED HEALTH!

Taking your medicines as directed includes:

- Attending clinic appointments as scheduled.
- Collecting medicines on time.
- Taking medicines as prescribed.

Remember those patients who comply to their treatment have better health outcomes than those who do not!

SOME DO'S AND DONT'S ABOUT YOUR MEDICINE

DO

- Tell all the doctors you visit about all the medicines you are taking or using. This will help prevent duplicate treatment or dangerous interactions of various medicines.
- Make sure that you understand why your doctor has prescribed a particular medicine and how the medicine is going to help you.
- Ask for how long you should continue to take the medicine and should you stop taking the medicine if you are feeling better.
- Ask when you should take the medicines in relation to food or with other medication?
- Tell your doctor if you have not taken your medicine for any reason.
- Tell your doctor if you are allergic to any medication (experience a bad reaction e.g. rash when taking certain medicines e.g. penicillin).
- Tell your doctor if you experience bad effects (nausea, vomiting, diarrhoea, dizziness, headaches, coughing etc) when taking a particular medicine.
- Check the expiry date on the medicine and hand inexpired or unused medicines to the pharmacy.
- Keep your medicine container closed at all times and away from children.

DON'T

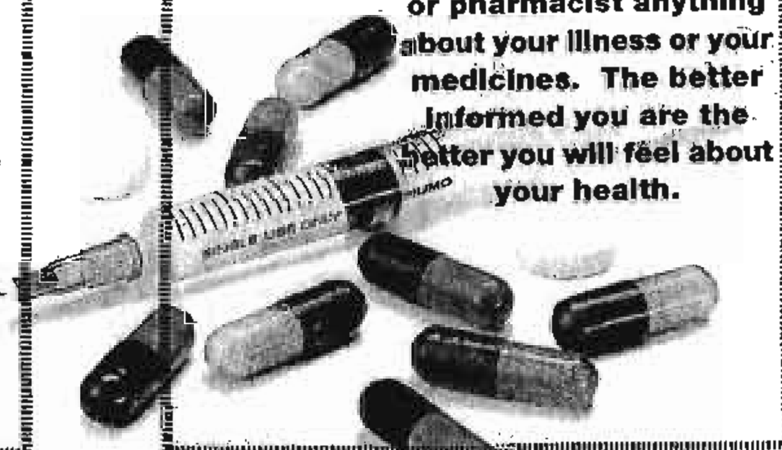
- Do not start taking any medicine again after a long time without consulting your doctor. The symptoms may due to illness entirely different from the one for which the medicine was prescribed.
- Do not keep medicine on your bedside table. There is much risk of taking either the wrong medicine or an overdose of the right one when you are half-asleep.
- Do not share your medicines with someone else or borrow from anybody.
- Do not change the container of your medicine in which you receive them. This will avoid possible confusion with your medicines.
- Do not mix different medicines especially tablets in one container.
- Do not store medicines in the bathroom cabinet, but in a cool dry place.
- Do not take medicines with alcohol.

USEFUL HINTS TO HELP YOU REMEMBER TO TAKE YOUR MEDICINE

- Use whatever memory aids you find useful to help you remember to take your medicine regularly as prescribed e.g. you may use a calendar on which you can tick off each dose of every medicine as you take it.
- Make sure that all the containers are clearly labelled with the name of the medicine and times of dosing.
- Write the name of the medical condition on the relevant container to avoid confusion if you are taking different medicines for different illnesses e.g. diabetes, high blood pressure.
- It is important to keep a medication record card, showing all the medicines you are taking.

REMEMBER

You should not be shy or afraid to ask your doctor or pharmacist anything about your illness or your medicines. The better informed you are the better you will feel about your health.



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UKUSEBENZISA IMITHI YAKHO NGENDLELA EFANELE KUBA NOMPHUMELA WEMPILO ENGCONO!

Ukusebenzisa imithi ngendlela otshelwe ngayo kubandakanya:

- Ukuhambela umtholampilo ngesikhathi esibekiwe.
- Ukulanda imithi ngesikhathi esibekiwe.
- Ukusebenzisa imithi njengoba kuhleliwe.

Khumbula iziguli eziyidlayo imithi yazo zinemiphumela emihle yempilo yazo kunalezo ezingayidlil

OKUFANELE UKWENZE NOKUFANELE UNGAKWENZI NGEMITHI YAKHO

OKUFANELE UKWENZE

- Batshele odokotela bonke ukuthi uze ngemithi yonke oyisebenzisayo. Loku kuzokusiza ukuthi kungaphindeki unyango noma kuhlangane imithi eyingozi.
- Qiniseka ngokuthi wazi ukuthi kungani udokotela ekuhlelele lowo muthi nokuthi umuthi uzokusiza ngani.
- Buza ukuthi uzowusebenzisa isikhathi esingakanani umuthi nokuthi kufanele uyeke yini ukusebenzisa umuthi uma uzizwa ungcono.
- Buza ukuthi ungawusebenzisa nini umuthi uma uqhathanisa nokudla kanye neminye imithi?
- Tshela udokotela uma ungawusebenzisanga umuthi ngesikhathi esithile.
- Tshela udokotela wakho uma unesihlungu sanoma yimuphi umuthi (uba nokufhile isibonelo: uyaqubuka uma esebenzisa imithi ethile isib: Penicillin).
- Tshela udokotela wakho uma uba (nomongoziya, ukubuyisa, isisu esihambisayo, ukuba nesiyezi, ikhanda, ukukhwehlela njll).
- Bhekisisa usuku oluwuphawu lokuthi umuthi usangasetshenziswa, kuthi lowo osuphelelwe isikhathi noma ongasebenzanga uwuyise kubagayimithi.
- Qikelela ukuthi isitsha somuthi sihlale sivaliwe futhi sikude nabantwana.

Okufanele ungakwenzi

- Musa ukusebenzisa imithi emva kwesikhathi eside kade ungayisebenzisi ngaphandle kokubonisana nodokotela. Izimpawu kungaba ezesifo esihlukile kunaleso imithi eyayilungiselelwe sona.
- Musa ukubeka imithi eduzane nombhede. Kunengozi yokuthatha umuthi okungesiwo noma uwusebenzise ngokweqile ngenxa yobuthongo.
- Musa ukusebenzisa imithi yakho nomunye umuntu, noma ukuboleka omunye umuntu.
- Musa ukushintsha into okufakwe kuyo imithi oyinikeziwe. Lokhu kuvimbela ukuthi ungaphambanisi imithi yakho.
- Musa ukuhlanganisa amaphilisi ahlukene entweni eyodwa.
- Musa ukubeka imithi endlini yokugezela, kodwa ibeke endaweni ebandayo.
- Musa ukuphuza imithi notshwala.

IZINTO EZINGAKUSIZA UKUKHUMBULA UKUSEBENZISA IMITHI

- Sebenzisa noma yiziphi izinsiza ezingakusiza ukhumbule ukusebenzisa imithi njalo njengoba utsheliwe isibonelo: Ungasebenzisa isibali zinsuku ukukhombisa ukuthi usuwusebenzisile umuthi noma uzowusebenzisa kanjani.
- Qiniseka ukuthi zonke izinto ezinemithi zibhaliwe igama lomuthi kanye nesikhathi sokuwusebenzisa.
- Bhala igama laleso sifo entweni efanele ukuvimbela ukungadidanisi imithi yezifo ezahlukene, isibonelo: isifo sikashukela (diabetes) ne High Blood Pressure.
- Kubalulekile ukuthi ugcine ikhadi lemithi, elikhombisa imithi oyisebenzisayo.

Khumbula

Akufanele wesabe ukubuza udokotela wakho noma yini ngesifo esikuphethe noma ngemithi. Ngesikhathi wazi kabanzi ngesifo sakho ingenkathi uzosheshe welulame empilweni.

Ihlanganiswe ngu : N Baal, J Mahlangu, P Moodley • School of Pharmacy and Pharmacology • University of Durban-Westville