ASPECTS OF DRUG USAGE IN A PRIVATE PRIMARY HEALTH CARE SETTING: A PHARMACOECONOMIC APPROACH

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Toward this goal I also labour, struggling according to His power that powerfully works in me

Colossians 1:29

Dedication

This Dissertation is dedicated in loving memory of my late grandmother Thandi Clara, for her support, understanding, courage and unconditional love throughout my hard times. I miss her dearly.

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ABSTRACT

Title: Aspects of drug usage patterns in a private primary health care setting: A pharmacoeconomic approach.

Key words: Drug usage patterns; managed and primary health care; pharmacoeconomics, drug utilisation, pharmacoepidemiology, evidence-based medicine, disease management, prevalence and medicine treatment cost.

In South Africa, significant changes in health care have taken place since the first democratic elections in 1994. The change had lead to a position of integrated service delivery with specific reference to primary health care. Increasingly in developing countries, the private sector impacts significantly on the rights to education and the highest attainable standard of health.

Inappropriate prescribing e.g. prescribing a drug without an acceptable indication, specifying an incorrect dosage, schedule or duration of treatment, duplicating therapeutic agents and prescribing drugs without adequate regard to potential interactions, can cause adverse outcomes, deplete health care resources, compromise the quality of care and possible increase in health costs. One approach monitoring prescribing practices is drug utilisation review.

The general objective of this study was to review and interpret aspects of drug usage patterns in a private primary health care setting, with special reference to the top ten diagnoses made and the top twenty medicine items prescribed as well as the associated costs. A quantitative, retrospective drug utilisation review as well as certain aspects of managed and primary health care, pharmacoeconomics, pharmacoepidemiology, medicine formularies and standard treatment guidelines were reviewed in the literature as a base for the study.

The results of the empirical study showed that 83648 patients consulted at the nine medicentres during the study period (1 January to 31 December 2001). A total number of 132591 patient visits (consultations) were made, 140723 medical conditions (diagnoses) performed and 516177 medicine items prescribed during the study period.

Analysis of medicine usage patterns and associated costs of the top ten diagnoses made and top twenty medicine items prescribed in the study population, revealed the following:

- The top ten diagnoses determined accounted for 29.07% of the total number of diagnoses made,
- a total medicine treatment cost accounting for 32.11% in the study population,
- the top twenty medicine items determined accounted for 56.23% of the total medicine items prescribed and
- a total medicine treatment cost accounting for 28.63% in the study population.

The highest prevalence of diagnoses made and medicine items prescribed was found in age groups 4 and 5 (i.e. patients between the ages of 19 to 40 years) and was also found to be more prevalent in the female than in the male population.

In completion of the research, recommendations to review the medicentres medicine treatment protocols and on provision of primary health care education were made. Reference to the investigation of environmental factors is also made.

OPSOMMING

Titel: Aspekte van die patrone van medikasiegebruik in die primêre gesondheidsorg opset: 'n Farmako-ekonomiese benadering.

Sleutelterme: Medikasiegebruikspatrone, beheerde en primêre gesondheidsorg, farmakoekonomie, medikasiegebruik, farmako-epidemiologie, reeds beproefde medisyne, siektebeheer, voorkoms en mediese behandelingskoste.

In Suid-Afrika het daar belangrike veranderinge in gesondheidsorg plaasgevind sedert die eerste demokratiese verkiesing in 1994. Die verandering het gelei na 'n proses van geintegreerde dienslewering met spesifieke verwysing na primêre gesondheidsorg. In ontwikkelende lande het die privaat sektor toenemend 'n belangrike impak op die reg tot onderwys en die hoogste bereikbare gesondheidstandaarde.

Onvanpaste voorskrifte, bv. die voorskryf van medikasie sonder 'n aanvaarbare aanduiding, die spesifisering van die verkeede dosis, skedule of duur van behandeling, die duplisering van terapeutiese agente en die voorskryf van medikasie sonder inagneming van die moontlike interaksies, kan teenstrydige uitkomste tot gevolg hê wat die beskikbare fondse van gesondheidsorg kan uitput en die kwaliteit van gesondheidsorg kan kompromiteer. Een benadering om die verskeidenheid in voorskrifpraktyke te verminder is die gebruik van 'n oorsig van reeds benutte medikasie.

Die algemene doel van hierdie studie was om 'n oorsig te gee van gebruikspatrone van medikasie in die primêre gesondheidsorgopset en ook om hierdie patrone te interpreter. 'n Kwantitatiewe, retrospektiewe oorsig oor die gebruik van medikasie sowel as ander aspekte van beheerde en primêre gesondheidsorg, farmako-ekonomie, farmakoepidemiologie, formuleringe en standaard behandelingsriglyne word in hierdie studie bespreek.

Die resultate van die empiriese studie het aangetoon dat 83648 pasiente die nege mediese sentrums wat in die ondersoek gebruik is gedurende die studieperiode van 1 Januarie tot 31 Desember 2001 besoek het. 'n Totaal van 132591 konsultasies is aangeteken en 140723 mediese toestande is gediagnoseer en 516177 medisyne items is gedurende die studietydperk voorgeskryf.

'n Analise van die medisynegebruikspatrone en die gepaardgaande kostes verbonde aan die top tien dignoses wat gemaak is, en die top twintig medisyne items wat aan die studiepopulasie voorgeskryf is het die volgende getoon:

- Die top tien diagnoses wat bepaal is was verantwoordelik vir 29.07% van die totale aantal diagnoses wat gemaak is.
- Die totale koste van mediese behandeling het 32.11% van die studiepopulasie beloop.
- Die top twintig medisyne items wat voorgeskryf is het 56.23% uitgemaak van die totale items wat voorgeskryf is.
- Dit was verantwoordelik vir 28.63% van die totale koste van mediese behandeling in die populasie.

Die hoogste voorkoms van dagnoses en die hoogste voorskrif van medikasie het in ouderdomsgroepe 4 en 5 (d.i. pasiente tussen die ouderdom 19 tot 40 jare) voorgekom en daar is ook gevind dat die voorkoms van voorskrifte vir die vroulike populasie hoër was, as die vir die manlike populasie.

Na voltooing van die navorsing is sekere aanbevelings gemaak naamlik, dat die mediese behandelingsprotokol sowel as die opvoeding oor primêre gesondheidsorg hiersin moet word. Daar word ook verwys na 'n ondersoek na die moontlike invloed van omgewingsfaktore.

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Forget "I can't" for those are the words of a coward and failure.

Remember "I'll try" for those are the words of a potential winner.

Respect and imitate "I will" for those are the words of a winner.

Unknown

CHAPTER 1

ASPECTS OF DRUG USAGE IN A PRIVATE PRIMARY HEALTH CARE SETTING: A PHARMACOECONOMIC APPROACH

1.1. INTRODUCTION

This study entails an investigation of diseases and medicine usage patterns from a pharmacoeconomic point of view, by using a database of a private primary health care setting.

1.2. PROBLEM STATEMENT

According to the World Health Organisation (WHO, 2003e:14) "Primary health care is an important feature of the health system. Over the years, it has drawn attention to the needs of the many and has been a powerful instrument for making governments and their partners recognize that the provision of health care cannot be left to professionals alone."

As total healthcare spending increases throughout the world, greater emphasis is being placed on research which demonstrates the value of medical interventions, including new and existing pharmaceuticals (Rizzo & Powe, 1999:340). Health care costs continue to rise, whether a country has a mainly public or mainly private financing or delivery system and therefore, most governments see these rising costs as problematic and are trying to implement reforms that will contain future expenses (Gratzer, 2003:7).

The continuous rise in pharmaceutical costs has caused concern to governments and its evaluations include any study designed to assess the cost (i.e. resources consumed) and consequences (clinical and humanistic) of alternative therapies (Robays, 1999:78). According to Vogenberg (2001:5) " Society is spending too much on health services; we are not getting our "money's worth" from the health care expenditures."

According to Robays (1999:80) "The rise in health care costs in the face of constrained resources leaves countries with two basic and often complementary options:

- *First*, countries may increase the amount of resources for health care by shifting funds from other areas of public sector expenditure or by increasing taxation or social insurance contributions. Shifting funds has important political and social consequences and governments are very reluctant to taking decisions in that sense.
- *Second*, countries can control health expenditure by pursuing reform strategies that influence either the *demand* for or the *supply* of health care services. Measures to reduce demand does shift a portion of health care costs to the individual, thus

> generating substantial equity problems. Influencing the supply of health services can also contain costs. Global budgets for pharmaceuticals in the hospital form part of a wide range of reform strategies that can be placed in this category. Overall, experience to date shows that establishing budgets appears to be the most effective means of containing costs."

In developing countries, medicines are mostly paid out-of-pocket by individual patients rather than through social security systems. High medicine treatment prices are a barrier to the use of medicines and health products (WHO, 2003d:4). It is estimated that the public system is responsible for providing health care to approximately 80% of the South African population; which comprises over 40% of the total health care spending for the country. The private sector therefore, covers only 20% of the population whilst accounting for more than half of the money spent on health care (WHO, 2003b:6).

There is both public and private financing of health care in South Africa, as well as public provision of health care and with respect to the financing of care, the public system is available for those South Africans who cannot afford to pay for health care themselves and who are not members of an insurance plan. Health insurance is voluntary in South Africa (Gratzer, 2003:6). The health status of the workforce in every country has an immediate and direct impact on national and world economies (WHO, 1999:2). Many countries still view primary health care both as a policy cornerstone and a framework for health care delivery, and they are re-examining this model to adapt it to a range of different health and social issues (WHO, 2003g:2).

Population demographics continue to present new scenarios, with substantial increases in birth rates in some countries, declines in others, a much larger world population of the elderly and dramatic changes in life expectancy in the countries most affected by Human Simplex Virus/ Acquired Immuno-deficiency Syndrome (HIV/AIDS) (WHO, 2003e:3).

1.3. RESEARCH QUESTIONS

The specific objectives for this study were based on the following research questions:

- What does managed health care (MHC) and the tools of managed health care entail?
- What does primary health care (PHC) and the elements of primary health care entail?
- With regard to a private primary health care setting:
  → what are the characteristics of the study population with regard to the number, age and gender of patients?
  → how many consultations are made in a year at these facilities?
  → how many diagnoses are made in a year at these facilities?
  → how many medicine items are prescribed in a year at these facilities?
- Does age have an influence on the number of patients, consultations, diagnoses and medicine items in a private primary health care setting?
- Does gender have an influence on the number of patients, consultations, diagnoses and medicine items in a private primary health care setting?
- Which diagnoses are regularly made in these facilities and according to which pathophysiological states can they be classified?
- Which medicine items are mostly prescribed in these facilities and according to which pharmacological groups can they be classified?
- What is the cost of medicine treatment in the private primary health care setting?
- Does age have an influence on the cost of medicine treatment in a private primary health care setting?
- Does gender have an influence on the cost of medicine treatment in a private primary health care setting?
- What is the medicine treatment cost of diagnoses that are regularly made in the private primary health care setting?
- What is the medicine treatment cost of the medicine items that are mostly prescribed in the private primary health care setting?
- Which recommendations may be formulated regarding medicine usage patterns in the private primary health care setting?

1.4. RESEARCH OBJECTIVES

1.4.1. General Objective

The general objective of this study is to review and analyse drug usage patterns in a private primary health care setting (medicentres), as well as to determine the medicine treatment cost thereof.

1.4.2. Specific Objectives

The specific objectives of this study were:

- To conceptualise from the literature what managed health care and its tools is all about.
- To conceptualise from the literature the concepts, approaches and elements of primary health care.

To determine from the database:

- the basic characteristics of the study population consulting (visiting) at the private primary health care medicentres (i.e. number of patients, consultations, diagnoses, medicine items, average age of patients and gender distribution),
- what the influence of age is on the number of consultations, diagnoses and medicine items in the study population,
- whether or not the number of consultations, diagnoses and medicine items differs according to gender in the study population,
- the top ten diagnoses in the study population (i.e. diagnoses which had the highest prevalence ranking from 1 to 10),
- the top twenty medicine items in the study population (i.e. medicine items which had the highest prevalence ranking from 1 to 20),
- if the top twenty medicine items that were prescribed for the study population were on the proposed medicentres medicine treatment protocols for the top ten diagnoses,
- the medicine treatment cost per clinic (medicentre) in the study population,
- the medicine treatment cost per age group in the study population,
- the medicine treatment cost per gender in the study population,
- the medicine treatment cost of the top ten diagnoses in the study population,
- the medicine treatment cost of the top twenty medicine items prescribed, and
- to formulate recommendations regarding the results obtained from the analysis.

1.5. RESEARCH METHOD

The research consists of two phases, namely a literature review and an empirical investigation.

1.5.1. Phase one: Literature review

The literature review will consist of one chapter. In this chapter, the first section will give a review of managed health care and the tools of managed health care *viz*. capitation, disease management, drug utilisation review, pharmacoeconomics, pharmacoepidemiology, evidence based medicine, formularies and standard treatment guidelines as well as the health care indicators.

The second section will focus on primary health care and its elements. The relevant aspects will be discussed and related to this research.

1.5.2. Phase two: Empirical investigation

The empirical investigation will consist of eight phases, including the following:

- The research design.
- Determination of data
- The selection of the study population.
- The selection of measuring instrument(s).
- Administration of measuring instrument(s).
- Data analysis.
- Reliability and validity of data.
- The report and discussion of the results of the empirical investigation.
- Conclusions and recommendations based on the results of the empirical investigation.

The empirical investigation will be discussed in detail in chapter 3.

1.6. RESEARCH DESIGN

The research design used for this study is retrospective (refer to paragraph 2.2.2.3.4), quantitative (refer to paragraph 2.2.2.3.5) and non-experimental.

The study population comprised of patients from nine clinics which were randomly selected from 33 clinics on the central database of a private primary health service provider (medicentres). The study period was from 1 January 2001 to 31 December 2001 (refer to paragraph 3.3.1).

The report and discussion of the results and conclusions and recommendations based on the results of the empirical investigation are given in chapters 4 and 5 respectively.

1.7. DIVISION OF CHAPTERS

The division of chapters will be as follows:

Chapter 1: Introduction

Chapter 2: Aspects of managed health care and primary health care

Chapter 3: Empirical investigation

Chapter 4: Results and discussion

Chapter 5: Conclusions and recommendations

1.8. CHAPTER SUMMARY

In this chapter, the problem statement, research question and objectives, research method, research design and division of chapters were discussed.

In chapter 2, a literature review on aspects of managed health care and primary health care will be given.

Obstacles don't have to stop you. If you run into a wall, don't turn around and give up. Figure out how to climb it, go through it, or work around it.

Michael Jordan

CHAPTER 2 ASPECTS OF MANAGED HEALTH CARE AND PRIMARY HEALTH CARE

2.1. INTRODUCTION

In this chapter the aspects of managed and primary health care will be discussed. Their concepts and development will be reviewed.

2.2. MANAGED HEALTH CARE

For the purpose of this study, "*managed health care*" will also be referred to as "*managed care*" because of its origin (see paragraph 2.2.1.1).

2.2.1. Concept and origin of managed health care

According to Al-Assaff (1998:5.) "The managed care concept involves understanding health care delivery systems based upon the components of access, expense and efficiency." Managed care was a concept developed primarily in the United States of America (USA) in the last couple of decades. Law (2003:1) states that "it started off in 1929 with Dr. Sidney A. Garfield who operated in the Mojave Desert in California, where he worked to serve thousands of workers on the Los Angeles Aqueduct. Dr. Garfield persuaded insurance companies to pay him a fixed amount per day for each covered worker and in return was able to treat uninsured workers as well by lowering his expenses by emphasis on the maintenance of health and safety rather than merely the treatment of illness and injury. The first HMO[1] was officially opened to the public in 1945."

Managed care is a constantly changing, sometimes complicated system of health care and to improve the performance of their health care systems, many countries are importing managed care and price competition from the USA (Grembowski *et al.*, 2002:1167). It is essential to demonstrate the quality, effectiveness and efficiency of services to compete in a managed care environment, therefore, in markets heavily penetrated by managed care, data is required to identify instances in which its practices have resulted in adverse outcomes (Neuman & Ptak, 2003:22). With the advent of managed care, the provision of healthcare has been transformed from a purely professional undertaking to a business providing professional services (Lens, 2002:121).

[1] Health Maintenance Organisation (refer to paragraph 2.2.1.3.1 and Glossary for definition)

2.2.1.1. Definition

Powell (as quoted by Williams and Torrens, 1993:226) defines managed care as a set of techniques used by or on behalf of purchasers of healthcare benefits to manage healthcare costs by influencing patient care decision-making through case-by-case assessments of the appropriateness of care prior to its provision. The term refers to a health care delivery system that contractually links doctors, hospitals and insurance plans and has been applied to a variety of pre-payment arrangements, negotiated discounts and prior authorisation of service requirements from the management (Lens, 2002:15).

Managed health care was also defined by Al-Assaf (1998:4) as a system of pre-paid health care services and benefits. Its goal is to improve access to and quality of care, while containing health care costs. Widespread implementation of managed care systems increasingly influences health service delivery and payment in a variety of ways and is a process used to deliver cost-effective care without limiting quality or access (Anon., 2002c:1).

According to Edwards (1998:1) "Managed care is also a term commonly used to describe an array of health care delivery and payment systems, including health maintenance organisations (HMOs), preferred provider organisations (PPOs), and point-of-service plans (gatekeeper PPOs)."

2.2.1.2. Origination and role of pharmacy benefit management (PBM) companies

PBMs are specialised entities established to develop and manage prescription drug benefits for their customers, including self-insured employers, managed care organisation (MCOs) and government-funded programmes (Mullins & Wang, 2002:10).

Over the past decade, PBMs have assumed an expanded role as intermediaries in the design and administration of pharmacy programmes and therefore, these companies now provide a range of sophisticated, clinically orientated services that increasingly influence physicians' prescribing patterns and patients' access to pharmaceuticals (Shulman, 1998:49).

The PBM companies have been leaders in the design and implementation of programmes to influence drug use and costs in managed care and their services include claims processing, negotiating purchases, designing the pharmacy benefit, managing the formulary, profiling prescribers and performing drug use review (Lyles & Palumbo, 1999:134).

The companies are also a growing source of disease management programmes and specialise in managing the outpatient prescription benefits of managed-care plans for health maintenance

organisations, thereby promoting patient compliance with drug regimens and improve health outcomes (Grabowski, 1998:16, Mullins & Wang, 2002:10).

According to Shulman (1998:50), the following list includes some of the central functions offered by PBMs:

- general design and structure of the drug benefit, including co-payments, deductibles, formulary compilation, prior authorisation requirements, etc,
- formulary services including interventions via on-line links with physicians and pharmacists to encourage formulary compliance and the use of selected or preferred products through generic and therapeutic interchange,
- educational programmes for physicians, pharmacists and patients,
- physician and pharmacist profiling and drug utilisation review,
- disease management programmes, treatment guidelines and cost-effective analysis and
- the integration of clients' laboratory services, pharmaceutical care and individual patients' clinical data, to allow an evaluation of disease prevention and management programmes.

2.2.1.3. Managed Care Organisations (MCOs)

A managed care organisation is an organisation that utilises concepts and tools to manage healthcare costs, such as pre-certification, concurrent review, case management, pharmacy formularies etc. (Powell, 2000:505). In the USA, MCOs have turned to pharmacy benefit management (PBM) companies to contain costs and provide total disease management packages (Thomas, 1996:9).

According to Entwistle *et al.* (1996:2-3) different groups of MCOs have varying expectations over the results which managed care will deliver and these can be divided into three main categories, namely:

- Health outcomes
  - The system will deliver improved health gains.
  - Such gains will be achieved in a cost effective manner.
- The provision of services
  - The services provided will focus on the health needs of the population.
  - Through choice and enrolment, individuals will be able to exert a greater influence over the appropriate delivery of services.
- Use of resources
  - Achieve a reduction in overall health care expenditure.
  - Achieve control in growth in expenditure.
  - Achieve more efficient use of the available resources.

- Achieve savings against budget.

Accredited managed care organisations are required to have a written plan for all utilisation review activities and the plan must specify the clinical protocol or criteria used to assess acuity, thereby outlining the process for authorising and denying services, appealing decisions and the roles and responsibilities of the provider and MCO (Neuman & Ptak, 2003:20).

2.2.1.3.1. Types of managed care organisations

The increase in the cost of health care and hospital costs has led to programmes of managed health care which intent to control health care utilisation and costs, therefore the current level of disgruntlement is low, compared with the earlier stages in the transition to HMOs, when dissatisfaction with insurance was more widespread (Paul, 2002:84; Rogoski, 2002:119). The following are examples of managed health care programmes:

♦ Health maintenance organisation (HMO)

A managed care style insurance model that uses primary care physicians as gatekeepers of contracted facilities (Powell, 2000:503).

Types of HMOs (Schickerling, 2003:5):

- Staff model – organisation owns its clinics and employs its doctors.
- Group model – contracts with medical groups for services.
- Independent physician association (IPA) model – contract with an IPA that in return contracts with individual physicians.
- Direct contract model – contracts directly with individual physicians.
- Network model – contracts with multiple groups of physicians to provide healthcare to its members.

♦ Management service organisation (MSO)

A management entity owned by a hospital, physician organisation or third party. The MSO contracts with payers and hospitals/physicians to provide services such as negotiating fee schedules, handling administrative functions and also billing and collections (Smith, 1996:485-486).

♦ Physician-Hospital organisation (PHO)

A hospital and a group of physicians jointly own this type of group. The PHO, in turn, contract with hospitals and physicians usually maintain ownership of their practices, while agreeing to accept managed care patients under the terms of the PHO agreement (Wertheimer & Navarro, 1999:377).

- Physician organisation (PO)

In this organisation, a group of physicians band together, usually for the purpose of contracting with managed care entities or to present the physician component in a PHO (Anon., 2002e:11).

- Preferred provider organisation (PPO)

PPOs are groups of providers (physicians, dentists, pharmacists and hospitals), who provide a single type of service. The groups of providers are organised by an insurance carrier to provide health care similar to an HMO but through a larger provider network that offers members more choice. The contracted providers must therefore agree to accept discounts and follow the utilisation procedures (Bootman *et al.*, 1996:244; Kongstvedt, 1993:257).

As managed care bumps and grinds along, those who doubt that its endless mutations can control costs effectively may wonder what motivated this great transformation in the first place. The basic and enduring stimulus to managed care is the proposition that the cost of health care equals its price times its volume and cost containment or component cost supply management has taken the form of multiple, uncoordinated measures, targeted at suppliers and providers (Brown, 1998:41; Elze, 1998:25).

2.2.2. Tools of managed health care

There are eight tools of managed health care and they will be discussed individually in subsequent sub-sections.

2.2.2.1. Capitation

In this section, a brief discussion on capitation will be given.

2.2.2.1.1. Overview

Capitation is a component of managed care systems that has resulted in complete restructuring of the reimbursement system, which is a prospective payment to a provider paid on a per capita basis. The rates are usually adjusted, based on demographics (age or gender for primary care services) or based on the type of service provided (e.g. a clinical laboratory, mental health or medical subspecialty services) (Anon., 2002b:13). In a primary care capitation model, the physician group receives a capitation payment in exchange for the obligation to provide only primary care services to the assigned patients.

Capitation or risk sharing programmes are financial arrangements that require providers and payers to establish a fixed fee per patient per time period (Thomas, 1996:14). The negotiated per capita rate is to be paid periodically, usually on a monthly basis to a health care provider. The provider is then responsible for delivering or arranging for the delivery of all health care services required by the covered person under the conditions of the provider contract.

2.2.2.1.2. Definition

Capitation is a prospective payment to a health care provider based on an actuarial projection of expected drug or medical service utilisation rates for a pre-determined patient population (Thwaites & Townsend, 1998:177).

According to Anon (2002b:1), "Capitation is a method of reimbursement that shifts the financial risk for the provision of care from the managed care organisation (MCO) or other payer to a physician or physician group/network by establishing a fixed amount to cover specific services for a defined patient population on a per member (patient) per month basis."

2.2.2.1.3. Types of capitation models

The different types of capitation arrangements from greatest risk to smallest risk are listed and discussed in table 2.1:

Table 2.1: The different types of capitation models (adapted from Anon, 2002b:4-7)

Type of capitation	Explanation
Full-risk capitation (also known as global risk).	Physicians accepting this type of model must have a substantial infrastructure and effective practice management. The physician group/network must provide or arrange for all professional and institutional services for its assigned patients.
Professional capitation (also known as multispeciality capitation).	In this model, the physician, physician group/network receives capitation payment and agrees to provide or arrange for all primary and speciality care physician services. If they cannot provide a particular service then they must enter into an arrangement to pay another physician to issue the service.
Primary care capitation	In a primary care capitation model, the physician group receives a capitation payment in exchange for the obligation to provide only primary care services for assigned patients, defined in a contract and frequently subject to negotiations.
Speciality capitation	In this model, the physician group receives a capitation payment in exchange for the obligation to provide speciality services for assigned patients. The specific services that are included in the speciality capitation are defined in the contract.

2.2.2.1.4. *Advantages and disadvantages of capitation*

The advantage of this mechanism is that, providers and payers become responsible for total patient care. Its advantage over the traditional fee-for-service programmes, is that they require that an interdisciplinary team meet and take responsibility for its decisions (Thomas, 1996:15).

The disadvantage of this method is the risk payers (MCOs) involve themselves in by obliging to pay for covered services without knowing in advance what services will be needed (Anon., 2002b:1).

2.2.2.2. Disease Management (DM)

This section will give a brief discussion on disease management and its programmes.

2.2.2.2.1. Overview

Disease management is a systematic approach to a health condition or a health care intervention that organises preventative, intervention and care approaches throughout the continuum of care and which measures outcomes in terms of populations, not individuals (Chang & Nash, 1998:11).

Healthcare industry providers have marketed the disease management programme as a way of improving resource allocation in healthcare and of containing costs (Bloor & Maynard, 2000:539). Figure 2.1 indicates the essential aspects of a disease management programme.

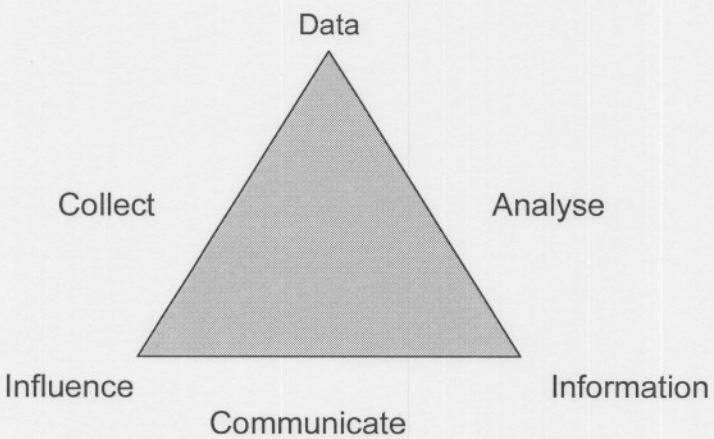


Figure 2.1: Essential aspects of a disease management programme (adapted from Bishop & Gonalez-Carvajel, 1998:119)

Received data regarding the components that make up the health system, is integrated in such a way that valuable information is maintained and by using data recorded from a number of sources (primary care records or prescription data) it should be possible to construct a horizontal patient record sufficient to start elementary disease management (Bishop & Gonalez-Carvajel, 1998:120).

The advantage of disease management over the current component system is that it stresses prevention over acute treatment of a chronic disease. To achieve these goals, disease management uses pharmacoeconomic evaluations and outcome measures to provide information that helps build formularies and clinical practice guidelines (Anon., 2003b:3).

2.2.2.2.2. Definition

According to Chang and Nash (1998:12) "Disease management is a system that integrates and co-ordinates all providers and facilities that ordinarily deal with the patient (i.e. physician, pharmacist, nurse, hospital laboratory, managed-care organisation, drug manufacturer etc.) to provide cost-effective patient care based on the clinical outcomes."

2.2.2.2.3. The concept of disease management

According to Wojner (2001:177) "The concept of disease management takes its origin from the pharmaceutical industry, which sought to partner with managed care organisations in the early 1990s for the development of comprehensive health strategies for a variety of diseases."

The subject of disease management has elicited a great deal of interest from both the pharmaceutical industry and the National Health Service. The programmes are often developed in sites such as physician practices or insurance companies, to undertake forward vertical integration into other parts of the healthcare process (Bloor & Maynard, 2000:539; Powell, 2000:15).

According to Anon (2002c:6) "disease management:

- emphasises evidence-based cost-effective recommendations and patient self-management education;
- supports the physician/patient relationship; and
- continuously evaluates clinical and economic outcomes with the goal of improving overall health."

2.2.2.2.4. Disease management programmes

Disease management programmes claim to focus on measurable outcomes and to be systematic, objective and comprehensive across the continuum of care needs (Lyles & Palumbo, 1999:136). The current evolution of disease management probably had much to do with the success of disease–based case management in acute setting and large case management (Powell, 2000:15).

Figure 2.2 identifies the relationships between DM, outcomes and case management strategies. According to Wojner (2001:179), "To be effective, DM must be viewed as a continuous process that unites services within both the acute and post-acute continua to provide comprehensive, interdisciplinary management of a disease."

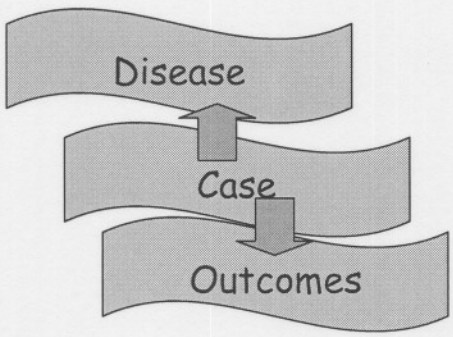


Figure 2.2: The relationship between disease, case and outcomes management (adapted from Wojner, 2001:178)

Take note: *Note that outcomes management drives development of both disease management and case management programmes.*

Case management is a collaborative process which assesses, plans, implements, co-ordinates, monitors, and evaluates options and services to meet an individual's health needs through communications and available resources to promote quality, cost-effective outcomes (Powell, 2000:35). Therefore, capturing, analysing and using epidemiological and individual patient data will be crucial to establish standards of care and quality in order to apply them in an effective case management setting (Elze, 1998:28).

The programmes are being used by a growing number of parties including pharmacy-benefit managers, managed-care organisations, academic medical centres and other health care providers to try and improve the efficiency of health care delivery (Chang & Nash, 1998:11).

Table 2.2: Three distinct types of disease management programmes (adapted from Wertheimer & Navarro, 1999:127)

PROGRAMME	EXPLANATION
Compliance enhancement	The programme is basically saying that whatever is good for the pharmaceutical industry is clearly good for the health plan.
Guidelines adherence	Firstly it is assumed that this programme will provide more cost-effective care and secondly that responsibility lies primarily with the physician.
Outcomes management	The enhancement of physiologic and psychologic patient outcomes through development and implementation of exemplary health practices and services, driven by outcomes assessment.

Disease management programmes have achieved a component of efforts to improve prescribing practices in both the institutional and ambulatory care settings, in various areas of the world and provide the mechanisms for developing standards, assessing current therapy, and implementing a specific intervention followed by reassessment of drug utilisation (Anon., 2002a:9).

2.2.2.2.5. Disease management and pharmacoeconomics

Pharmacoeconomics is one of the fundamental aspects in the development of disease management programmes (Wojner, 2001:177).

The role of pharmacoeconomics in disease management is to evaluate and identify cost-effective medications in the treatment of a particular disease. Therefore, with this information, informed formulary decisions can be made on the basis of cost effectiveness rather than cost containment (Chang & Nash, 1998:13). The push to create and implement disease management programmes will be an increased need for pharmacoeconomic studies to evaluate the cost effectiveness of different treatments in order to ascertain the best treatment options to implement in the programme (Thomas, 1996:9).

2.2.2.2.6. *Conclusion*

Management of a disease implies an ability to move across the health care continuum into a number of different care delivery settings, therefore, the major efforts of disease management should be made to effectively integrate all aspects of care for a particular disease.

2.2.2.3. Drug Utilisation Review (DUR)

In this section, a brief overview, definition, purpose and classifications of DUR will be given.

2.2.2.3.1. *Overview*

To select appropriate evidence for clinical decisions, the physician must be able to appraise the available information critically. One approach to reducing variability in prescribing practices is the drug utilisation review, "a formal program for assessing data on drug use against explicit, prospective standards and as necessary, introducing remedial strategies to achieve some desired end" (compare Anis *et al.*, 1996:637).

The efficacy of computer-based drug utilisation review depends on the plausible assumptions that greater adherence to many published criteria regarding drug-interactions, excessive dosages and other potential drug-therapy problems, will reduce the incidence of serious adverse effects, such as drug related hospitalisations (Soumerai & Lipton, 1995:1642).

Criteria developed for a drug utilisation review may vary according to the drug and population studied. One shortcoming of many drug utilisation review systems is an emphasis on evaluating overall drug cost without regard to the effect on the individual patient (Anis *et al.*, 1996:640).

2.2.2.3.2. *Definition*

Drug use review has been defined as 'an authorised, structured program that reviews, analyses and interprets patterns of drug usage in a given health care delivery system (Thomas, 1996:10). According to the WHO (2001a:3) "Drug utilisation studies are those dealing with the development, regulation, marketing, distribution, prescription, dispensing and use of medicines in a society, with special emphasis on the resulting medical, social and economic consequences."

2.2.2.3.3. Purpose of DUR

According to WHO (2003c:9) "*The principal aim of drug utilisation research is to facilitate the rational use of drugs in populations.*" A drug utilisation review (DUR) seeks to detect potentially inappropriate prescribing by applying explicit criteria to the patient prescription and medical history information, therefore mandated by law. DUR criteria focus on safety, appropriateness, effectiveness and cost-containment (Monane *et al.*, 1998:52).

A drug utilisation review ensures that prescribed medicine treatments and their subsequent reimbursement are appropriate for the condition being treated as well as being at the correct dose, duration and suitable to the specific patient's needs (Anon., 2002d:1). It also compares the actual drug prescribing according to predetermined criteria, identifying deviations from the criteria and initiating corrective action when necessary (Lyles & Palumbo, 1999:134).

Initially, DURs were performed retrospectively and were generally limited to hospital setting. Although physicians and pharmacy and therapeutics (P&T) committees found the information useful, it had very limited value for clinical decision making and prescribing.

2.2.2.3.4. Classification of drug utilisation studies

According to Sacristán and Soto (1994:300) drug utilisation studies (DUS) may be defined as "The marketing, distribution, prescription and use of drugs in a society, with special emphasis on the resulting medical, social and economic consequences." These studies can provide valuable information on the cost and effects (harmful and beneficial) of drugs and the outcomes can be used to discover the economic repercussions of inappropriate prescribing and to quantify the cost-effectiveness of various therapeutic interventions (WHO, 2003c:11).

DUR studies may be prospective, concurrent or retrospective depending on the specific role player targeted for review during the drug usage process (Anis *et al.,* 1996:636) and they constitute an integral part of clinical pharmacy programs in hospitals (Thomas, 1996:11).

- *Prospective review* has the greatest potential benefit for the patient, because it identifies drug therapy problems and corrects them before they can occur. It relies on criteria from published literature, clinical experience and basic pharmacological principles to provide an evaluation of drug therapy (Kralewski *et al.*, 1994:425). The DUR procedure is usually achieved through computer linkages between the DUR company and the network of participating pharmacies and it is accomplished through prior authorisation programmes, that require physicians to obtain approval before prescribing certain medications (Wertheimer & Navarro, 1999:379).

- *Concurrent review* concentrates on the appropriateness and correctness of the drugs prescribed while the patient is in the facility. Concurrent review is very limited and only used for patients on chronic medication and certain institutionalised patients. If the desired effect (therapeutic outcome) is not achieved, this review therefore allows for the changing of therapy (Blackburn, 1993:15; Powell, 2000:502).

- *Retrospective review* can be used to identify problems in prescribing patterns through the analysis and interpretation of aggregate archival data on drug prescriptions (Anis *et al.*, 1996:636). The programme is largely focused on preventing recurrence of a problem and is a structured ongoing initiative that interprets patterns of drug use in relation to predetermined criteria therefore attempt to minimise inappropriate prescribing (Hennessy *et al.*, 2003:1494; Kralewski *et al.*, 1994:431).

Retrospective review takes place after a prescription has been dispensed. The following are some, but not all, conflicts for which drug therapy is screened: drug-allergy contraindications, drug-disease contraindications, drug-drug interactions, duplicate therapy, incorrect dosage or duration of therapy, over- and under-utilisation and clinical abuse/misuse (Anis *et al.*, 1996:637).

Both retrospective and prospective review systems lack data such as the number, type and severity of diagnoses of the patient, therefore given the current emphasis on cost-containment, they usually focus on over prescribing. However, under prescribing can also affect the quality of care and has been de-emphasised too often (WHO, 2003f:17). When pharmacists review a patient's drug use, they often infer the diagnosis from the drug prescription. However, because patient characteristics and health status influence prescribing behaviour, assumptions about diagnosis cannot be made on the evidence of prescriptions alone (Anis *et al.*, 1996:636).

According to Hennessy *et al.* (2003:1495) "The process also allows for the identification of cases of drug misuse or abuse due to patients utilising multiple providers to obtain prescription medication and by reviewing multiple patient cases, the study can identify drug use patterns that may indicate prescribing and/or dispensing problems associated with particular drugs or drug classes." These problem areas may then be targeted for appropriate intervention strategies, with the goal of improving drug therapy, patient outcomes and quality of care (Anon., 2003b:14).

2.2.2.3.5. Classification of DUR

DUR can be classified as quantitative and qualitative and according to Kongstvedt (1993:154) "*The properties of Quantitative DUR are as follows:*

- It describes patterns of drug utilisation and cost.
- It quantitates drug utilisation and cost.
- It identifies areas and categories to be used for qualitative DUR.
- It identifies areas of education.
- It is not based on any predetermined criteria for standards.
- It can be used to describe the quality of drug use."

Quantitative DUR studies involve collecting, organising and displaying estimates or measurements of drug use (Kreling & Mott, 1993:416).

According to the WHO (2003f:20) "Qualitative studies assess the appropriateness of drug utilisation and generally link prescribing data to reasons (indications) for prescribing." The main aim of qualitative DUS's is determine the appropriateness of drug consumption and require the establishment of quality criteria for drug use, such as the duration of treatment, the most suitable dosage for each indication and utilisation of fixed combinations of drugs (Ferreira, 1999:1).

2.2.2.3.6. Applications of DUR

The cost per day of treatment is a DUS unit of measurement, defined as the sale price to the public of the Defined Daily Dose (DDD) of a specific drug. The treatment cost per day, plus the remaining costs (direct and indirect) can be utilised in many types of pharmacoeconomic studies. When used in cost-minimisation studies, it is important to be careful when assuming identical benefits between alternative therapies (Sacristán & Soto, 1994:301).

2.2.2.3.7. Drug utilisation studies/review and pharmacoeconomics

DUR and pharmacoeconomics both concern the consumption patterns of drugs, and their implications. Since DUR and pharmacoeconomics interact and integrate each other, a review of the literature on both represents a useful opportunity for underlining the role of DUR in fostering and broadening the scope and the effectiveness of the discipline of pharmacoeconomics (Garattini & Tognoni, 1993:162).

Drug utilisation studies can provide valuable information on the cost and effects (harmful and beneficial) of drugs. This information can be of great use in the subsequent elaboration of pharmacoeconomic studies and the outcomes from these studies can be used to discover the

economic repercussions of inappropriate prescribing and to quantify the cost-effectiveness of various therapeutic interventions (Ferreira, 1999:3).

Therefore, both these methods working in conjunction with each other, will contribute to a more rational use of drugs and any method that contributes information on the costs and effects of a drug will be of use in conducting a pharmacoeconomic study (Sacristán & Soto, 1994:299).

2.2.2.3.8. Conclusion

A number of interventions have been included as components of the DUR process, which are aimed at improving drug prescribing practices. The most effective intervention at this time has been shown to be face-to-face interaction with the prescriber. DUR interventions have however, rarely been subjected to quality pharmacoeconomic evaluation. Therefore, there is a need for future research to evaluate the effects of DUR programs on overall healthcare outcomes.

When studying problems in drug use, perhaps the most important objective of drug utilisation studies is to identify patterns of drug consumption, such as how people use medication in different geographical areas, overuse, underuse, misuse and incorrect use.

2.2.2.4. Pharmacoeconomics (PES)

2.2.2.4.1. Overview

Pharmacoeconomics is particularly relevant when managing the health of a group or population and any organisation that uses pooled resources to pay for health services e.g. managed care organisations, government programmes and insurance plans are included in this system (Vogenberg, 2001:2). The proportion of prescription costs paid for by publicly financed schemes has been increasing steadily and there are also concerns about the quality of prescribing patterns and the effectiveness of many drugs, with some preparations having little or no proven therapeutic value (Robays, 1999:80).

According to Olliaro *et al.* (2001:58) "One of the common features of developing countries in terms of pharmaceuticals is the lack of ability to generate independently the drugs that they need. These countries have to rely primarily upon products researched and developed by the pharmaceutical industry of richer countries, therefore, in the developing countries, generics are often produced and used when proprietary compounds outrun their patent restrictions."

2.2.2.4.2. Definition

According to Bootman et al. (1996:7) pharmacoeconomics has been defined as "The description and analysis of the costs of drug therapy to health care systems and society."

Pharmacoeconomics is the study of the cost effectiveness of interventions such as drugs or surgical procedures that involve the joint application of drug effectiveness with cost containment strategies to assist providers in making the optimal pharmaceutical choices (Robays, 1999:78).

2.2.2.4.3. Purpose

The primary purpose of pharmacoeconomic research is to assist in making health care decisions. Greater challenges in decision-making coupled with improvements in the techniques of the research, point to a greater role for pharmacoeconomics to help in delivering good, cost-effective health care (Thwaites & Townsend, 1998:175).

Pharmacoeconomic studies and evaluations can be used to discover the economic repercussions of inappropriate prescribing and to quantify the cost effectiveness of various therapeutic interventions, thereby assisting manufacturers, insurers, clinicians, government agencies, policy-makers and consumers to make informed appropriate decisions about adoption and application of new medications (Rizzo & Powe, 1999:340; Sacristán & Soto, 1994:299).

In private decision-making, pharmacoeconomic analysis is used by pharmaceutical and biotechnology manufacturers as well as medical suppliers to determine launch prices for new medical products based on willingness-to-pay (WTP) criteria (Greenberg *et al.*, 1999:427).

2.2.2.4.4. Pharmacoeconomic methods or tools

The use of pharmacoeconomic tools has grown dramatically in the past decade, as provision of health care throughout the industrialised world has required increased cost consciousness (Greenberg *et al.*, 1999:425).

Pharmacoeconomic studies differ from clinical studies in that they evaluate the efficiency of a medication, not just the efficacy (Chang & Nash, 1998:12). There are four types of pharmacoeconomic studies that can be performed on drugs. They are cost-benefit analysis, cost-effectiveness analysis, cost-minimisation analysis and cost-utility analysis. The decision of which type of analysis to use is dependent on the outcomes we wish to measure (Bootman *et al.*, 1996:9).

Table 2.3: Criteria for selecting pharmacoeconomic study methods (Chang & Nash, 1998:13)

METHOD	AIM
Cost-benefit analysis	Comparison of different programs with different outcomes (both costs and benefits are measured in pecuniary units to determine a cost-benefit ratio).
Cost-effectiveness analysis	Comparison of different therapies resulting in clinically different patient outcomes.
Cost-minimisation analysis	Comparison of similar therapies producing essentially identical outcomes.
Cost-utility analysis	Comparison of similar therapies affecting quality of life or patient preference treatment.
Cost-of-illness analysis	Represents a tool for quantifying the costs to society of a disease without considering any of its treatments.

- *Cost-benefit analysis (CBA)* - typically transforms its outcomes into rand values. This method is of value in disease management but the number of assumptions that have to be made to support this study limits its use (McIntosh *et al.*, 1999: 358). CBA is also used to compare the value of all resources consumed (costs) in providing a programme or intervention against the value of the outcome (benefits) from that programme or intervention (Bootman *et al.*, 1996:61).

  - *Direct Benefits*

    These benefits are defined as that portion of averted costs currently borne that are associated with spending health services. The benefits also represent potential savings in the avoided use of health resources.

  - *Indirect Benefits*

    Indirect benefits represent potential increased earnings and productivity gains that would not have been possible without the particular health care programme.

The two most commonly used studies for disease management are cost-effectiveness and cost-minimisation analyses.

- *Cost-effectiveness analysis (CEA)* - is helpful in choosing medications for a disease management program because it economically analyses different treatments with differing outcomes. Since differing therapies may have different clinical outcomes, we must be able to try and compare these interventions on an economic basis.

  - Applications of cost-effective analysis

  According to Bonk (1996:37) therapeutic decisions typically involve selection of an appropriate therapy for a patient or group of patients. The questions that should be asked when involving these applications are:

  - First, how can cost effectiveness analysis be applied to therapeutic decisions on a patient-by-patient basis.
  - Second, can this application on a patient-by-patient basis be extended to groups of patients.

  - Rationale for sensitivity analysis

  There are many uncertain estimates used in the cost effective analysis, therefore there is a strong need to test the sensitivity of the results to changes in these estimates (Bootman *et al.*, 1996:93).

- *Cost-minimisation analysis (CMA)* - should be used to evaluate the economic factors involved in the cost of different medications, since many medications are therapeutically equivalent and have similar clinical end-points. In this case, simply calculating the acquisition cost, administration cost and monitoring cost of both medications and choosing the lower costing medication can show the cost between two medications.

- *Cost-utility analysis (CUA)* – is used to determine cost in terms of utilities and adjusts its outcomes with differences in the quality of health gained. Unlike cost-benefit analysis, cost-utility analysis is used to compare two different drugs or procedures whose benefits may be different (WHO, 2003f:27).

  A common measure of health improvement used in cost utility analysis is the quality-adjusted life year (gained) [QALY]. It combines mortality and quality of life (QOL) gains i.e. the outcome of a treatment measured as the number of years saved, adjusted for quality (Thwaites & Townsend, 1998:178).

- *Cost-of-illness analysis* – represents a tool for quantifying the costs of a disease to society, without considering any of its treatments (Bonk, 1996:25). According to Bootman *et al.* (1996:47) the cost of an illness is the sum of three components:
  - The medical resources used to treat the illness.
  - The nonmedical resources associated with it.
  - Lost of productivity due to illness or disability (indirect costs).

This study identifies and evaluates the direct and indirect costs of a particular disease which will be discussed in paragraph 2.2.2.4.5.

2.2.2.4.5. Costs in pharmacoeconomics

According to Chang and Nash (1998:13) "Pharmacoeconomic studies evaluate the overall cost of an intervention (i.e. medication) by estimating the cost of each healthcare component and the intervention's effect on those costs. It takes into account not only direct costs (i.e. medication, laboratory monitoring, etc.) but also indirect costs (transportation to doctor, time off work, etc.). This takes the focus off the cost of the medication to evaluating cost effectiveness."

The costs in pharmacoeconomic research fall into four basic categories stratified by two parameters that are directly or indirectly related to the disease, treatment or programme and are medical or non-medical in nature (Bonk, 1996:71). The costs will be explained briefly in table 2.4.

Table 2.4: Four basic categories of cost used in pharmacoeconomics (adapted from Plosker, 1998:571-572)

Type of cost	*Definition*
Direct medical cost	Fixed and variable cost associated directly with a health care intervention (e.g. physician salaries)
Direct non-medical cost	A nonmedical cost associated with provision of medical services (e.g. transportation of a patient to a hospital)
Indirect medical cost	Cost of medical treatment (in life years) gained through an earlier intervention
Indirect non-medical cost (productivity cost)	Cost associated with reduced productivity due to illness, disability or death

The least costly alternative is not always the most economical, in particular, additional years of life recovered by effective health care programmes lead to an extended use of resources (indirect medical costs) (Robays, 1999:8).

2.2.2.4.6. Applications of pharmacoeconomics

Pharmacoeconomic studies not only identify which medication is most cost effective, but these studies are able to compare several cost effective medications to find which one is most beneficial in certain populations (Anon., 2002g:2). In the end pharmacoeconomic studies assign 'value' to a medication. If managed care is to control prescription drug expenses, then it must provide convincing evidence, i.e. pharmacoeconomic studies, that cost-limiting measures do not compromise quality (Lyles & Palumbo, 1999:135).

According to Smith (1996:423) "An important factor to consider when planning economic studies, is that although the majority of product safety and efficacy data is transferable internationally, other data must be collected on a local basis. This is because it is the way the product is used and the local costs and organisation of the healthcare system that will determine the impact upon resource utilisation."

Three broad areas to which pharmacoeconomic analyses are applied are: formulary decisions, provider practices and benefit design.

According to Anon (2003:4) "Generally, the aim of any pharmacoeconomic evaluation is to select one of several possible alternatives. The basics steps in an economic evaluation of drugs are:

- identification of the problem;
- selection of comparator therapies;
- selection of a perspective to be used (hospital, society, patient, third party payer, pharmacy, etc.);
- analysis of the costs of the comparator therapies and their beneficial and harmful effects;
- choice of appropriate type of analysis (cost-benefit, cost-effectiveness, cost-utility, cost-minimisation, etc.);
- correct analysis of the results in order to reach valid conclusions."

According to Mullins and Wang (2002:19-20) "PBMs can utilise the results of pharmacoeconomic analyses to develop a number of management strategies to produce a more cost-effective pharmaceutical care system and thereby decreasing costs and improving patient outcomes. However, the applicability of pharmacoeconomic information must be enhanced in order to be used more systematically by PBMs."

2.2.2.4.7. Conclusion

Given the prevalence of inappropriate prescribing, regulatory initiatives such as the Patented Medicines Board (in all the countries) and pharmacoeconomic guidelines may not be sufficient to contain costs, and more important, ensure high-quality and appropriate medical care. Patterns of medical care vary dramatically and physicians in different communities use and advocate different medical interventions.

Therefore, it is a question of comparing the costs and benefits of various therapeutic alternatives in order to choose the most efficient one. Measurement of both costs and benefits can be made prospectively from clinical trials or epidemiological studies, or retrospectively from publications, databases or hospital registers.

2.2.2.5. Pharmacoepidemiology

2.2.2.5.1. Overview

'Epidemiology' is the science, which studies patterns of health and disease in communities as well as the factors that determine these patterns (Booyens, 2000:8).

According to WHO (2003f:8) "Pharmacoepidemiology is the study of the use effects/side-effects of drugs in large numbers of people with the purpose of supporting the rational and cost-effective use of drugs in the population thereby improving health outcomes."

In pharmacoepidemiology, a common issue is the comparison of the risk of an adverse event associated with a given drug treatment and it uses observational methods to quantify drug exposure and to evaluate the effectiveness and safety of drug treatment in the general population (Maitland-van der Zee *et al.*, 2000:121; Tubert-Bitter *et al.*, 2000: 1268).

2.2.2.5.2. Types of epidemiological studies

Epidemiological studies can be identified using descriptive studies, namely: experimental and analytic observational studies which will subsequently be briefly discussed.

Table 2.5:Types of epidemiological studies used to test the hypothesis of adverse effects because of drug consumption (adapted from Chauvin *et al.*, 2002:456)

Type of study	Application
Experimental studies	
• Laboratory experiments - Randomised assignment	Control of challenge and environment
• Field experiments – Randomised assignment	Little control of challenge and environment
Analytic observational studies	
• Cross-sectional study	Sampling without regard to drug exposure or adverse reaction status
• Case-control study	Sampling on the basis of adverse reaction status
• Cohort study	Sampling on the basis of drug consumption status (exposure)

Randomised controlled trials tend to be designed to assess the effectiveness of a treatment and the design may not be powerful enough to detect any side effects that may occur (Anon., 2002a:1). The assessment of supposed adverse effects requires application of epidemiological tools through specific studies of different designs i.e. the retrospective surveys, cohort studies and case-control studies (Chauvin *et al.*, 2002:456).

In a cross-sectional study, exposure and disease information is ascertained at the same time; but this design is usually highly vulnerable to bias, because the time sequence of exposure and outcome is not ascertained (Maitland-van der Zee *et al.,* 2000:121). According to Waning and Montagne (2001:52) "Case-control design is an analytical, retrospective study comparing people with the diseases (cases) to a sample of people without the disease (controls) with respect to exposures or characteristics of interest (i.e. to identify factors that could be responsible for the development of a disease or drug use problem)." Cohort studies may also need to be undertaken to assess the safety of the intervention and the evidence used by clinicians to assess the balance between the harm and the good of the intervention (Anon., 2002a:5).

2.2.2.6. Evidence-Based Medicine (EBM)

Evidence-based medicine is an approach to practice and teaching that integrates pathophysiological rationale, caregiver experience and patient preferences with valid and current clinical research evidence (Ellrodt *et al.*, 1997:1687). The practice should enhance the quality of information available for patients, enabling them to discriminate between good and poor evidence and start involving consumers in determining the research agenda so that issues that they believe are important are addressed (Roberts, 1999:79).

Evidence-based medicine involves finding and interpreting the best evidence available to answer a specific clinical question and implementing the findings (Wiffen, 1997:510). Evidence-based medicine is the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients. The methods of epidemiology can thus be directly linked to a disease management and an evidence-based medicine approach where the focus is also on quality assurance and quality improvement.

Persons aged 65 and older comprise the nation's fastest growing population and consume more medications than any other patient group. Therefore, this trend may become necessary and appropriate as medication use remains one of the most cost-effective intervention physicians can provide to manage the medical conditions of older patients (Monane *et al.*, 1998:51). Sometimes more than one type of evidence is required for a clinician to determine whether an actual intervention will do more good than harm. Usually harmful side effects of a treatment occur much more infrequently than the beneficial effects (Roberts, 1999:79).

2.2.2.7. Formularies and Standard Treatment Guidelines

Formularies have become tools for assuring the selection of medications that have been demonstrated to be safe, effective and affordable while maintaining or improving quality patient care.

2.2.2.7.1. Drug formularies

A drug formulary is a continually updated list of medications that represents the current clinical judgement of physicians, pharmacists and other experts or managed care organisations in the diagnosis and treatment of diseases and preservation of health (Anon., 2002c:4). It is often viewed as a cost-containment tool but should not be simply a list of the 'cheapest' drug options; therefore formulary management decisions should extend beyond the evaluation of safety and efficacy, or only cost. They should include an assessment of the 'value' of healthcare products and services (Mullins & Wang, 2002:11).

Formulary issues are also important when PBM organisations are owned by drug manufacturers and therefore PBM programmes have mechanisms for distributing the power of formulary decision making, which can help to alleviate concerns about potential bias in formulary inclusions (Thomas, 1996:10). They can help MCOs and PBMs improve prescribing practices and control costs by limiting the drugs that can be prescribed or by indicating to the physician those medicines within a therapeutic category that are most economical for the health plan. Therefore, formularies reduce costs by limiting choice and although the initial purpose of a formulary was cost reduction, this entity has evolved to include quality of care considerations (Monane *et al.,* 1998:60).

The drugs that are not included on the formulary are not used expect by exception, or unless the patient is willing to pay an added charge. Substitution of generic drugs for brand-name drugs may also be mandated. Drugs that do not have favourable pharmacoeconomic evaluations will not stay on formularies, especially if there is an alternative of equal efficacy at lower total cost to the system (Anon., 2002c:5).

The formulary is a familiar concept in the hospital setting and an important cost control tool for pharmacy benefit management (PBM) companies (Thomas, 1996:9). In the managed-care setting, formularies are used by healthcare providers as a source of information about costs and appropriate use of medications. The question of whether or not to add a drug to a formulary will be, in the first instance, governed by considerations of the safety and effectiveness of the drug; while efficacy as determined by clinical trial results, is a key issue with the commitment to evidence-based medicine (Langley, 1999:218).

2.2.2.7.2. Standard treatment guidelines

Standard treatment guidelines are an effective tool for assisting health professionals to choose the most appropriate medicine for a given patient with a given condition. These guidelines should be developed at a national and local level and updated on a regular basis (WHO, 2001b:2).

According to Anon (2002h:2) "Standard treatment guidelines are a valuable resource in the management of drug therapy because:

- treatment of diseases may have many different approaches;
- many practitioners will not remember the best method of treatment;
- applying the most effective treatment benefits both the patient and the health care system and
- formulary management will have only limited impact if drugs are used incorrectly."

2.2.2.7.3. Conclusion

The question that remains unanswered is whether a formulary will reduce overall health care costs and the success of formularies in improving prescribing practices and quality of care remains unmeasured as well. Therefore, further research is needed to determine if the supposed benefits of formularies really exist. The challenge for the formulary committee lies therefore in considering the total cost of illness and health care and ensuring the accountability of medical and nonmedical resources consumed by the total cost of any programme.

A further discussion of the standard treatment guidelines is given in section 2.3.4.8.3.

2.2.2.8. Health care indicators

2.2.2.8.1. Overview

Drug use indicators are intended to measure specific aspects of the behaviour of health providers in health facilities in a reproducible manner and they can be used quickly and efficiently in many settings to assess potential drug use. Assessing the problems in drug use can then prioritise and focus subsequent efforts to correct these problems.

Objectives of a drug use study using indicators according to the WHO (1993:4), is as follows:

- Describing current treatment practices.
- Comparing the perfomance of individual facilities or prescribers.
- Periodic monitoring and supervision of specific drug use behaviours.
- Assessing the impact of an intervention.

2.2.2.8.2. Types of indicators

Drug use indicators were developed to be used as measures of performance in three general areas, which are related to the rational use of drugs in primary care. The core indicators are named in table 2.6.

Table 2.6: Core drug use indicators (adapted from WHO, 1993:12)

Prescribing indicators

- Average number of drugs per encounter.
- Percentage of drugs prescribed by generic name.
- Percentage of encounters with an antibiotic prescribed.
- Percentage of encounters with an injection prescribed.
- Percentage of drugs prescribed from essential drugs list or formulary.

Patient care indicators

- Average consultation time.
- Average dispensing time.
- Percentage of drugs actually dispensed.
- Percentage of drugs adequately labelled.
- Patients' knowledge of correct dosage.

Facility indicators

- Availability of copy of essential drugs list or formulary.
- Availability of key drugs.

The indicators are facility-based measures, meant to describe practices in a representative sample of health facilities and are used in prescribing practices to measure the performance of health care providers in several key dimensions related to the appropriate use of drugs. These indicators are then based on the practices observed in a sample of clinical encounters taking place at outpatient health facilities where they get treatment for acute and chronic illnesses (WHO, 1993:9-11).

Many critical questions in drug use depend on whether health care providers follow appropriate diagnostic procedures. Another important question depends on their selection of products and dosage schedules to fit the underlying health problems. According to Anis *et al.* (1996:635) "Prescribing a drug without an acceptable indication, specifying an incorrect dosage, schedule or duration of treatment, duplicating therapeutic agents and prescribing drugs without adequate regard to potential interactions are all forms of inappropriate prescribing."

However, determining the quality of diagnosis and evaluating the adequacy of drug choices is a complex undertaking in practice, and therefore beyond the scope of the core indicators.

2.2.2.8.3. Application of indicators

The process of monitoring the implementation of indicators requires the following basic steps:

- Defining the indicators and data needed.
- Collecting the data.
- Analysing the data.
- Evaluating the results; and
- Proposing changes, if needed (WHO, 1994:7).

To make the use of indicators for monitoring feasible, the procedures need to rely on sampling of as small a number of encounters as possible. A rapid way of identifying those facilities, which do not meet a specified norm, is therefore needed (Anis *et al.*, 1996:637).

According to Al-Assaf (1998:99) the desired attributes of quality indicators should be:

- Relevant and frequent.
- Nonobtrusive data collection.
- Cost-effective.
- Reliable and valid.
- Suitable for feedback, profiling and tracking.
- Flexible to allow for continuous adaptation.

Indicators and monitoring systems are only worthwhile if they intend to produce results that can be used to improve the performance of drug policy and to assess the effectiveness of overall drug policy strategies (WHO, 1994:8). The indicators should also be relevant, reliable and flexible to allow for continuous adaptation of the changing trends in the health care system that will result in a more competent approach by health professionals leading to a cost effective usage of medicine (Al-Assaf, 1998:101).

2.2.2.9. Summary: Tools of managed health care

If managed care is to control prescription drug expenses, then it must provide convincing evidence i.e. pharmacoeconomic studies, that cost limiting measures do not compromise quality. Three broad areas to which pharmacoeconomic analyses are applied are: formulary decisions, provider practices and benefit design.

Private sector drug use review programmes have been reported to emphasise cost and contract adherence, with less emphasis on pharmacotherapy, however, an online drug use review programme with explicit criteria or pharmacist intervention has reported improvement in pharmacotherapy in the elderly.

2.2.3. Managed health care in South Africa

The managed health care system was introduced in South Africa in 1993 to enable private health care providers to match the increasing demands of medical schemes by adopting a pro-active approach to providing cost-effective and quality medical services and products to ensure a reduced base-line cost (Wertheimer & Navarro, 1999:124). According to the Council for Medical Schemes (2003:1) "A new set of regulations governing managed health care activities in South Africa took effect on 1 January 2003, by way of amendment to the general regulations made in terms of the Medical Schemes Act, 1998."

One of the major premises underlying the growth of managed care is that it would lead to increased cost-effectiveness in healthcare decisions and outcomes. Many conceptual analyses have been performed on the incentives for cost-effective behaviour by different managed care organisational structures. However, very little is known about the actual decision-making procedures used by managed care organisations (MCOs) to achieve cost-effectiveness in their resource allocations (Alegria *et al.*, 2001:145).

Managed care organisations are structured either as comprehensive providers or as subcontracting entities working with the comprehensive provider. Most comprehensive providers like staff and group model health maintenance organisations (HMOs) provides comprehensive health services, assumes all financial risks for health care, and contracts with insurers on a capitated basis (Anon., 2001:1).

According to the Council for Medical Schemes (2003:17.) "If managed health care entails the use of a protocol, the following must be taken into consideration:

- Such protocol must be developed on the basis of evidence-based medicine, taking into account considerations of cost-effectiveness and affordability;
- the medical scheme and the managed health care organisation must provide such protocol to health care providers, beneficiaries and members of the public, upon request and
- provision must be made for appropriate exceptions where a protocol has been ineffective or causes or would cause harm to a beneficiary, without penalty to that beneficiary."

2.2.4. Summary: Managed health care

Managed care has become the hottest healthcare topic in the US and attracts increasing attention in Europe and other developing countries as well. Initially the fascination with the topic may seem strange; after all, managing patients' care has always been the physician's job description. Perhaps the most awarding approach, is to overlay this period with three cross-cutting dimensions within which to view the evolution of managed care: namely, as a policy strategy to contain costs; as a set of organisational innovations in the delivery and financing of care and as a growing body of medical knowledge.

If the goal of managed care is to increase quality and cost-effectiveness of services, attention should be given to what are going to be the criteria for an equitable allocation of services, to improve health and decrease need within the same level of funding. Determining whether or not a managed system of health care is ethical, requires a more objective assessment of the legitimacy of the efficiency as a guiding principle for the delivery of medical services.

2.3. PRIMARY HEALTH CARE (PHC)

For the purpose of this study "primary health care" will also be referred to as "primary care" (see paragraph 2.3.2).

2.3.1. Introduction

During the last 25 years, primary health care (PHC) has evolved and developed. Governments in most countries have accepted and adapted the philosophy and principles of PHC as the basis for their strategy for reforming and developing their health services systems (Kekki, 2003:2). Many health care systems are converging to a primary care-led health service in an attempt to provide more efficient and equitable care (Kernick, 2000:311).

2.3.2. Definition

According to Anon (2002f:1) "The definition for primary care as proposed by health professionals and politicians alternates between five generic categories. Each category can be differently interpreted and include:

- Services rendered by primary care practitioners.
- A process, such as the entry point into the health care system.
- The organisation of care or the means by which the two goals of a health services system- optimisation of health and equity in distributing resources are balanced.
- A set of attributes characterised by accessibility, co-ordination, continuity, comprehensiveness and accountability.
- Patient-oriented, community-based care, with some definitions of primary health care not only including but also requiring the active participation of nurse practitioners and certified midwives."

The definition of the concept as determined at Alma-Ata (WHO, 2003d:1) is:

"*Primary health care is essential health care made universally accessible to individuals and families in the community by means acceptable to them, through their full participation and at a cost that the community and the country can afford."*

The concept forms an integral part both of the country's health system, of which it is the central function and main focus, and of the overall social and economic development of the community. It is the first level of contact of individuals, the family and the community with the national health system, bringing health care as close as possible to where people live and work, and constitutes the first element of a continuing health care service."

2.3.3. The concept of primary health care

The concept of primary health care was developed in the 1940s and 1950s. The governments of several countries were urged to rationalise their highly technical approach to health care and to broaden their coverage by providing better basic services (Dennil *et al.*, 1995:1). The trend was towards expensive treatment for a few ill people rather than promotive and basic health care for many. These trends and inequalities were found in developed and developing countries worldwide.

Primary health care became a core concept for the World Health Organisation as a result of the Declaration of Alma-Ata in 1978, giving rise to the WHO's goal of health for all. The concepts developed at that International Conference on Primary Health Care continue to influence key aspects of international health policy, shaped in recent years by fresh ideas (WHO, 2003e:1).

All the concepts described above are encompassed in the "A"s of primary health care namely:

- *Availability* – the complete spectrum of services and facilities must be distributed so as to allow people (communities) to use them readily.
- *Affordability* – the cost of health services should be reasonable and no one should be barred from basic care as a result of not being able to pay.
- *Acceptability* – services must be personally and socio-culturally acceptable to the consumers.
- *Appropriateness* – a clear co-ordination must exist between the services available and the needs within the community.
- *Accessibility* – all barriers in the way of need-based access to appropriate health must be removed (Fortuin, 1995:21; Luiz, 1994:129).

A political philosophy that calls for radical changes in both the design and content of traditional health care services is encompassed in the concept of primary health care. It advocates an approach to health care based on principles that allow people to receive the care that enables them to lead socially and economically productive lives (Dennill *et al.,* 1995:14). Many countries are reforming their health sectors and basing these reforms on primary health care (PHC) and because of this it is clear that PHC must be strengthened in all countries and especially in developing countries (Kekki, 2003:2).

2.3.4. Elements of primary health care

The Jakarta conference on 'Leading Health Promotion into the 21 century' in 1997 was the first of the international conferences to be held in a developing region of the world and it acted as a catalyst for health promotion action, nationally, internationally and globally (O'Byrne, 2000:47). Brief discussions on the eight elements of primary care will be given in this section.

2.3.4.1. Preventive health services

The services include medical services which aim to prevent ill-health such as immunisation, family planning and personal health checks, as well as wider preventive health services such as child protection services for children at risk of child abuse (Ewles & Simnett, 2001:29). According to Dennill *et al.* (1999:36) the health professionals alone should not give health education; for it to be successful, a multidisciplinary, intersectoral approach must be used.

2.3.4.2. Promotion of food supply and proper nutrition

Adequate nutrition forms the basis of health and therefore without it "health for all" cannot be easily attained (Kekki, 2003:7). Economic situation, employment levels, commodity prices, the performance of the agricultural sector and food supplementation are all factors, which have an impact on the provision of foodstuffs. Facilities must also be developed to train the personnel needed from the different disciplines to carry out programmes on nutrition.

2.3.4.3. An adequate supply of safe water and basic sanitation

Dennill *et al.* (1999:37) states that safe water for drinking purposes should be colourless, odourless, pleasant to taste, free from disease-producing organisms and other agents. Sanitation must be safe in that there should be an adequate number of toilets and an effective system of removing and disposing of household waste.

2.3.4.4. Maternal and child health services (including family planning)

Women and children constitute a large proportion of the population and therefore by promoting their health, the social and economic burdens on the community can be reduced (Dennill *et al.*, 1999:38).

2.3.4.5. Immunisation against the major infectious diseases

The immunisation of children is one of the cost-effective means of improving child survival. The objective is to immunise children against the six preventable childhood diseases (measles, tetanus, tuberculosis, poliomyelitis, pertussis and diphtheria) as well as mumps and rubella thereby reducing morbidity and mortality (Anon., 2002f:4).

2.3.4.6. Prevention and control of locally endemic diseases

Endemic diseases can be divided into communicable and non-communicable diseases that include chronic diseases of lifestyle. Identifying diseases that are endemic, managing, controlling and monitoring these diseases in a specific area would be an objective in the management of these diseases (Dennil *et al.*, 1995:40).

2.3.4.7. Appropriate treatment of common diseases and injuries

According to Soumerai and Lipton (1995:1642-1643) "Recent research indicates that some of the most debilitating, costly and treatable illnesses are undertreated and the underuse of antihypertensive drugs (e.g. through non- or mal- compliance) has been associated with increases in hospital admissions." Women, minorities and children are particularly vulnerable to occupational hazards. This is especially true in the informal sector, where workers are not necessarily protected and are often subjected to highly unsafe conditions e.g. in factories (Anon, 1999:4).

Seven of the fifteenth leading causes of death for men between the ages of 15 to 44 are injury related. The work place in among the places where accidents are most likely to happen. But these accidents are preventable. Often the smallest actions such as the cover for a moving machine part, protective glasses or clothing or proper training and information can cut accident rates drastically (WHO, 2002a: 2).

2.3.4.8. Provision of essential drugs (medicine)

The concept of essential drugs has been disseminated and promoted extensively at the country level by the WHO's Action Programme on Essential Drugs, as well as by disease control programmes in the WHO, international and nongovernmental organisations throughout the world and bilateral agencies (WHO, 2002b:1).

2.3.4.8.1. Overview

According to Helling-Borda (1995:7) "National regulatory authorities are responsible for evaluating and approving drugs for sale in a country. The choice of drugs is intended to improve accessibility to, and the rational use of, pharmaceuticals which satisfy the health needs of the populations." Certain products may be deemed inappropriate for sale in a country because they are therapeutically of questionable value, because the active ingredients which they contain, present unnecessary and severe risks to the patients, because they contain irrational combinations of active ingredients, or for other reasons (WHO, 2003a:12).

There are now more than 100 national formularies, and by the end of 1999, 88 countries in all six of the WHO regions had introduced the essential drugs concept into curricula for medicine and pharmacy students (Anon., 2002h:2).

2.3.4.8.2. Definition

According to the WHO (1997:12) "Essential medicines are those that satisfy the priority health care needs of the population. They are selected with due regard to public health relevance, evidence on efficacy and safety as well as comparative cost-effectiveness."

2.3.4.8.3. Treatment guidelines and Essential Drugs List

Extensive research by the WHO has shown that standard treatment guidelines, essential drugs lists (EDL) and formularies promote rational prescribing of drugs by prescribers (WHO, 2003a:4).

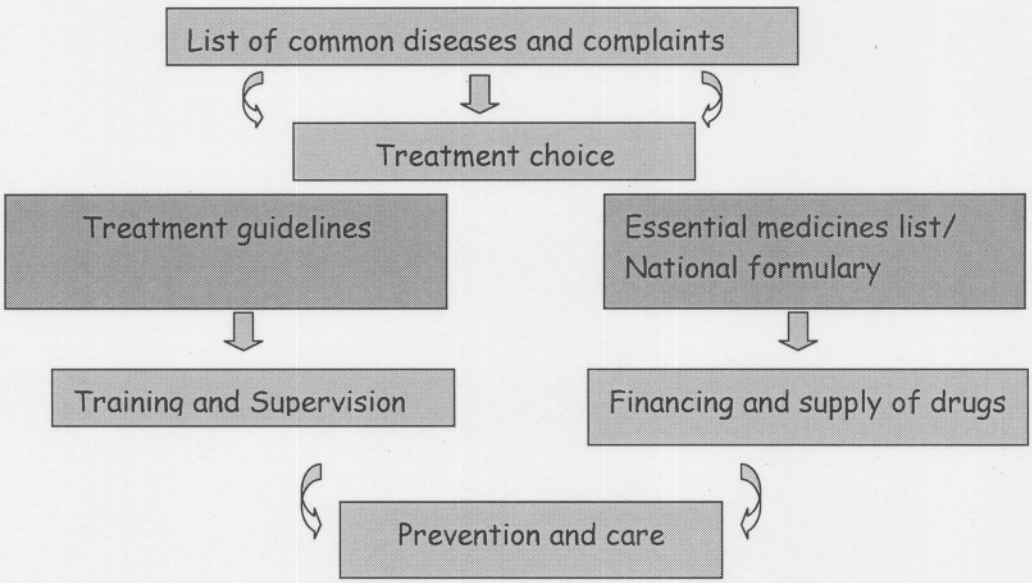


Figure. 2.3: Relation between treatment guidelines and a list of essential medicines (adapted from Laing, 2003:102)

According to Anon (2002h:1-2) "The criteria for the selection of essential drugs for primary health care in South Africa are based on the WHO guidelines for drawing up a national EDL. They include the following:

- Any drug included must meet the needs of the majority of the population.
- Sufficient proven scientific data regarding effectiveness must be available.
- Any drug included in the EDL should have a substantial safety and risk/benefit ratio.
- All products must be of an acceptable quality, and must be tested on a continuous basis.
- The aim, as a rule, is to include only products containing single pharmacologically active ingredients.
- Combination products, as an exception, will be included where patient compliance becomes an important factor, or two pharmacologically active ingredients are synergistically active in a product.
- Products will be listed according to their generic names only.
- Where drugs are clinically equally effective, the drugs will be compared on the best cost advantage, researched, pharmacokinetic properties, patient compliance and most reliable local manufacturer.

- Scientific data and appropriate references on its advantages and benefits must support a request for a new product to be included on the EDL over an existing product."

2.3.4.8.4. The Model List of Essential Medicines

The WHO Expert Committee on the use of essential drugs has been updating the WHO Model List of Essential Drugs every two years since 1977. The current version, the 13th list, dates from April 2003. It contains 316 active substances, which include 12 ARVs and over 60 other essential medicines for HIV-related care, including drugs against opportunistic infections (WHO, 1997:9).

The WHO List of Essential Drugs is a model, to guide countries and health services in developing their own national and local lists. Such lists should be evidence based, considering prevalent diseases, treatment facilities, training and experience of health personnel, financial resources, genetic factors and demographic factors (WHO, 2002b:1).

Criteria such as the pattern of prevalent disease, efficacy, safety, quality of products available, and cost are used to evaluate drugs for approval. From the approved products, some may be chosen as appropriate for self-medication. This choice varies from one country to another due to differences in healthcare systems and social and economic factors (Helling-Borda, 1995:8).

The WHO model formulary is the first global publication to give comprehensive information on all 325 medicines contained in the WHO model list of Essential Medicines and this list presents information on the recommended use, dosage, adverse effects, contraindications and warnings of these medicines (WHO, 2003a:24).

2.3.4.8.5. Conclusion

Despite all the efforts made, however, irrational prescribing, dispensing and consumption of medicines remains widespread, especially in the private sector. Irrational use can also be a major source of impoverishment for poor populations, which then becomes a health hazard. It is a particularly serious problem in developing countries where most drug purchases are made in the private sector. The above therefore shows that all health professionals especially pharmacists play an important role and should be included in making decisions regarding issues on medicines.

2.3.5. Primary health care in South Africa

Primary health care is at the heart of the plans to transform the health services in South Africa and an integrated package of essential primary health care services available to the entire population provides the solid foundations of a single, unified health system that also acts as guidance for provincial and district health authorities to provide the services (Department of Health, 2003:12).

The Constitution of South Africa aims at '*ensuring that a health system is developed which is capable of delivering quality health care to all the citizens efficiently and in a conductive and caring manner*'. However, currently the provincial health departments and local authorities provide 80% of public health services (hospitals, primary health care, laboratory and ambulance services) to the population. The private sector provides the remainder and therefore this goes to show how little the provincial health departments provide for private health services (Whittaker *et al.*, 2000:248).

Traditionally, the government has been viewed as the predominant provider of services such as hospitals and schools, vital for the realisation of rights to health and education. However, increasingly, including in developing countries, the private sector is playing an important role in such spheres (Malby, 2002:24).

According to Dennill *et al.* (1995:17) "The South African health system has evolved from different origins, the two main contributors being Western medicine and the various African cultures with their traditional tribal medicine. This has resulted in the development of two health systems in this country, alongside each other, with western medicine having the official status."

In South Africa, for example, those in the poorest quintile must travel almost 2 hours on average to obtain medical attention, compared with an average of 34 min for the richest quintile (Castro-Leal *et al.*, 2000:71).

The public health system provides free primary care services at point of delivery for expectant and nursing mothers, children under 6, and all who use the public health system. Public hospitals charge fees based on the Uniform Patient Fee Schedule. Private-sector health care is delivered through private hospital groups, private physician groups and solo practitioners. Mining companies provide health care services to their own employees through company-owned hospitals (WHO, 2003d:13).

National health policy is co-ordinated through a Department of Health and representatives from the nine provincial health departments. Provinces oversee public health services and the

operation of public hospitals whilst local authorities co-ordinate preventive and environment health services (WHO, 2003g:7). Problems aggravated by severe mal-distribution of resources between the public and private health sector are that – state health services must serve 80% of the country's population with 42% of the country's doctors and specialists and 86% of the nurses (Slabbert, 1997:10).

There are six compelling reasons for improving and extending primary health care services in South Africa and according to Harrison (1997:22) they are:

- From a human rights perspective, if equity is a goal, then meeting basic needs is a priority. In South Africa, African children under five years of age are eight times more likely to die of some or other disease than their white counterparts.
- Providing good, accessible primary health care will help ease the burden of disease for most poor and vulnerable South Africans by building more hospitals although this might not alleviate the situation overnight.
- From a health perspective, infectious diseases, maternal and perinatal mortality represent an "unfinished agenda" in which diseases of the poor persist, despite South Africa's relative wealth.
- Acute respiratory infections, tuberculosis, diarrhoea and perinatal causes, account for 47,5% of potential years of life lost in people under 65 years of age. With the exception of perinatal problems, generally none of the above require sophisticated medical cure but all require a systematic, comprehensive strategy of primary prevention and disease management.
- From the health service perspective, hospitals in our country face the twin dilemmas of having to care for people who should be treated at a lower level of care and having to manage more and more people with chronic diseases e.g. hypertensive and diabetic patients. The development of appropriate primary level services is crucial if higher level services are to run efficiently, both through better use of hospital services and greater prevention of chronic diseases.
- From an economic perspective, treating predominantly post-transitional health problems like hypertension, cancer, ischaemic heart disease and strokes is becoming increasingly expensive. Costs of treatment in the private sector are spiraling, while the public sector is forced to ration more severely. Unless explicit emphasis is placed on primary and secondary prevention strategies, medical care will become impossibly expensive and eat voraciously into the profits of the industry." He also concludes that while a commitment to primary health care does favour the poor in the short term, it represents the most logical long-term survival strategy for both the public and private sectors.

According to WHO (2003b:7) "An ageing population is important with respect to the future of a health care system because money is spent on the 65-plus age group and as this age group grows in size, countries will be required to spend more on health care."

2.3.6. Summary: Primary health care

The right to health care should be described as entitlement to a system of health protection, which provides equality of opportunity for people to enjoy the highest attainable level of health. The system is not confined to health care alone but rather, encompasses a wide range of socio-economic factors, such as nutrition, housing and safe water that promote conditions in which people can lead a healthy life.

Primary health care has transformed to change its focus from solely the curative approach to that of health, prevention and care. In contrast to that of the conventional health care system, the primary health care system embodies both health promotion and continuous care. Responsibility changes from dealing with the health sector alone and requires intersectoral collaboration, community participation and self-responsibility. This in turn leads to the different approaches regarding primary health care.

2.4. CHAPTER SUMMARY

Disease prevention begins with a threat to health – a disease or environmental hazard, and therefore seeks to protect as many people as possible from the harmful consequences of that threat. Health promotion begins with people who are basically healthy and seeks the development of community and individual measures, which can help them to develop lifestyles that can maintain and enhance their state of wellbeing.

Recent coverage in the media regarding concerns over the rising costs of healthcare and the price of pharmaceutical products is creating considerable public awareness of the potential impact of cost control measures that may be applied to the provision of healthcare. The World Health Organisation also stated in 1990 that effective medical and primary health care can be practised only where there is effective drug management (refer to paragraph 2.3.2). In these activities the pharmacist is therefore accepted worldwide as a vital member of the health-care team.

More recently, some countries have undertaken significant reforms, many of them aimed at expanding or improving primary health care. The WHO has conducted a review of the contribution that primary health care can make in addressing health issues of the twenty-first

century. In developing and middle-income countries in which most populations have access to health services, primary health care focuses on delivering the right services at the right level.

Health economics has established a rigorous theoretical framework, but it is time to move on rather than refine theory even further, therefore, effective use of medicine also depends on the actions of health care providers, formal and informal distribution channels, the pharmaceutical industry and the public in general to retain the costs in health care.

Hereby the first and second specific objectives, namely to conceptualise from the literature what managed health care and its tools is all about as well as the concepts, approaches and elements of primary health care have been reached.

The methodology of this research will be discussed in chapter 3.

It is not that things are difficult that we do not "dare", it is because we do not "dare", that things are difficult.

Unknown

CHAPTER 3 RESEARCH METHODOLOGY

3.1. INTRODUCTION

In this chapter the methodology followed in the study will be discussed.

3.2. STUDY OBJECTIVES

The general objective of the study was to investigate disease and medicine usage patterns from a pharmacoeconomic viewpoint, by using a database of a private primary health care setting.

The specific objectives of this study were to analyse in detail the study population according to clinic, agegroups and gender:

- To conceptualise from the literature what managed health care and its tools is all about.
- To conceptualise from literature the concepts, approaches and elements of primary health care.

To determine from the database:

- the basic characteristics of the study population consulting (visiting) at the private primary health care medicentres (i.e. number of patients, consultations, diagnoses, medicine items, average age of patients and gender distribution),
- what the influence of age is on the number of consultations, diagnoses and medicine items in the study population,
- whether or not the number of consultations, diagnoses and medicine items differs according to gender in the study population,
- the top ten diagnoses in the study population (i.e. diagnoses which had the highest prevalence ranking from 1 to 10),
- the top twenty medicine items in the study population (i.e. medicine items which had the highest prevalence ranking from 1 to 20),
- if the top twenty medicine items that were prescribed for the study population were on the proposed medicentres medicine treatment protocols for the top ten diagnoses,
- the medicine treatment cost per clinic[1] in the study population,
- the medicine treatment cost per age group in the study population,
- the medicine treatment cost per gender in the study population,
- the medicine treatment cost of the top ten diagnoses in the study population,
- the medicine treatment cost of the top twenty medicine items prescribed, and

[1] clinic = medicentre

- to formulate recommendations regarding the results obtained from the analysis.

3.3. RESEARCH METHODOLOGY

Health care is based on information management and the basic input to the system is data from the patient (Bishop & Gonalez-Carvajel, 1998:114). The data is augmented with the result of other initial investigations.

Figure 3.1 is an illustration of the flowing of the data through the health care environment.

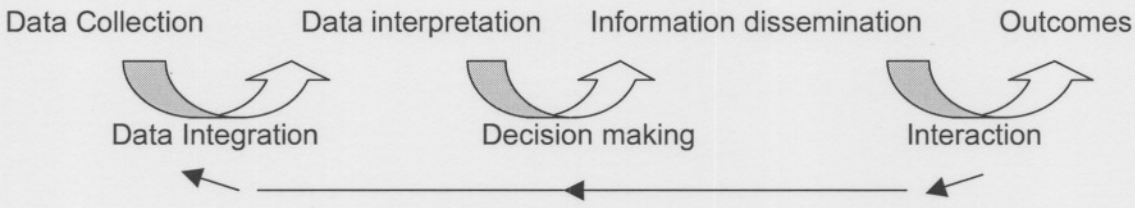


Figure 3.1: Data flow through the health care environment (adapted from Lilley, 1998:115)

Data collection involves applying the measuring instrument to the sample or cases selected for the investigation. Data processing involves data reduction, during which the quantitative and qualitative data is summarised. The data analysis is then followed by a synthesis which involves 'interpretation' or 'explanation' of the data (Mouton, 1998:176).

According to figure 3.1, once the data has been collected, it has to be analysed to produce the desired information. The results are then interacted in order to make decisions of whether they integrate. The sequence of data flow as applicable to this study will be described subsequently (Bishop & Gonalez-Carvajel, 1998:116).

3.3.1. Data collection

The study population consisted of a total of 83648 patients (refer to paragraph 4.2.1) who visited nine (9) medicentre's (private primary health care clinics) in South Africa. The nine clinics were randomly selected from 33 clinics, whose data was electronically available for the period, 1 January 2001 to 31 December 2001 on the central database of medicentres.

3.3.1.1. Aspects of literature that are used in the medicentres®

Table 3.1 shows the aspects of managed and primary health care implemented in the medicentres®.

Table 3.1: Aspects of managed and primary health care, which are applied in the medicentres®

Managed Health Care	Description
Types of health maintenance organisations (HMOs) ▪ Staff model ▪ Group model ▪ IPA ▪ PPO ▪ Direct contract model (paragraph 2.2.1.3.1)	The medicentres are an HMO hybrid, which uses network models e.g. staff and group models as well as IPA, PPO and direct contract models.
Tools of Managed Health Care	**Description**
Capitation (paragraph 2.2.2.1)	The medicentres use a capitation system, monthly payment is paid in advance to a provider that covers contracted services for the delivery of a health service.
Disease management (paragraph 2.2.2.2)	Uses pharmacoeconomic evaluations and outcome measures (information systems for DM) to provide information that helps build formularies and clinical practice guidelines.
DUR (paragraph 2.2.2.3)	Seeks to detect potentially inappropriate prescribing by applying explicit criteria to the patient prescription and medical history information thereby focusing on safety, appropriateness, effectiveness and cost-containment.
Pharmacoeconomics methods and tools (paragraph 2.2.2.4.4) ▪ Cost-effectiveness analysis ▪ Cost of illness analysis	The medicentres uses pharmacoeconomic methods and tools to control or reduce inefficiencies in the consumption, allocation or production of health care services in order to lower health care costs.
Evidence based medicine (paragraph 2.2.2.6)	The medicentres uses EBM to answer a specific clinical questions and implementing the findings (Cochrane database).
Health care indicators (paragraph 2.2.2.8.1)	Describe practices in a representative sample of health facilities and are used in prescribing practices to measure the performance of health care providers in several key dimensions related to the appropriate use of drugs.
Primary Health Care	**Description**
Elements of primary health care (paragraph 2.3.4)	Ensures that a health system is developed which is capable of delivering quality health care efficiently and in a conductive and caring manner to the communities (step up referral system).

3.3.2. Data analysis

3.3.2.1. The variables selected for analysis

The variables selected for the analyses were as follows:

3.3.2.1.1. Demographic information

The following demographic data was analysed:

- *Number of patients per clinic*

The total number of patients who visited each clinic was identified.

- *Gender distribution*

The total number of males and females in each clinic was identified. The number of "unknown" cases per clinic (i.e. cases where the gender was not indicated on the database) was also identified for the analysis.

- *Age*

For statistical analysis the ages of patients in the study population were categorised into six groups and the number of patients in the different age groups were determined for each clinic.

Table 3.2 gives the explanation of each category.

Table 3.2: Categories of age groups

Age group	*Years*	*Explanation*
1	≤ 0 and ≤ 6	All patients 6 years of age and younger were included in this category.
2	6 and ≤ 12	All patients older than 6 years of age up to and including the age of 12 years were included in this category.
3	12 and ≤ 19	All patients older than 12 years of age up to and including the age of 19 years were included in this category.
4	19 and ≤ 40	All patients older than 19 years of age up to and including the age of 40 years were included in this category.
5	40 and ≤ 60	All patients older than 40 years of age up to and including the age of 60 years were included in this category.
6	≥ 60	All patients older than 60 years were included in this category.

3.3.2.1.2. Consultations

The total number and average number of consultations per clinic, age group and gender was identified. Analysis on the cost of medicine treatment was also based on the number of consultations per clinic, age group and gender.

3.3.2.1.3. Diagnoses (medical conditions)

The total number and average number of medical conditions (diagnoses) per consultation were determined according to clinic, age group and gender. The top ten diagnoses were determined (chosen according to their prevalence) for each of the nine clinics (medicentres) as well as collectively for the total study population (refer to table A.4 in appendix A). These top ten medical conditions were also classified according to pathophysiological states. The treatment regimens (according to the primary health care provider protocols) used for each of the top ten medical conditions were identified; and compared to the top twenty medicine items prescribed in the study population (refer to paragraph 3.3.2.1.4).

The top ten diagnoses made were also distinguished as either "single" or "multiple" (according to the number of diagnoses made during a single consultation); and analysed with regard to prevalence and medicine treatment cost.

3.3.2.1.4. Medicine items (all medical supplies excluded)[1]

The total number and the average number of medicine items prescribed per consultation (refer to paragraph 3.3.2.1.2) were determined according to clinic, age group and gender. The top 20 medicine items prescribed for each of the nine clinics (medicentres) were identified according to prevalence. This collective list of the top twenty medicine items per clinic was then classified in groups according to the pharmacological mechanism of action using the classification system of the MIMS (Snyman, 2002:11-13a).

The collective list of top twenty medicine items prescribed in the study population was therefore compared to a list of medicine items (recommended treatment protocols) employed by the private health care provider (see appendix A and paragraph 3.3.2.1.3). The collective top twenty medicine items in the study population was also analysed according to cost (refer to paragraph 3.3.2.1.5).

[1] All non-medical supplies e.g. surgicals like gauze; sutchers etc. were excluded (refer to section 4.2.4 on annotations regarding data analysis).

3.3.2.1.5. Cost of medicine treatment

The cost of medicine treatment in the study population was determined according to the number of consultations per clinic, agegroup and gender. The total and average medicine treatment cost of the top ten diagnoses made for single and multiple diagnoses as well as the cost of the collective top twenty medicine items in the study population was determined.

3.3.2.2. Statistical methods used for analysis

The software that was used for statistical analysis was the Microsoft® Excel 97 and SAS 8.2® computer packages. Microsoft® Word 97 was used for the basic analysis of the data (e.g. writing out of the dissertation) and word processing. The SAS 8.2 programme was used for the collection and processing of the data. A scientific calculator was also used to calculate ratios and weighted averages.

The following statistical methods were used to analyse the data:

3.3.2.2.1. Frequencies

According to Huysamen (1998:15) "frequency is the number of cases observed in a particular category, therefore a frequency distribution shows the manner in which the scores on a variable are distributed, i.e. how the frequencies of the various measurement categories vary."

Frequencies and prevalence were regarded the same for the purpose of this study, therefore, frequency was used every time prevalence was determined. Prevalence was used to determine the number of patients, medical conditions (diagnoses) and medicine items according to clinic, age group and gender. It was also used to determine the top ten diagnoses (single and multiple diagnoses) as well as the top twenty medicine items in the study population.

3.3.2.2.2. *Averages*

- *Average value (mean)*

The best known single numerical value used to indicate the central position/location of the numbers is the "arithmetic mean" or "average" (Steyn *et al.*, 2000:99). To calculate the mean, the sums of all the entries are divided by the total number of entries. The following is the equation used for calculating the mean (Steyn *et al.*, 2000:99):

$$\text{Mean} = \bar{x} = \frac{\sum x}{n}$$

Where :

x = the values of the variable.

$\sum$ = the sum of all given x values

n = the number of observations.

The above formula was used to calculate the average age of patients in the study population. It was also used to calculate the average number of diagnoses and medicine items per consultation according to clinic, age group and gender. The average medicine treatment cost according to clinic, age group and gender as well as the average medicine treatment cost of the top ten diagnoses was determined.

- *Weighted average*

The weighted average is used when calculating a collective average ($\bar{x}_w$) of various sets of data. The following equation (Steyn *et al.*, 2000:102) is used to calculate the weighted average:

$$\bar{x}_w = \frac{\sum ni \sum \bar{xi}}{\sum ni}$$

Where

ni = the size

xi = the average (mean) of the i – data set, with i = 1,2,…, k.

The weighted average in this study was calculated by means of a scientific calculator making use of the statistical function of the calculator. This was used to calculate the weighted averages of medical conditions and medicine items per consultation according to clinic, age group and gender. The weighted average medicine treatment cost per consultation according to age group and gender was also determined.

3.3.2.2.3. Standard deviation

Standard deviation is technically a number in statistics that shows how widely members of a mathematical set vary from the average set (Gadsby *et al.*, 1995:1403). The standard deviation measures variability and the resulting measure of variability is the variance, and for technical reasons, the variance is computed by dividing by ***(n – 1)*** instead of ***n*** (n = number of

observations in data set) for a sample of data. However, the variance is expressed in terms of "square units" and not in the same units as the original observations (i.e. s^2) (Steyn *et al.*, 2000:132).

The equation is as follows (Steyn *et al.*, 2000:132):

$$s = \sqrt{\frac{\sum(x-\bar{x})^2}{n-1}}$$

Where:

s = standard deviation.

n = the number of observations.

$\bar{x}$ = the mean.

The standard deviation was used to calculate the deviation in the number of diagnoses and medicine items per consultation as well as the medicine treatment costs of individual therapies in the clinics according to agegroup and gender.

3.3.2.2.4. Ranges

The range of a set of *n* measurements $\chi_1, \chi_2, \ldots, \chi_n$ is defined to be the difference between the largest and the smallest measurements in a collection. It is based on only one of the scores between the largest and the smallest scores in the distribution (Huysamen, 1998:47; Mendenhall *et al.*, 1993:46).

$$r = \chi_{max} - \chi_{min}$$

Where:

r = range

χ_{max} = the largest score

χ_{min} = the smallest score

The range was used every time the average and standard deviation (e.g. 5.78±3.56) was calculated. It was used particularly to discuss the averages and standard deviations of diagnoses and medicine items per consultations according to clinic, age group and gender in the study population. The medicine treatment cost of the top ten diagnoses was also discussed using ranges.

3.3.2.2.5. Cost Prevalence Index

The cost prevalence index is an indicator used to measure if the cost of something is more than the prevalence or visa versa, indicating therefore if the cost is relatively expensive or inexpensive (Serfontein, 1989:180).

The following is the equation used for the calculation of the cost prevalence index (Serfontein, 1989:180):

$$\text{Cost prevalence index} = \frac{\text{Cost (\%)}}{\text{Prevalence (\%)}}$$

In the context of the study, the cost prevalence index can be interpreted as follows:

- If cost prevalence index < 1 then the therapy utilised is relatively inexpensive.
- If cost prevalence index = 1 then there is equilibrium between the costs and prevalence of therapy (i.e. the cost for that specific therapy is acceptable or justified).
- If cost prevalence index > 1 then the therapy utilised is relatively expensive.

The cost-prevalence index in this study was used to identify age groups, genders and clinics where the medicine treatment costs of the top ten diagnoses and top twenty medicine items in the clinics were greater than 1, therefore indicating that the cost of the medicine treatment was relatively expensive.

3.3.2.2.6. Effect sizes / d-value

Effect sizes (d-values) can be defined as "The degree to which the phenomenon is present in the population" (compare Cohen, 1969:210).

The formula for calculating d-value (Steyn, 1998:3) is as follows:

$$d = \frac{\overline{x}_a - \overline{x}_b}{s_{\max}}$$

Where: $\overline{x}_a$ = the average medicine cost of population *a*.

$\overline{x}_b$ = the average medicine cost of population *b*.

$s_{\max}$ = the maximum standard deviation between *a* and *b*.

According to Steyn (1998:3) the "d"-value can be interpreted as follows:

$|d|$ = 0.2 (small effect with no practical significant difference).

$|d|$ = 0.5 (medium effect which is observable and may be significant).

$|d|$ = 0.8 (large effect which is significant and of practical importance).

$|d|$ > 0.8 (assumed to have practical significant value).

For the purpose of this study, the d-value will be used to determine if there were practically significant differences between the average age of patients, average number of medical conditions, medicine items and the medicine treatment cost (for the top ten diagnoses: single vs. multiple diagnoses) per consultation according to clinic and age group. Only results with a value greater than 0.8 were assumed as being of practical significance and therefore discussed.

3.3.2.2.7. Ratio estimation / ratio

Ratio estimation is an estimation procedure based on the relationship between two variables *y* and *x* measured on the same set of sampled elements and requires the measurement of these variables on each element in the sample as well as a computation of the ratio of their sums. The use of ratio estimation is based on the assumption that the relationship between the variables *y* and *x* is stable over the entire population (Mendenhall *et al.*, 1993:812).

The formula for calculating the ratio estimation according to Mendenhall *et al.* (1993:812) is as follows:

$$\hat{R} = \frac{\sum_{i=1}^{n} y_i}{\sum_{i=1}^{n} x_i}$$

Where

y_i = the value of the variable

X_i = the value of the variable of the *i*-data set, with *i*= 1,2…k.

This equation was used to calculate the ratio of consultations per patient according to clinic, agegroup and gender.

3.3.3 Information dissemination

A discussion of the empirical investigation, the analysis of the results and conclusion of the results will follow in Chapter 4.

3.4. LIMITATIONS OF THE STUDY

This study had certain limitations, which are as follows:

- The database could not supply the diagnosis for which a certain drug was prescribed in cases where more than one diagnosis was made (i.e. multiple diagnoses) during a single patient visit (consultation).
- Some limitations of the study may be directly related to the statistical techniques used (i.e. the rounding off of calculations used to analyse the data).
- The data obtained and analysed from the data source can only be generalised to the database and the specific study population

3.5. RELIABILITY AND VALIDITY

The data for this analysis was directly obtained from a medicentres (clinics) database, therefore, direct manipulation of the data by the researcher was therefore impossible. The research was also conducted assuming that all the data is correct and valid.

3.6. ETHICAL CONSIDERATIONS

The identities of the patients and the clinics were kept intact. Only profile numbers were used to identify the patients, as the confidentiality of the patients and the clinics was a priority.

3.7. CHAPTER SUMMARY

The research methodology was discussed in this chapter. A layout of objectives regarding the analysis of data was given. Data collection and analysis, statistical methods used for analysis, information dissemination, limitations of the study, reliability and validity of the results and ethical considerations were discussed in this chapter.

In the following chapter the analysis and discussion of results will be given.

Life is not about how you fall, but about how you get up from that fall.

Unknown

CHAPTER 4 RESULTS AND DISCUSSION

4.1. INTRODUCTION

In this chapter the results of the retrospective analysis of the data, will be discussed. The results will be presented in four sections, namely:

- general analysis of the study population according to clinic,
- general analysis of the study population according to age groups,
- general analysis of the study population according to gender, and
- general analysis of the cost of medicine treatment of the top ten diagnoses and the top twenty medicine items.

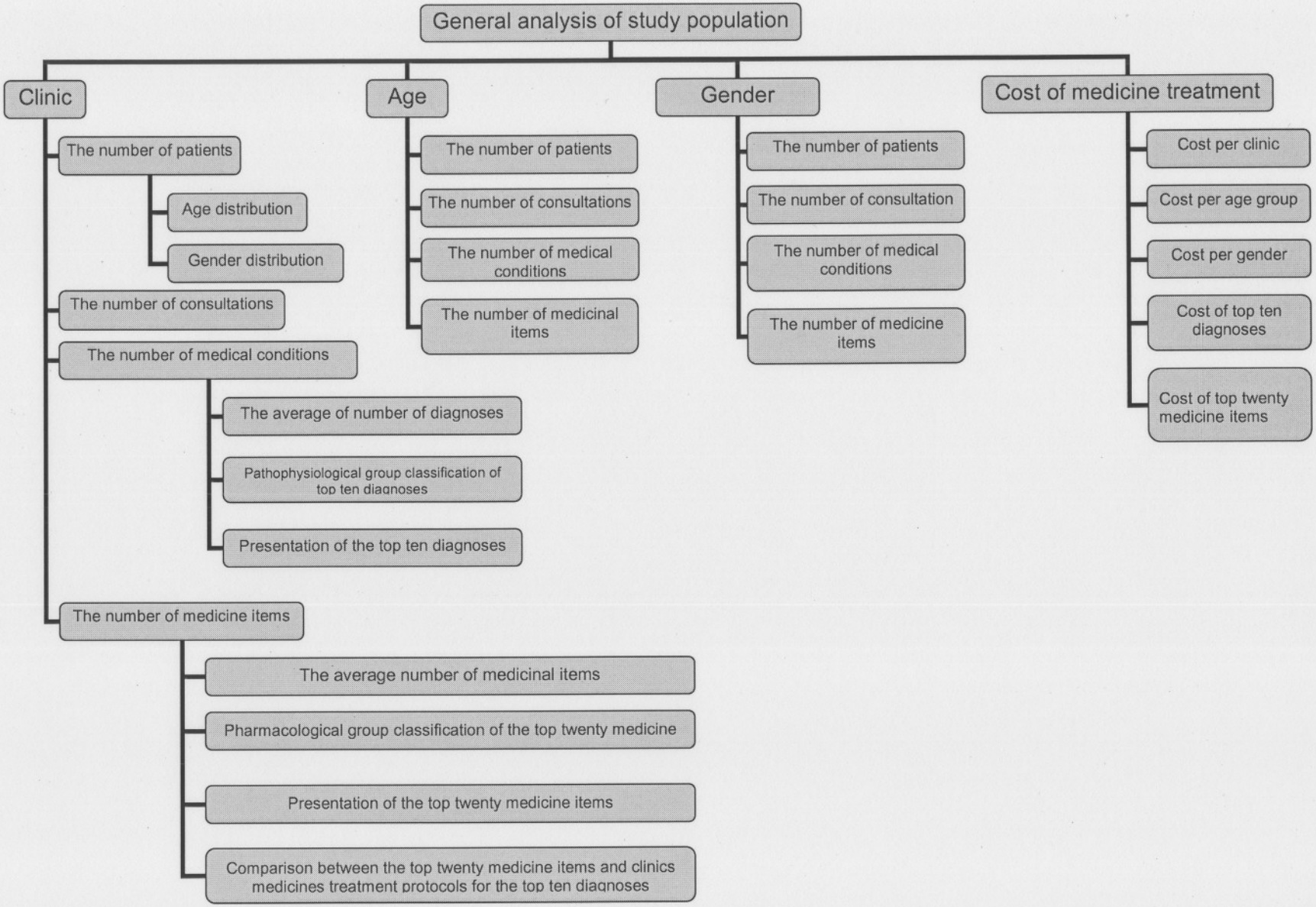
4.1.1. Annotations concerning the analysis of the data

- For the purpose of this analysis, medical conditions will also be referred to as diagnoses.
- Patient visits will also be referred to as consultations.
- Clinics refer to the number of patients at a specific clinic.
- Prevalence and frequency will be regarded as the same for the purpose of this study, implying the "number of times" that a specific course of therapy/treatment was prescribed or the "number of times" a specific diagnosis was made etc.
- Only results with a d-value of greater than 0.8 will be assumed as a practical significant difference (refer to paragraph 3.3.2.3.4).
- The percentages in tables do not necessarily add up to 100, due to the fact that the percentages were rounded off to two decimal places.
- The top ten medical conditions (diagnoses) diagnosed and the top twenty medicine items prescribed respectively will only be discussed according to clinic and the study population. Discussions according to age groups and gender will not be included in this analysis.
- Ages were categorised according to six age groups and numbers 1-6 were used to describe them in tables. The age groups are explained in chapter 3 (refer table to 3.1).
- Unknown groups are those groups in which age and gender were not specified in the database.
- Cost calculations are limited to aspects of medicine treatment, therefore non-medicine items e.g. swab, and gauzes etc. that do not contain active ingredients, were excluded from the list of drugs or medicine items.
- The total medicine treatment cost for the top ten diagnoses will be analysed using the number of *diagnoses* and not the number of *consultations*, because the data supplied for the cost of each diagnosis was calculated according to the total number of diagnoses.

- The major data sources are indicated in the appendix and therefore only summarized tables are given in discussions.
- Pathophysiological states are functional changes associated with or resulting from a disease or an injury (American heritage dictionary, 2000:1).
- In the case of age groups and gender, consultations, diagnoses, medicine items and cost were based on weighted averages.
- Tables in the appendix were arranged according to clinic, age group and gender; therefore, the sequence in the discussion might differ as some discussions are not necessarily in that order.

4.1.2. Presentation of the results

Figure 4.1 shows the presentation of the results in a form of an organogram.


General analysis of study population
Clinic
The number of patients
Age distribution
Gender distribution
The number of consultations
The number of medical conditions
The average of number of diagnoses
Pathophysiological group classification of top ten diagnoses
Presentation of the top ten diagnoses
The number of medicine items
The average number of medicinal items
Pharmacological group classification of the top twenty medicine
Presentation of the top twenty medicine items
Comparison between the top twenty medicine items and clinics medicines treatment protocols for the top ten diagnoses
Age
The number of patients
The number of consultations
The number of medical conditions
The number of medicinal items
Gender
The number of patients
The number of consultation
The number of medical conditions
The number of medicine items
Cost of medicine treatment
Cost per clinic
Cost per age group
Cost per gender
Cost of top ten diagnoses
Cost of top twenty medicine items

4.2. GENERAL ANALYSIS OF THE STUDY POPULATION ACCORDING TO CLINIC

In this section the general analysis of the study population i.e. number of patients, the number of consultations (patient visits), the number of medicine items prescribed and the total number of diagnoses made in the study population will be discussed according to clinic, age group and gender. The top ten medical conditions diagnosed and the top twenty medicine items prescribed will be discussed according to the individual clinics and according to the study population (all nine clinics' data combined).

4.2.1. The number of patients in the study population according to clinic

A general description of the study population according to clinic is given in table A.1 (refer to appendix A).

The study population consisted of all the patients that visited the selected nine clinics during the period 1 January 2001 to 31 December 2001 (refer to paragraph 3.3.1 on the compilation of the study population). The study population comprised of 83648 patients.

According to table A.1, clinic 8 accounted for the highest prevalence with regard to the number of patients, accounting for 20.76% (n = 83648) followed by clinic 1 with 12.53% and clinic 7, with 12.33%. Clinic 3 (with 4.24%) had the lowest prevalence of patients in the study population.

4.2.1.1. Age distribution according to clinic

A general description of the study population according to age group per clinic is given in table A.2 (refer to appendix A).

Table A.2 (in appendix A) shows that in clinics 8 and 2, age groups 1 (patients younger than six years) had the highest prevalence regarding the number of patients with 2.93% (n= 83648) and 2.21% respectively. Clinic 8 had the highest prevalence in age group 4 (19 to 40 years) and unknown (i.e. cases where the age group was not specified), amounting to 9.67% (n= 83648) and 0.46% respectively. Clinics 1 and 7 had the second and third highest prevalence in age group 4 with 5.76% and 5.51% in the study population.

According to table A.3 (in appendix A) clinic 9 had the highest average age of patients in the study population with 33.55 ± 20.31; a range of 13.24 and 53.86, indicating that patients in that clinic were between 13 and 54 years of age. Clinic 2 had the lowest average age of patients in the study population with 25.66 ± 19.85; a range of 5.81 and 45.51, indicating that patients in that clinic were between the ages of 6 and 46 years.

Table 4.1 shows the d-values calculated for the average age of patients per clinic in the study population (see table A.3. in appendix A).

Table 4.1: D-values calculated for the average age of patients per clinic

Clinic	1	2	3	4	5	6	7	8
2	0.33							
3	0.01	0.33						
4	0.07	0.27	0.06					
5	0.20	0.15	0.19	0.12				
6	0.04	0.29	0.03	0.02	0.14			
7	0.01	0.34	0.02	0.08	0.20	0.05		
8	0.00	0.33	0.00	0.06	0.18	0.04	0.01	
9	0.06	0.39	0.07	0.13	0.24	0.10	0.06	0.07

Table 4.1 shows that there was no practically significant difference found (i.e. d-values were <0.8) between the average ages of patients in the nine clinics.

Analysis according to age groups will be discussed further in section 4.3.

4.2.1.2. Gender distribution according to clinic

A general description of the study population according to gender was given according to clinic in table A.8 in appendix A.

According to table A.8 (in appendix A) clinic 8, had the highest prevalence with regard to the number of female patients in the study population accounting for 12.88% (n= 83648), followed by clinics 6 and 1 with 7.68% and 7.07% respectively. Clinic 3 had the lowest prevalence of female and male patients with 2.37% and 1.86% respectively. Clinics 8, 7 and 1 had the highest prevalence with regard to the number of male patients amounting to 7.79% (n= 83648), 5.70% and 5.45% respectively in the study population.

Analysis according to gender will be discussed further in section 4.4.

4.2.2. The number of consultations in the study population according to clinic

Table A.1 (appendix A) shows that a total number of 132591 consultations were made (i.e. the patients in the study population visited the clinics 132 591 times during the study period).

According to table A.1, clinic 8 had the highest number of consultations, which accounted for 17.99% (n = 132591) followed by clinic 7 with 14.08%. Clinic 3 had the lowest number of consultations i.e. 6.57%. This may be attributed to the fact that clinic 3 and 8 had the lowest and highest contribution in terms of the number of patients respectively in the study population.

Derived from table A.1 (appendix A), table 4.2 shows the ratio of consultations per patient in each of the different clinics.

Table 4.2: The ratios of consultations per patient per clinic

Clinic	Total number of patients per clinic	Total number of consultations (patient visits) per clinic	Ratio of consultations per patient per clinic
1	10480	16763	1:1.60
2	7576	11969	1:1.58
3	3549	8713	1:2.46
4	9250	13553	1:1.47
5	8358	11463	1:1.37
6	9993	15017	1:1.50
7	10313	18675	1:1.81
8	17362	23859	1:1.37
9	6767	12579	1:1.86
Total	**83648**	**132591**	**1:1.67**

The results in table 4.2 reveals that although clinic 3 had the lowest number of consultations, it had the highest ratio of consultations per patient with 1:2.46, which may be an indication that some patients visited (consulted) the clinic more than twice during the study period of one year.

4.2.3. The number of medical conditions (diagnoses) in the study population according to clinic

Tables A.1 (in appendix A) shows that a total number of 140723 medical conditions (diagnoses) were made during the study period. Clinic 8 had the highest prevalence 16.83% (n = 140723), followed by clinic 1 with 14.01% and clinic 7 with 13.27%. Clinic 3 had the lowest prevalence, accounting for only 6.31% (n = 140723) of diagnoses made during the 8173 patient visits in that specific clinic.

4.2.3.1. The average number of medical conditions per consultation per clinic

Table 4.3 gives the average number of medical conditions (diagnoses) per consultation per clinic.

It is clear from table 4.3, that clinic 5 and 8 had the lowest average number of medical conditions per consultation. The highest average number of medical conditions was found in clinics 6 and 1 with 1.19 ± 0.63 and 1.18 ± 0.79 respectively. The weighted average of medical conditions per consultation calculated for the total study population (n=9 clinics) was 1.06 ± 0.08, which indicates that between 0 and 1 diagnoses were made per consultation in the study population. Clinics 1 and 6 had the highest average number of medical conditions for the study

population showing that less than 1 condition, i.e. possibly no medical condition was found during that consultation.

Table 4.3: Average number of medical conditions (diagnoses) per consultation

Clinic	Total number of consultations	Total number of medical conditions (diagnoses)	Average number of medical conditions per consultation
1	16763	19719	1.18 ± 0.79
2	11969	13668	1.14 ± 0.62
3	8713	8877	1.02 ± 0.48
4	13553	14159	1.04 ± 0.65
5	11463	11251	0.98 ± 0.56
6	15017	17808	1.19 ± 0.63
7	18675	18670	1.00 ± 0.66
8	23859	23682	0.99 ± 0.44
9	12579	12889	1.02 ± 0.24
Total	**132591**	**140723**	**1.06 ± 0.08***

* *Refer to paragraph 3.3.2.2.2 for the calculation formula.*

Table 4.4 gives a comparison of the d-values calculated for the average number of medical conditions per consultation in the study population (as calculated in table 4.3).

Table 4.4: D-values calculated for the average number of medical conditions per consultation per clinic

Clinic	1	2	3	4	5	6	7	8
2	0.05							
3	0.20	0.19						
4	0.18	0.15	0.03					
5	0.25	0.26	0.07	0.09				
6	0.01	0.08	0.27	0.23	0.33			
7	0.23	0.21	0.03	0.06	0.03	0.29		
8	0.24	0.24	0.06	0.08	0.02	0.32	0.02	
9	0.20	0.19	0.00	0.03	0.07	0.27	0.03	0.07

According to the data in table 4.4 there was no practical significant difference between the average number of medical conditions per consultation between the nine clinics. The conclusion can therefore be made that there was a correlation between the number of patients, patient visits (consultations) and diagnoses made in those clinics.

4.2.3.2. Classification of medical conditions (diagnoses) according to pathophysiological states

Treatment of diseases in South Africa in the public sector is given according to standard treatment guidelines and essential drugs list drawn up by health care professionals (Department of Health, 2004:5). The medicentre's® (private primary health care clinics) use their own treatment protocols, specified for each of the diseases in the specific pathophysiological states. The medicentre's® treatment protocols was developed based on protocols from the WHO and the Cochrane Centre' database. These protocols were also accredited by the University of Pretoria (Anon., 2004:2).

According to table A.1 (appendix A) and table 4.3, a total number of 140723 medical conditions were diagnosed for the whole study population during the study period. The different diagnoses made in the study population were ranked (individually for each clinic) in descending order according to prevalence (refer to table A.4, appendix A).

Table A.4 was used for the following analysis:

- To determine the prevalence of the top 10 diagnoses in each individual clinic (as determined according to ranking order from table A.4) (n = 70 509) in terms of pathophysiological classification using the classification system employed by the medicentre's® (see table 4.5).
- To determine the prevalence of the top 10 diagnoses made overall in the study population (n= 40 913), the 10 individual diagnoses with the highest ranking orders in the individual clinics were combined and a "new" top 10 list according to prevalence was compiled (see table 4.6).

Table 4.5 gives a classification of the top ten diagnoses of the nine individual clinics (combined) into pathophysiological states.

According to table 4.5, the top 10 diagnoses made for each of the nine individual clinics represented 50.10% (n = 140723) of all the diagnoses made in the study population. The highest percentage of diagnoses made was found in the pathophysiological group, "respiratory" with 34.14% (n = 70509) and "musculoskeletal" with 15.12% (n = 70509). The lowest percentage of diagnoses made was in the pathophysiological group, "injuries" with 3.31%.

The disease with the highest incidence in the pathophysiological group "respiratory", was acute bronchitis infection representing 25.88% (n = 24069) and in the group "musculoskeletal" it was osteoarthritis representing 29.01% (n = 10660).

Table 4.5: Prevalence of the top ten diagnoses from the nine individual clinics according to pathophysiological states

Pathophysiological State	Specific diagnosis (According to the medicentre's® protocol)	Prevalence of specific diagnosis in all the nine clinics	Total prevalence of all the diagnoses	Percentage (%) (N=70509)
Gastrointestinal disorders	Gastro-enteritis	2983	6948	9.85%
	Uncomplicated gastritis	2855		
	Peptic ulceration	1110		
Cardiovascular disorders	Hypertension: New/Not controlled	5306	7973	11.31%
	Hypertension: Follow-up controlled	2667		
Genito-Urinary disorders	Urinary tract infection	2214	4688	6.65%
	Pelvic inflammatory disease	2474		
Gynaecology and Obstetrics	Amenorrhoea	977	4976	7.06%
	Antenatal: UTI* cystitis	990		
	Antenatal booking visit	1011		
	Antenatal follow-up	1998		
Musculoskeletal	Osteoarthritis	3092	10660	15.12%
	Muscle pains	1945		
	Arthralgia	2720		
	Myalgia: Diffuse myalgias	664		
	Fibrositis	1016		
	Weakness	1223		
Respiratory	Acute bronchitis infection	6229	24069	34.14%
	Upper respiratory infection	5732		
	Common upper respiratory tract	2893		
	Bronchopneunomia infection	1184		
	Cough	1936		
	Viral influenza infection	6095		
Dental and Oral conditions	Mild/Moderate dental abscess	1051	3165	4.49%
	Severe tooth cavity	2114		
Ear, Nose and Throat disorders	Tonsillitis	1988	5694	8.08%
	Acute sinusitis	3008		
	Severe sinusitis	698		
Injuries	Deep burns	2336	2336	3.31%
Total			**70509**	**100.01%**

** UTI = Urinary tract infection*

4.2.3.3. Presentation of the top ten diagnoses for the study population

Table 4.6 shows the top 10 diagnoses for the nine clinics combined according to prevalence.

Table 4.6: The top ten diagnoses for the study population

Medical condition / diagnosis	Prevalence of diagnoses made in all the clinics	Percentage (%) (N=40933)	Percentage (%) (N=140723)
Acute bronchitis infection	6229 [1]	15.22%	4.43%
Viral: Influenza	6095 [2]	14.90%	4.33%
Upper respiratory infection	5732 [3]	14.01%	4.07%
New/Not controlled hypertension	5306 [4]	12.97%	3.77%
Osteoarthritis	3092 [5]	7.56%	2.20%
Sinuses: Acute sinusitis	3008 [6]	7.35%	2.14%
Gastro-enteritis	2983 [7]	7.29%	2.12%
Upper respiratory tract: Common cold	2893 [8]	7.07%	2.06%
Uncomplicated gastritis	2855 [9]	6.98%	2.03%
Arthralgia	2720 [10]	6.65%	1.93%
Total	**40913**	**100%**	**29.07%**

The prevalence of the top 10 diagnoses made a total number of 40913 as compared to the total number of diagnoses made in the study population (n=140723, i.e. the diagnoses made in all the nine clinics combined), which makes it a percentage of 29.07%.

Acute bronchitis infection (which also proved to be the highest ranking diagnosis in the pathophysiological group "musculoskeletal" (refer to 4.2.3.2) proved to be the most prevalent diagnosis made in the study population, representing 4.43% (n =140723) of the total number of diagnoses made in the study population. The lowest prevalent diagnosis made was arthralgia, representing 1.93% (n= 140723) of the total number of diagnoses made in the study population.

4.2.4. The number of medicine items in the study population according to clinic

According to table A.1 (appendix A) a total of 516177 medicine items were dispensed during the study period.

4.2.4.1. The average number of medicine items per consultation per clinic

Table 4.7 shows the average number of medicine items prescribed per consultation in each of the clinics.

Table 4.7: The average number of medicine items prescribed per consultation according to clinic

Clinic	Total number of consultations per clinic (N =132591)	Total number of medicine items prescribed per clinic	Average number of medicine items prescribed per consultation
1	16763	60972	3.64 ± 1.56
2	11969	46839	3.91 ± 1.34
3	8713	30442	3.49 ± 1.52
4	13553	47734	3.52 ± 1.22
5	11463	41685	3.64 ± 1.36
6	15017	74578	4.97 ± 1.81
7	18675	60611	3.25 ± 1.39
8	23859	93877	3.93 ± 1.27
9	12579	59439	4.73 ± 1.87
Total	**132591**	**516177**	**3.89 ± 0.54**

According to table 4.7, clinic 8 had the highest number of medicine items with 18.19% (n = 516177) medicine items prescribed compared to the other clinics in the study population. Clinic 3 had the lowest number of medicine items of 30442 (5.90%) prescribed. This may be attributed to the fact that clinics 3 and 8 had respectively the lowest and highest contribution to the study population in terms of the number of patients (refer to table A.1) as well as the number of consultations made (refer to table 4.2).

From table 4.7, the weighted average for medicine items per consultation was calculated to be 3.89 ± 0.54, which indicates that patients in the study population received between 3 and 4 items per consultation.

Analysis on the average number of medicine items prescribed per consultation revealed that in the majority of the clinics (with exceptions to clinics 6 and 9), a minimum of 2 and a maximum of 5 medicine items was prescribed. In clinics 6 and 9 however, patients received up to almost 7 items per consultation. This may be an indication that these two clinics did not comply with the prescribed medicentre's® treatment protocols and should therefore be further investigated, as this might not only have cost implications but other reasons, such as the availability of medicines or the absence of the necessary competence, may be present.

Table 4.8 shows the d-values calculated between the different clinics regarding the average number of medicine items per consultation (as calculated from table 4.7).

According to table 4.8, practical significant differences were found for the average number of medicine items per consultation between clinics 3 and 6 (d-value = 0.82), clinics 4 and 6 (d-value = 0.80) and clinics 6 and 7 (d-value = 0.95) respectively.

Table 4.8: D-values calculated for the average number of medicine items per consultation according to clinic

Clinic	1	2	3	4	5	6	7	8
2	0.17							
3	0.10	0.28						
4	0.08	0.29	0.02					
5	0.00	0.20	0.10	0.09				
6	0.73	0.59	**0.82#**	**0.80#**	0.73			
7	0.25	0.47	0.16	0.19	0.28	**0.95#**		
8	0.19	0.01	0.29	0.32	0.21	0.57	0.49	
9	0.58	0.44	0.66	0.65	0.58	0.13	0.79	0.43

 # indicates that there was a practical significance (d ≥ 0.8)

In contrast with the results discussed on the average medicine items per consultation in clinics 6 and 9, the d-values calculated for the 'average number of medicine items per consultation did not show any practical significant differences for clinic 9. This could be ascribed to the fact that clinic 6 was dispensing more medicine items per consultation than the other three clinics (clinics 3, 4 and 7) and may be an indication that clinic 6 could be using a different medicine treatment protocol from the other clinics.

4.2.4.2. Classification of the top twenty medicine items according to prevalence and pharmacological groups

According to table A.1, a total number of 516177 medicine items were prescribed for the total study population (all 9 clinics combined) during the study period. As each clinic represented a unique set of prescribed medicine items, the prevalence of all these medicine items prescribed was ranked (individually for each clinic) in descending order (refer to table A.5 in appendix A).

Table A.5 was used for the following analysis:

- To determine the prevalence of the top 20 medicine items for each clinic (as determined according to the ranking order) in terms of the pharmacological classification system for medicine (N = 388 049). The classification system employed was that of MIMS® (Snyman, 2002: 11-13a), see table 4.9.
- To determine the prevalence of the top 20 medicine items prescribed overall in the total study population (n= 290 291). From this list, the first 20 items prescribed (rank orders 1 to 20) in each of the 9 clinics was selected and listed in table 4.10, "amounting" to a total of

290 291 medicine items (thus representing 56.24% of the total number of medicine items prescribed in the total study population).

Table 4.9 shows the classification and prevalence of the top twenty drugs of each of the nine clinics combined according to pharmacological groups (Snyman, 2002:11a-13a).

Table 4.9: Prevalence of the top 20 medicine items from the nine individual clinics according to pharmacological groups

Pharmacological group		Specific drug according to active ingredients (s)	Prevalence*	Total prevalence* per group	Percentage (%) (N=388049)
Anti-microbials	Anti-bacterials (Beta- lactam agents)	Amoxycillin, 250mg capsules Ampicillin, 250mg capsules Amoxycillin, 125mg/5ml suspension	17368 5498 5535	28401	7.32%
	(Sulphonamides, tetracyclines, macrolides & anti-protozoal agents)	Co-Trimoxazole, 480mg tablets Co-Trimoxazole, 240mg/5ml suspension Doxycline, 100mg capsules Erythromycin Estolate, 250mg capsules Metronidazole, 400mg tablets Metronidazole, 200mg tablets	16261 5653 8653 6155 3671 6846	47239	12.17%
Cardio-vascular drugs	Anti-hypertensives	Amiloride, hydrochlorothiazide, 5(50) mg tablets Hydrochlorothiazide, Potassium, 50mg/300mg tablets	9184 2562	11746	3.03%
Endocrine System	Corticosteroids	Prednisone, 5mg tablets	7321	7321	1.89%
Central nervous	Anxiolytics - Benzodiazepines, Anti-vertigo/Anti-emetic	Diazepam, 5mg tablets Metoclopramide, 10mg tablets	6499 4414	10913	2.81%
Urinary System	Urine alkaliser	Potassium Citrate. 1.25g/15ml syrup	9709	9709	2.50%
Ear, Nose & Throat	Mouth and throat preparations	Iodine Phenol Menthol lozenges	5457	5457	1.41%
Vitamins, Tonics, Minerals & Electrolytes	Vitamins and minerals	Multivitamin, tablets Ascorbic acid, 250mg tablets Folic Acid, 5mg tablets Calcium gluconate., 300mg tablets Vitamin B Complex, Forte tablets Ferrous Sulphate Complex, 170mg tablets	11112 5226 9257 2749 2730 9463	40537	10.45%

Table 4.9 continued..

Analgesics / Musculoskeletal [1]	**Analgesics and antipyretics**	Paracetamol, 500mg tablets Paracetamol, 120mg/5ml syrup	41879 12052	121339	31.27%
	Non-steroidal anti-inflammatory drugs (NSAIDS)	Ibuprofen, 200mg tablets Ibuprofen, 400mg tablets Diclofenac Sodium, 75mg injection Diclofenac Sodium, 25mg tablets Ung Methyl Salicylate ointment Indomethacin, 25mg capsules	18956 1973 17749 8151 14459 6120		
Respiratory	**Bronchodilators (methylxanthines)**	Theophylline anhydrous syrup	6600	84328	21.73%
	Cough mixtures and cough mixtures containing non-narcotic analgesics/NSAIDSOpiod analgesics; Decongestants and Vitamins	Diphenhydramine, ammonium 14mg/5ml syrup Diphenhydramine, paracetamol, phenyl-ephedrine, ascorbic acid capsules Paracetamol, codeine, 500(8)mg tablets Paraetamol, codeine, promethazine, 120mg/5ml syrup Paracetamol, caffeine, codeine, meprobamate, 320mg tablets Paracetamol, ephedrine, chlorpheniramine, 200mg tablets Chlorpheniramine, ephedrine, 2mg/5ml syrup Chlorpheniramine, ephedrine, 2(6)mg tablets	30055 1134 22941 2926 2491 12376 3307 2498		
Gastro-intestinal Tract	**Antidotes (non-specific)**	Ipecaecuana liquid elixir, 0.021ml/10ml syrup	3983	3983	1.03%
	Anti-spasmodic, acid reducers (anti-acids)	Hyoscine, 10mg tablets Aluminium hydroxide, 400mg/10ml suspension	6016 5472	11488	2.96%
Autocoides	**Anti-histamine**	Chlorpheniramine, 4mg tablets	5588	5588	1.44%
Total				***388049***	***100.01%***

* Prevalence of specific item prescribed in all the nine clinics.

The highest percentage of medicine items prescribed was found in the pharmacological group, "musculoskeletal agents and analgesics" with 31.27% (n = 38 8049) followed by the respiratory systems 21.73% (n = 38 8049). The top medicine item prescribed in the pharmacological group

[1] *For the purpose of this analysis and to simplify calculations, the pharmacological groups "analgesics" and "musculoskeletal" were considered as one group due to the fact that certain drugs (e.g. Ibuprofen) appear in both groups.*

musculoskeletal agents and analgesics was paracetamol tablets (500mg) representing 34.51% (n = 121339).

The combination cough syrup diphenhydramine hydrochloride and ammonium chloride (14mg/5mg) from the pharmacological group "respiratory" agents represented 35.64% (n = 84328). The pharmacological group antidotes was represented with 1.03% (n = 38 8049).

It is evident from table 4.8 that the majority of medicine items prescribed can be classified into pharmacological groups indicated for the treatment of acute conditions. The only pharmacological group indicated for the treatment of chronic conditions was cardio-vascular agents (anti-hypertensive agents). The prevalence of vitamins/tonics was also relatively high, as well as cough mixtures; the use of these medicines are controversial in terms of the "rational" drug use as these agents are prone to public misuse.

The relatively high prevalence of musculoskeletal agents, analgesics and respiratory system drugs as determined in table 4.9 correlates with the relatively high occurrences of diagnoses made in the corresponding groups (refer to table 4.5).

4.2.4.3. Presentation of the top twenty medicine items

Table 4.10 shows the top 20 medicine items prescribed and used in the database for the total study population.

According to table 4.10; the top 20 medicine items overall prescribed in the study population accounted for 56.23% (n= 516 177) of the total number of medicine items prescribed in all the nine clinics combined.

Paracetamol tablets proved to be the medicine item most used or dispensed in all the clinics during the study period, accounting for 14.43% (n =290 291) of the top twenty medicine items overall prescribed in the study population and 8.11% (n =516177) of all the total number of medicine items prescribed during the period. A possible reason for the high usage of paracetamol could be that it acts as both an analgesic and antipyretic agent, therefore being the most recommended painkiller in the clinics (Anon., 1999:25).

The majority of the items in the top 20 medicine items are representative of medication prescribed mainly for acute conditions; with the exception of the combination of amiloride/hydrochlorothiazide which is indicated for the treatment of chronic cardio-vascular conditions, e.g. hypertension, myocardial infarction, oedema etc. (Katzung, 1998:253). The

information regarding the usage of paracetamol will be discussed in the following section (see section 4.2.5).

Table 4.10: The top twenty medicine items for the study population

Name of medicine item	Prevalence of medicine items[2]	Percentage (%) (n = 290291)	Percentage (%) (n = 516177)
Paracetamol, 500mg tablets	41879 [1]	14.43%	8.11%
Diphenhydramine, ammonium chloride 14mg/5ml syrup	30055 [2]	10.35%	5.82%
Paracetamol, codeine phosphate, 500(8)mg tablets	22941 [3]	7.90%	4.44%
Ibuprofen, 200mg tablets	18956 [4]	6.53%	3.67%
Diclofenac sodium, 75mg Injection	17749 [5]	6.11%	3.44%
Amoxycillin, 250mg capsules	17368 [6]	5.98%	3.36%
Co-Trimoxazole, 480mg tablets	16261 [7]	5.60%	3.15%
Methyl salicylate ointment	14459 [8]	4.98%	2.80%
Paracetamol, ephedrine, chlorpheniramine, 200mg tablets	12376 [9]	4.26%	2.40%
Paracetamol, 120mg/5ml syrup	12052 [10]	4.15%	2.33%
Multivitamin, tablets	11112 [11]	3.83%	2.15%
Potassium Citrate. 1.25g/15ml syrup	9709 [12]	3.34%	1.88%
Ferrous sulphate complex, 170mg tablets	9463 [13]	3.26%	1.83%
Folic acid 5mg tablets	9257 [14]	3.19%	1.79%
Amiloride hydrochlorothiazide 5(50)mg tablets	9184 [15]	3.16%	1.78%
Doxycycline, 100mg capsules	8653 [16]	2.98%	1.68%
Diclofenac sodium, 25mg tablets	8151 [17]	2.81%	1.58%
Prednisone, 5mg tablets	7321 [18]	2.52%	1.42%
Metronidazole, 200mg tablets	6846 [19]	2.36%	1.33%
Diazepam, 5mg tablets	6499 [20]	2.24%	1.26%
TOTAL	**290291**	**99.98%**	**56.23%**

4.2.5. The top twenty medicine items and the medicentres® medicine treatment protocols for the top ten diagnoses

Table 4.11 gives a comparison between the top twenty medicine items prescribed in the study population and medicine treatment protocols for the top ten diagnoses.

[2] *Superscript numbers in column 2 indicate rank order on the scale of 1 to 20.*

Table 4.11: Comparison of the top twenty medicine items and the medicentres® medicine treatment protocols

Name of medicine item	Medicine item included in the medicentre's® medicine treatment protocol for the top ten diagnoses		The diagnosis for which the medicine item was prescribed
	YES	NO	
Paracetamol, 500mg tablets	✓		• Acute bronchitis infection • Osteoarthritis • Acute sinusitis • Common cold infection • Arthralgia • Viral influenza • Upper respiratory infection
Diphenhydramine, ammonium chloride, 14mg/5ml syrup	✓		• Acute bronchitis infection • Common cold infection • Viral influenza • Upper respiratory infection
Paracetamol, codeine phosphate, 500(8)mg tablets	✓		• Osteoarthritis • Arthralgia • Viral influenza
Ibuprofen, 200mg tablets	✓		• Osteoarthritis • Arthralgia • Upper respiratory infection
Diclofenac sodium, 75mg Injection	✓		• Osteoarthritis • Arthralgia
Amoxycillin, 250mg capsules	✓		• Acute bronchitis infection • Acute sinusitis • Upper respiratory infection
Co-Trimoxazole, 480mg tablets	✓		• Acute bronchitis infection • Acute sinusitis • Upper respiratory infection
Methyl salicylate ointment	✓		• Osteoarthritis
Paracetamol, ephedrine, chlorpheniramine, 200mg tablets	✓		• Common cold infection • Upper respiratory infection • Viral influenza
Paracetamol, 120mg/5ml syrup	✓		• Acute bronchitis infection • Acute sinusitis • Common cold infection • Arthralgia • Viral influenza • Upper respiratory infection
Multivitamin, tablets		✓	
Potassium Citrate 1.25g/15ml syrup		✓	
Ferrous sulphate complex, 170mg tablets		✓	
Folic acid, 5mg tablets		✓	
Amiloride hydrochlorothiazide, 5(50)mg tablets	✓		• New/not controlled hypertension
Doxycycline, 100mg capsules	✓		• Acute sinusitis • Upper respiratory infection
Diclofenac sodium, 25mg tablets	✓		• Osteoarthritis
Prednisone, 5mg tablets		✓	• Acute sinusitis
Metronidazole, 200mg tablets	✓		
Diazepam, 5mg tablets		✓	

Table 4.11 shows that paracetamol 500mg tablets and the paediatric (120mg/5ml) syrup, which were ranked number 1 and 10 respectively regarding to prevalence (refer to table 4.10) were indicated for 7 of the top 10 medical conditions according to the prescribed medicine protocols. This may be a possible reason why "paracetamol 500mg tablets" was the medicine item most prescribed in the study population.

The second most prescribed medicine item was diphenhydramine ammonium chloride 14mg/5ml syrup accounting for 40% of the diagnoses, which is mainly used for respiratory diseases. This correlates with the high incidences of respiratory diseases 17.12% (n= 140723) that were diagnosed in the study population (see also table 4.9). Compared with the state essential drug list, the drug is not an essential medicine (EDL, 1998:136-137).

From table 4.11, it shows that six medicine items that were amongst the top twenty medicine items prescribed in the study population were not included in the medicentre's® medicine treatment protocol for the top ten diagnoses.

4.2.6. Summary on the general analysis of the study population according to clinic

Clinic 3 had the lowest number of consultations and diagnoses made in the entire study population, but had the highest ratios for consultations 1:2.46 and diagnoses 1:2.50 per patient. This implies that in clinic 3 a patient had 2 or more consultations and diagnoses made during the study period.

Clinics that proved to have the highest number of patients, patient visits (consultations) and medical conditions (diagnoses), also proved to have a relatively high prevalence of medicine items prescribed (refer to table 4.2).

There was also a correlation between the high prevalence in specific pathophysiological and pharmacological groups, which indicated that the high prevalence of medicine items prescribed were used to treat medical conditions made in those specific group classifications (refer to tables 4.5 and 4.9).

4.3. GENERAL ANALYSIS OF THE STUDY POPULATION ACCORDING TO AGE GROUPS

A general description of the study population according to age groups was given in table A.2 in appendix A.

4.3.1. The number of patients in the study population according to age group

Figure 4.2 shows the number of patients in the study population according to age groups.

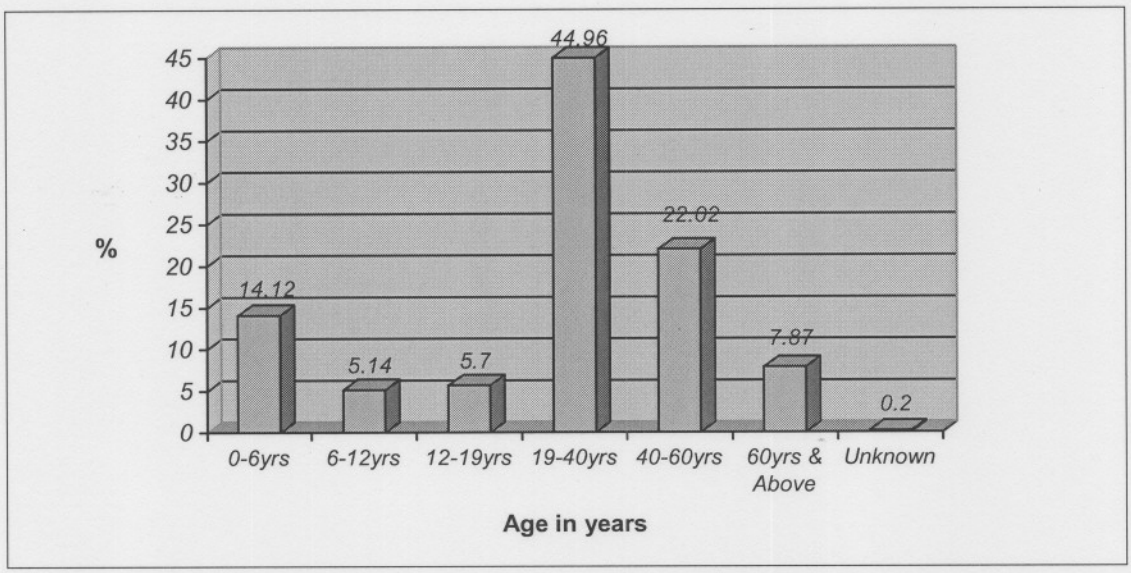


Figure 4.2: Percentages of the number of patients per age group in the study population

According to figure 4.2, age groups 4 and 5 (19 ≤ 40 and 40 ≤ 60 years) had the highest number of patients, 66.97% (n= 83648), with the majority of these patients in the age group 19 to 40 years (44.96%). This age group represent people who could be classified as available for economic activities. A relatively high incidence of diseases and injuries occurs with the majority of people in the working class, therefore clinic visits and time away from work is to be expected in that age group (WHO, 2002a:1). See also paragraph 2.3.4.7 and paragraph 4.2.4.3.

The third highest age group regarding the number of patients was age group1 (≤ 0 ≤ 6 years) with 14.12%.

4.3.2. The number of consultations according to age group in the study population

Table 4.12 (which was compiled from table A.6 in appendix A) shows the ratio of the number of consultations per patient in the study population.

According to table 4.12 age groups 4 and 5 (patients between 19 and 60 years of age) had the highest number of consultations with 42.82% (n=132591) and 25.69% respectively. This age

group was followed by age groups 1 and 6 with 12.35% (n=132591) and 9.60% for the study population.

Table 4.12: The ratio of consultations per patient according to age group in the study population

Age group		Total number of patients	Total number of consultations	Ratio of consultations per patient
1	≤ 0 ≤ 6	11813	16372	1:1.39
2	6 ≤ 12	4301	5773	1:1.34
3	12 ≤ 19	4768	6488	1:1.36
4	19 ≤ 40	37607	56770	1:1.51
5	40 ≤ 60	18416	34061	1:1.85
6	≥ 60	6579	12728	1:1.93
Unknown		164	399	1:2.43
Total		**83648**	**132591**	-

Age groups 4 to 6 had very high ratios of consultation per patient, with the highest being age group 6 (i.e. patients over 60 years of age), with a ratio of 1:1.93. Age group 6 consists mainly of the elderly (i.e. most patients with chronic conditions e.g. hypertensives, diabetics etc. fall under this group) therefore this explains the high ratio of consultation per patient found in this group (Harrison, 1997:22) (see section 2.3.5).

4.3.3. The number of diagnoses in the study population according to age group

Table 4.13 was compiled from table A.6 in appendix A, where the weighted average number of diagnoses per consultation was given according to age group for the individual clinics.

Table 4.13: The weighted average number of medical conditions per consultation per age group in the study population

Age group		Total number of consultations	Total number of diagnoses	Weighted average number of diagnosis per consultation
1	≤ 0 ≤ 6	16372	17037	1.04 ± 0.09
2	6 ≤ 12	5773	6089	1.05 ± 0.07
3	12 ≤ 19	6488	6258	0.97 ± 0.06
4	19 ≤ 40	56770	56847	1.00 ± 0.07
5	40 ≤ 60	34061	38538	1.13 ± 0.10
6	≥ 60	12728	15541	1.22 ± 0.14
Unknown		399	413	0.99 ± 0.11
Total		**132591**	**140723**	

According to table 4.13 patients in age groups 4 and 5 had the highest number of diagnoses made with 40.40% (n=140723) and 27.39% of the study population. Age groups 1 and 6 followed with 12.11% (n=140723) and 11.04% respectively, this may be influenced by the fact that these age groups had also a relatively high total number of patients.

The highest weighted average number of diagnoses per age group of 1.22 ± 0.14 was in age group 6 (≥ 60 years) indicating that patients in this age group are usually diagnosed with more than one type of medical condition per consultation.

Table 4.14 shows the d-values calculated for the weighted average number of diagnoses per consultation according to age group in the study population.

Table 4.14: D-values calculated for the weighted average number of diagnoses per consultation according age groups

Age group	≤ 0 ≤ 6	6 ≤ 12	12 ≤ 19	19 ≤ 40	40 ≤ 60	≥ 60
6 ≤ 12	0.11					
12 ≤ 19	0.78	***1.14***				
19 ≤ 40	0.44	0.71	0.43			
40 ≤ 60	***0.90***	***0.80***	***1.60***	***1.30***		
≥ 60	***1.29***	***1.21***	***1.79***	***1.57***	0.64	
Unknown	0.45	0.55	0.18	0.09	***1.27***	***1.64***

According to table 4.14, practical significant differences were found for weighted average number of diagnoses per consultation between age groups 1 and 5 (d-value = 0.90); age groups 1 and 6 (d-value = 1.29); age groups 2 and 3 (d-value = 1.14); age groups 2 and 5 (d-value = 0.80) and age groups 2 and 6 (d-value =1.21). Practical significant differences were also found for the weighted average number of diagnoses per consultation between age groups 3 and 5 (d-values = 1.60); age groups 3 and 6 (d-values =1.79); age groups 4 and 5 (d-values = 1.30) and between age groups 4 and 6 (d-values =1.57). The d-values calculated between age groups 5 and 6 and the "unknown" group was respectively 1.27 and 1.64. This could be ascribed to the fact that age groups 5 and 6 had more diagnoses made per consultation than the other age groups.

4.3.4. The number of medicine items prescribed in the study population according to age group

Table 4.15 was compiled from table A.7 in appendix A, where the weighted average number of medicine items per consultation was given according to age group for the individual clinics.

Table 4.15: The weighted average number of medicine items per consultation per age group in the study population

Age group		Total number of consultations	Total number of medicine items	Weighted average number of medicine items per consultation
1	≤ 0 ≤ 6	16372	61447	3.75 ± 0.37
2	6 ≤ 12	5773	20634	3.57 ± 0.43
3	12 ≤ 19	6488	23028	3.55 ± 0.48
4	19 ≤ 40	56770	213503	3.76 ± 0.51
5	40 ≤ 60	34061	138675	4.07 ± 0.64
6	≥ 60	12728	57655	4.53 ± 0.84
Unknown		399	1235	3.10 ± 0.53
Total		**132591**	**516177**	

According to table 4.15, patients in age groups 4 and 5 had the highest number of medicine items prescribed to them accounting for 41.36% (n= 516177) and 26.87% respectively. These age groups had weighted averages of medicine items per consultation of 4.07 ± 0.64 and 4.53 ± 0.84, which indicates that patients received between 4 and 5 medicine items per consultation for both these age groups.

According to tables 4.12 and 4.13 age groups 1 and 6 had the second highest number of consultations and diagnoses, as well as the highest number of medicine items prescribed for them with 11.90% and 11.17% (n= 516177) respectively of the study population. This could be attributed to the fact that patients in age group 1 (≤ 0 ≤ 6 years) are newborns and infants who often seek medical attention (because of the many sicknesses they usually suffer from) (WHO, 2003e:12). Patients in age group 6 (≥ 60 years) are more prone to chronic medicine usage (some can be on anti-diabetic and anti-hypertensive treatments at the same time, therefore consume more medications than any other patient group). Also refer to paragraph 2.2.2.6.

Table 4.16 shows the d-values calculated for the weighted average number of medicine items per consultation according to age group in the study population.

Table 4.16: D-values calculated for the weighted average number of medicine items per consultation according age groups

Age group	≤ 0 ≤ 6	6 ≤ 12	12 ≤ 19	19 ≤ 40	40 ≤ 60	≥ 60
6 ≤ 12	0.42					
12 ≤ 19	0.42	0.04				
19 ≤ 40	0.02	0.37	0.41			
40 ≤ 60	0.50	0.78	**0.81**	0.48		
≥ 60	**0.93**	**1.14**	**1.17**	**0.92**	0.55	
Unknown	**1.23**	**0.89**	**0.85**	**1.25**	**1.52**	**1.70**

According to table 4.16, practical significant differences were found for the weighted average number of medicine items per consultation between age groups 1 and 6, and unknown (d-values = 0.93 and 1.23), age groups 2 and 6, and unknown (d-values = 1.14 and 0.89), age groups 3 and 5, 6 and unknown (d-values = 0.81, 1.17 and 0.85), age groups 4 and 6, and unknown (d-values = 0.92 and 1.25), age groups 5 and unknown (d-value = 1.52) and age group 6 and unknown (d-value = 1.70). This could be ascribed to the fact that age group 6 and "unknown" were prescribed more medicine items per consultation than the other age groups.

4.3.5. Summary on the general analysis of the study population according to age groups

Patients in age groups 4 and 5 (19 to 60 years) made up more than half the number of patients that visited the clinics and were diagnosed in the study population. Patients between 19 and 60 years of age are normally working people and are classified as the economic group. These people are prone to diseases because they are the most active group and are also exposed occupational hazards (see paragraph 2.3.2.1).

Although age groups 4 and 5 had the highest prevalence of patients, consultations and diagnoses in the study population, age groups 1 ($\leq 0 \leq 6$ years) and 6 (≥ 60 years) had the highest number of medicine items prescribed to them. This may be because patients in age group 1 are children and usually need medical attention because of their unstable conditions until they grow older (refer to 4.3.4). Likewise, patients in age group 6 are the elderly and are often on chronic medication where usually two or more medicine items are prescribed (refer to 2.2.2.3.4).

Age groups 4 and 5 ($19 \leq 40$ and $40 \leq 60$ years) had the highest number of patients, 66.97% (n= 83648), 68.50% (n= 132591) of consultations, 67.78% (n= 140723) of diagnoses and 68.23% (n= 516177) of medicine items in the whole study population. The second highest age group was age group1 ($\leq 0 \leq 6$ years) followed by age group 6 (≥ 60 years).

4.4. GENERAL ANALYSIS OF THE STUDY POPULATION ACCORDING TO GENDER

In table A.8 (in appendix A) a general description of the study population according to gender was given per clinic and will be discussed subsequently.

4.4.1. The number of patients in the study population according to gender

Figure 4.3 shows the gender distribution of patients in the study population.

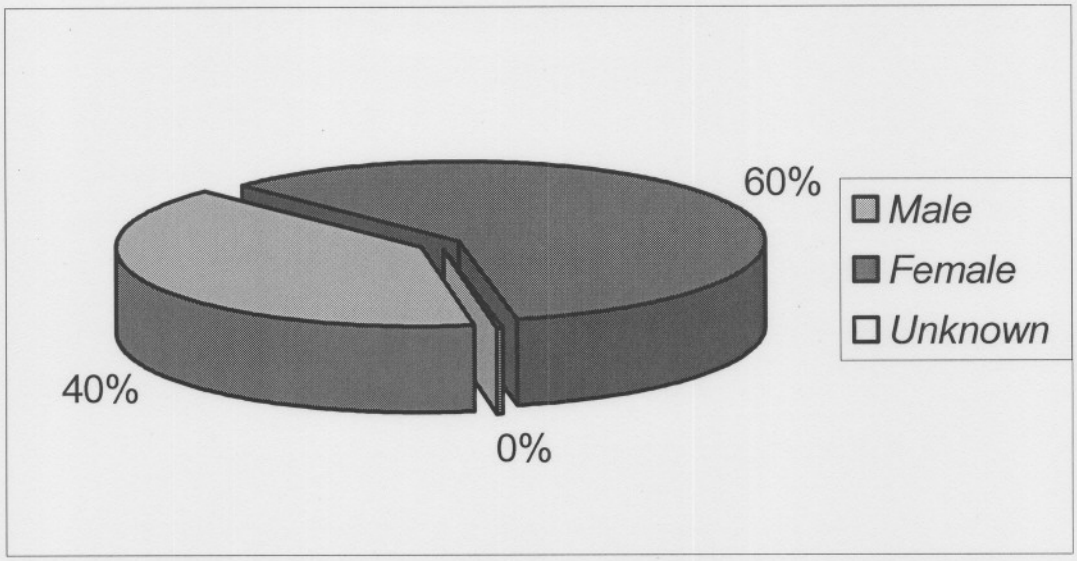


Figure 4.3: The number of patients according to gender in the study population

According to table A.8 (in appendix A), of the 83648 patients in the study population, 33650 (40.23%) were male, 49774 (59.50%) female and 224 (0.27%) were unknown (i.e. cases where gender was not indicated). These results are therefore in accordance with literature (Rowe, 1998:186), in support that females consult more than males do, as they are more susceptible to diseases in general (refer to paragraph 2.3.2.1).

4.4.2. The number of consultations in the study population according to gender

Table 4.17 was compiled from table A.12 in appendix A and shows the ratio of consultations per patient per gender in the study population.

Table 4.17: The ratio of consultations per patient according to gender

Gender	Total number of patients	Total number of consultations	Ratio of consultations per patient per gender
Male	33650	52610	1:1.56
Female	49774	79458	1:1.60
Unknown	224	523	1:2.33
Total	**83648**	**132591**	-

According to Anon (1999:4) "Women get pregnant are more prone to diseases and are particularly vulnerable to occupational hazards e.g. in factories (due to their physiological composition) (refer to paragraph 2.3.4.7) and can therefore be expected to seek medical attention on a regular basis."

According to table 4.17, the ratios of consultation per gender for male and female patients in the study population were more or less the same (i.e. 1:1.60 vs. 1:1.56) and were thus not in accordance with literature. Ratios calculated for the "unknown" group was however much higher than expected with (1:2.33) and should be investigated further.

4.4.3. The number of diagnoses in the study population according to gender

Table 4.18 was compiled from table A.9 (in appendix A), where the average number of diagnoses per consultation was given according to gender for the individual clinics.

Table 4.18: The weighted average number of diagnoses per consultation per gender

Gender	Total number of consultations	Total number of diagnoses	Weighted average number of diagnoses per consultation	D-values
Male	52610	55065	1.05 ± 0.07	0.22
Female	79458	85106	1.07 ± 0.09	0.67
Unknown	523	552	1.01 ± 0.08	0.50
Total	132591	140723		

According to table 4.18, the ranges for the weighted average number of diagnoses per consultation for males and females were the same (0.98±1.12 vs. 0.98±1.16) indicating that for patients in both of these genders, at least one diagnosis was made during a consultation. Although females had a higher number of diagnoses made (refer to table 4.18), the same number of diagnoses were made per consultation for both males and females. The d-values also indicate that there was no practical significant difference in the average number of diagnoses per consultation between males and females, but only a medium effect which was observable and may be significant in the unknown group.

4.4.4. The number of medicine items in the study population according to gender

Compiled from table A.10 in appendix A, table 4.19 shows the weighted average number of medicine items per consultation according to gender in the study population.

Table 4.19: The weighted average number of medicine items per consultations per gender

Gender	Total number of consultations	Total number of medicine items	Weighted average number of medicine items per consultation per gender	D-value
Male	52610	198692	3.78 ± 0.53	0.35
Female	79458	315738	3.97 ± 0.55	1.25
Unknown	523	1747	3.28 ± 0.52	0.94
Total	**132591**	**516177**		

Table 4.19 shows that the genders, males and females had the same average number of medicine items per consultation (3.78 ± 0.53 vs. 3.97 ± 0.55). This indicates that there were between 4 and 5 medicine items prescribed for both the genders and although females had a relatively higher number of medicine items prescribed to them (refer table 4.19), the same number of medicine items per consultation was prescribed for both males and females. The d-values also indicate that there was no practical significant difference in the average number of medicine items per consultation between males and females, but a practical significant difference observable for the unknown group.

4.4.5. Summary on the general analysis of the study population according to gender

Women and children are vulnerable to diseases and occupational hazards and this is especially true in the informal sector, where workers are not necessarily protected and are therefore often subjected to highly unsafe conditions (see paragraph 2.3.2.1). This fact attributes to the high prevalence of patients consulting, diagnoses and medicine items prescribed amongst females.

4.5. SUMMARY: GENERAL ANALYSIS

The study population consisted of 83648 patients that visited nine private primary health care clinics, however the contribution from the different clinics with regard to the total number of patients per clinic varies between 4.24% (clinic 3) and 20.76% (clinic 8). Refer to table A.1 in appendix A.

There were no practical significant differences between the different clinics regarding the average ages of the patients (refer to table 4.1). The majority of the patients in the study population were between the ages of nineteen and fourty years (refer to table A.2 in appendix A). From the analysis, females had the highest prevalence accounting for 59.50% (n= 83648) of patients visiting the nine primary health care clinics (refer to paragraph 4.2.1.2).

A total number of 516177 medicine items were dispensed during the 1325921 consultations made during the study period. In comparison to the other clinics, clinic 8 had the highest number of consultations 17.99% (n = 132591) and medicine items 18.19% (n = 516177)

dispensed. The medicine items on the top 20 list which was determined from all the medicine items used in all the nine clinics combined amountied to 290291 (see table 4.10), with 74.81% (n = 388049) of the total top twenty medicine items prescribed for the nine individual clinics in total and 56.24% (n = 516177) of the total medicine items prescribed in the study population. Musculoskeletal agents and analgesics were the most dispensed pharmacological group of drugs.

The total number of diagnoses made during the 1325921 consultations was 140723 for the study period, with 29.07% documented as part of the top 10 list of diagnoses made in all the nine clinics combined (see table 4.6). In comparison with the other clinics, clinic 8 had the highest number of consultations and diagnoses made.

Diagnoses or medical conditions that made the top 10 list determined from all the diagnoses in all the nine clinics combined (see table A.4 appendix A), were 40913 representing 58.03% (n = 70509) of the total top ten medical conditions (diagnoses) and 29.07% (n = 140723) of the total diagnoses made in the study population. The pathophysiological groups, 'respiratory' and 'injuries' had the highest and the lowest percentage prevalence representing 17.10% and 1.66% (n = 140723) respectively.

Clinic 3 had the lowest number of consultations and diagnoses made in the entire study population, but had the highest ratios for consultations 1:2.46 and diagnoses 1:2.50 per patient. This implies that in some cases a patient had 2 or more consultations and diagnoses made during the study period.

4.6. GENERAL ANALYSIS OF THE COST OF MEDICINE TREATMENT

In this section the total cost of medicine treatment for the study population according to clinic, age group and gender will be discussed.

Take note: Analysis in this section (paragraphs 4.6.1 to 4.6.3) was done according to the number of consultations (patient visits) in the nine clinics.

4.6.1. The general analysis on the cost of medicine treatment in the nine clinics

Table 4.20 gives a description of the total medicine treatment cost in each clinic, the average medicine treatment cost per consultation and the cost prevalence indices (calculated using a calculator. Refer to paragraph 3.3.2.2.5 for a formula on how to calculate this) in each of the nine primary health care clinics.

Table 4.20: Medicine treatment cost and consultation prevalence in the study population (n = 9 clinics)

Clinic	Number of consultations per clinic	Prevalence of consultations per clinic (%) (N = 132591) [A]	Total medicine treatment cost per clinic (R)	Percentage medicine treatment cost (%) (N=R1729072.70) [B]	Average medicine treatment cost per consultation per clinic (R)	Cost prevalence Index [B] ÷ [A]
1	16763	12.64	222603.75	12.87	13.28 ± 36.63	1.02
2	11969	9.03	129251.06	7.48	10.80 ± 9.02	0.83
3	8713	6.57	135792.14	7.85	15.59 ± 26.60	1.19
4	13553	10.22	176532.38	10.21	13.03 ± 40.43	1.00
5	11463	8.65	135515.23	7.84	11.82 ± 11.66	0.91
6	15017	11.33	236404.80	13.67	15.74 ± 14.68	1.21
7	18675	14.08	225397.21	13.04	12.07 ± 15.03	0.93
8	23859	17.99	254742.77	14.73	10.68 ± 8.58	0.82
9	12579	9.49	212833.33	12.31	16.92 ± 19.98	1.30
Total	**132591**	**100**	**1729072.70**	**100**	**13.04 ± 2.10***	-

* *Refer to paragraph 3.3.2.2.2 for the formula of calculation.*

A total number of 132591 consultations were performed in the study population (refer to tables A.1 in appendix A), with a total medicine treatment cost of R1 729 072.70.

In comparison with the other clinics, clinic 8 had the highest total medicine treatment cost which accounted for R254 742.77 and this may be ascribed to the fact that clinic 8 had the highest contribution in terms of the number of patients (refer to table A.1 in appendix A), number of

consultations (refer to table 4.2), number of diagnoses (refer to table 4.3) as well as number of medicine items prescribed (refer to table 4.7) in the study population, but had the lowest average medicine treatment cost per consultation R10.68 ± R8.58 in the study population. The highest average medicine treatment cost per consultation was in clinic 9 with R16.92 ± R19.98 although it only ranked fifth with regard to the highest total medicine treatment cost in the study population. Clinic 2 had the lowest total medicine treatment cost of R129 251.06.

The cost prevalence indices for clinics 1, 3, 4, 6 and 9 were more than 1 (see table 4.20), which indicates that the cost of medicine treatment in those clinics was relatively expensive.

Table 4.21 gives a comparison of the d-values calculated for the average medicine treatment cost per consultation between the different clinics (calculated from table 4.20).

Table 4.21: D-values calculated for the average medicine treatment cost per consultation (n=9 clinics)

Clinic	1	2	3	4	5	6	7	8
2	0.07							
3	0.06	0.18						
4	0.006	0.06	0.06					
5	0.04	0.09	0.14	0.03				
6	0.07	0.34	0.00	0.07	0.27			
7	0.03	0.08	0.13	0.02	0.02	0.24		
8	0.07	0.01	0.18	0.06	0.10	0.34	0.09	
9	0.10	0.31	0.05	0.10	0.26	0.06	0.24	0.31

Table 4.21 shows that there is no practical significant difference between the average medicine treatment cost per consultation for the different clinics. This may be an indication that the clinics complied with the medicine treatment protocols, or that similar diseases were encountered at the nine different clinics.

4.6.2. The general analysis on the cost of medicine treatment according to age groups

Compiled from table B.1 in appendix B, table 4.22 shows the number of consultations and medicine treatment cost per age group in the study population.

Take note: the averages and standard deviations for the unknown groups could not be calculated due to unavailable data.

Table 4.22: General medicine treatment cost analysis according to age groups

Age group		Number of consultations	Percentage consultations (%) (N = 132591) [A]	Medicine treatment cost (R)	Percentage medicine treatment cost (%) (N=1729072.70) [B]	Weighted average medicine treatment cost per consultation	Cost prevalence Index [B] ÷ [A]
	(Years)						
1	≤ 0 ≤ 6	16372	12.35	182497.39	10.55	11.77 ± 1.20	0.85
2	6 ≤ 12	5773	4.35	65721.72	3.80	12.46 ± 1.47	0.87
3	12 ≤ 19	6488	4.89	72958.35	4.22	12.81 ± 3.54	0.86
4	19 ≤ 40	56770	42.82	610992.18	35.34	11.78 ± 2.16	0.83
5	40 ≤ 60	34061	25.69	461312.08	26.68	15.47 ± 3.07	1.04
6	≥ 60	12728	9.60	196802.99	11.38	17.03 ± 3.12	1.19
Unknown		399	0.30	138787.99	8.03	-	26.77
Total		132591	100	1 729 072.70	100	-	-

According to table 4.22 the medicine treatment cost was the highest in age groups 4 and 5 (19 to 60 years) accounting for 35.34% (n = R1 729 072.70) and 26.68% respectively of the total medicine treatment cost, as well as the highest weighted average medicine treatment costs for all the nine clinics combined. The third and fourth highest age groups with regard to the total medicine treatment cost were age groups 6 and 1 with 11.38% (n = R1 729 072.70) and 10.55% respectively. This information correlates with the highest numbers of consultations and medicine items prescribed that were determined for these age groups in the previous sections (see paragraphs 4.3.2 and 4.3.4).

Age group 2 (6 to 12 years) had the lowest total medicine treatment cost of R65 721.72, which represented 3.80% of the total medicine treatment cost in the study population. The cost prevalence indices were the highest in age groups 4 and 5 representing 1.04 and 1.19 and therefore this indicates that the total medicine treatment cost was relatively expensive in those age groups.

Table 4.23 indicates d-values for the weighted average medicine treatment cost per consultation according to age group in the study population.

Table 4.23 shows that practical significant differences were found for the weighted average medicine treatment cost per consultation between age groups 1, 5 and 6 (d-values=1.21 and 1.69), age groups 2, 5 and 6 (d-values=0.98 and 1.46) and age groups 4, 5 and 6 (d-values=1.20 and 1.68). This could be ascribed to the fact that there was more cost involved in age groups 4,5 and 6 since it was determined that the same age groups had the highest number of patients, consultations and medicine items prescribed to them (refer to paragraphs 4.3.2-4).

Table 4.23: D-values calculated for the weighted average medicine treatment cost per consultation according to age group

Age Group	≤ 0 ≤ 6	6 ≤ 12	12 ≤ 19	19 ≤ 40	40 ≤ 60	Unknown
6 ≤ 12	0.47					-
12 ≤ 19	0.29	0.10				-
19 ≤ 40	0.005	0.31	0.29			-
40 ≤ 60	**1.21**	**0.98**	0.75	**1.20**		-
≥ 60	**1.69**	**1.46**	**1.19**	**1.68**	0.50	-
Unknown	-	-	-	-	-	-

4.6.3. The general analysis on the cost of medicine treatment according to gender

Table 4.24 gives an analysis of the medicine treatment according to gender for the study population. This table was compiled from table B.2 (refer to appendix B).

Table 4.24: General medicine treatment cost analysis according to gender

Gender	Total number of consultations	Percentage consultations (%) [A]	Medicine treatment cost (R)	Percentage medicine treatment cost (%) [B]	Weighted average medicine treatment cost	Cost prevalence Index [B] ÷ [A]
Male	52610	39.68	678 961.67	39.27	13.24 ± 2.27	0.99
Female	79458	59.93	1 044 291.70	60.40	13.60 ± 2.52	1.01
Unknown	523	0.39	5 819.26	0.34	-	0.87
Total	**132591**	**100**	**1 729 072.70**	**100.01**	-	-

According to table 4.24 the total medicine treatment cost for males accounted for 39.27% (n = R1 729 072.70), for females it was 60.40% and for unknown cases of gender it was 0.34% of the total cost spent on the medicine treatment for the study population. No practical significant difference (d-value < 0.8) was found between the gender groups.

The weighted average medicine treatment cost per consultation for male and females (as calculated from the average medicine treatment cost per consultation for different gender groups) were respectively R39.55 ± 3.38 and R60.59 ± 3.36 (refer table B.2 in appendix B). It can therefore be deduced that the average medicine treatment cost for males ranged from R36.17 to R42.93 and for females between R57.23 and R63.95. This information shows that the medicine treatment cost was more for females than it was for males. This can, however, be ascribed to the fact that there were more female patients during the study period than male patients (refer to paragraph 4.4.1).

From table 4.24 females had a high cost prevalence index (i.e. > 1), however, this figure is marginal, which indicates that there was an equilibrium between the medicine treatment cost and prevalence in this gender group.

4.6.4. Summary: General cost analysis

Clinics 8 and 2 had the highest and lowest total medicine treatment cost respectively for the study population (refer to table 4.20) and this may be ascribed to the number of patients and patients visits (consultations) made in those clinics (refer to table A.1 in appendix A). Age groups 4 and 5 had the highest total medicine treatment cost compared to the other age groups and this correlates with the highest numbers of consultations and medicine items determined for those age groups (refer to table 4.15). Female patients had the highest total medicine treatment cost per consultation as compared to male patients and this could be due to the fact that more female patients visited the clinics than male patients (refer to table 4.17).

4.7. THE COST ANALYSIS OF THE TOP TEN DIAGNOSES (SINGLE AND MULTIPLE DIAGNOSES)

In this section the prevalence and total medicine treatment cost of the top ten diagnoses (as identified in table 4.6) will be discussed (according to single and multiple diagnoses). Multiple diagnoses will not be discussed further because only the cost of the specific/single diagnoses was analysed.

Take note: that the analysis in this section (paragraph 4.7.1 to 4.7.10) will be done according to the number of diagnoses made per clinic and not according to the number of consultations as with sections 4.6.1-3 because the data supplied for the cost of each diagnosis was calculated according to the total number of diagnoses.

The top ten diagnoses represented 29.07% (n= 140723) (refer to table 4.6), of all the diagnoses made in the study population with a total medicine treatment cost of R555 212.78 (representing 32.11% (n= R1 729 072.70) of the total cost of medicine treatment in the study population).

Table 4.25 shows the total medicine treatment cost of the top ten diagnoses.

Table 4.25: The total medicine treatment cost of the top ten diagnoses (both single and multiple diagnoses)

Name of diagnosis	Prevalence of diagnoses made in all nine clinics	Percentage prevalence [A]	Total medicine treatment cost (R)	Percentage medicine treatment cost [B]	Cost prevalence index [B] ÷ [A]
Acute bronchitis infection	6229 [1]	15.22%	89 171.23 [2]	16.06%	1.06
Viral: Influenza	6095 [2]	14.90%	67 381.70 [3]	12.14%	0.81
Upper respiratory infection	5732 [3]	14.01%	66 122.84 [4]	11.91%	0.85
New/Not controlled hypertension	5306 [4]	12.97%	102 402.04 [1]	18.44%	1.42
Osteoarthritis	3092 [5]	7.56%	46 267.68 [5]	8.33%	1.10
Sinuses: Acute sinusitis	3008 [6]	7.35%	43 467.51 [6]	7.83%	1.07
Gastro-enteritis	2983 [7]	7.29%	30 561.35 [10]	5.50%	0.75
URT: common cold	2893 [8]	7.07%	32 750.17 [9]	5.90%	0.83
Uncomplicated gastritis	2855 [9]	6.98%	41 564.53 [7]	7.49%	1.07
Arthralgia	2720 [10]	6.65%	35 523.73 [8]	6.40%	0.96
Total	**40913**	**100%**	**555 212.78**	**100%**	-

* URT: Upper respiratory tract

From table 4.25 it can be deduced that new or not controlled hypertension had the highest total medicine treatment cost with 5.92% (n= R1 729 072.70) of the top ten diagnoses as determined for the study population. Acute bronchitis infection was ranked the highest in terms of the

prevalence with 4.43% (n= 140723, see table 4.6) but was only ranked second in terms of the total medicine treatment cost with 5.16% (n= R1 729 072.70) of the top ten diagnoses as determined for the study population. Gastroenteritis was ranked number seven with regard to prevalence but had the lowest total medicine treatment cost accounting for 1.77% (n= R1 729 072.70) of the top ten diagnoses in the study population.

In 50% of the determined top ten diagnoses, the cost prevalence indices were greater than one, indicating that the total medicine treatment cost for these diagnoses was relatively expensive. The diagnoses were as follows: hypertension with 1.42, osteoarthritis with 1.10, acute sinusitis and uncomplicated gastritis with 1.07 and acute bronchitis with 1.06.

Sections 4.7.1 to 4.7.10 gives a discussion of the top ten diagnoses individually.

4.7.1. Acute bronchitis infection

The total prevalence of acute bronchitis infection accounted for 4.43% (n=140723) of all the diagnoses made in the study population (see table 4.6), with a total medicine treatment cost of 5.16% (n= R1 729 072.70) of the total cost in the study population. The resulting overall cost prevalence index for acute bronchitis infection therefore calculated to 1.16 (see paragraph 3.3.2.2.2.3 for calculation formula and example). This indicates that the total medicine treatment cost for acute bronchitis infection per diagnosis was relatively expensive.

4.7.1.1. Medicine treatment cost and prevalence for acute bronchitis infection for both single and multiple diagnosis

Figure 4.4 shows the medicine treatment cost and prevalence of diagnoses for acute bronchitis infection for both the single and multiple diagnoses in the study population (n = 9 clinics).

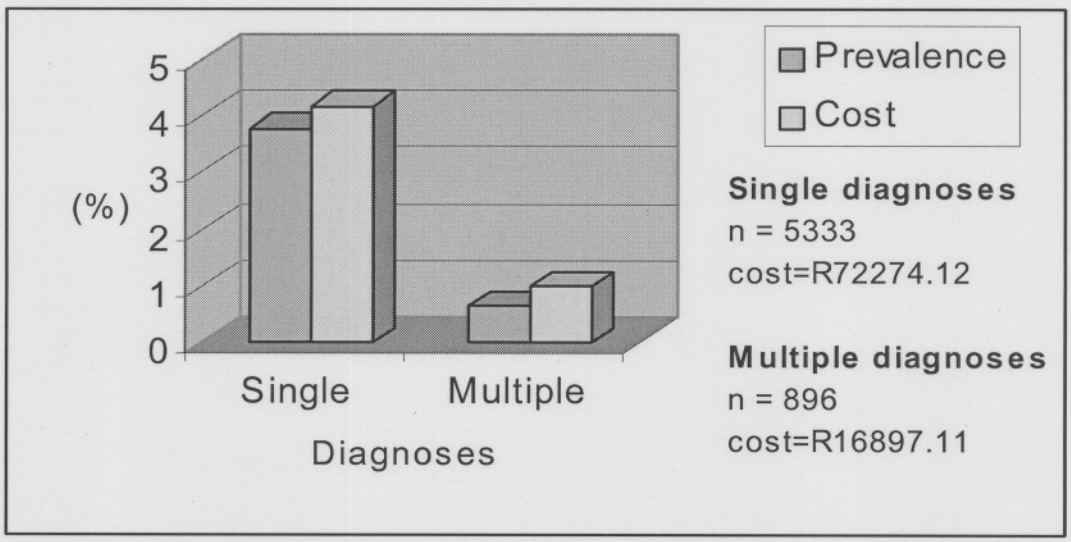


Figure 4.4: Medicine treatment cost and prevalence for acute bronchitis infection (single and multiple diagnoses)

According to figure 4.4 acute bronchitis infection (single diagnosis) represented 85.62% (n = 6229) of the diagnoses made for this type of infection at a cost of R72 274.12 (81.05%) of the total cost for acute bronchitis infection in the study population. The cost prevalence index therefore calculated to 0.95 indicating that the total medicine treatment cost for this single diagnosis was relatively inexpensive.

The remaining 896 (n = 6229) diagnoses made in this type of infection were multiple diagnoses with total medicine treatment cost of R16897.11 (n = R89 171.23). The cost prevalence index for acute bronchitis infection (multiple diagnoses) was 1.32, indicating that the total medicine treatment cost for multiple diagnoses was relatively expensive. A possible reason for this could be that in multiple diagnoses more than one disease was diagnosed and more medicine treatment subsequently given thereby driving an increase in the cost per consultation and diagnosis.

4.7.1.2. Average medicine treatment cost for acute bronchitis infection: single diagnosis vs. multiple diagnoses

Table B.3 (in appendix B) shows the average medicine treatment cost of both single and multiple diagnoses for acute bronchitis infection.

According to table B.3 it indicates that clinic 9 had the highest total medicine treatment cost for acute bronchitis infection (single diagnosis) accounting for 1.45% (n= R1 729 072.70) of the study population. This was followed by clinic 8 with 0.98% and the lowest was clinic 3 with 0.07% (n= R1 729 072.70) and 0.001% for single and multiple diagnoses respectively in the study population.

From table B.3 clinic 9 had the highest average medicine treatment costs for both single and multiple diagnoses with averages of R20.86 $\pm$ 21.85 and R19.34 $\pm$ 11.72 respectively. The average medicine treatment cost for single diagnosis was more than that of multiple diagnosis, which indicates that the cost for single and multiple diagnoses were between R0.00 and R42.71 as well as between R7.62 and R31.06 for single and multiple diagnoses respectively. For the single diagnoses of acute bronchitis infection, clinic 9 had a high standard deviation, which may be an indication that the medicine treatment cost for the single diagnosis of acute bronchitis infection was relatively high and that the medicine treatment protocol was not adhered to.

Table 4.26 indicates the comparison of the d-values for the average medicine treatment costs for acute bronchitis infection (single vs. multiple diagnoses) as calculated from table B.3 in appendix B).

Table 4.26: D-values calculated for the average medicine treatment cost of acute bronchitis infection (single vs. multiple diagnoses)

Clinic	1 N=19719	2 N=13668	3 N= 8877	4 N= 14159	5 N=11251	6 N=17808	7 N=18670	8 N=23682	9 N=12889
D-value	0.36	0.47	0.07	0.32	0.68	0.58	0.63	0.68	0.07

From table 4.26 it can then be deduced that there were no practical significant differences between the average medicine treatment costs for single diagnosis of acute bronchitis infection and that of multiple diagnoses for the same condition.

The average medicine treatment cost for the single diagnosis of acute bronchitis infection (refer to table B.3 in appendix B) between the different clinics was further analysed in table 4.27.

Table 4.27: D-values calculated for the average medicine treatment cost of acute bronchitis infection (single diagnosis) according to clinic

Clinic	1	2	3	4	5	6	7	8
2	0.26							
3	0.07	0.44						
4	0.04	0.34	0.04					
5	0.02	0.36	0.12	0.07				
6	0.13	0.19	0.26	0.19	0.15			
7	0.00	0.30	0.07	0.03	0.03	0.15		
8	0.15	0.18	0.29	0.21	0.19	0.03	0.18	
9	0.39	0.51	0.36	0.37	0.40	0.45	0.38	0.46

The information in table 4.27 indicates that there were no practical significant differences between the average medicine treatment costs of single diagnosis of acute bronchitis infection between the nine clinics.

4.7.2. Viral influenza infection

Take note: viral influenza can be distinguished as type A and B (refer to appendix C.2).

The total prevalence of both single and multiple diagnoses in the nine clinics for viral influenza (type A and B) accounted for 4.33% (n=140723) (see table 4.6) with a total medicine treatment cost of R67 381.70 (n= R1 729 072.70). The cost prevalence index therefore calculated to 0.90 indicating that the total medicine treatment cost per diagnoses was relatively inexpensive.

4.7.2.1. Medicine treatment cost and prevalence for viral influenza for both single and multiple diagnoses

Figure 4.5 shows the medicine treatment cost and prevalence of diagnoses of viral influenza (type A and B) for both the single and multiple diagnoses in the study population (n= 9 clinics).

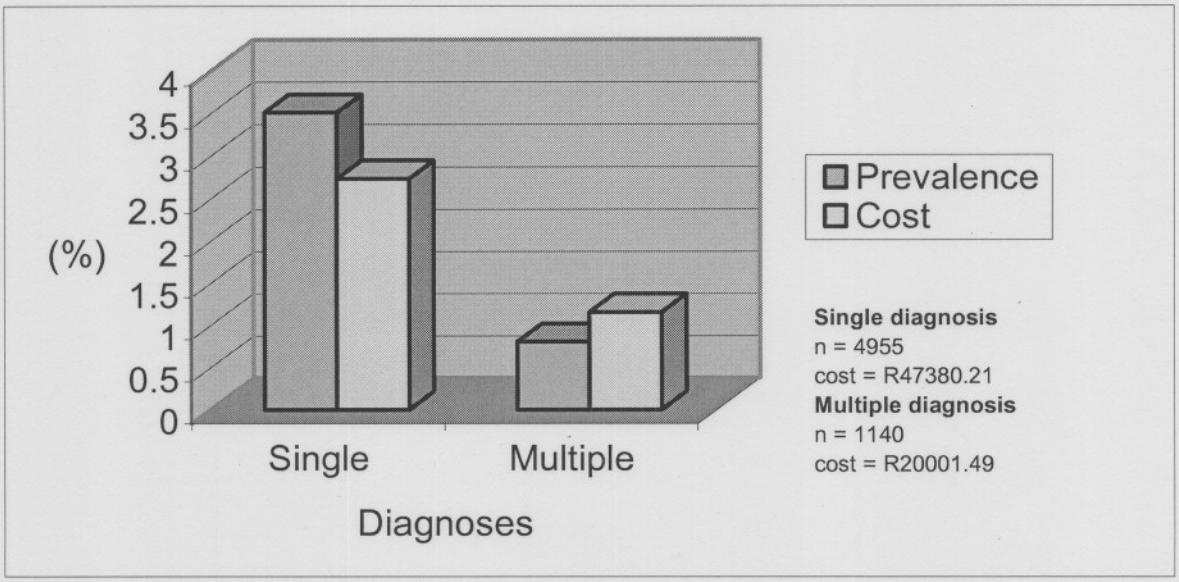


Figure 4.5: Medicine treatment cost and prevalence for viral influenza infection (type A and B): single and multiple diagnoses

According to figure 4.5 the prevalence of single diagnosis for viral influenza in all the nine clinics represented 81.30% (n = 6095) for this type of diagnosis made, with a medicine treatment cost of R47 380.21 (70.32%). The cost prevalence index was 0.86, thus indicating that the medicine treatment cost for single diagnosis of viral influenza was relatively inexpensive.

The remaining 1140 (18.90%) diagnoses made were multiple diagnoses with a total medicine treatment cost of R20 001.49 (29.68%) and a cost prevalence index of 1.59 thus indicating that for multiple diagnoses of viral influenza, the total medicine treatment cost was relatively expensive. This could be due to the fact that more medicine was dispensed because more than one diagnosis was made.

According to table B.4 (in appendix B) the total prevalence of single diagnoses viral influenza A and B were 3609 and 1346 accounting for 2.56% (n= 140723) and 0.96% respectively. The total medicine treatment cost for single diagnoses viral influenza A was R33 933.47 and for viral influenza B it was R13 446.74, accounting for 1.96% (n= R172 9072.70) and 0.78% respectively. The cost prevalence indices were therefore calculated to be 0.77 for influenza A and 0.81 for viral influenza B, which indicates that the medicine treatment cost for both viral influenza A and B was relatively inexpensive.

4.7.2.2. Average medicine treatment cost for viral influenza: single vs. multiple diagnoses

Table B.4 (in appendix B) gives the average medicine treatment cost of both single and multiple diagnoses for viral influenza type A and B.

According to table B.4, in clinic 2 there were no cases of viral influenza B with multiple diagnoses and clinic 9 had no cases of viral influenza A with multiple diagnoses. Clinics 6 had the highest total medicine treatment cost for viral influenza A (both single and multiple diagnoses) accounting for 0.51% (n= R1 729 072.70) and 0.38% respectively of the study population.

Clinic 9 had the highest total medicine treatment cost for viral influenza B (single diagnosis) with 0.29% (n= R1 729 072.70) in the study population.

From table B.4 clinic 6 had the highest average medicine treatment cost for single diagnosis viral influenza A with R10.25 ± R7.40, which indicates that the medicine treatment cost was between R2.85 and R17.65. Clinics 3 and 9 had the highest average medicine treatment cost for single diagnosis viral influenza B with R10.54 ± R11.39 and R10.43 ± R4.73 indicating that the medicine treatment cost was relatively inexpensive and between R5.70 and R15.16 for clinic 9. The standard deviations in clinic 9, for both single and multiple diagnoses were greater than the medicine treatment cost averages, therefore, this implies that a relatively wide range of medicine treatment costs were encountered and that they did not comply with the protocols.

Compiled from table B.4 in appendix B, table 4.28 indicates the d-values between single and multiple diagnoses for the average medicine treatment cost results for viral influenza.

From the information given in table 4.28 it can be deduced that in clinic 6 there was a practical significant difference between the average medicine treatment cost of single and multiple diagnoses for viral influenza type B (d-value=0.82). This could be due to the fact that there was more medicine treatment cost involved for the multiple diagnoses since more than one diagnosis was made.

Table 4.28: D-values calculated for the average medicine treatment cost of viral influenza (single vs. multiple diagnoses)

Clinic	Type of influenza	D-value
1 (N=19719)	*Viral influenza A* *Viral influenza B*	0.56 0.44
2 (N= 13668)	*Viral influenza A* *Viral influenza B*	0.45 #
3 (N= 8877)	*Viral influenza A* *Viral influenza B*	0.44 0.45
4 (N= 14159)	*Viral influenza A* *Viral influenza B*	0.53 0.44
5 (N=11251)	*Viral influenza A* *Viral influenza B*	0.50 0.13
6 (N=17808)	*Viral influenza A* *Viral influenza B*	0.71 **0.82**
7 (N= 18670)	*Viral influenza A* *Viral influenza B*	0.46 0.52
8 (N= 23682)	*Viral influenza A* *Viral influenza B*	0.66 0.28
9 (N= 12889)	*Viral influenza A* *Viral influenza B*	# 0.47

Viral Influenza A = Viral infections
Viral Influenza B = Respiratory system infections
 # Indicates that there was no average and standard deviation for the corresponding diagnosis therefore the d-value could not be calculated.

The average medicine treatment cost for the single diagnoses of viral influenza A and B between the different clinics was (refer to table B.4 in Appendix B) further analysed in tables 4.29 and 4.30.

Table 4.29: D-values calculated for the average medicine treatment cost of viral influenza A (single diagnosis) according to clinic

Clinic	1	2	3	4	5	6	7	8
2	0.03							
3	0.03	0.003						
4	0.01	0.03	0.03					
5	0.17	0.15	0.16	0.07				
6	0.15	0.12	0.12	0.11	0.27			
7	0.01	0.02	0.02	0.02	0.12	0.13		
8	0.01	0.04	0.03	0.01	0.14	0.15	0.01	
9	0.08	0.08	0.08	0.02	0.10	0.20	0.06	0.06

Table 4.29 indicates that there was no practical significant difference found between the average medicine treatment costs of single diagnoses for viral influenza type A.

Table 4.30: D-values calculated for the average medicine treatment cost of viral influenza B (single diagnosis) according to clinic

Clinic	1	2	3	4	5	6	7	8
2	0.04							
3	0.13	0.15						
4	0.26	0.28	0.16					
5	0.25	0.29	0.07	0.10				
6	0.01	0.05	0.13	0.26	0.26			
7	0.10	0.18	0.06	0.20	0.16	0.14		
8	0.03	0.003	0.12	0.28	0.18	0.02	0.08	
9	0.18	0.27	0.01	0.17	0.10	0.26	0.09	0.12

Table 4.30 indicates that there was no practical significant difference found between the average medicine treatment costs of single diagnoses for viral influenza type B.

4.7.3. Upper respiratory infection (URI)

The total prevalence of both diagnoses (single and multiple) for URIs for upper respiratory infection in the study population was 5732 (4.07%) with a total medicine treatment cost of R66 122.84 (3.82%). The cost prevalence index was calculated at 0.94. This indicates that the total medicine treatment cost for URIs was relatively inexpensive.

4.7.3.1. Medicine treatment cost and prevalence of URIs for both single and multiple diagnoses

Figure 4.6 shows the medicine treatment cost and prevalence of diagnoses of URIs for both single and multiple diagnoses in the study population (n=9 clinics).

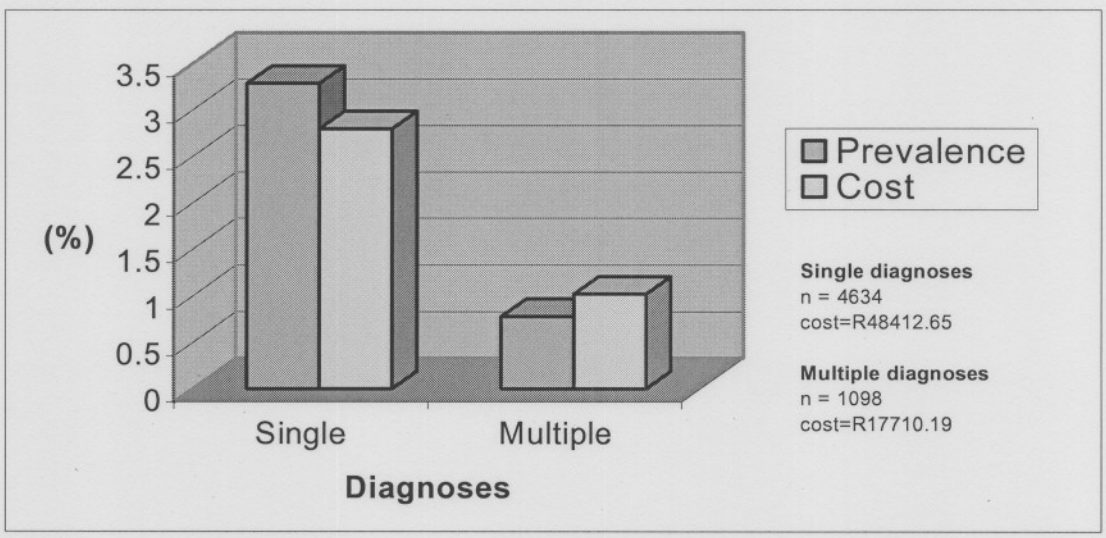


Figure 4.6: Medicine treatment cost and prevalence for URIs (single and multiple diagnoses)

According to figure 4.6 the prevalence of single diagnosis for upper respiratory infection represented 80.84% (n = 5732) of all URI cases diagnosed with a total medicine treatment cost of R48 412.65 (73.22%). The cost prevalence index was 0.91 indicating that the medicine treatment cost was relatively inexpensive for URI single diagnosis in the study population.

The remaining 1098 (19.16%) diagnoses made were multiple diagnoses with a total medicine treatment cost of R17 710.19 (26.78%). The cost prevalence index was 1.40, indicating that in this type of diagnosis the medicine treatment cost was relatively expensive. This may be because there were other diagnoses made with URI thus increasing the total medicine treatment cost.

4.7.3.2. Average medicine treatment cost for URI: single vs. multiple diagnoses

Table B.5 (in appendix B) shows the average medicine treatment cost of both single and multiple diagnoses for URIs.

According to table B.5 clinics 8 and 7 had the highest total medicine treatment cost for URIs (single diagnoses) accounting for 1.03% (n= R1 729 072.70) and 0.43% of the study population. Clinic 9 had the lowest total medicine treatment cost for both single and multiple diagnoses with R287.45 and R20.58 respectively. Clinics 6 had the highest total medicine treatment cost for URIs (multiple diagnoses) with R4 363.21 (n= R1 729 072.70) in the study population.

Clinic 9 had the highest average medicine treatment cost for both single and multiple diagnoses with R15.97 $\pm$ 9.12, indicating that the medicine treatment cost for the single diagnosis was between R6.85 and 25.09 and an average of R20.58 for multiple diagnoses. The lowest average medicine treatment cost for both single and multiple diagnoses for URIs were in clinic 2 with R8.50 $\pm$ 5.46 and R11.92 $\pm$ 7.85, indicating that the medicine treatment cost was between R3.04 and R13.96 as well as between R4.07 and R19.77 respectively for the study population.

Table 4.31 indicates the comparison of d-values on the average medicine treatment cost of upper respiratory infection, as compiled from table B.5 in appendix B.

Table 4.31: D-values calculated for the average medicine treatment cost of upper respiratory infection (single vs. multiple diagnoses)

Clinic	1 N=19719	2 N=13668	3 N= 8877	4 N= 14159	5 N=11251	6 N=17808	7 N=18670	8 N=23682	9 N=12889
D-value	0.48	0.44	0.42	0.69	0.36	0.58	0.40	0.44	0.51

From table 4.31 it can be deduced that there was no practical significant differences between the average medicine treatment cost for a single diagnosis of upper respiratory infection vs. that of multiple diagnoses in the study population.

The average medicine treatment cost for the single diagnosis of URIs (from table B.5 in appendix B) between the different clinics was further analysed in table 4.32.

Table 4.32: D-values calculated for the average medicine treatment cost of upper respiratory infection (single diagnosis) according to clinic

Clinic	1	2	3	4	5	6	7	8
2	0.31							
3	0.02	0.23						
4	0.32	0.49	0.30					
5	0.13	0.45	0.07	0.24				
6	0.27	0.48	0.25	0.09	0.19			
7	0.13	0.09	0.15	0.42	0.23	0.39		
8	0.06	0.36	0.02	0.28	0.07	0.23	0.18	
9	0.63	**0.82**	0.61	0.27	0.55	0.38	0.74	0.59

The information in table 4.32 indicates that there was a practical significant difference in the average medicine treatment cost for upper respiratory infection (single diagnosis) between clinics 2 and 9 with a d-value of 0.82. A possible reason for this could be that the two clinics are using different medicine treatment protocols and this should be further investigated.

4.7.4. New/ not controlled Hypertension

Take note: that there are three stages of new/not controlled hypertension (i.e. stage 1-3) and each stage has three groups A, B and C (refer to table C.4 for the different stages of hypertension).

The total prevalence for both single and multiple diagnoses in the study population for new and or not controlled hypertension was 5306 (3.77%) with a total medicine treatment cost of R102 402.04 (5.92%). The cost prevalence index therefore was 1.57. The treatment cost of hypertension therefore proved to be relatively expensive.

4.7.4.1. Medicine treatment cost and prevalence of hypertension for both single and multiple diagnoses

Figure 4.7 shows the medicine treatment cost and prevalence of diagnoses of new and or not controlled hypertension (stages 1-3) for the study population (n=9 clinics).

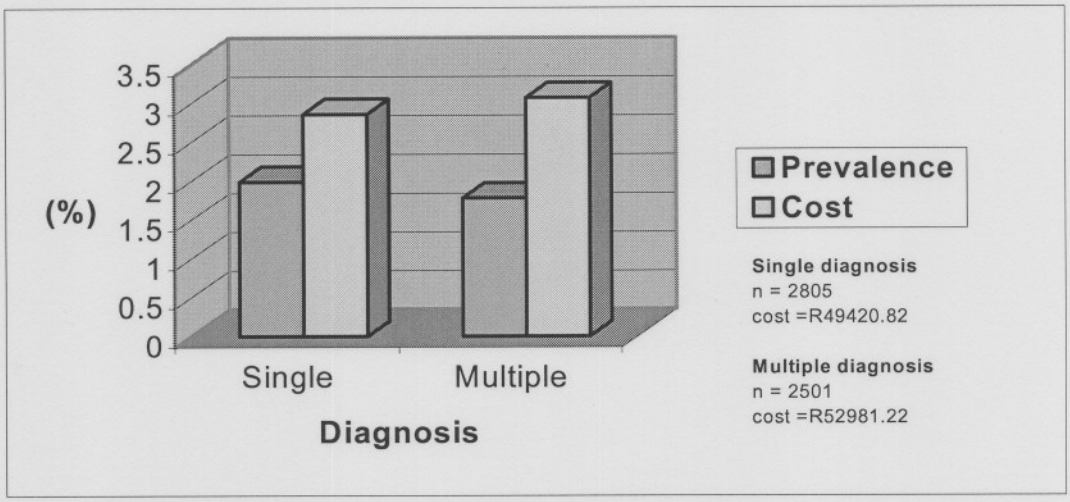


Figure 4.7: Medicine treatment cost and prevalence for hypertension (single and multiple diagnoses)

The prevalence of single diagnosis for hypertension represented 52.86% (n = 5306) of diagnoses made for this disease with a medicine treatment cost of R49 420.82 (48.26%) as shown in figure 4.7. The cost prevalence index was 0.91 thus indicating that the medicine treatment cost was relatively inexpensive.

The remaining 2501(47.14%) diagnoses made for new/not controlled hypertension were multiple diagnoses with a total medicine treatment cost of R52 981.22 (51.74%). The cost prevalence index was 1.10 indicating that the cost was relatively expensive due to the fact that more than one diagnosis was made.

4.7.4.2. Average medicine treatment cost for hypertension: single vs. multiple diagnoses

Table B.6 (in appendix B) shows the average medicine treatment cost of both single and multiple diagnoses for new/not controlled hypertension (stages 1-3, groups A, B and C).

According to table B.3, stage 1 (groups A and B) were the most prevalent in most of the clinics. Clinics 3 and 4 had the highest total medicine treatment cost for single diagnosis hypertension (stage 1, group A) accounting for 0.74% (n= R1 729 072.70) and 0.27% respectively in the study population. Clinic 4 had the highest total medicine treatment cost for multiple diagnosis hypertension (stage 1, group A) accounting for 0.41% (n= R1 729 072.70) in the study

population. Single diagnosis of hypertension stage 1 (group B) had the highest total medicine treatment cost in clinic 8 with 0.07% (n= R1 729 072.70) in the study population.

The standard deviations were the highest for single diagnoses of hypertension in clinic 3 with R22.08 ± 24.57 and R25.56 ± 30.41 (stage 1, group A and C respectively) and R18.02 ± 19.14 (stage 2, group A), and in clinic 4 with R31.04 ± 33.89 (stage 1, group B) and R31.46 ± 47.34 (stage 2, group B) which could be an indication that for these stages in hypertension, protocols were not adhered to.

Table 4.33 indicates the d-values on the average medicine treatment cost of new and or not controlled hypertension for both single and multiple diagnoses.

Table 4.33: D-values calculated for the average medicine treatment cost of new/not controlled hypertension (single vs. multiple diagnoses)

Clinic	Total number of diagnoses per clinic	Type of hypertension								
		STAGE 1			*STAGE 2*			*STAGE 3*		
		GRP A	*GRP B*	*GRP C*	*GRP A*	*GRP B*	*GRP C*	*GRP A*	*GRP B*	*GRP C*
		D-value			**D-value**			**D-value**		
1	19719	0.36	0.39	#	**0.96**	0.74	-	#	-	#
2	13668	0.29	0.19	0.14	**0.81**	**3.39**	-	0.53	#	#
3	8877	0.01	0.42	#	0.43	0.25	#	#	-	#
4	14159	0.26	0.24	0.14	0.15	0.08	#	-	#	#
5	11251	0.08	0.33	#	0.47	#	**2.14**	0.44	0.40	0.27
6	17808	0.33	0.25	**0.86**	0.42	0.54	#	0.21	**0.94**	#
7	18670	0.02	0.41	0.42	0.38	0.37	0.11	0.49	0.79	0.17
8	23682	0.27	0.09	**1.64**	0.64	0.43	#	0.46	0.26	0.003
9	12889	0.00	-	-	#	0.27	-	-	#	0.30

 # Indicates that only the average and not the standard deviation was given for the particular diagnosis or only the average and standard deviation for one diagnosis was given, therefore a proper d-value could not be calculated.
- Indicates that the type / group of hypertension was not found in that specific clinic.

From table 4.33 it can be deduced that practical significant differences were found in clinics 1 and 2 for the average medicine treatment cost between single and multiple diagnoses of hypertension (stage 2, group A) with d-values=0.96 and 0.81 respectively as well as in clinics 2 and 6 (hypertension stage 2 and 3, group B) d-value=3.39 and 0.94 respectively. Clinics 5, 6 and 8 had d-values of 2.14, 0.86 and 1.64 for hypertension stage 2 (group C) and stages 1 (group C) respectively. This indicates that there might have been different medicine treatment protocols used in the treatment of these stages of hypertension by the different clinics.

Table B.7 to B.15 (in appendix B) indicates the d-values for the average medicine treatment cost of single diagnoses new/not controlled hypertension (stages 1-3, groups A, B and C) (refer to table B.6 in appendix B for average costs of diagnoses).

- **Stage 1 (group A):** According to table B.7 (in appendix B) there was a practical significant difference in the average medicine treatment cost between clinics 2,6,7,8 and clinic 9 with d-values =1.16, 0.83, 1.08 and 1.20 respectively.

- **Stage 1 (group B):** From table B.8 there was no practical significant difference in the average medicine treatment cost between the nine clinics.

- **Stage 1 (group C):** According to table B.9 there was a practical significant difference in the average medicine treatment cost between clinics 6 and 8 with a d-value of 0.85.

- **Stage 2 (group A):** From table B.10 there was a practical significant difference in the average medicine treatment cost between clinics 4 and 8 with a d-value of 1.15.

- **Stage 2 (group B):** According to table B.11 there was a practical significant difference in the average medicine treatment cost between clinics 2 and 9 with a d-value of 0.91.

- **Stage 2 (group C):** From table B.12 there was a practical significant difference in the average medicine treatment cost between clinics 3 and 5 with a d-value of 2.23 as well as in clinics 5 and 8 with a d-value of 1.76.

- **Stage 3 (group A):** According to table B.13 there was no practical significant difference in the average medicine treatment cost between the nine clinics.

- **Stage 3 (group B):** From table B.14 there was a practical significant difference in the average medicine treatment cost between clinics 4,6,7,8 and clinic 9 with d-values =2.21, 1.89, 2.09 and 1.87 respectively.

- **Stage 3 (group C):** According to table B.15 there was a practical significant difference in the average medicine treatment cost between clinics 4, 8 and 9 with d-values of 1.10 and 1.14 respectively as well as clinics 7 and 8 with a d-value =0.81.

From the above it can be deduced that clinic 9 might have been using a different medicine treatment protocol or was not adhering to one as compared to the other clinics for the treatment of new/not controlled hypertension.

4.7.5. Osteoarthritis

The total prevalence of osteoarthritis (both single and multiple diagnoses) in the study population accounted for 3092 (2.20%) with a total medicine treatment cost of R46267.68 (2.68%). The cost index calculated to 1.22, which indicates that the medicine treatment cost was relatively expensive for this specific diagnosis.

4.7.5.1. Medicine treatment cost and prevalence of osteoarthritis for both single and multiple diagnoses

Figure 4.8 shows the medicine treatment cost and prevalence of diagnoses of osteoarthritis for both the single and multiple diagnoses in the study population (n=9 clinics).

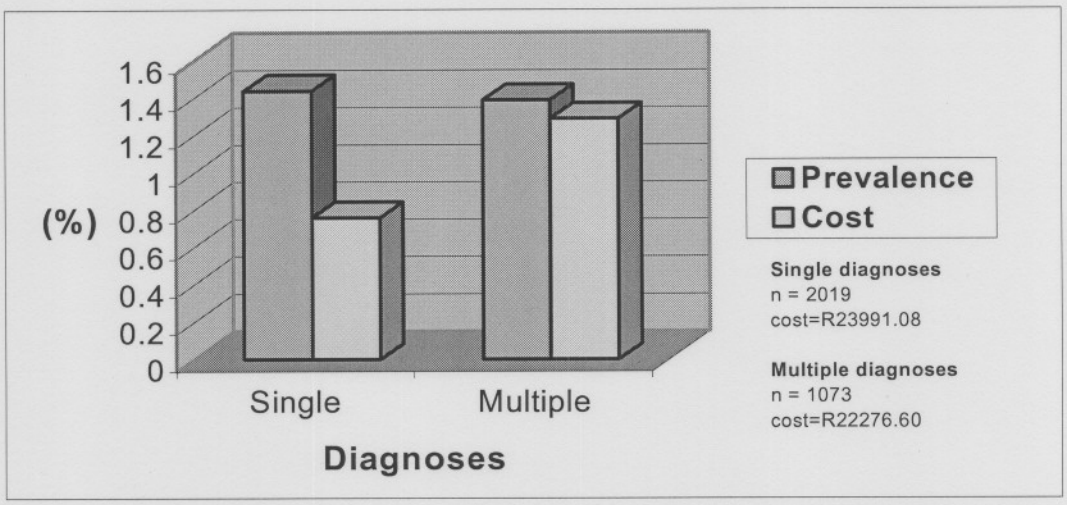


Figure 4.8: Medicine treatment cost and prevalence for osteoarthritis (single and multiple diagnoses)

According to figure 4.8 the prevalence of single diagnosis osteoarthritis represented 65.30% (n = 3092) of the diagnoses made in this type of ailment at a total medicine treatment cost of R23 991.08 (51.85%). The cost prevalence index was 0.97 indicating that the treatment cost was relatively inexpensive for osteoarthritis single diagnoses.

The remaining 1073 (34.70%) diagnoses made in this type of ailment were multiple diagnoses, with a total medicine treatment cost of R22 276.60 (48.15%). The cost prevalence index was calculated to 1.39 indicating that the medicine treatment cost was relatively expensive. A possible reason could be that there was more than one diagnosis made and therefore probably more medicine treatment dispensed for this diagnosis.

4.7.5.2. Average medicine treatment cost for osteoarthritis: single diagnosis vs. multiple diagnoses

Table B.16 (in appendix B) shows the average medicine treatment cost of both single and multiple diagnoses for osteoarthritis.

According to table B.16 clinics 8 and 9 had the highest total medicine treatment cost for single diagnoses osteoarthritis accounting for 0.46% (n= R1 729 072.70) and 0.45% respectively. The lowest total medicine treatment cost for single diagnosis was in clinic 3 with 0.01% for the study population. Clinic 6 had the highest total medicine treatment cost for multiple diagnoses osteoarthritis accounting for 0.67% (n= R1 729 072.70) for the study population.

From table B.16, clinic 6 had the highest average medicine treatment cost for both the single and the multiple diagnoses with R16.53 ± 11.68 and R27.13 ± 18.78 respectively, indicating that the medicine treatment cost was between R4.85 and R28.21 and between R8.35 and R45.91 respectively. This indicates that clinic 6 might have been using a different medicine treatment protocol for the treatment of osteoarthritis compared to the other clinics.

Table 4.34 indicates the d-values for the average medicine treatment cost of osteoarthritis single and multiple diagnoses as calculated from table B.16 in appendix B).

Table 4.34: D-values calculated for the average medicine treatment cost of osteoarhtritis (single vs. multiple diagnoses)

Clinic	1 N=19719	2 N=13668	3 N= 8877	4 N= 14159	5 N=11251	6 N=17808	7 N=18670	8 N=23682	9 N=12889
D-value	0.43	**0.85**	0.21	0.49	0.53	0.56	0.51	0.64	0.66

From the information in table 4.34 it can be deduced that there was a practical significant difference between the average medicine treatment cost for osteoarthritis single diagnosis and that of multiple diagnoses in clinic 2, with a d-value of 0.85. This may be because in multiple diagnoses, more than one diagnosis is made; therefore probably more than one medicine treatment was given and the cost increased.

The average medicine treatment cost for single diagnosis of osteoarthritis was further discussed in table 4.35 by showing the d-values for the average medicine treatment cost of osteoarthritis (refer to table B.16 in appendix B for the average medicine treatment cost).

Table 4.35: D-values for the average medicine treatment cost of osteoarthritis (single diagnosis) according to clinic

Clinic	1	2	3	4	5	6	7	8
2	0.39							
3	0.03	0.27						
4	0.12	0.09	0.15					
5	0.14	0.14	0.15	0.02				
6	0.48	0.69	0.46	0.60	0.58			
7	0.04	0.25	0.01	0.16	0.14	0.45		
8	0.15	0.19	0.13	0.03	0.02	0.57	0.13	
9	0.43	0.77	0.27	0.39	0.50	0.22	0.23	0.57

The information in table 4.35 indicates that there was no practical significant difference in the average medicine treatment cost of single diagnosis osteoarthritis between the nine clinics. This might indicate that the clinics were adhering to the same medicine treatment protocol for osteoarthritis (single diagnosis).

4.7.6. Acute sinusitis

The total prevalence of both single and multiple diagnoses in the nine clinics for acute sinusitis was 3008 (2.14%) and a total medicine treatment cost of R43 467.51 (2.51%). The cost prevalence index therefore was 1.17. This shows that the medicine treatment cost for acute sinusitis in the nine clinics was relatively expensive.

4.7.6.1. Medicine treatment cost and prevalence of acute sinusitis for both single and multiple diagnoses

Figure 4.9 shows the medicine treatment cost and prevalence of both single and multiple diagnoses of acute sinusitis in the study population (n=9 clinics).

Acute sinusitis, single diagnosis represented 75% (n = 3008) of the diagnoses made in this type of infection with a total treatment cost of R31 288.34 (71.98%). The cost prevalence index was calculated to 0.96 indicating that the medicine treatment cost in this type of infection was relatively inexpensive.

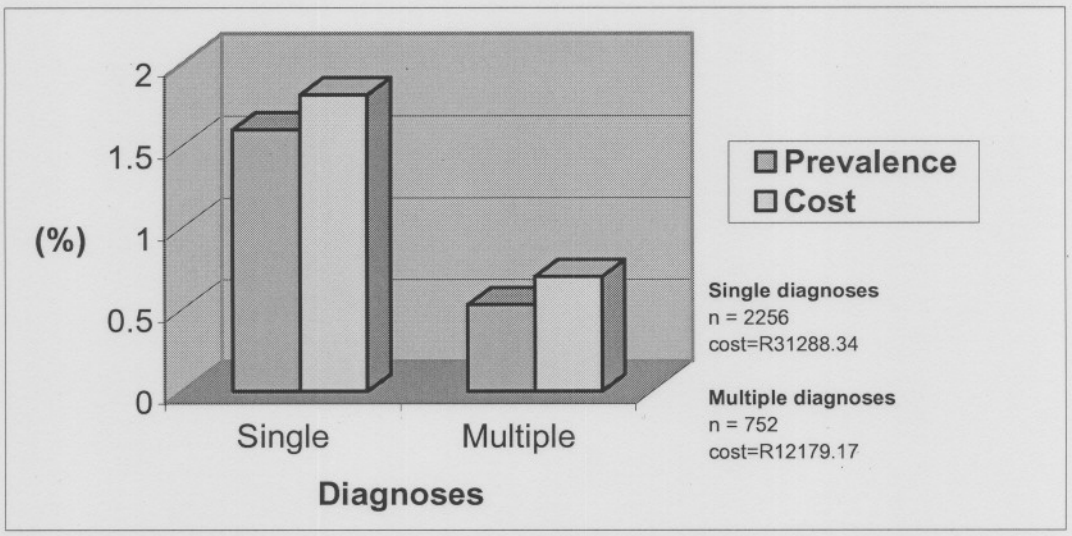


Figure 4.9: Medicine treatment cost and prevalence for acute sinusitis (single and multiple diagnoses)

The remaining 752 (25%) diagnoses made were multiple diagnoses, with a medicine treatment cost of R12 179.17 (28.02%). The cost prevalence index was calculated to 1.12 indicating that the medicine treatment cost was relatively expensive since more than one diagnosis was made, more medicine treatment was given and therefore increased the cost.

4.7.6.2. Average medicine treatment cost for acute sinusitis: single vs. multiple diagnoses

Table B.17 (in appendix B) shows the average medicine treatment cost of both single and multiple diagnoses for acute sinusitis.

According to table B.17 clinic 9 had the highest total medicine treatment cost for single diagnosis acute sinusitis accounting for 0.86% (n= R1729072.70) but the lowest total medicine treatment cost for multiple diagnoses with 0.01%. Clinic 1 had the highest total medicine treatment cost for multiple diagnoses of acute sinusitis with 0.23% (n= R1729072.70) in the study population.

Clinic 9 had the highest average medicine treatment cost for single diagnosis acute sinusitis with R16.95±11.78 indicating that the medicine treatment cost was between R5.17 and R28.73. Although clinic 3 had the lowest average medicine treatment cost for single diagnosis acute sinusitis with R9.56±13.10, it had the highest average medicine treatment cost for multiple diagnoses with R22.24±21.89. This indicates that the medicine treatment cost for single diagnosis acute sinusitis was between R0.00 and R22.66, therefore the medicine treatment protocol might have not been adhered to and due to the cost implications this must be further

investigated. For the multiple diagnoses the average medicine treatment cost was between R0.35 and R44.13.

Table 4.36 indicates the d-values for the average medicine treatment cost of acute sinusitis for both single and multiple diagnoses.

Table 4.36: D-values calculated the average medicine treatment cost of acute sinusitis (single vs. multiple diagnoses)

Clinic	1 N=19719	2 N=13668	3 N= 8877	4 N= 14159	5 N=11251	6 N=17808	7 N=18670	8 N=23682	9 N=12889
D-value	0.36	0.35	0.58	0.12	0.40	0.33	0.30	0.51	0.27

Table 4.36 indicates that there was no practical significant difference in the average medicine treatment cost between the single and multiple diagnoses for acute sinusitis in the study population.

A further discussion on the average medicine treatment cost of single diagnoses will be given in table 4.37 indicating the comparison of the d-values for the average medicine treatment cost of acute sinusitis (refer to table B.17 in appendix B).

Table 4.37: D-values calculated for the average medicine treatment cost of acute sinusitis (single diagnosis) according to clinic

Clinic	1	2	3	4	5	6	7	8
2	0.09							
3	0.10	0.04						
4	0.30	0.37	0.35					
5	0.17	0.26	0.21	0.17				
6	0.29	0.33	0.36	0.09	0.21			
7	0.13	0.20	0.21	0.17	0.00	0.20		
8	0.03	0.06	0.08	0.32	0.27	0.30	0.15	
9	0.52	0.58	0.56	0.23	0.40	0.07	0.39	0.54

From information obtained in table 4.37, it was shown that there was no practical significant difference in the average medicine treatment cost of single diagnoses acute sinusitis in the nine primary health care clinics.

4.7.7. Gastroenteritis (GE)

The total prevalence of both diagnoses (single and multiple) for gastroenteritis was 2983 (2.12%) and the total medicine treatment cost was R30 561.35 (1.77%) in the study population. The cost prevalence index was 0.83. This indicates that the medicine treatment cost for gastroenteritis was relatively inexpensive for the nine clinics.

4.7.7.1. Medicine treatment cost and prevalence of GE for both single and multiple diagnoses

Figure 4.10 shows the medicine treatment cost and prevalence of diagnoses for gastroenteritis infection for both the single and multiple diagnoses in the study population (n=9 clinics).

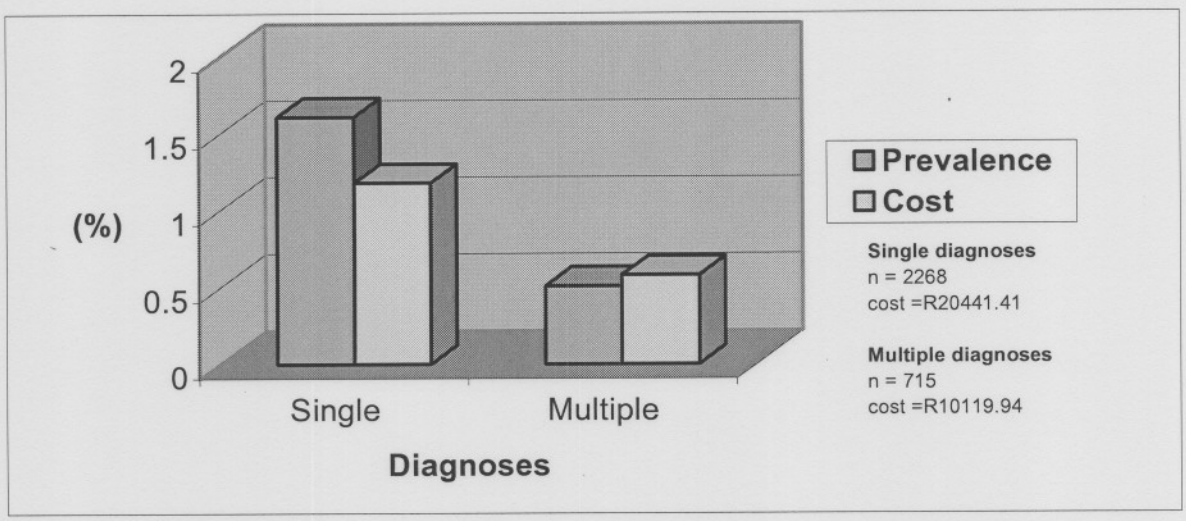


Figure 4.10: Medicine treatment cost and prevalence for gastroenteritis (single and multiple diagnoses)

According to figure 4.10 the single diagnoses made for gastroenteritis in the nine clinics represented 76.03% (n = 2983) made for this type of infection with a total medicine treatment cost of 66.89% (n= R30 561.35). The cost prevalence index was calculated to 0.88 indicating that the medicine treatment cost was relatively inexpensive.

The remaining 23.97% (n = 2983) diagnoses made were multiple diagnoses, with a total medicine treatment cost of 33.11% (n= R30 561.35). The cost prevalence index calculated to 1.38 indicating that the medicine treatment for this type of infection was relatively expensive. This could be because there was more than one diagnosis made in this case and therefore more medicine treatment was dispensed.

4.7.7.2. Average medicine treatment cost for GE: single vs. multiple diagnoses

Table B.18 (in appendix B) shows the average medicine treatment cost of both single and multiple diagnoses for gastroenteritis.

According to table B.18 clinic 6 had the highest total medicine treatment cost for both single and multiple diagnoses of gastroenteritis accounting for 0.33% (n= R1 729 072.70) and 0.22% respectively for the study population. Clinics 4 and 9 had the lowest total medicine treatment cost for single and multiple diagnoses accounting for 0.06% (n= R 1729 072.70) and 0.02% respectively.

From table B.18 clinic 6 had the highest average medicine treatment cost for both single and multiple diagnoses of gastroenteritis with R11.03±6.37 and R16.84±14.53 respectively. This indicates that for clinic 6 the average medicine treatment cost was between R4.66 and R17.40 for gastroenteritis single diagnosis and between R2.31 and R31.37 for the multiple diagnoses in the study population.

Table 4.38 indicates the d-values for the average medicine treatment cost for GE single vs. multiple diagnoses.

Table 4.38: D-values calculated for the average medicine treatment cost for gastroenteritis (single vs. multiple diagnoses)

Clinic	1 N=19719	2 N=13668	3 N= 8877	4 N= 14159	5 N=11251	6 N=17808	7 N=18670	8 N=23682	9 N=12889
D-value	0.62	0.14	0.47	0.63	0.78	0.40	0.47	0.51	0.33

Table 4.38 indicates that there was no practical significant difference between the average medicine treatment cost for a single diagnosis of gastroenteritis and that of multiple diagnoses.

Table 4.39 indicates a further discussion of the d-values for the average medicine treatment cost of single diagnosis gastroenteritis (refer to table B.18 appendix B for the average values of medicine treatment cost).

Table 4.39: D-values calculated for the average medicine treatment cost of gastroenteritis (single diagnosis) according to clinic

Clinic	1	2	3	4	5	6	7	8
2	0.40							
3	0.19	0.01						
4	0.17	0.14	0.08					
5	0.22	0.19	0.08	0.00				
6	0.66	0.35	0.24	0.49	0.49			
7	0.14	0.16	0.10	0.03	0.02	0.50		
8	0.55	0.16	0.10	0.27	0.34	0.22	0.28	
9	0.51	0.13	0.07	0.23	0.30	0.27	0.24	0.05

From the information in table 4.39, it is clear that there was no practical significant difference in the average medicine treatment cost for gastroenteritis single diagnosis in the clinics under study. This could be that the clinics were using the same medicine treatment protocols for the treatment of gastroenteritis.

4.7.8. Upper respiratory tract: common cold

The total prevalence of both single and multiple diagnoses for upper respiratory tract (common cold) in the nine clinics was 2893 (2.06%) with a total medicine treatment cost of R32750.17 (1.89%). The cost prevalence calculated to 0.92 thus indicating that the medicine treatment cost in this type of infection was relatively inexpensive.

4.7.8.1. Medicine treatment cost and prevalence of common cold for both single and multiple diagnoses

Figure 4.11 shows the medicine treatment cost and prevalence of diagnoses for the common cold infection in both single and multiple diagnoses in the study population (n =9 clinics).

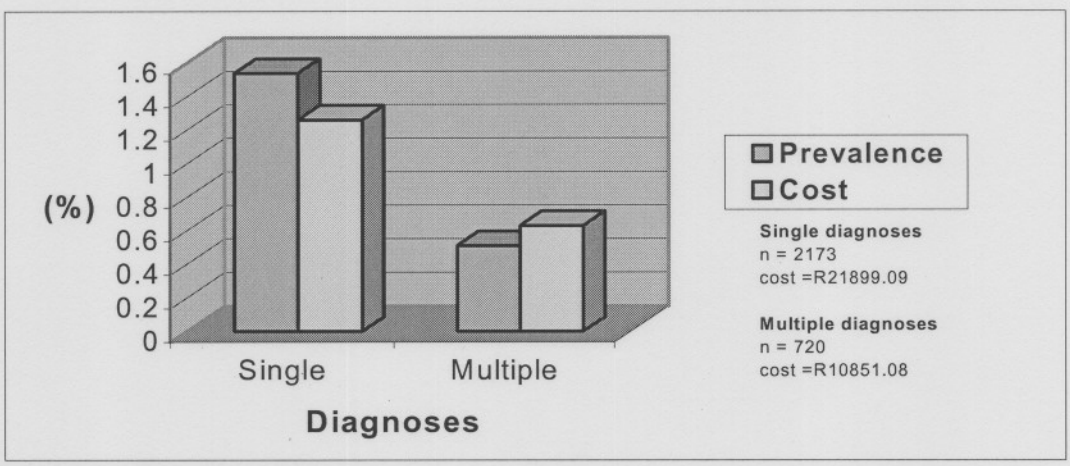


Figure 4.11: Medicine treatment cost and prevalence for common cold (single and multiple diagnoses)

According to figure 4.11 the prevalence of single diagnoses for upper respiratory tract (common cold) in the nine clinics represented 75.11% (n = 2893) diagnoses made in this type of infection with a total medicine treatment cost of R21 899.09 (66.87%). The cost prevalence index therefore calculated to 0.89 indicating that the medicine treatment cost for this type of infection was relatively inexpensive.

The remaining 720 (24.89%) diagnoses made were multiple diagnoses with a total medicine treatment cost of R10 851.08 (33.13%). The cost prevalence index calculated to 1.33, thus indicating that the medicine treatment cost was relatively expensive due to the fact that there was more than one diagnosis made and probably more medicine treatment dispensed.

4.7.8.2. Average medicine treatment cost for common cold: single vs. multiple diagnoses

Table B.19 shows the average medicine treatment cost of both single and multiple diagnoses for common cold infection.

According to table B.19 clinics 8 and 9 had the highest and lowest total medicine treatment cost for single diagnosis common cold with 0.43% (n= R1 729 072.10) and 0.01% respectively. Clinics 4 and 3 had the highest and lowest total medicine treatment cost for multiple diagnosis common cold with 0.14% (n= R1 729 072.10) and 0.0003% respectively for the study population.

From table B.19 clinics 9 and 2 had the highest and lowest average medicine treatment cost for single diagnosis of the common cold with R14.96±12.62 and R8.40±5.21, indicating that the medicine treatment cost was between R2.34 and R27.58 as well as between R3.91 and R13.61 respectively for the study population.

Table 4.40 indicates the d-values of the average medicine treatment cost for single and multiple diagnoses upper respiratory tract (common cold).

Table 4.40: D-values calculated for the average medicine treatment cost of common cold (single vs. multiple diagnoses)

Clinic	1 N=19719	2 N=13668	3 N= 8877	4 N= 14159	5 N=11251	6 N=17808	7 N=18670	8 N=23682	9 N=12889
D-value	0.57	0.41	0.38	0.61	0.73	0.58	0.37	0.39	-

From table 4.40 it can be deduced that there was also no practical significant difference in the average medicine treatment cost for a single diagnosis of the common cold and that of multiple diagnoses in the nine clinics.

A further discussion of the average medicine treatment cost for single diagnosis is shown in table 4.41 indicating the comparison of d-values for the average medicine treatment cost of upper respiratory tract: common cold (refer to table B.8 in appendix B).

Table 4.41: D-values calculated for the average medicine treatment cost of common cold (single diagnosis) according to clinic

Clinic	1	2	3	4	5	6	7	8
2	0.27							
3	0.04	0.16						
4	0.13	0.08	0.12					
5	0.10	0.18	0.08	0.06				
6	0.20	0.43	0.07	0.31	0.27			
7	0.08	0.14	0.08	0.06	0.00	0.26		
8	0.27	0.50	0.11	0.38	0.34	0.08	0.33	
9	0.41	0.52	0.37	0.48	0.44	0.31	0.45	0.27

The information in table 4.41 indicates that there was no practical significant difference in the average medicine treatment cost of single diagnoses of the common cold between the nine clinics. This could be that the clinics were following the same medicine treatment protocols for the treatment of common cold.

4.7.9. Uncomplicated gastritis

4.7.9.1. Medicine treatment cost and prevalence of uncomplicated gastritis for both single and multiple diagnoses

The total prevalence of both single and multiple diagnoses for uncomplicated gastritis in the nine clinics was 2.03% (n= 140723) with a total medicine treatment cost amounting to 2.40% (n= R1 729 072.70). The cost prevalence index therefore was 1.18. It indicates that the treatment cost for uncomplicated gastritis was relatively expensive in the nine clinics combined.

Figure 4.12 shows the medicine treatment cost and prevalence of diagnoses for uncomplicated gastritis for both single and multiple diagnoses in the study population (n=9 clinics).

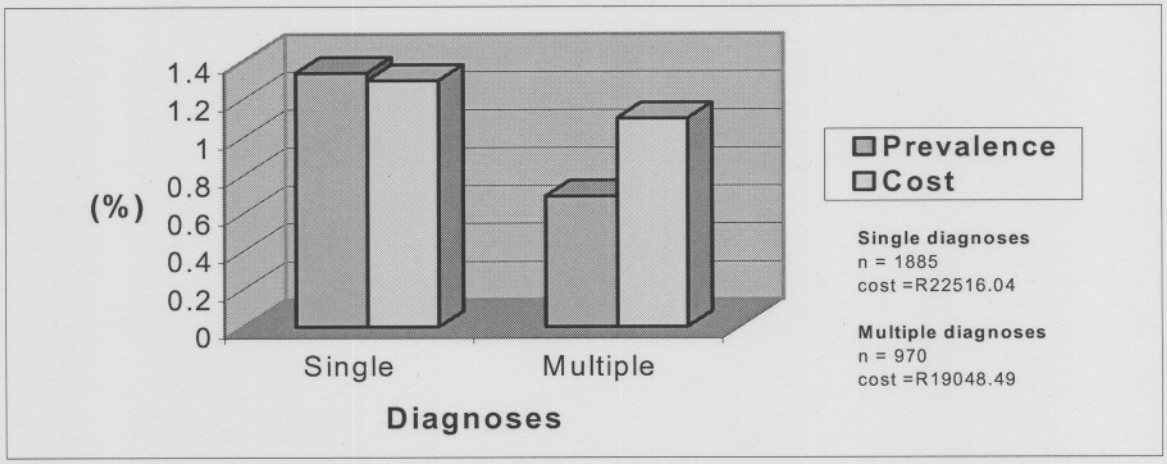


Figure 4.12: Medicine treatment cost and prevalence for uncomplicated gastritis (single and multiple diagnoses)

According to figure 4.12 the prevalence of single diagnoses for uncomplicated gastritis represented 66.02% (n = 2855) diagnoses made for this type of infection with a total medicine treatment cost of 54.17% (n= R41 564.53). The cost prevalence index in this case was 0.82 thus indicating that the medicine treatment cost was relatively inexpensive.

The remaining 33.98% (n = 2855) diagnoses made, were multiple diagnoses with a total medicine treatment cost of 45.83% (n= R41 564.53) and a cost prevalence index calculating to 1.35, indicating that the medicine treatment cost for this diagnosis was relatively expensive. This may be ascribed to the fact that there was more than one type of diagnosis made.

4.7.9.2. Average medicine treatment cost for uncomplicated gastritis: single vs. multiple diagnoses

Table B.20 (in appendix B) shows the average medicine treatment cost of both single and multiple diagnoses for uncomplicated gastritis.

According to table B.20, clinic 9 had the highest (single diagnosis) and lowest (multiple diagnoses) total medicine treatment cost for uncomplicated gastritis accounting for 0.43% (n= R1 729 072.10) and 0.01% respectively. Clinics 6 and 1 had the highest (multiple diagnoses) and lowest (single diagnosis) total medicine treatment cost accounting for 0.45% (n= R1 729 072.10) and 0.03% respectively in the study population.

From table B.20 clinics 3 and 1 had the highest and lowest average medicine treatment cost for single diagnosis uncomplicated gastritis with R16.17±15.83 and R8.61±3.92 respectively, indicating that the medicine treatment cost was between R0.34 and R32.00 as well between

R4.69 and R12.53 for the single diagnosis in the study population. Clinics 6 and 2 had the highest and lowest average medicine treatment cost for multiple diagnosis of uncomplicated gastritis with R24.70 ± R17.56 and R11.59 ± R6.21 respectively, indicating that the medicine treatment cost was between R7.14 and R42.26 as well as between R5.38 and R17.80 for the multiple diagnoses in the study population.

Table 4.42 indicates the d-values on the average medicine treatment cost of uncomplicated gastritis for single and multiple diagnoses.

Table 4.42: D-values calculated for the average medicine treatment cost of uncomplicated gastritis (single vs. multiple diagnosis)

Clinic	1 N=19719	2 N=13668	3 N= 8877	4 N= 14159	5 N=11251	6 N=17808	7 N=18670	8 N=23682	9 N=12889
D-value	0.48	0.47	0.02	0.56	0.66	0.52	0.75	0.56	0.05

From table 4.42 it can be deduced that there was no practical significant difference found between the average medicine treatment cost between single and multiple diagnoses of uncomplicated gastritis in the nine clinics.

The average medicine treatment cost for single diagnosis of uncomplicated gastritis between the different clinics was further analysed in table 4.43 (refer to table B.20 in appendix B).

Table 4.43: D-values calculated for the average medicine treatment cost of uncomplicated gastritis (single diagnosis) according to clinic

Clinic	1	2	3	4	5	6	7	8
2	0.00							
3	0.48	0.48						
4	0.02	0.00	0.47					
5	0.23	0.16	0.42	0.19				
6	0.68	0.68	0.04	0.67	0.59			
7	0.24	0.24	0.37	0.23	0.10	0.52		
8	0.40	0.39	0.31	0.39	0.26	0.42	0.16	
9	0.41	0.40	0.14	0.40	0.33	0.12	0.28	0.20

The information in table 4.43 shows that there was no practical significant difference in the average medicine treatment cost of single diagnosis of uncomplicated gastritis in the clinics. Therefore the clinics could have been using the same medicine treatment protocol for the treatment of uncomplicated gastritis.

4.7.10. Arthralgia

The total prevalence of both diagnoses (single and multiple) for arthralgia in the nine clinics was 2720 (1.93%) with a total medicine treatment cost of R35 523.73 (2.05%). The cost prevalence index was 1.06. Therefore it indicates that the medicine treatment cost for arthralgia was relatively expensive in the nine clinics combined.

4.7.10.1. Medicine treatment cost and prevalence of arthralgia for both single and multiple diagnoses

Figure 4.13 shows the medicine treatment cost and prevalence of diagnoses for arthralgia (both single and multiple diagnoses) in the study population (n=9 clinics).

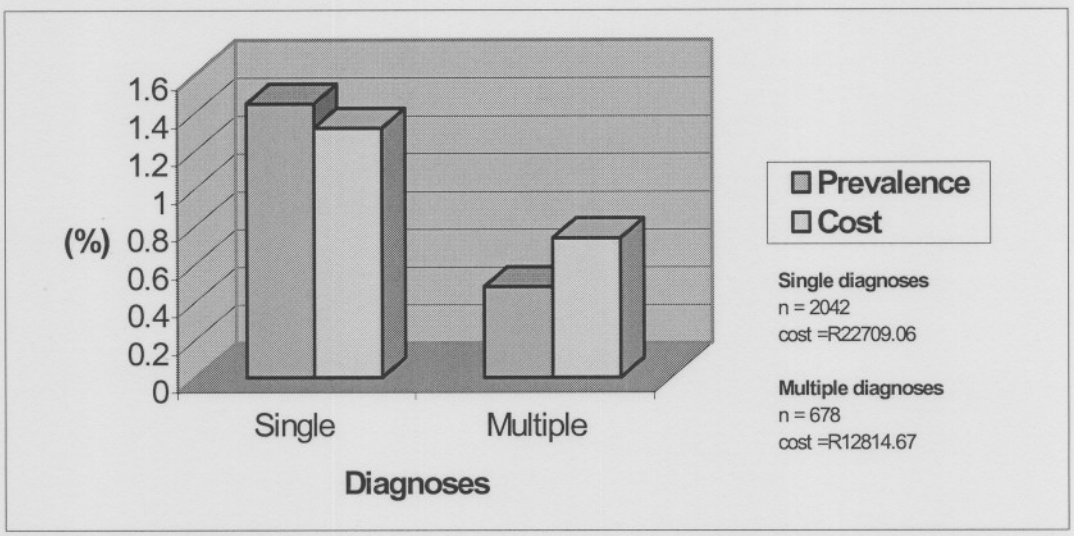


Figure 4.13: Medicine treatment cost and prevalence for arthralgia (single and multiple diagnoses)

According to figure 4.13 the prevalence of single diagnoses made for arthralgia represented 75.07% (n = 2720) and the medicine treatment cost was R22 709.06 (63.93%). The cost prevalence index was 0.85 indicating that the medicine treatment cost was relatively inexpensive.

The remaining 678 (24.93%) diagnoses made were multiple diagnoses, with a total medicine treatment cost of R12 814.67 (36.07%) and a cost prevalence index of 1.45, indicating that more than one diagnosis was made, therefore the medicine treatment cost was relatively expensive.

4.7.10.2. Average medicine treatment cost of arthralgia: single vs. multiple diagnoses

Table B.21 (in appendix B) shows the average medicine treatment cost of both single and multiple diagnoses for arthralgia.

According to table B.21 clinic 5 had the lowest total medicine treatment cost for both single and multiple diagnoses of arthralgia accounting for 0.01% (n= R1 729 072.70) and 0.01% respectively in the study population. Clinics 9 and 1 had the highest total medicine treatment cost respectively for single and multiple diagnoses of arthralgia with 0.85% (n= R1 729 072.70) and 0.38%, indicating that the cost for single diagnosis of arthralgia was more than that of multiple diagnoses. This could be due to the fact that clinic 9 might have not been complying with the same medicine treatment protocol as the other clinics.

From table B.21 clinic 9 had the highest average medicine treatment cost for both the single and multiple diagnoses with R12.62 ± 10.43 and R25.26 ± 29.39, indicating that the medicine treatment cost was between R2.19 and 23.05 for single diagnosis and between R0.00 and R54.65 for the multiple diagnoses. This indicates that the clinic did not adhere to the same medicine treatment protocol as the other clinics. Clinics 7 and 2 had the lowest average medicine treatment cost for single and multiple diagnoses respectively with R6.69 ± 5.58 and R12.61 ± 9.42, indicating that the medicine treatment cost was between R1.11 and R12.27 for single diagnosis arthralgia and between R3.19 and 22.03 for multiple diagnoses arthralgia in the study population.

Table 4.44 indicates d-values of the average medicine treatment cost of athralgia, both single and multiple diagnoses.

Table 4.44: D-values calculated for the average medicine treatment cost of arthralgia (single vs. multiple diagnoses)

Clinic	1 N=19719	2 N=13668	3 N= 8877	4 N= 14159	5 N=11251	6 N=17808	7 N=18670	8 N=23682	9 N=12889
D-value	0.59	0.21	0.69	0.46	0.45	0.55	**1.04**	0.68	0.43

From table 4.44 it can be deduced that there was a practical significant difference in the average medicine treatment cost between single and multiple diagnoses of arthralgia in clinic 7. This indicates that the medicine treatment cost for the multiple diagnoses of arthralgia was relatively more expensive due to the fact that there was more than one diagnosis made.

The average medicine treatment cost for the single diagnosis of arthralgia between the different clinics was further analysed in table 4.45.

Table 4.45: D-values calculated for the average medicine treatment cost of arthralgia (single diagnosis) according to clinic

Clinic	1	2	3	4	5	6	7	8
2	0.08							
3	0.07	0.00						
4	0.03	0.09	0.09					
5	0.26	0.23	0.23	0.25				
6	0.27	0.15	0.16	0.28	0.44			
7	0.28	0.24	0.24	0.26	0.02	0.45		
8	0.07	0.12	0.12	0.05	0.29	0.32	0.28	
9	0.36	0.21	0.22	0.38	0.56	0.07	0.57	0.42

The information from table 4.45 indicates that there were no practical significant differences in the average medicine treatment cost of single diagnosis arthralgia between the nine clinics. This indicates that the clinics were following the same medicine treatment protocol in cases where only single diagnosis arthralgia was diagnosed.

4.8. THE COST ANALYSIS OF THE TOP TWENTY MEDICINE ITEMS

Table 4.46 shows the medicine treatment cost of the top twenty medicine items.

Table 4.46: The total medicine treatment cost of the top twenty medicine items

Name of medicine item	*Prevalence of medicine item*	*Percentage prevalence of medicine item [A]*	*Medicine treatment cost (R)*	*Percentage medicine treatment cost [B]*	*Cost prevalence index [B] ÷ [A]*
Paracetamol, 500mg tablets	41879 [1]	14.43%	32 775.02 [6]	6.62%	0.46
Diphenhydramine, ammonium chloride 14mg/5ml syrup	30055 [2]	10.35%	44 810.61 [4]	9.05%	0.87
Paracetamol, codeine phosphate, 500(8)mg tablets	22941 [3]	7.90%	72 036.52 [1]	14.55%	**1.84**
Ibuprofen, 200mg tablets	18956 [4]	6.53%	25 496.06 [7]	5.15%	0.79
Diclofenac sodium, 75mg Injection	17749 [5]	6.11%	18 382.25 [12]	3.71%	0.61
Amoxycillin, 250mg capsules	17368 [6]	5.98%	67 459.84 [2]	13.63%	**2.28**
Co-Trimoxazole, 480mg tablets	16261 [7]	5.60%	35 655.52 [5]	7.20%	**1.29**
Methyl salicylate ointment	14459 [8]	4.98%	10 470.29 [15]	2.12%	0.43
Paracetamol, ephedrine, chlorpheniramine, 200mg tablets	12376 [9]	4.26%	15 568.65 [13]	3.15%	0.74
Paracetamol, 120mg/5ml syrup	12052 [10]	4.15%	20 445.84 [9]	4.13%	**1.00**
Multivitamin, tablets	11112 [11]	3.83%	3 898.18 [19]	0.79%	0.21
Potassium Citrate. 1.25g/15ml syrup	9709 [12]	3.34%	13 883.94 [14]	2.80%	0.84
Ferrous sulphate complex, 170mg tablets	9463 [13]	3.26%	5 104.81 [17]	1.03%	0.32
Folic acid 5mg tablets	9257 [14]	3.19%	4 759.39 [18]	0.96%	0.30
Amiloride hydrochlorothiazide 5(50)mg tablets	9184 [15]	3.16%	18 634.26 [11]	3.76%	**1.19**
Doxycycline, 100mg capsules	8653 [16]	2.98%	53 125.87 [3]	10.73%	**3.60**
Diclofenac sodium, 25mg tablets	8151 [17]	2.81%	22 188.84 [8]	4.48%	**1.59**
Prednisone, 5mg tablets	7321 [18]	2.52%	19 055.54 [10]	3.85%	**1.53**
Metronidazole, 200mg tablets	6846 [19]	2.36%	7 848.12 [16]	1.59%	0.67
Diazepam, 5mg tablets	6499 [20]	2.24%	3 384.17 [20]	0.68%	0.30
Total	**290291**	**99.98%**	**494 983.72**	**99.98%**	-

Table 4.46 indicates that although paracetamol 500mg tablets had the highest number with regard to prevalence accounting for 8.11% (n= 516177), the tablets only rank sixth with regard to the total medicine treatment cost with 1.90% (n= R1 729 072.70) in the study population. The combination of paracetamol and codeine phosphate tablets had the highest medicine treatment cost with 4.17% (n= R1 729 072.70) but ranked third with regard to prevalence accounting for 4.44% (n= 516177). Amoxycillin had the second highest total medicine treatment cost amounting to R67 459.84 (n= R1 729 072.70) and ranked sixth with regard to prevalence,

accounting for 3.36% (n= 516177) in the study population. A possible reason for the relatively high usage of paracetamol in the clinics is because it is the most recommended painkiller (refer to paragraph 4.2.4.3). There is also a relatively high usage of antibiotics in the clinics (refer to table 4.9), hence the high medicine treatment cost for amoxycillin.

There was a correlation with regard to both prevalence and the total medicine treatment cost for diazepam 5mg tablets. It ranked number twenty for both with 1.26% (n= 516177) of the total number of medicine items and 0.20% (n= R1 729 072.70) of the total medicine treatment cost in the study population.

4.9. SUMMARY: COST OF DRUG THERAPY

The medicine treatment cost was generally relatively expensive in clinics 1, 3, 4, 6 and 9 (refer to table 5.13). Clinic 8 had the highest medicine treatment cost, accounting for 14.73% (n= R1 729 072.70) in the study population, followed by clinics 6 and 1. There was a high prevalence of diagnoses between ages 19 to 40 years and as this can be expected, the medicine treatment cost was the highest with R610 992.18 accounting for 35.34% (n= R 1 729 072.70).

Females had a relatively high prevalence of consultations (refer to paragraph 4.2.3.5) and diagnoses as well a relatively expensive medicine treatment cost compared to males (refer figure 4.5) and therefore had the highest prevalence of medicine treatment cost, accounting for 60.40% (n= R 1 729 072.70) in the study population.

The medicine treatment cost was found to be relatively expensive in more than 50% of the top 10 diagnoses discussed, namely: acute bronchitis infection, hypertension, osteoarthritis, acute sinusitis, uncomplicated gastritis and arthralgia.

Some people succeed because they are destined to, but most people succeed because they are determined to.

Unknown

CHAPTER 5 CONCLUSIONS AND RECOMMENDATIONS

5.1. INTRODUCTION

Conclusions and recommendations regarding the management of diseases in the medicentres will be made in this chapter. The limitations regarding this study will be stated and recommendations for future research will also be proposed.

5.2. CONCLUSIONS

The following conclusions regarding the results obtained in chapter 4, and as formulated by specific objectives stated in chapter 1, can be made:

- The ***first*** research objective was to conceptualise from the literature what managed health care and its tools is all about. Managed health care is a system of pre-paid health care services and benefits and its goal is to improve access to and quality of care while containing health care costs. The tools of managed health care discussed in the literature all relate to proper and cost-effective use of medicine treatment, thus DUR and pharmacoeconomics document the key roles of epidemiology and economics in medicine (and in society) to be assumed as the cornerstones of pharmacology and therapeutics. Variability of prescribing practices is a result of medical uncertainty and therefore, to facilitate more rational prescribing (which will then lead to rational usage of medicines) requires evaluation of factors such as physicians and patient characteristics as well as efficacy and cost of individual drugs. Guidelines to the usage of medicine can also be achieved through proper usage of treatment protocols drawn from recommended formularies and standard treatment guidelines.

- The ***second*** research objective was to conceptualise from literature the concepts, approaches and elements of primary health care. Primary health care became a core concept for the WHO as a result of the Declaration of Alma-Ata, giving rise to the WHO's goal of health for all. Concepts developed at the conference continue to influence key aspects of international health policy, shaped in recent years by fresh ideas. The goals of a health system should be to provide all necessary care to everybody, improve the mean level of quality of care, reduce variations in this care and eliminate waste.

- The ***third*** objective was to determine the basic characteristics of the study population consulting (visiting) at the private primary health care setting (with regard to the number of patients, consultations, diagnoses, medicine items, the average age of patients and gender distribution). There were 83648 patients in the study population. These patients visited the 9 medicentres a total of 132591 times (i.e. the number of consultations). A total number of 140723 diagnoses were made with 516177 medicine items being prescribed during the consultations.

  From the 9 medicentres, which the study population was compiled from, clinic 8 contributed the most in terms of the number of patients (20.76%), consultations (17.99%), as well as the number of diagnoses (16.83%) and medicine items prescribed (18.19%) in the study population.

  About 67% (n=83648) of the study population was between the ages of 19 to 60 years (with about half of these patients above the age of 40 years), and 19% were children below the age of 12 years. There was no practical significant difference between the average ages of patients in the nine medicentres. The majority of patients in the study population (i.e. 60%) were also females (n=83648).

- The ***fourth*** objective was to determine the influence age has on the number of consultations, diagnoses and medicine items in the study population. It was determined that patients between the ages of 19 to 60 years (age groups 4 and 5) had the highest number of consultations 68.50% (n=132591), medical conditions 67.78% (n=140723) and medicine items 68.23% (n=516177) prescribed in the study population. This indicates that age does not have an influence on the number of consultations, diagnoses and medicine items prescribed. However, the d-values for the weighted average number of diagnoses and medicine items per consultation for age groups 4 and 5 were calculated to be 1.13 and 0.48, therefore indicating that there was a practical significant difference found on the average number of diagnoses per consultation and no practical significant difference found on the average number of medicine items prescribed per consultation for theses age groups respectively.

- The ***fifth*** objective was to determine the influence gender has on the number of consultations, diagnoses and medicine items in the study population. It was determined that females had the highest number of consultations 59.93% (n=132591), medical conditions 60.48% (n=140723) and medicine items prescribed 61.17% (n=516177) in the study population. This indicates that gender does not have an influence with regard to the number of consultations, diagnoses and medicine items prescribed. However, the d-values

calculated for the weighted average number of diagnoses and medicine items per consultation for females were 0.67 and 1.25 respectively. Indicating that there was no practical significant difference found on the average number of diagnoses per consultation but a practical significant difference found on the average number of medicine items prescribed per consultation for the females.

- The ***sixth*** objective was to determine the top ten diagnoses (medical conditions) in the study population during the study period. The top ten diagnoses were determined according to prevalence of the diagnoses for the nine clinics collectively (refer to paragraph 4.2.3.2) and were then classified into pathophysiological states (refer to table 4.5). The top ten diagnoses (refer to table 4.6) with the highest prevalence determined for the study population represented 29.07% (n= 140723) of all the diagnoses made during the study period. Eight of these "top ten" diagnoses can be referred to as acute conditions except for hypertension and osteoarthritis, which were the only two diagnoses identified as chronic conditions which accounted for 7.86% (n= 140723). There was a relatively high incidence of respiratory diseases, which accounted for 17.10% (n= 140723) of the total number of diagnoses made for the study population.

- The ***seventh*** objective was to determine the top twenty medicine items prescribed. The top twenty prescribed medicine items were determined according to prevalence for the nine clinics collectively (refer to paragraph 4.2.4.2) and were then classified into pharmacological groups (refer to table 4.9). The top 20 medicine items prescribed (refer to table 4.10) represented 56.23% (n= 516177) of the total number of medicine items prescribed for the study population, with paracetamol being the most prescribed medicine item.

- The ***eighth*** objective was to determine if the top twenty medicine items that were prescribed for the study population were on the proposed medicentres medicine treatment protocols for the top ten diagnoses. Six of the top twenty prescribed medicine items (refer to table 4.11), namely: multivitamin tablets, potassium citrate syrup, ferrous sulphate complex tablets, folic acid tablets, diclofenac sodium and diazepam tablets were not on the medicentres' proposed medicine treatment protocols for the top ten diagnoses.

- The ***ninth*** objective was to determine the medicine treatment cost per clinic (medicentre) in the study population. The total medicine treatment cost for the study population amounted to R 1 729 072.70 and clinic 8 had the highest medicine treatment cost with 14.73% (n= R 1 729 072.70) and clinic 2 had the lowest medicine treatment cost with 7.47% of the total medicine treatment cost made for the study population. However, the d-values indicated that

there was no practical significant difference between the average medicine treatment cost per consultation for the nine medicentres.

- The ***tenth*** objective was to determine the medicine treatment cost per age group in the study population. Age group 4 and 5 (i.e. patients between the ages of 19 to 60 years) had the highest medicine treatment cost with 62.02% (n= R 1 729 072.70) of the total medicine treatment cost made for the study population. The lowest medicine treatment cost was in age group 2 (i.e. patients between the ages of 6 and 12) with 3.80% of the total medicine treatment cost during the study period. The d-value calculated for the weighted average medicine treatment cost per consultation between age groups 4 and 5 was 1.20, indicating that there was a practical significant difference between the medicine treatment cost in these age groups.

- The ***eleventh*** objective was to determine the medicine treatment cost per gender in the study population. Females had the highest medicine treatment cost with 60.40% (n= R 1 729 072.70) of the total medicine treatment cost for the study population and the cost prevalence index was calculated to be 1.01, which indicates that the medicine treatment cost for females was relatively expensive. The d-value calculated for the weighted average medicine treatment cost per consultation between males and females was 0.14 indicating that there was no practical significant difference between the medicine treatment cost between these genders.

- The ***twelfth*** objective was to determine the medicine treatment cost of the top ten diagnoses made in the study population. The medicine treatment cost of the top ten diagnoses determined (refer to table 4.6) amounted to R555 212.78, accounting for 32.11% (n= R1 729 072.70) of the total medicine treatment cost in the study population. Hypertension had the highest medicine treatment cost contributing 5.92% to the total medicine treatment cost in the study population.

- The ***thirteenth*** objective was to determine the medicine treatment cost of the top twenty medicine items prescribed in the study population. The cost of the top twenty medicine items determined (refer to table 4.9) amounted to R494 983.72, accounting for 28.63% (n= R1 729 072.70) of the total medicine treatment cost in the study population. Paracetamol, codeine phosphate combination tablets had the highest medicine treatment cost contributing 4.17% to the total medicine treatment cost in the study population.

- The ***fourteenth*** objective was to formulate recommendations regarding the results obtained from the analysis, which are listed in paragraph 5.3.

5.3. RECOMMENDATIONS

After completion of the research and from results obtained from the study, the following recommendations for further research can be made:

- Due to the relatively high incidence of respiratory diseases in the clinics a further investigation on how these diseases are handled in the clinics should be made because most of the top twenty medicine items prescribed were used for these conditions. Environmental factors could have had an influence on the high incidence of these diseases, therefore, this could be further investigated.
- In some of the clinics the number of medicine items prescribed was relatively high and therefore, it is recommended that a standard for the number of medicine items prescribed per patient per consultation should be given.
- Medicine treatment costs for some diagnoses (e.g. upper respiratory infection and hypertension) were relatively high in some clinics (e.g. clinics 2, 6 and 9) which could be an indication that these clinics did not comply with the recommended treatment protocols. Therefore, this should be further investigated.
- Further investigation should be made on the usage of chronic medication (such as hypertensive medication) as the medication is relatively expensive and therefore, monitoring is essential to prohibit misuse or inappropriate use, as such medication can be a cost driver.
- It is recommended that primary health education be given in schools and clinics to promote self care and hygiene especially amongst females (especially pregnant women) as they are more prone to diseases than the male gender.

5.4. LIMITATIONS AND SHORTCOMINGS OF THIS RESEARCH

The following limitations and shortcomings should be taken into account when evaluating the results and conclusions of this research project:

- After the refinement of data, all data entered on the database was considered accurate and without fault.
- All prices and costs for medical conditions and medicine items indicated on the database were considered to be correctly submitted and it was considered that the medicine was given at the same price in all the nine clinics.
- Cost calculations were limited to the aspects of medicine treatment, i.e. non-medical items e.g. swabs, gauze etc. (that do not contain active ingredients) were excluded from the list of medicine items (drugs) and their cost was therefore also excluded from the database.

5.5. CHAPTER SUMMARY

In this chapter, conclusions, limitations and shortcomings of this research as well as recommendations on further research regarding the results obtained and discussed in chapter 4 were given.

The research questions have been answered and the research objectives therefore reached.

When one door closes, another opens. But we often look so regretfully upon the closed door that we don't see the one that has opened for us.

Alexander Graham Bell

APPENDIX A

Table A.1: General description of the study population according to clinic.

Clinic	Number of patients	Number of consultations	Number of diagnoses	Number of medicine items
1	10480	16763	19719	60972
2	7576	11969	13668	46839
3	3549	8713	8877	30442
4	9250	13553	14159	47734
5	8358	11463	11251	41685
6	9993	15017	17808	74578
7	10313	18675	18670	60611
8	17362	23859	23682	93877
9	6767	12579	12889	59439
Total	**83648**	**132591**	**140723**	**516177**

Table A.2: General description of the study population according to age groups

Clinic	Age group	Total number of patients	Total number of consultations	Total number of diagnoses	Total number of medicine items
1	**≤ 0 ≤ 6**	1042	1509	1738	5542
	6 ≤ 12	616	868	1022	3004
	12 ≤ 19	653	872	881	2926
	19 ≤ 40	4814	7072	7806	25738
	40 ≤ 60	2613	4639	5831	17198
	≥ 60	736	1760	2397	6442
	Unknown	6	43	44	122
2	**≤ 0 ≤ 6**	1845	2755	3227	9926
	6 ≤ 12	545	665	740	2352
	12 ≤ 19	497	668	679	2440
	19 ≤ 40	3067	4875	5276	19031
	40 ≤ 60	1140	1979	2401	8150
	≥ 60	477	1004	1302	4865
	Unknown	5	23	43	75

Table A.2 continue…

3	≤ 0 ≤ 6	375	722	736	2486
	6 ≤ 12	231	433	431	1456
	12 ≤ 19	241	385	371	1308
	19 ≤ 40	1535	3349	3255	11497
	40 ≤ 60	910	3085	3287	10952
	≥ 60	251	722	780	2685
	Unknown	6	17	17	58
4	≤ 0 ≤ 6	1269	1630	1513	5720
	6 ≤ 12	513	654	656	2169
	12 ≤ 19	590	762	689	2416
	19 ≤ 40	4220	5949	5754	19962
	40 ≤ 60	1894	3229	3861	12052
	≥ 60	755	1306	1663	5351
	Unknown	9	23	23	64
5	≤ 0 ≤ 6	1273	1534	1689	5463
	6 ≤ 12	386	493	518	1667
	12 ≤ 19	447	567	490	1833
	19 ≤ 40	4298	5846	5328	20816
	40 ≤ 60	1535	2319	2430	8913
	≥ 60	405	662	757	2835
	Unknown	14	42	39	158
6	≤ 0 ≤ 6	1551	2014	2118	9344
	6 ≤ 12	463	585	650	2645
	12 ≤ 19	569	773	817	3284
	19 ≤ 40	4216	6100	6737	28590
	40 ≤ 60	2261	3891	5060	20661
	≥ 60	903	1595	2365	9859
	Unknown	30	59	61	195
7	≤ 0 ≤ 6	1202	1714	1673	5732
	6 ≤ 12	522	713	722	2176
	12 ≤ 19	577	837	769	2486
	19 ≤ 40	4610	7526	6919	23382
	40 ≤ 60	2678	6094	6480	20581
	≥ 60	716	1689	2022	6013
	Unknown	8	102	85	241
8	≤ 0 ≤ 6	2454	3230	3057	12249
	6 ≤ 12	679	810	796	2834
	12 ≤ 19	743	886	836	3054
	19 ≤ 40	8085	10999	10703	40742

Table A.2 continue....

	40 ≤ 60	3686	5331	5502	22719
	≥ 60	1635	2523	2698	12001
	Unknown	80	80	90	278
9	**≤ 0 ≤ 6**	802	1264	1286	4985
	6 ≤ 12	346	552	554	2331
	12 ≤ 19	451	738	726	3281
	19 ≤ 40	2762	5054	5069	23745
	40 ≤ 60	1699	3494	3686	17449
	≥ 60	701	1467	1557	7604
	Unknown	6	10	11	44

Table A.3: Average age of patients for all the nine clinics.

Clinic	Average age of patients (in years)
1	32.24 ± 18.06
2	25.66 ± 19.85
3	32.13 ± 18.45
4	30.97 ± 19.25
5	28.71 ± 17.45
6	31.44 ± 19.95
7	32.43 ± 18.45
8	32.17 ± 19.57
9	33.55 ± 20.31

Table A.4: Top ten medical conditions (diagnoses) made in the study population (according to frequency)

Name of diagnosis	Clinic 1 (N = 19719)	Clinic 2 (N = 13668)	Clinic 3 (N = 8877)	Clinic 4 (N = 14159)	Clinic 5 (N = 11251)	Clinic 6 (N = 17808)	Clinic 7 (N = 18670)	Clinic 8 (N = 23682)	Clinic 9 (N = 12889)	Total (N = 140723)
Hypertension: New/Not Controlled Ω	928 [1]	335 [8]	771 [1]	885 [1]	(139) [17]	740 [4]	606 [3]	579 [8]	323 [8]	5306
Hypertension: Follow-up Controlled	715 [2]	(62) [45]	193 [8]	428 [5]	(191) [12]	(199) [18]	(265) [13]	(348) [15]	266 [10]	2667
Arthralgia Ω	583 [3]	(73) [40]	(113) [18]	(106) [33]	(44) [53]	(314) [12]	(51) [75]	(270) [20]	1166 [2]	2720
Deep Burns	548 [4]	(249) [13]	(143) [11]	(232) [15]	(196) [11]	(273) [13]	362 [9]	(329) [17]	(4) [193]	2336
Viral: Influenza Ω	537 [5]	613 [2]	734 [2]	307 [9]	421 [5]	1265 [1]	1370 [1]	(288) [18]	560 [5]	6095
Mild/moderate dental abscess	501 [6]	(15) [138]	(64) [34]	(213) [17]	(45) [52]	(58) [53]	(93) [49]	(48) [92]	(14) [101]	1051
Myalgia: Diffuse myalgias	459 [7]	(34) [79]	(75) [27]	(52) [55]	-	(115) [27]	(20) [153]	(128) [39]	(1) [380]	884
Infection: Bronchitis: Acute Ω	426 [8]	407 [6]	(95) [22]	402 [6]	341 [6]	1063 [2]	529 [4]	1719 [2]	1247 [1]	6229
Upper respiratory infection Ω	418 [9]	973 [1]	344 [5]	479 [4]	(57) [43]	637 [7]	1022 [2]	1783 [1]	(19) [85]	5732
Sinuses: Acute sinusitis Ω	399 [10]	(207) [18]	(95) [23]	(156) [23]	735 [1]	(112) [30]	(218) [19]	(194) [29]	892 [3]	3008
Antenatal: U.T.I.: Cystitis	(4) [305]	496 [3]	(3) [211]	(37) [72]	(119) [20]	(250) [15]	(18) [164]	(52) [87]	(11) [112]	990
Antenatal follow-up	(56) [79]	438 [4]	(67) [28]	(87) [41]	219 [10]	(198) [19]	(232) [18]	(409) [13]	292 [9]	1998
Pelvic inflammatory disease	(177) [31]	408 [5]	(22) [74]	(236) [14]	(75) [32]	719 [5]	(236) [16]	511 [10]	(90) [28]	2474
Upper respiratory tract: Common cold Ω	(369) [13]	362 [7]	170 [9]	496 [3]	(62) [42]	(228) [16]	465 [6]	729 [5]	(12) [111]	2893
Tonsilitis	(38) [93]	319 [9]	(104) [19]	(127) [27]	(50) [48]	(34) [95]	(310) [11]	815 [4]	(191) [15]	1988
Antenatal booking visit	(66) [70]	263 [11]	(42) [47]	(99) [36]	251 [7]	(112) [28]	(48) [77]	(106) [45]	(24) [72]	1011
Urinary tract infection	(268) [18]	(245) [15]	454 [3]	(125) [28]	534 [2]	(89) [38]	(290) [12]	(169) [30]	(40) [53]	2214
Muscle pains	(217) [22]	(92) [36]	347 [4]	313 [8]	(42) [58]	(4) [321]	409 [7]	(458) [11]	(63) [36]	1945
Cough	(390) [11]	(190) [20]	305 [6]	362 [7]	(53) [47]	(44) [74]	(104) [40]	(343) [16]	(145) [20]	1936
Gastroenteritis Ω	(224) [21]	(186) [21]	201 [7]	(179) [22]	478 [3]	741 [3]	375 [8]	(447) [12]	(152) [19]	2983
Peptic ulceration	(207) [27]	(95) [33]	147 [10]	(74) [45]	(108) [22]	(26) [109]	(125) [35]	(71) [64]	257 [11]	1110
Severe tooth cavity	(332) [15]	(93) [35]	(64) [35]	622 [2]	(44) [54]	(54) [59]	487 [5]	(358) [14]	(60) [39]	2114
Osteoarthritis Ω	(44) [88]	(262) [12]	(33) [54]	264 [10]	(38) [64]	709 [6]	(180) [24]	930 [3]	632 [4]	3092
Sinuses: severe sinusitis	(127) [39]	(9) [191]	(40) [50]	(8) [204]	458 [4]	(10) [199]	(3) [388]	(40) [101]	(3) [242]	698
Gastritis: uncomplicated Ω	(123) [41]	(119) [27]	(95) [21]	(251) [11]	238 [8]	482 [9]	334 [10]	668 [7]	545 [6]	2855
Infection: Broncho pneumonia	(182) [29]	(6) [226]	(67) [30]	(190) [20]	(100) [26]	365 [11]	(100) [42]	(139) [36]	(35) [57]	1184
Amenorrhoea	(12) [191]	(1) [428]	(2) [269]	(49) [57]	232 [9]	(103) [31]	(47) [79]	514 [9]	(56) [40]	1016
Fibrositis	(150) [37]	(41) [69]	-	(150) [25]	(2) [405]	604 [8]	(157) [28]	(70) [68]	(49) [44]	1223
Weakness	(24) [127]	(31) [82]	(11) [107]	(35) [77]	(35) [66]	(30) [99]	(97) [46]	671 [6]	(43) [51]	977

( ) Indicates that the diagnosis appears on t he list of diagnosis for that particular clinic but not in the top 10 according to frequency and percentage
Ω Indicates that the diagnosis appears in the top 10 diagnoses for all the nine primary health care clinics
Superscripts indicate the rank orders for the diagnoses in each clinic

Table A.5: Top twenty medicine items made in the study population (according to frequency)

Name of product ℜ	Clinic 1 (N = 60972)	Clinic 2 (N= 46839)	Clinic 3 (N = 30442)	Clinic 4 (N = 47734)	Clinic 5 (N = 41685)	Clinic 6 (N = 74578)	Clinic 7 (N = 60611)	Clinic 8 (N = 93877)	Clinic 9 (N =59439)	Total (N = 516177)
Paracetamol, 500mg tablets Ω	3768 [1]	4162 [1]	3278 [1]	4173 [1]	3723 [1]	5316 [1]	3929 [1]	10350 [1]	3180 [4]	41879
Diphenhyd, Amm. 14mg/5ml syrup Ω	3601 [2]	2631 [2]	1446 [2]	4021 [2]	2070 [2]	4164 [2]	2902 [2]	5989 [2]	3231 [3]	30055
Parac, Codeine, 500(8)mg tablets Ω	3216 [3]	(556) [24]	994 [5]	1597 [6]	1444 [5]	3856 [3]	2201 [4]	4652 [3]	4425 [1]	22941
Ibuprofen, 200mg tablets Ω	2882 [4]	1934 [5]	1299 [3]	2430 [3]	1664 [4]	2069 [9]	2460 [3]	2937 [7]	1281 [11]	18956
Amoxycillin, 250mg capsules Ω	2471 [5]	(519) [25]	1225 [4]	1834 [5]	1871 [3]	1698 [14]	1913 [6]	3854 [6]	1983 [7]	17368
Co-Trimoxazole, 480mg tablets Ω	2446 [6]	2047 [4]	688 [10]	940 [13]	1364 [6]	3693 [4]	1612 [8]	2664 [10]	(807) [24]	16261
Diclofenac Sod, 75mg injection Ω	1966 [7]	(257) [40]	953 [6]	1855 [4]	(327) [32]	2811 [5]	1173 [13]	4411 [4]	3996 [2]	17749
Ung Methyl Salicylate ointment Ω	1578 [8]	886 [17]	(335) [26]	1039 [11]	976 [13]	2223 [7]	1286 [9]	4072 [5]	2064 [6]	14459
Amiloride, HCTZ, 5(50) mg tablets Ω	1320 [9]	(619) [23]	600 [12]	(572) [23]	(583) [22]	2117 [8]	1636 [7]	1430 [20]	(307) [43]	9184
Potassium Cit. 1.25g/15ml syrup Ω	1266 [10]	1519 [7]	553 [13]	(413) [29]	1054 [12]	(835) [25]	1257 [10]	(1160) [26]	1652 [10]	9709
Multivitamin, tablets Ω	1171 [11]	1210 [11]	806 [8]	1135 [10]	769 [15]	2595 [6]	(560) [30]	1598 [16]	1268 [12]	11112
Parac, Ephe, Chlor, 200mg tablets Ω	1113 [12]	1627 [6]	443 [20]	1191 [9]	809 [14]	1606 [15]	1962 [5]	1646 [15]	1979 [8]	12376
Paracetamol, 120mg/5ml syrup Ω	1096 [13]	1077 [13]	811 [7]	1440 [8]	1071 [10]	1745 [13]	1083 [15]	2888 [8]	(841) [22]	12052
Iodide Phenol Menthol lozenges	1040 [14]	899 [16]	444 [19]	(490) [25]	(205) [52]	(860) [24]	(583) [29]	(628) [38]	(308) [42]	5457
Diclofenac Sod, 25mg tablets Ω	991 [15]	1219 [10]	735 [9]	1480 [7]	650 [20]	1604 [16]	948 [17]	-	(453) [35]	8080
Erythromycin. Estol, 250mg capsules	931 [16]	(214) [47]	(299) [31]	(420) [28]	-	(752) [27]	(633) [28]	2057 [11]	(849) [21]	6155
Chlorpheniramine, 4mg tablets	915 [17]	(125) [66]	(288) [35]	804 [17]	(393) [28]	(785) [26]	(483) [37]	1449 [19]	(346) [39]	5588
Ascorbic, 250mg tablets	804 [19]	(216) [46]	(284) [36]	(412) [30]	(534) [25]	(921) [23]	1193 [12]	(134) [78]	(728) [27]	5226
Ampicillin, 250mg capsules	776 [20]	987 [15]	(243) [41]	(191) [56]	659 [19]	(481) [44]	981 [16]	(99) [88]	1081 [16]	5498
Diphen, Para, Ph-Eph, Asc.Ac capsules	(30) [139]	(1) [185]	601 [11]	(77) [120]	-	-	(171) [77]	(254) [63]	-	1134
Indomethacin, 25mg capsules	(570) [26]	(141) [61]	482 [14]	(320) [40]	(303) [36]	1222 [18]	826 [20]	(1129) [27]	1127 [13]	6120
Doxycycline, 100mg capsules Ω	895 [18]	1283 [8]	(347) [25]	826 [15]	682 [18]	1781 [12]	(669) [27]	(1392) [22]	(778) [25]	8653
Hyoscine, 10mg tablets	(554) [29]	(176) [55]	477 [15]	(485) [26]	1095 [9]	(615) [33]	(687) [26]	(869) [29]	1058 [17]	6016

Table A.5 continue...

Ferrous Sulphate Co, 170mg tablets$^{\Omega}$	(688) ^{22}	868 ^{18}	466 ^{16}	651 ^{20}	1135 ***8***	1956 ^{10}	1201 ^{11}	1668 ^{14}	(830) ^{23}	9463
Folic Acid, 5mg tablets $^{\Omega}$	(568) ^{27}	1271 ^{9}	465 ^{17}	(577) ^{22}	1059 ^{11}	1950 ^{11}	1094 ^{14}	(1179) ^{25}	1093 ^{15}	9257
Hydro–Thiazide, Pot, 50mg/300mg tablets	(238) ^{61}	(133) ^{64}	459 ^{18}	820 ^{16}	(5) ^{160}	(27) ^{127}	(308) ^{53}	(569) ^{40}	(3) ^{153}	2562
Co-Trimoxazole, 240mg/5ml suspension	(491) ^{35}	2057 ^{3}	(104) ^{61}	(224) ^{49}	(322) ^{33}	1157 ^{19}	(408) ^{42}	(663) ^{36}	(227) ^{53}	5653
Ipecae Liq. Ex, 0.021ml/10ml syrup	(136) ^{84}	1175 ^{12}	-	-	(312) ^{35}	(299) ^{56}	(491) ^{33}	1518 ^{17}	(52) ^{93}	3983
Chlorphen, Ephed, 2mg/5ml syrup	-	1004 ^{14}	(91) ^{65}	(342) ^{37}	(148) ^{59}	(543) ^{36}	(338) ^{46}	(103) ^{85}	(522) ^{33}	3091
Para, Cod, Promet, 120mg/5ml syrup	(473) ^{36}	765 ^{19}	(40) ^{106}	(334) ^{38}	(1) ^{200}	-	(331) ^{48}	(554) ^{41}	(428) ^{37}	2926
Metronidazole, 400mg tablets	(497) ^{33}	744 ^{20}	(82) ^{68}	(550) ^{24}	(604) ^{21}	-	(486) ^{36}	-	(708) ^{28}	3671
Diazepam, 5mg tablets $^{\Omega}$	(529) ^{32}	(188) ^{54}	(398) ^{22}	1017 ^{12}	(552) ^{24}	1030 ^{20}	(485) ^{35}	1722 ^{13}	(577) ^{32}	6499
Amoxycillin, 125mg/5ml suspension	(467) ^{39}	(249) ^{42}	(304) ^{29}	688 ^{19}	(582) ^{23}	(530) ^{39}	(545) ^{31}	(1424) ^{21}	(746) ^{26}	5535
Parac, Caff, Cod, Mepro, 320mg tablets	(561) ^{28}	(196) ^{52}	-	876 ^{14}	(63) ^{96}	-	(795) ^{22}	-	-	2491
Alum.Hydrox, 400mg/10ml suspension	(656) ^{24}	(366) ^{32}	(394) ^{23}	704 ^{18}	(365) ^{29}	(688) ^{30}	842 ^{19}	1457 ^{18}	-	5472
Prednisone, 5mg tablets $^{\Omega}$	(219) ^{65}	(104) ^{73}	(78) ^{70}	(398) ^{31}	1173 ^{7}	(508) ^{42}	(223) ^{68}	2718 ^{9}	1900 ^{9}	7321
Chlorphen, Ephedr, 2(6) mg tablets	(472) ^{37}	-	(348) ^{24}	-	729 ^{16}	-	(716) ^{24}	(233) ^{65}	-	2498
Metronidazole, 200mg tablets $^{\Omega}$	(578) ^{25}	(416) ^{28}	(264) ^{38}	(316) ^{42}	690 ^{17}	1562 ^{17}	(304) ^{54}	1747 ^{12}	969 ^{20}	6846
Ibuprofen, 400mg tablets	-	(650) ^{22}	-	-	-	-	904 ^{18}	-	-	1554
Theophylline Anhydr, syrup	(371) ^{45}	-	(424) ^{21}	(322) ^{39}	(204) ^{53}	(932) ^{22}	-	(964) ^{28}	2533 ^{5}	5750
Calcium Gluc, 300mg tablets	-	(142) ^{60}	(192) ^{44}	(108) ^{109}	(17) ^{137}	(278) ^{57}	(219) ^{69}	(336) ^{54}	1112 ^{14}	2404
Metoclopramide, 10mg tablets	(410) ^{43}	(506) ^{26}	(126) ^{54}	(381) ^{32}	(258) ^{42}	(535) ^{37}	(487) ^{34}	(716) ^{33}	995 ^{18}	4414
Vitamin B Co, Forte tablets	-	(108) ^{72}	(11) ^{141}	-	(364) ^{30}	(94) ^{89}	-	(1181) ^{24}	972 ^{19}	2730

( ) Indicates that the drug appears in the list of drugs for that particular clinic but not on the top 20 according to frequency and percentage

$^{\Omega}$ Indicates that the drug appears on the top 20 drugs for all the nine primary health care clinics

Superscripts indicate the rank orders for the drugs in each clinic

$^{\Re}$ Medicine items include drugs but exclude surgicals e.g. gauze, syringes etc.

Table A.6: The average number of diagnoses per consultation per clinic according to age group in the study population

Clinic	Age group	Total number of patients	Total number of consultations	Total number of diagnoses	Average number of diagnoses per consultation
1	≤ 0 ≤ 6	1042	1509	1738	1.15 ± 0.72
	6 ≤ 12	616	868	1022	1.18 ± 0.75
	12 ≤ 19	653	872	881	1.01 ± 0.70
	19 ≤ 40	4814	7072	7806	1.10 ± 0.76
	40 ≤ 60	2613	4639	5831	1.26 ± 0.84
	≥ 60	736	1760	2397	1.36 ± 0.82
	Unknown	6	43	44	1.02 ± 0.55
2	≤ 0 ≤ 6	1845	2755	3227	1.17 ± 0.63
	6 ≤ 12	545	665	740	1.11 ± 0.60
	12 ≤ 19	497	668	679	1.04 ± 0.51
	19 ≤ 40	3067	4875	5276	1.08 ± 0.55
	40 ≤ 60	1140	1979	2401	1.21 ± 0.69
	≥ 60	477	1004	1302	1.30 ± 0.72
	Unknown	5	23	43	1.09 ± 0.28
3	≤ 0 ≤ 6	375	722	736	1.02 ± 0.40
	6 ≤ 12	231	433	431	1.00 ± 0.37
	12 ≤ 19	241	385	371	0.96 ± 0.44
	19 ≤ 40	1535	3349	3255	0.97 ± 0.48
	40 ≤ 60	910	3085	3287	1.07 ± 0.49
	≥ 60	251	722	780	1.08 ± 0.51
	Unknown	6	17	17	1.00 ± 0.34
4	≤ 0 ≤ 6	1269	1630	1513	0.93 ± 0.62
	6 ≤ 12	513	654	656	1.00 ± 0.54
	12 ≤ 19	590	762	689	0.90 ± 0.55
	19 ≤ 40	4220	5949	5754	0.97 ± 0.63
	40 ≤ 60	1894	3229	3861	1.20 ± 0.69
	≥ 60	755	1306	1663	1.27 ±0.70
	Unknown	9	23	23	1.00 ± 0.51
5	≤ 0 ≤ 6	1273	1534	1689	1.10 ± 0.57
	6 ≤ 12	386	493	518	1.05 ± 0.50
	12 ≤ 19	447	567	490	0.86 ± 0.52
	19 ≤ 40	4298	5846	5328	0.91 ± 0.54
	40 ≤ 60	1535	2319	2430	1.05 ± 0.59
	≥ 60	405	662	757	1.14 ± 0.66
	Unknown	14	42	39	0.93 ± 0.26

Table A.6 continued…

6	≤ 0 ≤ 6	1551	2014	2118	1.05 ± 0.47
	6 ≤ 12	463	585	650	1.11 ± 0.51
	12 ≤ 19	569	773	817	1.06 ± 0.55
	19 ≤ 40	4216	6100	6737	1.10 ± 0.55
	40 ≤ 60	2261	3891	5060	1.30 ± 0.70
	≥ 60	903	1595	2365	1.48 ± 0.80
	Unknown	30	59	61	1.03 ± 0.18
7	≤ 0 ≤ 6	1202	1714	1673	0.98 ± 0.50
	6 ≤ 12	522	713	722	1.01 ± 0.52
	12 ≤ 19	577	837	769	0.92 ± 0.56
	19 ≤ 40	4610	7526	6919	0.92 ± 0.62
	40 ≤ 60	2678	6094	6480	1.06 ± 0.73
	≥ 60	716	1689	2022	1.20 ± 0.78
	Unknown	8	102	85	0.83 ± 0.56
8	≤ 0 ≤ 6	2454	3230	3057	0.95 ± 0.40
	6 ≤ 12	679	810	796	0.98 ± 0.38
	12 ≤ 19	743	886	836	0.94 ± 0.43
	19 ≤ 40	8085	10999	10703	0.97 ± 0.43
	40 ≤ 60	3686	5331	5502	1.03 ± 0.48
	≥ 60	1635	2523	2698	1.07 ± 0.49
	Unknown	80	80	90	1.13 ± 0.53
9	≤ 0 ≤ 6	802	1264	1286	1.02 ± 0.17
	6 ≤ 12	346	552	554	1.00 ± 0.13
	12 ≤ 19	451	738	726	0.98 ± 0.19
	19 ≤ 40	2762	5054	5069	1.00 ± 0.25
	40 ≤ 60	1699	3494	3686	1.05 ± 0.27
	≥ 60	701	1467	1557	1.06 ± 0.25
	Unknown	6	10	11	1.10 ± 0.30

Table A.7: The average number of medicine items per consultation per clinic according to age group in the study population

Clinic	Age group	Total number of patients	Total number of consultations	Total number of medicine items	Average number of medicine items per consultation
1	≤ 0 ≤ 6	1042	1509	5542	3.67 ± 1.34
	6 ≤ 12	616	868	3004	3.46 ± 1.43
	12 ≤ 19	653	872	2926	3.36 ± 1.43
	19 ≤ 40	4814	7072	25738	3.64 ± 1.53
	40 ≤ 60	2613	4639	17198	3.71 ± 1.65
	≥ 60	736	1760	6442	3.66 ± 1.70
	Unknown	6	43	122	2.84 ± 1.20
2	≤ 0 ≤ 6	1845	2755	9926	3.60 ± 1.17
	6 ≤ 12	545	665	2352	3.54 ± 1.05
	12 ≤ 19	497	668	2440	3.65 ± 1.24
	19 ≤ 40	3067	4875	19031	3.90 ± 1.29
	40 ≤ 60	1140	1979	8150	4.12 ± 1.44
	≥ 60	477	1004	4865	4.85 ± 1.59
	Unknown	5	23	75	3.26 ± 1.39
3	≤ 0 ≤ 6	375	722	2486	3.44 ± 1.09
	6 ≤ 12	231	433	1456	3.36 ± 1.15
	12 ≤ 19	241	385	1308	3.40 ± 1.46
	19 ≤ 40	1535	3349	11497	3.43 ± 1.43
	40 ≤ 60	910	3085	10952	3.55 ± 1.63
	≥ 60	251	722	2685	3.72 ± 1.95
	Unknown	6	17	58	3.41 ± 1.68
4	≤ 0 ≤ 6	1269	1630	5720	3.51 ± 0.96
	6 ≤ 12	513	654	2169	3.32 ± 1.16
	12 ≤ 19	590	762	2416	3.17 ± 1.17
	19 ≤ 40	4220	5949	19962	3.36 ± 1.18
	40 ≤ 60	1894	3229	12052	3.73 ± 1.30
	≥ 60	755	1306	5351	4.10 ± 1.26
	Unknown	9	23	64	2.78 ± 1.18
5	≤ 0 ≤ 6	1273	1534	5463	3.56 ± 1.17
	6 ≤ 12	386	493	1667	3.38 ± 1.13
	12 ≤ 19	447	567	1833	3.23 ± 1.31
	19 ≤ 40	4298	5846	20816	3.56 ± 1.34
	40 ≤ 60	1535	2319	8913	3.84 ± 1.45
	≥ 60	405	662	2835	4.28 ± 1.48
	Unknown	14	42	158	3.76 ± 1.54

Table A.8: General description of the study population according to gender

Clinic	Gender	Total number of patients	Total number of consultations	Total number of diagnoses	Total number of medicine items
1	Male	4561	7013	7952	24557
	Female	5913	9707	11723	36293
	Unknown	6	43	44	122
2	Male	2759	3936	4486	14732
	Female	4812	8010	9157	32032
	Unknown	5	23	25	75
3	Male	1556	3879	3964	13301
	Female	1980	4811	4890	17058
	Unknown	13	23	23	83
4	Male	3595	5205	5177	17621
	Female	5639	8311	8943	30002
	Unknown	16	37	39	111
5	Male	3498	4733	4800	17222
	Female	4833	6676	6394	24255
	Unknown	27	54	57	208
6	Male	3525	5277	6191	25339
	Female	6421	9655	11532	48934
	Unknown	47	85	85	305
7	Male	4769	8394	8467	26593
	Female	5517	10153	10090	33687
	Unknown	27	128	113	331
8	Male	6513	9038	8778	35490
	Female	10776	14704	14776	57970
	Unknown	73	117	128	417
9	Male	2874	5135	5250	23837
	Female	3883	7431	7601	35507
	Unknown	10	13	38	95

Table A.9: The average number of diagnoses per consultation per clinic according to gender in the study population

Clinic	Gender	Total number of patients	Total number of consultations	Total number of diagnoses	Average number of diagnoses per consultation
1	Male	4561	7013	7952	1.13 ± 0.75
	Female	5913	9707	11723	1.21 ± 0.81
	Unknown	6	43	44	1.02 ± 0.55
2	Male	2759	3936	4486	1.14 ± 0.58
	Female	4812	8010	9157	1.14 ± 0.63
	Unknown	5	23	25	1.09 ± 0.28
3	Male	1556	3879	3964	1.02 ± 0.45
	Female	1980	4811	4890	1.02 ± 0.50
	Unknown	13	23	23	1.00 ± 0.29
4	Male	3595	5205	5177	0.99 ± 0.61
	Female	5639	8311	8943	1.08 ± 0.68
	Unknown	16	37	39	1.05 ± 0.52
5	Male	3498	4733	4800	1.01 ± 0.55
	Female	4833	6676	6394	0.96 ± 0.57
	Unknown	27	54	57	1.06 ± 0.45
6	Male	3525	5277	6191	1.17 ± 0.61
	Female	6421	9655	11532	1.19 ± 0.64
	Unknown	47	85	85	1.00 ± 0.27
7	Male	4769	8394	8467	1.01 ± 0.62
	Female	5517	10153	10090	0.99 ± 0.69
	Unknown	27	128	113	0.88 ± 0.55
8	Male	6513	9038	8778	0.97 ± 0.45
	Female	10776	14704	14776	1.00 ± 0.44
	Unknown	73	117	128	1.09 ± 0.51
9	Male	2874	5135	5250	1.03 ± 0.21
	Female	3883	7431	7601	1.02 ± 0.26
	Unknown	10	13	38	1.09 ± 0.37

Table A.10: The average number of medicine items per consultations per clinic according to gender in the study population

Clinic	Gender	Total number of patients	Total number of consultations	Total number of medicine items	Average number of medicine items per consultation
1	Male	4561	7013	24557	3.50 ± 1.49
	Female	5913	9707	36293	3.74 ± 1.60
	Unknown	6	43	122	2.84 ± 1.20
2	Male	2759	3936	14732	3.74 ± 1.28
	Female	4812	8010	32032	4.00 ± 1.37
	Unknown	5	23	75	3.26 ± 1.39
3	Male	1556	3879	13301	3.43 ± 1.44
	Female	1980	4811	17058	3.55 ± 1.57
	Unknown	13	23	83	3.61 ± 1.55
4	Male	3595	5205	17621	3.39 ± 1.15
	Female	5639	8311	30002	3.61 ± 1.25
	Unknown	16	37	111	3.00 ± 1.21
5	Male	3498	4733	17222	3.64 ± 1.32
	Female	4833	6676	24255	3.63 ± 1.38
	Unknown	27	54	208	3.85 ± 1.65
6	Male	3525	5277	25339	4.80 ± 1.71
	Female	6421	9655	48934	5.07 ± 1.86
	Unknown	47	85	305	3.59 ± 1.17
7	Male	4769	8394	26593	3.17 ± 1.33
	Female	5517	10153	33687	3.32 ± 1.43
	Unknown	27	128	331	2.59 ± 1.38
8	Male	6513	9038	35490	3.93 ± 1.23
	Female	10776	14704	57970	3.94 ± 1.29
	Unknown	73	117	417	3.56 ±1.17
9	Male	2874	5135	23837	4.64 ± 1.78
	Female	3883	7431	35507	4.78 ± 1.92
	Unknown	10	13	95	4.85 ± 2.14

APPENDIX B

Table B.1: Total medicine treatment cost in the study population according to age group.

Clinic	Age group	Percentages of consultations	Average medicine treatment cost per consultation	Total medicine treatment cost	Percentage medicine treatment cost	Cost prevalence index
1	≤ 0 ≤ 6	9.00%	10.90 ± 6.64	16448.48	7.39%	0.82
	6 ≤ 12	5.18%	11.60 ± 13.24	10072.21	4.52%	0.87
	12 ≤ 19	5.20%	9.70 ± 8.83	8454.82	3.80%	0.73
	19 ≤ 40	42.19%	11.81 ± 53.18	83515.07	37.52%	0.89
	40 ≤ 60	27.67%	15.42 ± 17.67	71530.68	32.13%	1.06
	≥ 60	10.50%	18.26 ± 19.13	32138.97	14.44%	1.38
2	≤ 0 ≤ 6	23.02%	9.93 ± 9.05	27366.94	21.17%	0.92
	6 ≤ 12	5.56%	11.97 ± 8.36	7957.83	6.16%	1.11
	12 ≤ 19	5.58%	9.16 ± 8.00	6115.66	4.73%	0.85
	19 ≤ 40	40.73%	10.36 ± 8.70	50512.31	39.08%	1.04
	40 ≤ 60	16.53%	12.06 ± 9.61	23866.86	18.47%	1.12
	≥ 60	8.39%	13.12 ± 9.55	13175.01	10.19%	1.21
3	≤ 0 ≤ 6	8.29%	8.86 ± 8.40	168.37	0.12%	0.01
	6 ≤ 12	4.97%	11.20 ± 6.76	123.24	0.09%	0.02
	12 ≤ 19	4.42%	17.73 ± 21.95	106.41	0.08%	0.02
	19 ≤ 40	38.44%	7.39 ± 5.66	207.03	0.15%	0.00
	40 ≤ 60	35.41%	8.83 ± 11.68	247.37	0.18%	0.00
	≥ 60	8.29%	4.45 ± 2.11	22.26	0.02%	0.00
4	≤ 0 ≤ 6	12.03%	12.30 ± 9.88	20047.47	11.36%	0.94
	6 ≤ 12	4.83%	14.21 ± 12.15	9294.07	5.26%	1.09
	12 ≤ 19	5.62%	18.72 ± 15.24	14267.45	8.08%	1.44
	19 ≤ 40	43.89%	11.59 ± 25.44	68952.22	39.06%	0.89
	40 ≤ 60	23.82%	14.12 ± 13.50	45594.85	25.83%	1.08
	≥ 60	9.64%	13.84 ± 13.22	18069.67	10.24%	1.06
5	≤ 0 ≤ 6	13.38%	12.38 ± 12.11	18984.90	14.01%	1.05
	6 ≤ 12	4.30%	12.81 ± 12.17	6313.79	4.66%	1.08
	12 ≤ 19	4.95%	10.35 ± 13.80	5868.87	4.33%	0.87
	19 ≤ 40	51.00%	10.55 ± 9.69	61672.65	45.51%	0.89
	40 ≤ 60	20.23%	13.26 ± 12.04	30740.04	22.68%	1.12
	≥ 60	5.78%	17.32 ± 18.54	11468.25	8.46%	1.46
6	≤ 0 ≤ 6	13.41%	13.58 ± 8.35	27348.78	11.57%	0.86
	6 ≤ 12	3.90%	14.45 ± 11.52	8455.64	3.58%	0.92
	12 ≤ 19	5.15%	13.26 ± 12.20	10250.65	3.34%	0.84
	19 ≤ 40	40.62%	13.73 ± 13.86	83768.71	35.43%	0.87
	40 ≤ 60	25.91%	18.57 ± 16.78	72247.65	30.56%	1.18
	≥ 60	10.62%	21.12 ± 17.88	33689.32	14.25%	1.34

Table B.1 continue…

7	≤ 0 ≤ 6	9.18%	11.25 ± 8.32	19275.05	8.55%	0.93
	6 ≤ 12	3.82%	10.07 ± 8.11	7182.29	3.19%	0.84
	12 ≤ 19	4.48%	9.58 ± 10.76	8017.22	3.56%	0.79
	19 ≤ 40	40.30%	9.70 ± 13.88	72985.89	32.38%	0.80
	40 ≤ 60	32.63%	14.20 ± 16.66	86520.54	38.39%	1.18
	≥ 60	9.04%	18.03 ± 19.75	30444.31	13.51%	1.49
8	≤ 0 ≤ 6	13.54%	12.40 ± 7.52	40039.94	15.72%	1.16
	6 ≤ 12	3.39%	10.93 ± 6.96	8849.92	3.47%	1.02
	12 ≤ 19	3.71%	9.92 ± 8.66	8786.70	3.45%	0.93
	19 ≤ 40	46.10%	9.78 ± 8.34	107549.57	42.22%	0.92
	40 ≤ 60	22.34%	11.03 ± 9.50	58787.70	23.08%	1.03
	≥ 60	10.57%	11.92 ± 8.78	30075.50	11.81%	1.12
9	≤ 0 ≤ 6	10.03%	10.14 ± 5.36	12817.46	6.02%	0.60
	6 ≤ 12	4.38%	13.54 ± 10.06	7472.73	3.51%	0.80
	12 ≤ 19	5.86%	15.03 ± 19.21	11090.57	5.21%	0.89
	19 ≤ 40	40.12%	16.19 ± 21.49	81828.73	38.45%	0.96
	40 ≤ 60	27.73%	20.54 ± 22.57	71776.39	33.72%	1.22
	≥ 60	11.64%	18.90 ± 16.99	27719.70	13.02%	1.12

Table B.2: Total medicine treatment cost in the study population according to gender.

Clinic	Gender	Percentages of consultations	Average medicine treatment cost per consultation	Total medicine treatment cost	Percentage medicine treatment cost	Cost prevalence index
1	Male	41.84%	11.94 ± 12.40	83724.26	37.61%	0.90
	Female	57.91%	14.26 ± 46.93	138435.99	62.19%	1.07
2	Male	32.88%	11.57 ± 9.64	45525.09	35.22%	1.07
	Female	66.92%	10.42 ± 8.68	83469.53	64.58%	0.97
3	Male	44.52%	12.26 ± 24.50	47561.97	35.03%	0.79
	Female	55.22%	18.26 ± 27.93	87825.31	64.68%	1.17
4	Male	38.40%	13.08 ± 55.23	68077.78	38.56%	1.00
	Female	61.32%	12.99 ± 27.46	107973.46	61.16%	1.00
5	Male	41.29%	12.84 ± 11.13	60773.49	44.85%	1.09
	Female	58.24%	11.09 ± 11.98	74017.13	54.62%	0.94
6	Male	35.14%	15.90 ± 14.64	83893.20	35.49%	1.01
	Female	64.29%	15.69 ± 14.72	151482.75	64.08%	1.00
7	Male	44.95%	11.65 ± 12.80	97821.21	43.40%	0.97
	Female	54.37%	12.44 ± 16.67	126329.25	56.05%	1.03
8	Male	37.88%	11.11 ± 8.34	100407.01	39.42%	1.04
	Female	61.63%	10.42 ± 8.72	153285.76	60.17%	0.98
9	Male	40.65%	17.76 ± 20.67	91177.66	42.84%	1.05
	Female	59.07%	16.35 ± 19.49	121472.56	57.07%	0.97

Table B.3: Average medicine treatment cost of acute bronchitis (single and multiple diagnoses) per clinic.

Clinic	Total number of diagnoses per clinic	Number of diagnoses		Total medicine treatment cost of each diagnosis[π] (R)		Average medicine treatment cost (R)	
		Single	Multiple	Single	Multiple	Single	Multiple
1	**19719**	330	96	4082.84	1613.59	12.37 ± 9.75	16.81 ± 12.19
2	**13668**	331	96	3049.76	1377.62	9.81 ± 5.98	14.35 ± 9.67
3	**8877**	87	8	1137.29	108.75	13.07 ± 7.35	13.59 ± 6.85
4	**14159**	335	67	4270.30	1135.21	12.75 ± 8.61	16.94 ± 12.99
5	**11251**	292	49	3556.02	821.16	12.18 ± 6.52	16.76 ± 8.00
6	**17808**	790	273	8792.44	5937.41	11.13 ± 6.97	21.75 ± 18.42
7	**18670**	431	98	5372.02	2442.59	12.46 ± 8.75	24.92 ± 19.90
8	**23682**	1557	162	16986.09	2551.84	10.91 ± 5.09	15.75 ± 7.11
9	**12889**	1220	47	25027.36	908.94	20.86 ± 21.85	19.34 ± 11.72
Total	**140723**	**5333**	**896**	**72 274.12**	**16 897.11**		

[π] *(Refer to table 4.20 for the total medicine treatment cost of each clinic)*

Table B.4: Average medicine treatment cost of viral influenza (single and multiple diagnoses) per clinic.

Clinic	Total number of diagnoses per clinic	Type of viral Influenza	Number of diagnoses		Total medicine treatment cost of each diagnosis[π] (R)		Average medicine treatment cost (R)	
			Single	Multiple	Single	Multiple	Single	Multiple
1	19719	Viral Influenza A	368	87	3369.30	1597.44	9.16 ± 4.96	18.36 ± 16.49
		Viral Influenza B	74	8	674.36	185.76	9.11 ± 7.53	23.22 ± 32.22
2	13668	Viral Influenza A	513	83	4809.68	1366.77	9.38 ± 7.49	16.47 ± 15.73
		Viral Influenza B	17	-	149.28	-	8.78 ± 6.06	-
3	8877	Viral Influenza A	554	83	5185.90	1218.82	9.36 ± 7.15	14.68 ± 12.16
		Viral Influenza B	66	31	695.93	612.98	10.54 ± 11.39	19.77 ± 20.34
4	14159	Viral Influenza A	214	43	1928.61	657.10	9.01 ± 11.04	15.28 ± 11.79
		Viral Influenza B	45	5	577.20	99.61	12.83 ± 14.53	19.22 ± 11.07
5	11251	Viral Influenza A	322	92	2654.25	1213.33	8.24 ± 5.39	13.19 ± 9.86
		Viral Influenza B	4	3	45.31	37.40	11.33 ± 8.88	12.47 ± 7.57
6	17808	Viral Influenza A	876	318	8982.70	6606.25	1025 ± 7.40	20.77 ± 14.77
		Viral Influenza B	50	21	453.11	366.51	9.06 ± 5.27	17.45 ± 10.27
7	18670	Viral Influenza A	661	143	6087.93	2247.44	9.21 ± 7.88	15.72 ± 14.08
		Viral Influenza B	456	110	4510.34	2003.27	9.89 ± 5.93	18.21 ± 15.97
8	23682	Viral Influenza A	87	7	792.49	128.78	9.11 ± 6.08	18.40 ± 14.13
		Viral Influenza B	160	34	1397.83	436.03	8.74 ± 14.53	12.82 ± 8.75
9	12889	Viral Influenza A	14	-	122.61	-	8.76 ± 4.01	-
		Viral Influenza B	474	72	4943.38	1224.00	10.43 ± 4.73	17.00 ± 14.01

[π] *(Refer to table 4.20 for the total medicine treatment cost of each clinic)*

Viral Influenza A = Infections (viral); Viral Influenza B = Respiratory system infection

Table B.5: Average medicine treatment cost of upper respiratory infection (single and multiple diagnoses) per clinic.

Clinic	Total number of diagnoses per clinic	Number of diagnoses		Total medicine treatment cost of each diagnosis[π] (R)		Average medicine treatment cost (R)	
		Single	Multiple	Single	Multiple	Single	Multiple
1	19719	306	112	3132.08	1676.76	12.37 ± 9.75	16.81 ± 12.19
2	13668	637	336	5411.99	4003.92	9.81 ± 5.98	14.35 ± 9.67
3	8877	339	5	3526.09	93.91	13.07 ± 7.35	13.59 ± 6.85
4	14159	379	100	5054.41	2366.44	12.75 ± 8.61	16.94 ± 12.99
5	11251	41	16	449.93	209.38	12.18 ± 6.52	16.76 ± 8.00
6	17808	418	219	5247.05	4363.21	11.13 ± 6.97	21.75 ± 18.42
7	18670	816	206	7513.73	3401.92	12.46 ± 8.75	24.92 ± 19.90
8	23682	1680	103	17789.92	1574.07	10.91 ± 5.09	15.75 ± 7.11
9	12889	18	1	287.45	20.58	20.86 ± 21.85	19.34 ± 11.72
Total	140723	4634	1098	48 412.65	17 710.19		

[π] *(Refer to table 4.20 for the total medicine treatment cost of each clinic)*

Table B.6: Average medicine treatment cost of new/not controlled hypertension (single and multiple diagnoses) per clinic.

Clinic	Total number of diagnoses	Type of hypertension	Frequency of diagnoses		Total medicine treatment cost of each diagnosis[π] (R)		Average medicine treatment cost (R)	
			Single	Multiple	Single	Multiple	Single	Multiple
1	19719	STAGE 1: GRP A	191	389	2846.40	8078.31	14.90 ± 14.12	20.77 ± 16.10
		: GRP B	202	90	4926.01	3089.25	24.39 ± 23.68	34.33 ± 25.50
		: GRP C	7	-	177.00	-	25.29 ± 24.73	-
		STAGE 2: GRP A	1	3	17.06	83.95	17.06	27.98 ± 11.41
		: GRP B	22	21	426.89	742.13	19.40 ± 17.24	35.34 ± 21.50
		: GRP C	-	-	-	-	-	-
		STAGE 3: GRP A	-	1	-	7.82	-	7.82
		: GRP B	-	-	-	-	-	-
		: GRP C	-	1	-	11.09	-	11.09
2	13668	STAGE 1: GRP A	36	68	341.35	873.92	9.48 ± 7.36	12.85 ± 11.63
		: GRP B	41	104	470.29	1384.28	11.47 ± 9.20	13.31 ± 9.77
		: GRP C	10	13	147.84	209.28	14.78 ± 4.88	16.10 ± 9.59
		STAGE 2: GRP A	17	29	210.30	619.93	12.37 ± 5.51	21.38 ± 11.07
		: GRP B	4	5	46.80	152.29	11.70 ± 4.80	30.46 ± 5.54
		: GRP C	-	-	-	-	-	-
		STAGE 3: GRP A	2	3	32.35	67.17	16.17 ± 10.03	22.39 ± 11.63
		: GRP B	1	-	24.75	-	24.75	-
		: GRP C	1	1	17.23	11.59	17.23	11.59

Table B.6 continue….

3	8877	STAGE 1: GRP A	578	72	12763.60	1577.75	22.08 ± 24.57	21.91 ± 17.60
		: GRP B	47	6	1107.31	82.48	23.56 ± 23.17	13.75 ± 5.23
		: GRP C	11	1	281.14	97.15	25.56 ± 30.41	97.15
		STAGE 2: GRP A	18	20	324.32	647.58	18.02 ± 19.14	32.38 ± 33.26
		: GRP B	4	3	73.10	66.82	18.28 ± 15.74	22.27 ± 8.01
		: GRP C	7	1	64.44	28.73	9.21 ± 7.39	28.73
		STAGE 3: GRP A	1	-	16.88	-	16.88	-
		: GRP B	-	-	-	-	-	-
		: GRP C	2	-	96.90	-	48.45 ± 44.65	-
4	14159	STAGE 1: GRP A	363	437	4641.34	7019.72	12.79 ± 11.79	16.06 ± 12.59
		: GRP B	10	18	310.43	409.55	31.04 ± 33.89	22.75 ± 11.68
		: GRP C	7	15	100.23	241.50	14.32 ± 13.06	16.10 ± 6.27
		STAGE 2: GRP A	9	12	183.00	227.01	20.33 ± 8.97	18.92 ± 9.52
		: GRP B	7	2	220.19	55.49	31.46 ± 47.34	27.74 ± 7.89
		: GRP C	1	-	3.62	-	3.62	-
		STAGE 3: GRP A	-	-	-	-	-	-
		: GRP B	2	-	23.24	-	11.62 ± 11.72	-
		: GRP C	2	-	28.25	-	14.12 ± 11.59	-

Table B.6 continue….

5	11251	STAGE 1: GRP A	35	30	693.75	536.01	19.82 ± 23.63	17.87 ± 9.89
		: GRP B	5	5	148.58	94.53	29.72 ± 32.63	18.91 ± 9.86
		: GRP C	1	1	3.73	32.56	3.73	32.56
		STAGE 2: GRP A	12	7	199.99	150.50	16.67 ± 10.25	21.50 ± 7.39
		: GRP B	5	1	66.37	15.11	13.27 ± 11.40	15.11
		: GRP C	4	3	109.10	29.88	27.28 ± 8.10	9.96 ± 4.00
		STAGE 3: GRP A	2	7	37.87	103.65	18.94 ± 9.39	14.81 ± 7.72
		: GRP B	7	4	175.23	168.49	25.03 ± 22.39	42.12 ± 42.73
		: GRP C	4	6	111.77	214.31	27.94 ± 23.75	35.72 ± 28.41
6	17808	STAGE 1: GRP A	139	183	1768.10	3126.51	12.72 ± 7.70	17.08 ± 13.19
		: GRP B	11	7	198.96	110.63	18.09 ± 9.07	15.80 ± 7.74
		: GRP C	5	12	75.99	345.98	15.20 ± 3.04	28.83 ± 15.89
		STAGE 2: GRP A	57	170	1097.05	5031.40	19.25 ± 20.24	29.60 ± 24.36
		: GRP B	14	34	305.52	1189.11	21.82 ± 15.03	34.97 ± 24.29
		: GRP C	1	17	17.39	474.71	17.39	27.92 ± 10.18
		STAGE 3: GRP A	15	48	379.14	1453.00	25.28 ± 16.16	30.27 ± 24.14
		: GRP B	3	19	52.89	508.66	17.63 ± 4.67	26.77 ± 9.69
		: GRP C	1	4	14.96	133.47	14.96	33.37 ± 7.92

Table B.6 continue….

7	18670	STAGE 1: GRP A	22	26	202.52	232.59	9.21 ± 10.80	8.95 ± 6.73
		: GRP B	40	56	421.65	868.76	10.54 ± 12.08	15.51 ± 11.77
		: GRP C	31	59	511.24	1559.00	16.49 ± 10.72	26.42 ± 23.54
		STAGE 2: GRP A	51	51	821.62	1371.78	16.11 ± 16.82	26.90 ± 28.64
		: GRP B	51	72	821.54	2055.63	16.11 ± 12.77	28.55 ± 33.99
		: GRP C	41	37	1006.70	1045.06	24.55 ± 34.27	28.24 ± 20.92
		STAGE 3: GRP A	20	19	288.68	455.58	14.43 ± 19.34	23.98 ± 17.99
		: GRP B	9	11	139.35	336.09	15.48 ± 8.96	30.55 ± 19.06
		: GRP C	4	6	140.32	183.15	35.08 ± 26.81	30.52 ± 17.57
8	23682	STAGE 1: GRP A	144	97	1304.58	1212.73	9.06 ± 7.64	12.50 ± 12.70
		: GRP B	105	25	1275.69	330.25	12.15 ± 12.02	13.21 ± 8.21
		: GRP C	7	7	77.16	137.53	11.02 ± 4.93	19.65 ± 5.25
		STAGE 2: GRP A	21	13	209.88	219.71	9.99 ± 6.98	16.90 ± 10.81
		: GRP B	34	17	540.30	367.84	15.89 ± 13.31	21.64 ± 10.69
		: GRP C	3	1	39.13	21.99	13.04 ± 8.08	21.99
		STAGE 3: GRP A	34	19	572.07	380.98	16.83 ± 7.06	20.05 ± 6.14
		: GRP B	27	20	481.58	462.36	17.84 ± 9.25	23.12 ± 20.27
		: GRP C	2	3	26.65	40.11	13.33 ± 13.83	13.37 ± 3.62
9	12889	STAGE 1: GRP A	58	12	1208.14	250.01	20.83 ± 9.77	20.83 ± 10.36
		: GRP B	-	-	-	-	-	-
		: GRP C	-	-	-	-	-	-

Table B.6 continue…

		STAGE 2: GRP A	1	-	28.10	-	28.10	-
		: GRP B	168	75	3657.40	1853.53	21.77 ± 11.01	24.71 ± 7.86
		: GRP C	-	-	-	-	-	-
		STAGE 3: GRP A	-	-	-	-	-	-
		: GRP B	2	-	75.08	-	37.54 ± 10.54	-
		: GRP C	5	2	192.79	93.24	38.56 ± 22.17	46.62 ± 26.67

$^{\pi}$ *(refer to table 4.20 the total medicine treatment cost of each clinic)*

Table B.7: D-values for the average medicine treatment cost of hypertension stage 1: group A (single diagnosis) according to clinic.

Clinic	1	2	3	4	5	6	7	8
2	0.38							
3	0.29	0.51						
4	0.15	0.28	0.38					
5	0.21	0.44	0.09	0.30				
6	0.15	0.42	0.38	0.01	0.30			
7	0.40	0.03	0.52	0.30	0.45	0.33		
8	0.41	0.05	0.53	0.32	0.46	0.48	0.01	
9	0.42	**1.16**	0.05	0.68	0.04	**0.83**	**1.08**	**1.20**

Table B.8: D-values for the average medicine treatment cost of hypertension stage 1: group B (single diagnosis) according to clinic

Clinic	1	2	3	4	5	6	7	8
2	0.55							
3	0.04	0.52						
4	0.20	0.58	0.22					
5	0.16	0.56	0.19	0.04				
6	0.27	0.72	0.24	0.38	0.36			
7	0.58	0.08	0.56	0.60	0.59	0.63		
8	0.52	0.06	0.49	0.56	0.54	0.49	0.13	
9	-	-	-	-	-	-	-	-

Table B.9: D-values for the average medicine treatment cost of hypertension stage 1: group C (single diagnosis) according to clinic

Clinic	1	2	3	4	5	6	7	8
2	0.42							
3	0.01	0.35						
4	0.44	0.04	0.37					
5	#	#	#	#				
6	0.41	0.09	0.34	0.07	#			
7	0.36	0.16	0.30	0.17	#	0.12		
8	0.58	0.76	0.48	0.25	#	**0.85**	0.51	
9	-	-	-	-	-	-	-	-

Table B.10: D-values for the average medicine treatment cost of hypertension stage 2: group A (single diagnosis) according to clinic

Clinic	1	2	3	4	5	6	7	8
2	#							
3	#	0.30						
4	#	**0.89**	0.12					
5	#	0.42	0.07	0.36				
6	#	0.34	0.06	0.05	0.13			
7	#	0.22	0.10	0.25	0.03	0.16		
8	#	0.34	0.42	1.15	0.65	0.46	0.36	
9	#	#	#	#	#	#	#	#

Table B.11: D-values for the average medicine treatment cost of hypertension stage 2: group B (single diagnosis) according to clinic

Clinic	1	2	3	4	5	6	7	8
2	0.45							
3	0.06	0.42						
4	0.25	0.42	0.28					
5	0.36	0.14	0.32	0.38				
6	0.14	0.67	0.22	0.20	0.57			
7	0.19	0.35	0.14	0.32	0.22	0.38		
8	0.20	0.31	0.15	0.33	0.20	0.39	0.02	
9	0.14	**0.91**	0.22	0.20	0.75	0.003	0.44	0.44

Table B.12: D-values for the average medicine treatment cost of hypertension stage 2: group C (single diagnosis) according to clinic

Clinic	1	2	3	4	5	6	7	8
2	-							
3	-	-						
4	-	-	#					
5	-	-	**2.23**	#				
6	-	-	#	#	#			
7	-	-	0.45	#	0.08	#		
8	-	-	0.47	#	**1.76**	#	0.34	
9	-	-	-	-	-	-	-	-

Table B.13: D-values for the average medicine treatment cost of hypertension stage 3: group A (single diagnosis) according to clinic

Clinic	1	2	3	4	5	6	7	8
2	-							
3	-	#						
4	-	-	#					
5	-	0.28	#	-				
6	-	0.56	#	-	0.39			
7	-	0.09	#	-	0.23	0.56		
8	-	0.07	#	-	0.22	0.52	0.12	
9	-	-	-	-	-	-	-	-

Table B.14: D-values for the average medicine treatment cost of hypertension stage 3: group B (single diagnosis) according to clinic

Clinic	1	2	3	4	5	6	7	8
2	-							
3	-	#						
4	-	#	-					
5	-	#	-	0.60				
6	-	#	-	0.51	0.33			
7	-	#	-	0.33	0.43	0.24		
8	-	#	-	0.53	0.32	0.02	0.26	
9	-	#	-	**2.21**	0.56	**1.89**	**2.09**	**1.87**

Table B.15: D-values for the average medicine treatment cost of hypertension stage 3: group C (single diagnosis) according to clinic

Clinic	1	2	3	4	5	6	7	8
2	-							
3	-	#						
4	-	#	0.77					
5	-	#	0.46	0.58				
6	-	#	#	#	#			
7	-	#	0.30	0.78	0.27	#		
8	-	#	0.79	0.06	0.62	#	**0.81**	
9	-	#	0.22	**1.10**	0.45	#	0.13	**1.14**

Table B.16: Average medicine treatment cost of osteoarthritis (single and multiple diagnoses) per clinic.

Clinic	Total number of diagnoses per clinic	Number of diagnoses		Total medicine treatment cost of each diagnosis$^{\pi}$ (R)		Average medicine treatment cost (R)	
		Single	Multiple	Single	Multiple	Single	Multiple
1	**19719**	27	17	294.21	316.31	10.90 ± 6.29	18.61 ± 17.80
2	**13668**	121	141	1024.26	2266.38	8.46 ± 5.37	16.07 ± 8.97
3	**8877**	16	17	178.81	229.02	11.18 ± 10.16	13.47 ± 11.01
4	**14159**	115	149	1093.86	2394.08	9.51 ± 11.22	16.07 ± 13.38
5	**11251**	21	17	203.74	242.17	9.70 ± 8.56	14.25 ± 8.60
6	**17808**	283	426	4678.05	1556.30	16.53 ± 11.68	27.13 ± 18.78
7	**18670**	78	102	883.20	1896.37	11.32 ± 11.24	18.59 ± 14.27
8	**23682**	804	126	7913.61	1902.76	9.84 ± 7.15	15.10 ± 8.25
9	**12889**	554	78	7721.34	1473.21	13.94 ± 7.11	18.89 ± 7.49
Total	**140723**	***2019***	***1073***	***23 991.08***	***22 276.60***		

$^{\pi}$ (Refer to table 4.20 for the total medicine treatment cost of each clinic)

Table B.17: Average medicine treatment cost of acute sinusitis (single and multiple diagnoses) per clinic.

Clinic	Total number of diagnoses per clinic	Number of diagnoses		Total medicine treatment cost of each diagnosis[π] (R)		Average medicine treatment cost (R)	
		Single	Multiple	Single	Multiple	Single	Multiple
1	**19719**	144	255	1565.69	3949.02	10.87 ± 8.04	15.49 ± 12.71
2	**13668**	119	88	1199.79	1198.00	10.08 ± 8.47	13.61 ± 9.97
3	**8877**	65	30	621.18	667.10	9.56 ± 13.10	22.24 ± 21.89
4	**14159**	101	55	1435.61	867.30	14.21 ± 11.29	15.77 ± 13.21
5	**11251**	564	171	6907.95	2713.94	12.25 ± 5.99	15.87 ± 9.14
6	**17808**	57	55	900.24	1180.58	15.79 ± 17.07	21.47 ± 12.92
7	**18670**	161	57	1987.54	898.47	12.34 ± 11.22	15.76 ± 10.86
8	**23682**	165	29	1751.98	463.19	10.62 ± 5.54	15.97 ± 10.50
9	**12889**	880	12	14918.36	241.57	16.95 ± 11.78	20.13 ± 7.26
Total	**140723**	**2256**	**752**	**31 288.34**	**12 179.17**		

[π] *(refer to table 4.20 for the total medicine treatment cost of each clinic)*

Table B.18: Average medicine treatment cost of gastroenteritis (single and multiple diagnoses) per clinic.

Clinic	Total number of diagnoses per clinic	Number of diagnoses		Total medicine treatment cost of each diagnosis[π] (R)		Average medicine treatment cost (R)	
		Single	Multiple	Single	Multiple	Single	Multiple
1	**19719**	162	62	1110.37	772.98	6.85 ± 4.86	12.47 ± 9.11
2	**13668**	126	60	1110.12	583.68	8.81 ± 4.24	9.73 ± 6.45
3	**8877**	162	39	1406.21	652.76	8.68 ± 9.66	16.74 ± 17.06
4	**14159**	136	43	1078.22	603.01	7.93 ± 6.18	14.02 ± 9.62
5	**11251**	354	124	2796.99	1464.31	7.90 ± 4.83	11.81 ± 5.03
6	**17808**	516	225	5689.45	3789.38	11.03 ± 6.37	16.84 ± 14.53
7	**18670**	276	99	2137.65	1469.81	7.75 ± 6.62	14.85 ± 15.23
8	**23682**	409	38	3926.05	509.60	9.60 ± 5.03	13.41 ± 7.40
9	**12889**	127	25	1186.35	274.41	9.34 ± 3.58	10.98 ± 5.02
Total	**140723**	**2268**	**715**	**20 441.41**	**10 119.94**		

[π] *(Refer to table 4.20 for the total medicine treatment cost of each clinic)*

Table B.19: Average medicine treatment cost of common cold (single and multiple diagnoses) per clinic.

Clinic	Total number of diagnoses per clinic	Number of diagnoses		Total medicine treatment cost of each diagnosis[π] (R)		Average medicine treatment cost (R)	
		Single	Multiple	Single	Multiple	Single	Multiple
1	**19719**	238	131	2339.70	1853.81	9.83 ± 3.98	14.15 ± 7.63
2	**13668**	252	110	2117.05	1225.05	8.40 ± 5.21	11.14 ± 6.75
3	**8877**	167	3	1709.73	43.74	10.24 ± 11.31	14.58 ± 10.72
4	**14159**	340	156	3031.15	2358.91	8.92 ± 6.91	15.12 ± 10.18
5	**11251**	47	15	440.05	235.88	9.36 ± 4.82	15.73 ± 8.70
6	**17808**	142	86	1567.08	1459.10	11.04 ± 6.12	16.97 ± 10.23
7	**18670**	329	136	3066.17	2308.02	9.32 ± 6.74	16.97 ± 20.86
8	**23682**	646	83	7448.62	1366.57	11.53 ± 6.32	16.46 ± 12.68
9	**12889**	12	-	179.54	-	14.96 ± 12.62	-
Total	**140723**	**2173**	**720**	**21 899.09**	**10 851.08**		

[π] *(Refer to table 4.20 for the total medicine treatment cost of each clinic)*

Table B.20: Average medicine treatment cost of uncomplicated gastritis (single and multiple diagnoses) per clinic.

Clinic	Total number of diagnoses per clinic	Number of diagnoses		Total medicine treatment cost of each diagnosis[π] (R)		Average medicine treatment cost (R)	
		Single	Multiple	Single	Multiple	Single	Multiple
1	**19719**	56	67	482.15	876.56	8.61 ± 3.92	13.08 ± 9.33
2	**13668**	70	49	605.75	567.87	8.65 ± 5.63	11.59 ± 6.21
3	**8877**	61	34	986.27	537.35	16.17 ± 15.83	15.80 ± 13.65
4	**14159**	163	88	1416.00	1395.53	8.69 ± 4.56	15.86 ± 12.75
5	**11251**	142	96	1358.51	1464.34	9.57 ± 4.20	15.25 ± 8.66
6	**17808**	162	320	2527.57	7904.71	15.60 ± 10.29	24.70 ± 17.56
7	**18670**	172	162	1761.84	3855.98	10.24 ± 6.73	23.80 ± 18.16
8	**23682**	527	141	5952.18	2256.66	11.29 ± 6.73	16.00 ± 8.41
9	**12889**	532	13	7425.77	189.49	13.96 ± 13.19	14.58 ± 6.25
Total	**140723**	**1885**	**970**	**22 516.04**	**19 048.49**		

[π] *(refer to table 4.20 for the total medicine treatment cost of each clinic)*

Table B.21: Average medicine treatment cost of arthralgia (single and multiple diagnoses) per clinic.

Clinic	Total number of diagnoses per clinic	Number of diagnoses		Total medicine treatment cost of each diagnosis$^{\pi}$ (R)		Average medicine treatment cost (R)	
		Single	Multiple	Single	Multiple	Single	Multiple
1	**19719**	241	342	2128.06	6621.47	8.83 ± 7.66	19.36 ± 17.86
2	**13668**	49	24	482.77	302.74	9.85 ± 13.20	12.61 ± 9.42
3	**8877**	87	26	850.89	883.82	9.78 ± 13.00	33.99 ± 35.23
4	**14159**	75	31	647.00	515.09	8.63 ± 7.37	16.62 ± 17.29
5	**11251**	32	12	218.12	201.04	6.82 ± 3.39	16.75 ± 22.13
6	**17808**	145	169	1721.36	3220.12	11.87 ± 11.42	19.05 ± 13.11
7	**18670**	37	14	247.50	193.06	6.69 ± 5.58	13.79 ± 6.85
8	**23682**	218	52	1802.07	675.29	8.27 ± 5.08	12.99 ± 6.91
9	**12889**	1158	8	1611.29	202.04	12.62 ± 10.43	25.26 ± 29.39
Total	**140723**	**2042**	**678**	**22 709.06**	**12 814.65**		

$^{\pi}$ *(Refer to table 4.20 for the total medicine treatment cost of each clinic)*

APPENDIX C

In this section a brief discussion of the top ten diagnoses (individually) will be given.

C.1. Acute bronchitis infection

Definition and aetiology:

Acute bronchitis is a viral or bacterial infection of the bronchi. The bronchial tree is made up of tubes that carry air into the lungs. When these tubes get infected, they swell and mucus (thick fluid) forms. This makes it hard for a person to breathe, making a whistling sound when they breathe (Whiteside & Whiteside, 2002:105). It is a lower respiratory tract infection that causes reversible bronchial inflammation. In up to 95% of the cases, the cause is viral. In most cases, the same viruses that cause colds cause acute bronchitis and the viruses attack the lining of the bronchial tree causing infection. As your body fights back against these viruses, more swelling occurs and more mucus is made (Hueston & Mainous, 1998:1).

Viral bronchitis is usually part of an upper respiratory viral infection accompanied by other manifestations of viral infection (Department of Health and human services, 2003:15). The viruses that cause acute bronchitis are sprayed into the air or onto people's hands when they cough, so you can get the disease if you breathe in these viruses (Whiteside & Whiteside, 2002:106).

Clinical features:

Patients are usually far advanced in their disease, with symptoms of airway obstruction by the time they seek medical attention (Herfindal & Gourley, 1996:686).

- Cough with generalised coarse crackles, with or without wheezes.
- The cough is initially often non-productive, but becomes productive with yellow or greenish sputum (especially when a secondary bacterial infection is present).
- Upper respiratory infection such as rhinorrhea and sore throat.

Differential diagnosis:

Table C.1 indicates diseases which can lead to a misdiagnose of acute bronchitis.

Table C.1: Differential diagnosis of Acute Bronchitis (Hueston & Mainous, 1998:3)

Disease process	Signs and symptoms
Reactive airway disease	
Tuberculosis	This is very common and must always be excluded.
Asthma	Evidence of reversible airway obstruction even when not infected and transient pulmonary infiltrates.
Allergic aspergillosis	Eosinophilia in sputum and peripheral blood smear.
Occupational exposures	Symptoms worse during the work week but tend to improve during weekends, holidays and vacations.
Chronic bronchitis	Chronic cough with sputum production on a daily basis for a minimum of three months. Typically occurs in smokers.
Respiratory infection	
Sinusitis	Tenderness over the sinuses. Postnasal drainage.
Common cold	Upper airway inflammation and no evidence of bronchial wheezing.
Pneumonia	Evidence of infiltrate on the chest radiograph.

The following are protocols of drug therapy treatment as proposed by the Department of Health and the medicentres®.

Treatment / prevention:

(According to the EDL, 1998:136)

Drug treatment:

	Drug	***Dosage***	***Dosage Regimen***
Adults	Doxycycline	200mg tablet 100mg tablet	Immediately followed by twice daily oral, with food for minimum of 5 days
		OR	
Children over 10 years and adults	Amoxycillin	250mg tablet	oral 8 hourly for 5 days
Children over 12 years and adults:	Paracetamol	500mg tablet	1-2 tablets oral 4-6 hourly when needed to a maximum of 4 doses daily

(According to the medicentres® protocol).

Protocol 1:

Drug	***Dosage***	***Dosage Regimen***
Amoxycillin	250mg capsules	three times a day
Diphenhydramine	14mg/5ml syrup	three times a day
Paracetamol	500mg tablets	when necessary

Protocol 2:

Drug	***Dosage***	***Dosage Regimen***
Diphenhydramine	14mg/5ml syrup	three times a day
Co-Trimoxazole	480mg tablets	twice a day
Paracetamol	500mg tablets	when necessary

C.2. Viral influenza

Definition and aetiology:

Viral influenza is an acute, usually self limited, febrile illness caused by infection with a type A or B virus that occurs in outbreaks of varying severity. The attack rate during such outbreaks is as high as 10 to 40% over a period of between 5 to 6 weeks duration (Rijal, 2002:4). The virus that causes influenza is an orthomyxovirus. This family contains influenza A, B and C. Type A has been isolated from humans, animals and birds, whereas types B and C appear to infect only humans (Mabry, 1999:1).

Influenza is a general term that has been used for centuries to describe an acute, contagious respiratory disease. It is a viral infection capable of causing epidemic or pandemic outbreaks of acute respiratory illness. Epidemics of influenza have been recognised for more than 100 years and, despite advances in medical therapy and antibiotic technology, they continue to cause significant morbidity and mortality among persons of all ages (Rhoton-Vlasak, 1999:1).

Clinical features:

In healthy adults, illness may range from the occasional asypmtomatic infection to more serious and occationally fatal primary influenza pneumonia. The incubation period is usually 3-4 days, followed by a sudden rise in body temperature, often up to 39.2°C. It may also be associated with malaise, myalgia, sore throat, nasal congestion, cough and headache. More severe illness can result due to either primary influenza pneumonia or secondary bacterial pneumonia (Rhoton-Vlasak, 1999:3). The most common bacterial organisms are *Staphylococcus aureus, Streptococcus pneumoniae and Haemophilus influenzae.* Other features may include fever (often higher in children) and often extreme fatigue (Rijal, 2002:2).

Epidemiology:

Influenza is a disease that comes in seasonal epidemics and occurs due to minor changes in the influenza viral antigenic proteins (antigenic drift). These account for most of the changes in the viruses from one season to another. Occurrence of epidemics has been associated with influenza A viruses (Keen, 1995:6).

Treatment and prevention:

Prevention and control:

It is recommended that high-risk groups be vaccinated annually, including persons older than 65 years of age and persons with suppressed immune systems. It is also of importance that health care workers and vital community personnel be vaccinated annually (Mabry, 1999:3).

Treatment:

(According to literature, medicentre's update, 1999:4)

Non-drug treatment:

For uncomplicated viral influenza, treatment is generally supportive.

- Bed rest.
- Adequate hydration.
- Analgesia.

Drug treatment:

Antiviral agents (recommended for treatment of viral influenza type A),

Drug	Dosage	Dosage Regimen
Amantidine hydrochloride	100mg	oral twice a day
Rimantidine hydrochloride	100mg	oral twice a day

(According to medicentres® protocol)

Protocol 1:

Drug	Dosage	Dosage Regimen
Ascorbic acid	250mg tablets	three times a day
Diphenhydramine, Ammonia.	14mg/5ml syrup	three times a day
Indomethacin	25mg capsules	three times a day
Parac, ephe, chlor,	200mg tablets	three times a day

Protocol 2:

Drug	Dosage	Dosage Regimen
Diclofenac sodium,	75mg injection	immediately
Paracetamol, codeine,	500(8) mg tablets	six hourly
Theophylline, hydrox, theop, diph	Syrup	three times daily

Protocol 3:

Drug	Dosage	Dosage Regimen
Aspirin *(contradicted in children and teenagers because of an association with Reye's syndrome)*	300mg tablets	three times a day
Ascorbic acid	250mg tablets	three times a day
Chlorphen, ephedrine,	2(6)mg tablets	three times a day
Theophy, hydrox, theop, diph	Syrup	three times a day

C.3. Upper respiratory infection

Definition and aetiology:

According to Hong *et al.*, (1999:511), "Upper respiratory infection (URI) includes any infectious disease process that usually involves the respiratory system starting with the nose and ending just before the lungs. The infections could be caused by viruses or bacteria and include conditions such as the common cold, influenza, sinus problems, minor sore throat etc." Sometimes bronchitis is called an upper respiratory infection. However, because the bronchi are found in the lungs, bronchitis is actually a lower respiratory infection or a lung condition. Sinus and ear infections are usually bacterial complications of viral URIs (Greeff, 1993:142).

Most of these infections are mild and go away with or without treatment. However, some URIs can be more serious and may have long-term effects. A few examples can be mentioned, e.g. untreated streptococcal pharyngitis (strep throat) can lead to kidney damage or rheumatic fever, which can damage the heart. Acute otitis media can result in hearing loss. Upper respiratory infections can also put people at risk of getting pneumonia, which may be life threatening especially in the elderly and very young (Brochert, 2001:2).

Clinical features:

Many of the signs and symptoms depend on the type of upper respiratory infection. Common symptoms of URIs include: a runny or stuffy nose, sore throat, fever, headache, cough, malaise, muscle aches, loss of appetite and ear pain (Keen, 1995:1).

Treatment and prevention:

Prevention:

Many cases of upper respiratory infection cannot be prevented. Almost all the URIs are contagious. They are transmitted through respiratory secretions. Sneezing and coughing can spread these droplets, so avoiding sick people can help prevent some cases (Brochert, 2001:3). Frequent hand washing can also help reduce the spread of many URIs and vaccines are used to help prevent some cases.

Treatment:

Drug treatment (As according to the type of infection) (Hong *et al.*, 1999:512).

For URIs caused by a virus, antibiotics are not helpful. Someone with a cold should remember that antibiotics could cause more harm than good in these cases. In severe cases of flu, antiviral medications such as rimantadine may be given. For bacterial infections such as bacterial pneumonia, antibiotics are given (Gonzales *et al.*, 1997:902).

C.4. Hypertension

Definition and aetiology:

Blood pressure is the force of blood pushing against your blood vessels. Your blood pressure is at its greatest when your heart contracts and is pumping blood. This is systolic blood pressure. When your heart rests between beats, your blood pressure falls and this is called diastolic blood pressure (Department of Health and Human Services, 2003:1). Normal blood pressure is considered to be 120/80mmHg. Blood pressure that stays between 120-139/80-89 is considered prehypertension and above this level (140/90mmHg or higher) is considered high hypertension (for easier classifications of hypertension refer table C.2).

Hypertension or high blood pressure is defined as an abnormal elevation of arterial blood pressure. When your blood pressure is too high, the blood is pushing too hard against the walls of the blood vessels. High blood pressure makes your heart work too hard and if it stays high for too long, it may damage your heart, blood vessels and other organs (Montana, 2003:1).

Hypertension is the most important major risk factor for premature cardiovascular death. South Africa has one of the highest heart-related death rates in the world and coronary heart disease causes twice as many deaths among adult South Africans as cancer and road accidents combined (Greeff, 1993:67). Complications of hypertension are related either to sustained elevations of blood pressure, with consequent changes in the vasculature and heart, or to atherosclerosis that accompanies and is accelerated by long standing hypertension (Tierney *et al.*, 2001:452).

There are millions of patients who are asymptomatic and these patients are at an increased risk of cardiovascular disease because they remain undiagnosed. Treatment for hypertension reduces the mortality and morbidity associated with this condition but it is estimated that only 50% of all the sufferers receive adequate therapy.

Table C.2: Classification of Hypertension (Weibert, 1996:701).

Classification	*Systolic Pressure (mmHg)*	*Diastolic Pressure (mmHg)*
Normal blood pressure	< 130	< 85
High normal blood pressure	130 – 139	85 - 89
Stage 1 (mild)	140 – 159	90 - 99
Stage 2 (moderate)	160 – 179	100 - 109
Stage 3 (severe)	180 - 209	110 - 119
Stage 4 (very severe)	≥ 210	≥ 120

Clinical features:

The clinical signs and symptoms of hypertension are not sufficient to make a diagnosis because it is usually an asymptomatic disease. There have been reports of headache, epistaxis (nosebleeds) and tinnitus (ringing in the ears) and these are believed to be symptoms of high blood pressure, although a direct relationship cannot be found (Greeff, 1993:73).

Complications of Hypertension (Greeff, 1993:73)

Hypertensive complications	***Arteriosclerotic complications***
Congestive heart failure	Ischaemic heart disease
Cardiomegaly, left ventricular hypertrophhy	Myocardial infarction
Cerebral haemorrhage	Sudden death
Renal failure	Angina pectoris
Retinopathy	Atherothrombotic stroke
Accelerated hypertension	Peripheral vascular Insufficiency
Aortic dissection	

Treatment and prevention:

Prevention:

- Aim for a healthy weight.
- Choose foods lower in fat and calories.
- Eat smaller portions of food.
- Try not to gain extra unnecessary weight. Lose weight if you are overweight. Try losing weight slowly, about ½ to 1kg each week until you reach a healthy weight.
- Be physically active every day.
- Read food label and choose foods with less salt and sodium.
- Use less salt when cooking.
- Cut back on alcoholic beverages.

Treatment:

Drug treatment

There are many drugs available to lower blood pressure. The drugs work in various ways and many people need to take two or more drugs to bring their blood pressure down to a healthy level.

Table C.3 shows the classifications of drugs that are used to treat hypertension and their specific uses.