THE VALUE OF THE "TOP TWENTY" PHARMACEUTICAL PRODUCTS AS A MANAGEMENT INSTRUMENT IN A MANAGED HEALTH CARE ORGANISATION

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Education is the great engine to personal development.
It is through education that the daughter of a peasant can become a doctor,
That the son of a mine worker can become the head of a mine,
That the child of a farm worker can become the president of a great nation.
It is what we make of what we have, that separates one person from another.

-Nelson Mandela-

ABSTRACT

TITLE: The value of the "top twenty" pharmaceutical products as a management instrument in a managed health care organisation.

KEY WORDS: healthcare, "top twenty" pharmaceutical products, management instrument(s), pharmacoeconomics, drug utilisation review, evidence - based medicine, disease management.

Health is a fundamental human right. Access to health care, which includes providing a population with safe, effective, good quality drugs at the least possible cost, is a prerequisite to realising that right. Drugs or medicines play a fundamental role in the effectiveness, efficiency and responsiveness of health care systems. Drugs also constitute a major recurrent expense in both state-run and private sector health care. To ensure that health care workers prescribe the most cost-effective drugs through the essential drugs list, training, as well as evaluation and monitoring systems must be regarded as important elements of containing costs.

Pharmaceutical benefit management programmes such as pharmacoeconomics, drug utilisation review (DUR), evidence-based medicine and disease management have emerged as tools to ensure cost-effective selection and use of drugs, particularly for chronic diseases. These managed care tools are often investigated to determine whether new technologies or interventions are appropriate and have "value".

Affordable prices of medicines, on their own, however, do not ensure access to medicines. Also important are reliable procurement, distribution and storage systems, and appropriately trained personnel to manage these components of drug management. Poorly regulated drug supply systems can have serious consequences such as antibiotic resistance, problems with safety or quality and most importantly wastage, as it is believed that a significant proportion of drugs purchased by the state in South Africa find their way into the private sector market through a "grey market".

The general objective of this study was to review and analyse the cost and medicine usage of the "top twenty" pharmaceutical products according to the monthly pharmaceutical purchasing reports of the Department of Health in the North West Province.

The research can be classified as retrospective and quantitative. The data used for the analysis were obtained over a two-year study period (1 Apr 2000 – 28 Feb 2002) from the private provider operating the medical stores in the North West Province.

The results of the empirical investigation, showed the total number of "top twenty" products appearing during the study period amounted to 460 different products having a total purchasing cost of R 66,263,674.51 representing 37.2% (n = R 178,163,061.50) of all pharmaceutical products purchased during the two-year period.

Through analysis it was found, when classified according the Anatomical Therapeutic Chemical (ATC) therapeutic main group, antihypertensives had the highest quantity purchased for year one (20.69%; n = 134,515,640) with cough and cold preparations revealing the highest purchasing quantity for year two (40.55%; n = 103,567,031) of all "top twenty" pharmaceuticals during the study period.

Antibacterials for systemic use presented with the highest cost percentages for both years, representing 20.68% (n = R35, 568,221.31) and 16.72% (n = R 31,370, 435.51) respectively. Hydrochlorothiazide presented with the highest purchasing quantity for both years when classified according to chemical substance with, Methyldopa having the highest purchasing cost for year one followed by vaccine Hib-DTP 10 dose vial (*Haemophilus influenzae* type B vaccine-diphtheria, pertusis and tetanus vaccine) for year two. Furthermore it was also found that the majority of the "top twenty" products were in the oral dosage form. Finally it was concluded that drugs used in the treatment of hypertension and cardiac failure were the most utilised in comparison to other "top twenty" products during the study period. Possible misappropriation based on the defined daily dose of the "top twenty" products might have occurred.

In completion of this study, recommendations for future research were made.

OPSOMMING

TITEL: Die waarde van die "top twintig" farmaseutiese produkte as 'n bestuursinstrument binne die raamwerk van 'n beheerde gesondheidsorg organisasie.

SLEUTELWOORDE: gesondheidsorg, "top twintig" farmaseutiese produkte, bestuursinstrument, farmako-ekonomie, medisyneverbruik hersiening, bewese medisyneverbruik, siektebestuur.

Gesondheid is 'n basiese mensereg. Toegang tot gesondheidsorg, waardeur die voorsiening van veilige, effektiewe en goeie kwaliteit medikasie aan 'n gemeenskap ingesluit word, is 'n voorvereiste vir die verwerkliking van daardie reg. Medikasie beklee 'n fundamentele plek in die mate waartoe enige gesondheidsorgsisteem effektief, toereikend en met positiewe response funksioneer. Medikasie veroorsaak ook groot en herhalende uitgawes in beide die staatsondersteunde en privaat sektore van gesondheidsorg. Om te verseker dat gesondheidwerkers die mees koste-effektiewe medisynes deur middel van die essensiële medisynelys voorskryf, moet verwante programme vir opleiding sowel as evaluering en beheer as uiters belangrik beskou word, veral met die oog op kostebeheer.

Programme om farmaseutiese voordele te kontroleer het ontwikkel (byvoorbeeld farmako-ekonomie, medisyneverbruik hersiening, bewese medisyneverbruik, siektebestuur) en dien as instrumente om koste-effektiewe seleksie en verbruik van medisynes te bevorder, veral met betrekking tot die behandeling van kroniese siektes. Navorsing word van tyd tot tyd in verband met sodanige beheerinstrumente gedoen sodat vasgestel kan word of nuwe tegnologie of tussentrede toepaslik en "waardevol" sal wees.

Bekostigbare pryse vir medisynes as sodanig, is egter nie 'n waarborg vir toegang tot medisynes nie. Eweneens belangrik is die betroubare aankoop, verspreiding en berging van medisynes asook opgeleide personeel om hierdie komponente van medisynebeheer te bestuur en in plek te hou. Indien programme vir medisynevoorsiening swak bestuur word, kan ernstige gevolge te wagte wees, byvoorbeeld weerstand teen antibiotika, probleme met die veiligheid of kwaliteit van die produkte, en dan veral ook ten opsigte van vermorsing, juis omdat vermoed word dat 'n beduidende hoeveelheid medisynes wat deur die staat in Suid-Afrika aangekoop word 'n pad vind na 'n privaatsektormark bekend as die "grys mark".

Die oorhoofse doel met hierdie studie was om die koste en gebruikspatrone van die "top twintig" farmaseutiese produkte te analiseer en te hersien. Die navorsing is gedoen in ooreenstemming met die maandelikse farmaseutiese aankoopverslae van die Departement van Gesondheid, Noordwes Provinsie.

Die navorsing kan as retrospektief en kwantitatief geklassifiseer word. Die inligting vir die studiedoeleindes is van die databasis van die mediese store van die Noordwesprovinsie verkry en die navorsing is oor 'n tydperk van twee jaar uitgevoer (1 April 2000 tot 28 Februarie 2002).

Volgens die resultate van die navorsing het dit duidelik geword dat die aantal produkte wat gedurende die studietydperk as "top twintig" produkte verskyn het, 'n somtotaal van 460 verskillende produkte beloop het. Die aankoopkoste hieraan verbonde was R 66,263,674.51 en hierdie bedrag is verteenwoordigend van 37.2% (n = R 178,163,061.50) van alle farmaseutiese produkte wat gedurende die verloop van die twee jaar aangekoop is.

Die ontleding is gedoen in ooreenstemming met die Anatomiese, Terapeutiese en Chemiese (ATC) hoofgroep klassifisering en het getoon dat anti-hipertensie preparate die hoogste aantal aankope van al die "top twintig" produkte behaal het vir jaar een van die studieperiode (20.69%; n = 134,515,640). Vir jaar twee van die studietydperk het hoes en verkoue preparate as hoogste verkopers uitgewys (40.55%; n = 103,567,031).

Vir albei die studiejare het antibakteriële preparate vir sistemiese gebruik die hoogste kostepersentasies bereik, naamlik 20.68% (n = R35, 568,221.31) en 16.72% (n = R31, 370,435.51) respektiewelik. Indien geklassifiseer volgens chemiese bestanddele, het hidrochloortiasied vir albei studiejare die hoogste aantal aankope getoon met methyldopa teen die hoogste aankoopkoste vir jaar een, gevolg deur entstof Hib-DTP (*Haemophilus influenzae* type B entstof - dipteria, kinkhoes en tetanus entstof; 10-dosis ampule) vir jaar twee. Daar is ook vasgestel dat die meerderheid van die "top twintig" produkte in die orale toedienvorm aangebied is. 'n Verdere gevolgtrekking was dat die medisynes wat vir die behandeling van hipertensie en hartversaking aangewend word, as die meesgebruikte preparate uitgewys het in vergelyking met die ander "top twintig" produkte. Moontlike wanproporsies, gebaseer op die voorgeskrewe daaglikse dosisse van toepassing op die "top twintig" produkte, kon ingeglip het.

Na afhandeling van die studie was dit moontlik om 'n aantal voorstelle vir toekomstige navorsing te formuleer.

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millions of children and adults die each year from acute respiratory infections, diarrhoeal diseases, malaria, pregnancy-related anaemia, and other common conditions that can be prevented or treated with modern drugs. For those who do have access to essential drugs, many receive the wrong drug, wrong dosage, or a quantity insufficient for their needs. Even when patients receive the correct drug, between one-third and two-thirds do not consume it correctly.

Prior to 1994, the South African health system was built on apartheid ideology and characterised by racial and geographic disparities, with the majority of the population having limited access to health care services, delivered by a highly stressed and fragmented system (Department of Health (1999: 7).

According to the Department of Health (2001a: 14) one of the key challenges in health care is to improve the quality of care provided by the public health sector. That includes ensuring the availability of affordable, good quality drugs and the training of health providers in the rational use of drugs. Also the use of the Essential Drugs List (EDL) and the training of health providers in procurement and rational prescription must be strengthened.

The Department of Health (1999: 9) stated that although the World Bank classifies South Africa as a middle-income country, economic growth has not matched the level of population growth, thus making it clear that the majority of South Africans will continue to depend on the public health system in the foreseeable future.

The development and implementation of the National Drug Policy (NDP), aimed at equity in the provision of health care for all citizens, can be regarded as a very necessary step towards addressing existing problems. Specific objectives were set out in this framework in terms of health, economic and national development (Department of Health 1996: 3).

The implementation of an Essential Drugs Programme (EDP) formed an integral part of the strategy to implement the NDP, leading to rationalisation of the wide variety of medicines available in the public sector.

The South African pharmaceutical sector plainly reflected the historical effects, inefficiencies, and distortions in the health system. According to stringent norms set by the World Bank for essential pharmaceutical expenditure, South Africa needs approximately R220 million for the provision of essential medicines each year (based on 1.5 US $ per capita per annum, assuming a

population of 40 million people). This is exceeded in South Africa by a factor of 30. Even in the public sector, the excess is more than seven fold. It can be assumed that there are cumulative losses in procurement and distribution, and further losses due to inappropriate prescribing, lack of compliance, fraud and theft (Folb *et al.*, 1995:1).

This dissertation focuses on the aspects of medicine provision in a provincial health care environment, health policy and includes a description of the essential drugs concept, drug management as well as challenges facing the pharmaceutical sector.

1.3 Research Questions

The following research questions can be formulated:

- What would public health and managed health care entail?
- What would disease management, evidence - based medicine, pharmacoeconomics and a drug utilisation review entail?
- What does management information, entail with particular reference to the decision-making process refer to?
- What does drug management involve?
- What does the concept "top twenty "pharmaceutical products entail?
- What is the extent of the prevalence and cost associated with the "top twenty" pharmaceutical products according to the monthly reports?
- What differences can be identified with regard to the prevalence and cost of the different therapeutic groups over the two-year study period?
- What is the prevalence and cost associated with the different dosage forms of the "top twenty" pharmaceutical products?
- What are the differences in utilisation patterns of the different "top twenty" pharmaceutical products" per year?
- What recommendations may be formulated regarding the cost and usage patterns of these products in the public health sector?

1.4 Research Objectives

This research includes a general as well as various specific objectives.

1.4.1 General Objective

The general objective of this study is to review and analyse the cost and medicine usage of the "top twenty" pharmaceutical products according to the monthly pharmaceutical purchasing reports as obtained from the Department of Health in the North West Province.

1.4.2 Specific Objectives

The specific objectives are as follows:

- To conceptualise from the literature what public health care and managed health care entail.
- To conceptualise from the literature the concepts of what disease management, pharmacoeconomics, drug utilisation review, evidence - based medicine and management information systems entail.
- To review drug management from the literature.
- To review the nature of pharmaceutical products from the monthly pharmaceutical purchasing reports of the North West Department of Health from the period 1st April 2000 to 28th February 2002.
- To determine the prevalence and cost of the "top twenty pharmaceutical products" according to the monthly pharmaceutical purchasing reports.
- To determine the prevalence and cost of the different therapeutic groups of the "top twenty" pharmaceutical products with reference to the monthly pharmaceutical purchasing reports.
- To determine the utilisation of the different dosage forms as identified from the "top twenty" pharmaceutical products, as well as the costs associated with these respective dosage forms.
- To determine the utilisation patterns of the "top twenty" products over the two-year study period.
- To formulate recommendations regarding the cost and usage patterns of these products.

1.5 Research Method

The research consisted of two individual phases in order to accomplish the set objectives. The phases are as follows and will be fully discussed in Chapter 4.

1.5.1 Phase 1: Literature Review

The literature review is divided into two steps. The introduction of the literature review entails an overview of the public health sector in South Africa, with special emphasis given to the health sector in the North West Province. Followed by a brief review of managed health care principles, management information systems as well as the pharmaceutical supply system, which are utilised in the delivery of favourable health care in South Africa. The above will be discussed in Chapter 2.

The second step of the literature study, namely a brief summary of the "top twenty" pharmaceutical products as identified from the monthly pharmaceutical purchasing reports, will be discussed in Chapter 3. The literature study will provide a classification and summary of the "top twenty" pharmaceutical products, according to main indications and possible side effects, with related dosages appearing in Appendix A.

1.5.2 Phase 2: Empirical Investigation

The empirical investigation comprises several steps with a complete discussion in Chapter 4. The data utilised during this phase were obtained from the private provider operating the medical stores of the Department of Health in the North West Province. The study period ranged from 1 April 2000 – 28 February 2002. The monthly report for March 2002, was not printed due to the financial year ending, therefore the "top twenty" products for the period march 2002 was not available for analysis. The report and discussion of the results obtained from the empirical investigation, as well as the conclusion, recommendations and limitation based on the results will be discussed in Chapter 5 and 6 respectively.

1.6 Division of Chapters

The division of chapters will be as follows:

Chapter 1: Introduction

Chapter 2: Health and health care concepts.

Chapter 3: A descriptive summary of pharmaceutical products appearing as a "top twenty" product according to the monthly pharmaceutical purchasing report.

Chapter 4: Empirical investigation.

Chapter 5: Results and discussion.

Chapter 6: Conclusions and recommendations.

1.7 Chapter Summary

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

In the following chapter, health and health care concepts will be discussed.

Chapter 2:

Health Care: Concepts and Approaches

2.1 Introduction

In this chapter aspects of health care in South Africa will be briefly discussed, with a brief outline of the health status in the North West Province. Managed health care will also be discussed, followed by pharmacoeconomics, drug utilisation and evidence - based medicine and disease management as information instruments of managed health care. Management information systems will also be briefly reviewed in this chapter as a component of the management decision-making process. The drug management process will also be briefly summarised. The literature review will attempt to outline the relevant information needed to conclude some specific objectives set out in this study.

2.2 Aspects of the Health Care System of South Africa

The health service inherited in 1994 was a reflection of a system, which focussed primarily on supporting the apartheid state, rather than on improving health or providing an efficient and effective health service. Like the country, the health service had been fragmented, with resources, and access to health care, having been distributed along racial lines. Management inefficiencies were deeply rooted and many programmes for disease prevention and control were weak. For its gross domestic product and health expenditure, the health of South Africans compared poorly to other countries, even discounting HIV/AIDS, which was only just beginning to have an impact. South Africa, whatever its socio-economic circumstance, carried a high burden of disease. This burden was worst amongst Africans (Buch, 2000:56).

The enormous difficulties that this "inheritance" has posed and continues to pose for health sector development play an important role in future health sector development.

Much progress has been made since 1994 in overcoming the apartheid legacy. A few key areas will be highlighted.

In April-May 1994, the African National Congress (ANC) published its National Health Plan in consultation with the World Health Organization (WHO) and the United Nations Children Fund (UNICEF) after winning the first democratic elections ever held.

The health plan is based on the belief that every individual has the right to achieve optimal health. Principles that form the basis of the health plan are as follows (ANC, 1994 19-20):

- *Equity.* Health for all cannot be acquired through the supply of equitable health services alone but rather through the achievement of equitable social and economic development. The need for employment, education, adequate housing, water, sanitation and electricity are all vital if "health for all" is to be attained.
- *Right to health.* This principle is based on the premise that each individual has the right to attain optimal health and the State must provide the environment in which this can be achieved.
- *Primary health care approach.* Comprehensive primary health care as identified by the WHO, forms the basis of this approach. It includes all aspects of community development and community involvement, which are imperative if the system is to be successful. Through this approach the inequalities in access to health services in rural and deprived communities will be a priority for improvement.
- *A single, comprehensive, equitable and integrated national health system must be created.* The system will be in control of all structures dealing with health, both public and private. It will be responsible to the people and all racial, tribal, ethnic and gender discrimination will be eradicated.
- *Co-ordination and decentralisation of services.* Clinics, health centres and independent practitioners will be the first contacts the people will have with the health system. Authority and control over the funding will be decentralised to the lowest level possible compatible with rational planning and the maintenance of good quality care.
- *Priorities.* The groups regarded as being most vulnerable, such as mothers and children, the disabled, the underserved in rural areas and those with debilitating diseases and conditions such as AIDS (Acquired Immunodeficiency Syndrome), tuberculosis, gastro-enteritis, heart disease and trauma, will be given priority care.
- *Promotion of health.* Health workers must give attention to the importance of health education, especially with regard to sexuality, child spacing, oral health, substance abuse, environmental health, occupational health and healthy lifestyles. Traditional healers and alternative health care practitioners must be integrated into the team of health workers.
- *Respect for all.* A charter of patient's rights will be introduced to ensure the right of all people to be treated with dignity and respect.

- *A health information system.* There is a need for appropriate and reliable data, which are essential for good planning and management. This will improve the efficiency of service.
- *Additional components of primary health care.* To cover the specific needs of primary health care in South Africa, the new government added more to the existing eight of the WHO. They are emergency, occupational and mental health services.

Primary Health Care approach is central to the delivery of health services. Primary Health Care was defined in the Declaration of Alma Ata as: "*Primary Health Care is essential health care based on practical, scientifically sound and socially acceptable methods and technology made universally accessible to individuals and families in the community through their full participation and at a cost that the community and country can afford to maintain every stage of their development in the spirit of self-reliance and self-determination. It forms an integral part on 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* (WHO, 2002 a: 1).

Health sector reform has also concentrated on the hospital restructuring and reform in public health policies. Hospitals have been classified into four categories: district; regional; central and specialised.

Secondary level hospitals normally have different services dealing with specific diseases or conditions. The main responsibilities of secondary health care services include (Anon, 2002a: 29):

- ❖ Inpatient diagnosis and treatment.
- ❖ Outpatient services.
- ❖ Care of older persons with more complex or rare conditions is shared with the tertiary level services.
- ❖ Laboratory services.
- ❖ Referral to specialist care.
- ❖ Support to the primary level health care.
- ❖ Pharmaceutical services.
- ❖ Rehabilitation services, including psychosocial services.
- ❖ Training and education of health service professionals.

In South Africa there are seven medical schools directly linked to tertiary hospital complexes, offering specialised services. Responsibilities of tertiary health care services include (Anon, 2002a: 29):

- Provision of a full range of specialised medical, surgical, psychiatric diagnostics, therapeutic and rehabilitation services.
- Specialist multi-disciplinary care for older persons with complex and multiple chronic conditions or diseases.
- Support to secondary level hospitals, doctors and other care providers.
- Research and quality care audits.
- Training and education of health service professionals.
- Specialised support services, including specialist pharmaceutical services.

2.3 Public Health Defined

According to the Institute of Medicine (1988,1) public health was at first defined by Winslow, 1920 as "*the science and art of preventing disease, prolonging life and promoting health and efficiency through organised community effort*".

The Association of Schools of Public Health (ASPH, 2003:1) defined public health as "*the strategic, organised, and interdisciplinary application of knowledge, skills, and competencies necessary to perform essential public health services and other activities to improve the population's health*".

> Public health therefore deals with groups of people rather than with individuals. Its area of operation is large including public, private and non-governmental health sectors rather than the consulting room, ward or laboratory, although each of these also forms areas of public health intervention. The main goal of public health is health and well - being of which healing is a part. Its scientific base is a multitude of disciplines rather than medicine alone. And its outcomes are usually not "all or nothing" events such as in clinical medicine (a patient is either cured or not) but rather expressed in relative terms such as "reduced risk", "improved cost-effectiveness", or "greater equity" (Ijsselmuiden, 1996:9).

In April 1997 the Ministry of Health published the White Paper Transformation of the Health System in South Africa. It contains the policy objectives and principles upon which the Unified Health System of South Africa is based. It also contains implementation strategies to meet the

basic needs of the South African people, within the constraints determined by the limited available resources, and within both the public and private sectors (Dept of Health, 1995:1).

Other achievements include (Buch, 2000:56):

- The establishment of a unitary health system with a single national department and nine provincial departments.
- The appointment, for the first time, of talented managers of "colour" to executive positions.
- The removal of structural racism.
- The upgrading of many clinics and health centres and the building of approximately five hundred new ones, in poor, hitherto under-served communities. Although a number are yet to be made fully operational, this step did bring elements of the PHC within reach of many for the first time.
- The introduction of free primary health care not only made good economic sense, but also removed the affordability barrier that many faced.
- Progress, albeit variable, in the establishment of District Health System (DHS), with provinces and local authorities starting to pool their resources and integrate care, so as to offer a more comprehensive service under one roof. This not improve economies of scale and efficiency, but means that parents do not have to travel to two or more venues and face duplicate queues and examinations to get care for themselves and their family.
- Community service for newly qualified doctors, which further strengthened services in the poorest parts of the country.
- Contracting Cuban doctors to improve medical care in "under-doctored" areas.
- A massive primary school nutrition programme, which even with implementation difficulties, meant that many children were no longer too hungry to learn.
- The addition of Hepatitis B and *Haemophilus Influenza B* vaccines to the routine immunisation schedule.
- The launch of various programmes to tackle priority health problems, including Integrated Management of Childhood Illnesses, Directly Observed Treatment (DOT), short-course for the management of Tuberculosis and a Maternal Mortality Programme.
- Restructuring of the district surgeon system.
- Promulgation of important pieces of legislation that are steering the health sector towards greater effectiveness.
- Important efforts to improve public health, including measures to curtail use of tobacco.
- The launch of the Patient's Charter to serve as a benchmark of how patients could expect to be treated.

But not all has been positive. The negative side aspects include (Buch, 2000:57):

- A relentlessly worsening HIV/AIDS epidemic which government has not sufficiently got to grips with.
- A reduction in health budgets in real terms, after increases in the first two years. The reasons for the decreases include
    - a reduction in the central hospital conditional grant;
    - tightened provincial health votes and health inflation remaining above general inflation; and
    - wide scale rank and leg promotions for health staff.
- An inability to retrench or transfer staff which prevented tackling of inequity and inefficiency.
- The difficulties imposed by the rules governing management of the public service.

These and other factors have placed pressure on the health service, and have led to concern about quality and efficiency. Staff morale and motivation have also been affected. The National Department of Health to its credit, facilitated an open look at the progress over the 1994-1999 periods, and emerged with a strategic framework to address the health priorities for the period 1999-2004. A ten-point plan "to strengthen implementation of efficient, effective and high quality services" is based on the following components:

- Decreasing morbidity and mortality rates through strategic interventions.
- Revitalisation of public health services.
- Accelerating delivery of an essential package of primary health care services through district health services.
- Improving resource mobilisation and management and equity in allocation.
- Improving human resource development and management.
- Improving quality of care.
- Enhancing communication and consultation in the health system and with communities.
- Legislative reform.
- Re-organisation of certain support services.
- Strengthening co-operation with international partners.

On this basis, accelerating quality health service delivery was identified as a strategic focus for the next five years.

2.4 Overview of the Health Care Status In The North West Province

The North West Department of Health is situated within the North West Province, with the province being spatially a medium – size province, consisting of the Bophirima, Southern, Central, and Bojanala district regions. It has twenty-two districts, one from the former Cape Province, ten from the former Transvaal and eleven from the former Bophuthatswana.

The North West province has grown to 3,669,349 million people from the 1996 population census to 2001 census. This marks an increase in the headcount of 314,524 from the last census results. Roughly 65% of people in the province live in non-urban areas. The population density is 31 people per square kilometre, which is slightly less than the national average of 36 people per square kilometre, and considerably less than Gauteng's approximately 468 people per square kilometre. The province's low population density has several implications with regard to the rendering of health services, particularly to small communities in rural areas. The Department has to operate a number of mobile clinics to render health services to communities that live far from fixed health facilities (Oosthuizen, 2004:7)

The distribution of the population by health region is as follows: Bojanala (32%), Mafikeng (centrally 21%, Vryburg (12%) and Southern (16%). According to the finding of census 2001, the results reveal that the majority of the population is young – with the majority percentage of the youth falling in the 10-14-age range. The young population is typical of most developing countries (Oosthuizen, 2004:7).

2.4.1 Broad Structure of the North West Department of Health

According to Oosthuizen (2004:7) the department has the following health facilities:

- 4 provincial (level 2) hospitals
- 2 psychiatric hospitals
- 21 district hospitals
- 10 community hospitals
- 343 clinics and health centres
- 56 mobile clinics

The department of health participates in several public private partnerships (PPP 's) initiatives. These includes the outsourcing of management of drugs in procurement and distribution to a private provider operating the medical stores on managed care principles, with other initiatives involving the outsourcing of security, catering and waste management.

2.4.2 Impact of HIV/AIDS on the Population Within the Province

According to Oosthuizen (2003:9) the infant mortality rate within the North West province has increased significantly during the period 1994-2000. The estimates are 108 000 and 127 000 respectively. The projections for the future look discouraging with an estimate of 139 000 during 2005. The estimates are quite high, mainly due to the impact of HIV/Aids on the population.

HIV prevalence in the North West Province has steadily increased over the period 1997-2001. This can be seen from table 2.1, which reflects the HIV prevalence by region over the period 1997-2001.

Table 2.1. HIV Prevalence By Region in the North West Province: 1997 to 2001 (Oosthuizen, 2003:8)

Year	*Southern Region*	*Mafikeng*	*Bojanala*	*Vryburg*	*Province*
1997	21.4	19.6	18.6	13.8	18.1
1998	30.3	23.2	19.7	15.8	21.3
1999	27.6	23.6	24.4	16.0	23.1
2000	28.4	24.4	22.5	17.1	22.9
2001	33.5	22.0	27.4	13.0	25.2

- **HIV/AIDS Policy**

  The primary objectives behind the North West Department of Health's HIV/AIDS policy, which was developed to be consistent with that of the national Department of Health, are to reduce the number of HIV infections and to reduce the impact of HIV/AIDS on individuals, and families. In pursuit of these objectives, the Department identified the following as its priority areas: prevention, treatment, care and support, human rights, monitoring, research and evaluation.

The Department of Health has adopted the following strategies to achieve the objectives of the policy:

- The provision of HIV/ AIDS/ STD (sexually transmitted diseases) education to increase public awareness;
- Increased access to voluntary HIV testing and counselling to promote behavioural change and appropriate referral to services;
- Improvement of STD management, to reduce STD and HIV incidence and prevalence;
- Improved treatment of HIV positive persons and persons with AIDS, thereby promoting better quality of life and limit the need for hospital care;
- Increased number of projects that target HIV high transmission areas;
- Improved prevention and treatment of TB and other opportunistic infections;
- Strengthened the capacity of health personnel to provide HIV/AIDS, STDs and TB treatment, care and support;
- Implementation of future comprehensive treatment plans for HIV/AIDS patients.

2.4.3 Impact of Tuberculosis within the Province.

In respect of TB, the following were observed in 2001-2002:
During the period 2001, 13923 patients were registered on the electronic TB register. Of these, 12073 or 86% were people who never had TB before (new patients), and 1926 or 13.8% were people who had, had a previous attack of TB (re-treatment patients).

Tuberculosis distribution according to age groups indicated that 29% of patients were within the age group 25-34 years and 26% within the 35-44 years age group. The age group 15-44 years accounts for 69% of the caseloads, which coincides with the age groups of highest HIV+ prevalence. Overall, the incidence of TB in the province is 409/100000; whereas internationally an incidence of higher than 200/100 000 is regarded as a serious epidemic.

Table 2.2 below shows that during 2001/2002, tuberculosis was the most commonly notified disease, accounting for 94.7% of all notifications, followed by malaria with 328 cases, pesticidal poisoning with 167 cases, and measles with 66 cases.

Table 2.2 Notifiable Diseases Within the North West Province 2001/2 (Oosthuizen, 2003:11)

Disease	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Total
Acute flaccid paralysis	0	2	2	0	0	1	0	1	2	0	0	2	10
Cholera	0	0	0	0	0	0	0	0	0	0	0	1	1
Food Poisoning	0	1	0	0	0	0	0	0	0	0	0	0	1
Malaria	39	41	27	5	23	9	12	16	22	99	32	3	328
Measles	1	1	0	1	19	10	32	9	8	0	3	2	86
Meningo-coccal Infection	0	0	1	0	1	1	1	0	0	0	0	0	4
Pesticidal Poisoning	52	4	11	6	13	18	12	9	7	11	15	9	167
TB intestines	1	0	0	1	0	0	0	0	0	0	0	0	2
TB meninges CNS	9	10	9	0	1	19	9	10	12	10	6	2	97
TB miliary	4	5	19	9	22	3	2	7	1	0	3	1	76
TB other organs	19	19	24	20	38	16	49	16	13	34	7	3	258
TB other Respiratory	0	0	0	0	1	0	0	0	0	0	0	0	1
TB primary	18	42	48	76	88	80	71	46	25	35	30	3	562
TB pulmonary	782	1054	861	851	846	845	903	995	570	856	666	168	9397
Tetanus	1	0	0	0	0	0	0	0	0	0	0	0	1
Typhoid fever	0	0	0	0	0	0	0	0	0	3	0	0	3
Viral hepatitis A	0	0	0	1	0	2	0	1	0	0	1	1	6
Viral hepatitis B	0	0	2	1	0	0	1	1	0	0	1	0	6
Viral hepatitis non A-B	0	0	0	0	0	0	1	0	0	0	0	0	1
Total	*925*	*1179*	*1040*	*973*	*1040*	*996*	*1098*	*1110*	*651*	*1049*	*763*	*192*	*10980*

The aim of the Department's policy on Tuberculosis is to reduce the incidence of this disease in the North West Province. Towards this end, the Department has adopted the DOTS (directly observed treatment strategy) approach to managing this ailment. This approach advocates that once patients are diagnosed with TB, and treatment is prescribed, a treatment supporter should be identified (by the patient) to ensure that the TB patient takes his/her anti-TB drugs regularly. Through this approach it is hoped that TB patients presenting at primary health care services will be cured, without them necessarily spending months in hospitals or waiting for hours to be treated at clinics and community health centres (Oosthuizen, 2003:11).

2.4.4 Miscellaneous Provincial Health Care Indicators

- **Maternal Mortality Rate**

The reported figures for maternal mortality rates were: 185/100 000.

- **Live Births**

In 2001/2002, 48/100 000 live births were reported.

- **Major causes of death:**

Common killer diseases in children for the period 2001/2002 were as follows (Oosthuizen, 2003:12):

- Pneumonia (bacterial).
- Pneumonia (PCP).
- Gastro enteritis.
- Meningitis (bacterial).
- Meningitis (cryptococcal).

Common killer diseases (medical) in adults for the period 2001/2002 were as follows (Oosthuizen, 2003:12):

- Tuberculosis (TB).
- Pneumonia (bacterial).
- Pneumonia (PCP).
- Gastro enteritis.
- Meningitis (bacterial).
- Meningitis (cryptococcal).
- Diabetes Mellitus (complications).
- Hypertension (complications, e.g. stroke).

Most common causes of hospital admissions in Klerksdorp/Tshepong/Potchefstroom/Witrand (KTPW) Hospital Complex were as follows Oosthuizen (2003: 13):

- Cardiac failure.
- TB/AIDS related conditions.
- Diabetes.
- Peptic ulcer.
- Trauma.
- Bullet wound.
- Laparotomy.
- Fractures
- Hypertension.
- Asphyxia prematurity.
- Gastro enteritis.
- Pneumonia.
- Hernia repair.
- ENT-tonsillectomy.
- Opthamology-lens implants.
- MVA (motor vehicle accident)

2.4.5 Major Health Service Challenges facing the North West Department of Health

The key challenges identified, among them are as follows (Oosthuizen, 2004: 9):

- To integrate the various departmental and transversal information systems into one management information system to assist in improved decision – making and planning.
- To improve the implementation of the Uniform Patient Fees billing systems at all hospitals so as to ensure greater revenue generation.
- To implement the NDOH (National Department of Health) comprehensive treatment to patients infected and affected with HIV and AIDS.
- To improve quality of services by implementing clinical guidelines and improving peer review and clinical audit mechanisms at all facilities.
- To implement the designated provider network and pharmacy management benefit policy.
- To maintain the high level of immunisation coverage of one-year olds achieved by immunisation services.
- To implement new legislation.

- To expand tuberculosis control, especially with regard to cure rate, smear conversion rate and interruption rate.
- To decentralise district health services to appropriate level.

Whilst no direct referring to medicine is noted, it is apparent that the provision and availability of essential medicines is an integral component for essential health care delivery. Therefore importance should be given with regard to the improvement, provision and availability of essential medicines to health communities.

2.5 Managed Health Care

Managed care has been developed in response to ever-increasing health care costs and dysfunctional fragmented services, and it covers a range of activities carried out in different organisational settings (Fairfield *et al.*, 1997:1823).

A definition of managed health care offered by Iglehart (1994:1167-1171) is as follows: *"a variety of methods of financing and organising the delivery of comprehensive health care in which an attempt is made to control costs by controlling the provision of services".*
Pohly (1999:61) defines managed care as systems and techniques used to control the use of health care services. It includes a review of medical necessity, incentives to use certain providers, and case management. Managed care is a broad term and encompasses many different types of organisations, payment mechanisms, review mechanisms and collaborations.

Therefore managed care (also called managed health care) is any method for organising health care providers, usually doctors and hospitals, in an attempt to achieve the dual goals of

- controlling health care costs; and
- managing the quality of care.

Managed care organisations use various utilisation management strategies to control use of services. The basic idea is to review and supervise expensive decisions, ensuring that they accord with prescribed guidelines. Utilisation management seeks to reduce health care costs primarily by avoiding unnecessary hospital admissions and reducing length of stay (Fairfield *et al.*, 1997:1824). Pharmacy benefit management tools used to control the rapid growth of medication utilisation and pharmaceutical expenditures can be divided into 5 primary categories namely; disease management, utilisation management, formulary management, delivery or

management systems and benefit design and consumer cost sharing as illustrated in figure 2.1 (Scott, 2001: 1-22; Pharmacy Benefit Management Institute, 2001:1).

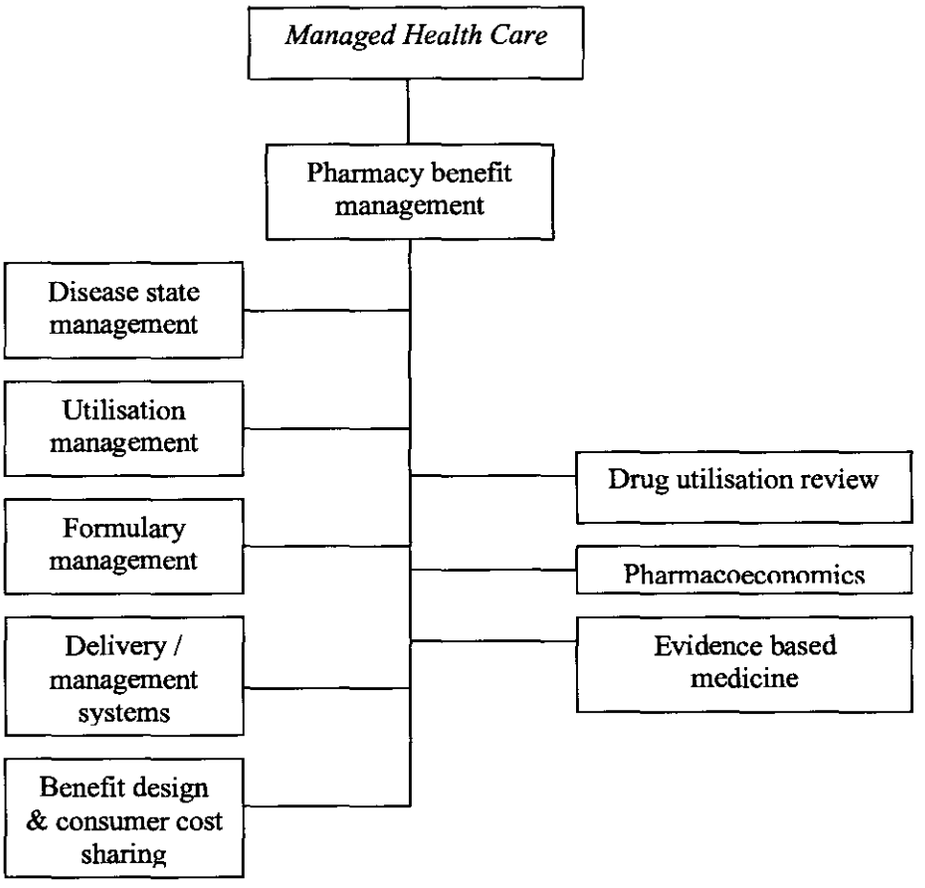


Figure 2.1. Primary categories of managed health care as adapted from Scott (2001: 1-22) & Pharmacy Benefit Management Institute (2001:1).

Disease management is often regarded as one of the ways of achieving the implementation of a managed care programme, but also is viewed as a mechanism aimed at improving cost effectiveness of care. The disease management approach to patient care seeks to coordinate resources across the health care delivery system. A combination of patient education, provider use of practice guidelines, appropriate consultation, and supplies of drugs and ancillary services all come together in the disease management process (Hunter & Fairfield, 1997:50-53).

The disease management process has three parts namely (Delby, 1996:4-8):

- A knowledge base that quantifies the economic structure of the disease and includes guidelines covering care to be provided, by whom, and in what setting for each part of the process.
- A care delivery system without traditional boundaries between medial specialties and institutions.
- A continuous improvement process, which develops and refines the knowledge base, guidelines and delivery systems.

Although the concept of "managed health care" and the implementation thereof has been directed at the private health care environment in the last ten years, the principles and concepts have been used by the public health care sector for decades. Table 2.3 below represents a few examples of principles of managed health care that have been implemented in both the private and public health care environments.

Table 2.3 Principles of Managed Health Care Implemented In The Private and Public Health Care Environments.

Principle	*Private Health Care*	*Public Heath Care*
Medicine Availability	"Freely"	Limited formulary
Medicine Selection	MCC registration	MCC registration/Evidence Based
Procurement	Limited sources	Alternative and negotiable
Price	Negotiable	Fixed tender price
Utilisation	Less controlled	More controlled
Prescribed protocols	Less regulated	More regulated

The difference may be at least in the terminology used in the public and private sectors but the principles used remain the same (see also paragraphs 2.5.2 and 2.5.3) with the private sectors implementing more and more of these methods to control cost and usage patterns of medicines.

2.5.1 Pharmacoeconomics

2.5.1.1 Pharmacoeconomics defined

Pharmacoeconomics is generally defined as " *the description and analysis of the costs and consequences of pharmaceuticals and pharmaceutical services and their impact on individuals, health care systems, and society*" (Bootman, 1995:S16). Pharmacoeconomics is being adopted as a health science discipline by the pharmaceutical industry, academic pharmaceutical sciences, and pharmacy practitioners across the world.

Pharmacoeconomics is a division of outcomes research. Outcomes research efforts can be classified into five areas (Bootman, 1995:S16) which includes

- evaluation of variations in medical practice patterns;
- evaluation of the effectiveness of treatments and other interventions;
- evaluation of the appropriateness of therapeutic alternatives, which determines circumstances in which a treatment should or should not be used;
- evaluation and development of tools for identifying patient preferences about treatment options; and
- use of methods for measuring changes in health status and patient satisfaction with the health care process.

Therefore pharmacoecomics not only measures the clinical and cost impact of health care but also the outcomes that take the patient's perspective into account.

2.5.1.2 Overview of Pharmacoeconomic Methods

Pharmacoeconomic research includes four main research methods of economic evaluation, each dealing with costs but differing in the way that the consequences of health care programmes are measured and valued (Drummond *et al.*, 1997:2). Table 2.4 summarises these methods in terms of measurements of costs and consequences

Table 2.4 Measurements of Costs and Consequences in Economic Evaluation (Drummond *et al.*, 1997:2).

Type of study	*Measurement / valuation of cost in both alternatives*	*Identification of consequences*	*Measurement / valuation of consequences*
Cost-minimisation analysis	Monetary	Identical in all relevant respects	None
Cost-effectiveness analysis	Monetary	Single effect of interest, common to both alternatives, but achieved to different degrees	Natural units (e.g. life years gained, blood pressure reduction, etc)
Cost-utility analysis	Monetary	Single or multiple effects, not necessarily common to both alternatives	Health years or (more often) quality-adjusted-life-years
Cost-benefit analysis	Monetary	Single or multiple effects, not necessarily common to both alternatives	Monetary value

2.5.1.3 Uses of Pharmacoeconomic Data

Pharmacoeconomic literature can be used to support a variety of decisions with impacts ranging from the individual patient to an entire health care system. Pharmacoeconomic data can be used in the following ways (Mullins and Wang, 2002:9; Sanchez, 1999:1630):

- *Individual patient treatment.* Pharmacoeconomic data are often critical to determining which treatment alternative or course of therapy has the best clinical, economic, and humanistic profile.
- *Formulary management.* Pharmacoeconomic data are invaluable for supporting formulary management by assessing the value (economic, clinical, and humanistic outcomes) on health care products and services. The application of pharmacoeconomics in formulary development, results in a formulary with lower cost trends that recognise the need to improve clinical, economic, and humanistic outcomes of patients (White, 2001:1).

- *Drug-use guidelines.* Pharmacoeconomic literature can help with the development of guidelines according to which treatment alternatives and dosage regimens are in the best interest of the patient and the organisation. Pharmacoeconomic studies can further enhance the impact of therapeutic guidelines as they are primarily clinically and economically based.
- *Disease management initiatives.* The goal of disease management programmes is to promote the most cost-effective treatments for specific diseases and disorders. PBMs utilise disease management programmes to promote patient compliance with drug regimens and improve health outcomes. Disease management decisions should be based on sound pharmacoeconomic data to ensure that quality care is optimised per health monetary unit spent.
- *Pharmaceutical services evaluation.* Pharmacoeconomic data from the literature can be useful in determining the value of an existing pharmaceutical service, estimating the potential worth of a proposed service, and capturing the value of a cognitive clinical intervention.

Clearly, the use of pharmacoeconomics, when combined with sensitivity to the unique needs of individuals, can help plans and management to create the most cost-effective, outcome-focused, and humane prescription benefit for all constituents-payers, physicians, and most importantly, patients (White, 2001:5). This study utilises information aspects of pharmaceuticals related to procurement and distribution for control purposes and evaluation procedures in decision making. Pharmacoeconomics, as a managed health care tool thus provides useful information for management decision-making purposes.

2.5.2 Drug Utilisation Review (DUR)

Drug utilisation reviews (DUR) provide the mechanism for developing standards, assessing current therapy, and implementing a specific intervention followed by reassessment of drug utilisation. DUR has therefore been adopted as a mechanism for balancing cost-containment and quality in prescription drug programmes (Kreling & Mott, 1993:415-417; Blackburn, 1993:14). DUR programmes include evaluation of drug use patterns in relation to standards, as well as efforts to correct those usage patterns that are inconsistent with the standards (Kreling & Mott, 1993:420). These DUR programmes are generally accepted as important components of quality assessment processes (Blackburn, 1993:19).

2.5.2.1 Drug Utilisation Review Defined

DUR according to Edgren (1996:117) is defined as *an authorised, structured and continuing programme that reviews, analyses, and interprets aggregate patterns of medication use measured against predetermined standards and criteria for specific health care delivery systems.* Kreling and Mott (1993:416) refer to DUR as a variety of utilisation review activities. These activities can be classified into one of two categories namely: DUR studies and DUR programmes.

2.5.2.2 Classification of DUR Studies

Drug utilisation review studies can be classified as quantitative or qualitative studies. *Quantitative studies* involve collecting, organising and displaying estimates or measurements of drug use. The results of these activities usually take the form of absolute or relative quantitative data describing the use of drugs within specified time frames and drug, patient and/or prescriber categories.

Quantitative DUR studies have been used (Sacristan & Soto, 1994:300)

- to ascertain the quantities of drugs consumed in a specific period and in a specific geographical area (national, regional, local);
- to investigate the development of drug utilisation over time;
- to compare drug consumption in different geographical areas;
- to identify areas of possible over or under-utilisation of drugs;
- to estimate the utilisation of drugs according to certain variables (age, sex, social class, etc.) and;
- to estimate the prevalence of particular illnesses based on the consumption of drugs utilised in their treatment.

Qualitative studies include collecting, organising, analysing and reporting information on the rationality of drug use (Kreling & Mott, 1993:416). Therefore these studies set out to determine the appropriateness of drug consumption through the establishment of quality criteria for drug use, such as duration of treatment, the most suitable dosage for each indication, the most effective and/or safe choice of drug for each indication, the choice of efficient drugs, utilisation of fixed combinations of drugs, etc (Sacristan & Soto, 1994:300).

Both quantitative and qualitative DUR studies may be combined into a single effort to produce information about patterns and amounts of drug use as well as quality of drug use.

DUR studies may be further distinguished as prospective, concurrent and retrospective.
Prospective DUR refers to programmes where the evaluation of therapy, and intervention if necessary, occurs before the patient receives the first dose of a drug thereby anticipating and avoiding problems that might occur in a particular patient prior to consumption of the drug (Blackburn, 1993:15; Sacristan & Soto, 1994:301).

Concurrent DUR takes place during the period when patients and drug dispensers interact; thus, the responsibility of the review of the drug therapy for appropriateness and correctness rests with the pharmacist (Kreling & Mott, 1993:416; Guo *et al.*, 1997:28).

Retrospective DUR serves to identify previous trends in drug use and may be used to develop future interventions designed to enhance drug use (Kreling and Mott, 1993:416). Retrospective DUR describes programmes where the evaluation of therapy and intervention is performed after the patient had completed the therapy (Blackburn, 1993:15).

2.5.2.3 Units Of Measurement In The Drug Utilisation Studies

Assessment of the comparison of the use of individual drugs or groups of drugs requires some standardised units of comparison. According to Smid and Kilonzo (1999:1) it is important to have both a classification system and a unit of measurement, in order to measure drug use. According to the ATC (Anatomical Therapeutic Classification) system (refer to Par 3.2), drugs are divided into various groups according to the bodily organ or system on which they act and their chemical, pharmacological, and therapeutic properties.

The WHO Drug Utilization Research Group (DURG) chose the defined daily dose (DDD) technique to convert figures on drug consumption from different sources into comparable units (Sacristan & Soto, 1994:301). The DDD is defined as the assumed average maintenance dose per day for a drug used for its main indication in adults. The DDD for substances is normally based on monotherapy (Smid & Kilonzo, 1999:1).

Most often data are presented as the numbers of DDDs per 1000 inhabitants per day, which is a technical measurement that allows comparisons between different time periods and between

geographical areas. In general, the DDD methodology is a valuable step in overall drug use measurement, but for more precise estimates of drug use it must be supplemented by other techniques (Sacristan & Soto, 1994:301). Both of these approaches form part of this study.

DUR and pharmacoeconomics both concern the consumption patterns of drugs, and their implications (Garratini & Tognoni, 1993:162). The use of drug utilisation studies in conjunction with pharmacoeconomic analysis can result in more cost-effective utilisation of medicines and a better utilisation of pharmacoeconomic methods, both of which contribute to a more rational use of drugs (Sacristan & Soto, 1994:299).

2.5.3 Evidence - Based Medicine

Seeking an evidence base for medicine is as old as medicine itself, but in the past decade the concept of evidence based medicine has done a good job in focussing explicit attention on the application of evidence from valid clinical research to clinical practice (Knottnerus & Dinant, 1997:1109).

2.5.3.1 Evidence - Based Medicine Defined

Sackett *et al.* (1996:71) defined evidence-based medicine as the *"conscientious, explicit and judicious use of the current best evidence in making decisions about the care of individual patients."*

According to Lohr *et al.* (1998:1) evidence - based medicine focuses on the use of the best available clinical (efficacy) evidence to inform decisions about patient care. Strauss and Sackett (1998:339) stated that evidence based medicine involves integrating clinical expertise with the best available clinical evidence derived from systematic research.

2.5.3.2 Steps Necessary in the Practise of Evidence - Based Medicine

The practice of evidence - based medicine is a process of lifelong self-directed learning in which caring for patients creates a need for clinically important information about diagnoses, prognoses, treatment and other health care issues.
Five steps are necessary to the practice of evidence-based medicine. These are briefly summarised as follows:

- Convert the need for information into clinically relevant, answerable questions.
- Find, in the most efficient way, the best evidence with which to answer these questions (whether the evidence comes from clinical examination, laboratory tests, published research, or other sources).
- Critically appraise the evidence for its validity and usefulness (clinical applicability).
- Integrate the appraisal with clinical expertise and apply the results to the clinical practice.
- Evaluate performance.

2.5.3.3 Advantages of Evidence - Based Medicine

Straus and Sackett (1998:339), have summarised the possible advantages of evidence based medicine as follows:

- ❖ Practising evidence-based medicine allows clinicians to keep up with the rapidly growing body of medical literature.
- ❖ Evidence - based medicine improves clinicians' skills in asking answerable questions and finding the best evidence to answer these questions.
- ❖ Evidence - based medicine can provide a framework for critically appraising evidence.
- ❖ Practising evidence - based medicine encourages clinicians to integrate valid and useful evidence with clinical expertise and each patient's unique features, and enables clinicians to apply evidence to the treatment of patients.

Evidence - based medicine forms part of the baseliners to establish a medicine formulary or standard treatment guidelines in a health care environment. Thus, one would accept that the prescribing of the "top twenty" pharmaceutical products in a managed health care environment be based upon evidence – based criteria.

2.5.4 Management Information Systems

2.5.4.1 Management Information System Defined

A management information system (MIS) is defined as a man-made system that generally consists of an integrated set of computer-based and manual components established to facilitate an organisation's operational functions and to support management decision making by

providing information that can be used to plan and control the activities of the organization (Gelinas & Sutton, 2002: 13).

2.5.4.2 Management Process

The management process as a component of the management information system is a man-made system consisting of people, authority, organisation, policies, and procedures whose objective is to plan and control the operations of the organisation (Gelinas & Sutton, 2002: 13).

The three of the most prominent management activities are:

- Planning.
- Control.
- Decision-making.

2.5.4.3 Management Uses of Information

An information system serves two important functions within an organisation. Firstly, the information system mirrors and monitors actions in the operations system by processing, recording, and reporting of organisational events. The second major function is to support managerial activities, including management decision – making (Gelinas & Sutton, 2002: 13).

2.5.4.4 Data Versus Information

According to Gelinas and Sutton (2002: 31), information is defined as *"data presented in a form that is useful in a decision-making activity"*. The information has value to the decision maker because it reduces uncertainty and increases knowledge about a particular area of concern.
Data is defined *"as facts or figures in raw form"*. Data represent the measurements or observations of objects and events. To become useful to a decision maker, data must be transformed into information through data analysis (Gelinas & Sutton, 2002: 31).

2.5.4.5 Qualities of Information

For information to be useful in assisting managers and decision makers, it is essential that information posses the following important qualities, namely (Gelinas & Sutton, 2002: 31)

- Effectiveness.
- Efficiency.
- Confidentiality.
- Integrity.
- Accuracy.
- Availability.
- Compliance.
- Reliability.

2.5.4.6 Management Decision Making

Decision making is the process of making choices. It is the central activity of all management. Simon, H. (1960) as quoted by Gelinas and Sutton, (2002:37) describes decision making as a three-step process namely:

- *Intelligence:* searching the environment for conditions calling for a decision.
- *Design:* inventing, developing, and analysing possible causes of action.
- *Choice:* selecting a course of action.

Decisions may be classified as structured or unstructured. Structured decisions may be defined as those for which all three decision phases (intelligence, design and choice) are relatively routine or repetitive. Unstructured decisions are those for which none of the decision phases (intelligence, design and choice) are routine or repetitive.

Planning and control are essential components of the decision-making process. A plan (also referred to as a strategy) is the means (organisational structure and processes) by which an organisation has chosen to achieve its objectives and critical success factors. Thus strategic planning is the process of selecting the organisation's long-term objectives and setting of strategies for achieving those objectives.

The strategic planning process may be summarised as follows (Gelinas & Sutton, 2002:59):

- Assess the environment for factors that may influence the selecting of objectives.

- ❖ Develop objectives (goals) through the assessment of the strengths and weaknesses of the environment.
- ❖ Derive critical success factors; these are factors that are central to the accomplishment of the objectives. Examples of these factors may include cost control, product pricing, etc.
- ❖ Develop a strategy and implement processes in support of the objectives.
- ❖ Identify performance indicators that will demonstrate achievement of the organisation's strategies and critical success factors.

Thus the planning process must ensure that individuals or functions work toward a common objective.

The concept of control is not new. Control together with planning and decision-making is one of the three primary functions in the management process. The primary reason for control is to help ensure that system goals are achieved.

The major reasons for exercising control over management processes are the following:

- To provide reasonable assurance that the goals of each process are being achieved.
- To mitigate the risk that the organisation will be exposed to acts such as losses due to fraud, etc.
- To provide reasonable assurance that certain legal obligations are being met.

Monitoring and evaluation are an integral part of the management cycle, and act as means by which the management process can be controlled. Systematic monitoring, based on programme objectives and linked to specific activities, is essential for improving performance and achieving long-term programme goals. Indicators can be used to help measure changes directly or indirectly and assess the extent to which the targets and objectives of a program are being attained.

2.5.4.7 Uses for Management Information Systems in Managed HealthCare Environment

According to Chetty (1999:55) the use of management information systems may be summarised in the following points, namely:

- ❖ To determine the overall and per patient costs.
- ❖ To track and identify costs that are high and warrant an explanation.
- ❖ Tracking of costs to compensate physicians who are compensated based on cost centres.
- ❖ To track information that is crucial to negotiate capitation contracts.
- ❖ Gathering information needed for strategic planning.

- ❖ Gathering information with fields to measure patient satisfaction (e.g. waiting time, perceived quality of care, etc.)
- ❖ The use of electronic data interchange in conjunction with management information systems capabilities will decrease costs, increase efficiency and increase payment rates.
- ❖ Management information systems are important to track referrals and practice patterns; the requests of the tests and procedures.
- ❖ To track utilisation and then institute measures to modify its own behaviour.

In this study the information provided by the medical stores in the North West Province will form the base to analyse aspects of medicine provision

2.6 Drug Management Systems

Drug management is concerned with practical ways in which governments, policy makers, and essential drugs programmes managers, and others can work to ensure that high-quality essential drugs are available, affordable, and used appropriately.

Five broad themes capture the most important insights regarding managing drug supply (Quick *et al.*, 1997:15):

- ➢ National drug policy provides a sound foundation for managing drug supply.
- ➢ Wise drug selection underlies all other improvements.
- ➢ Effective management saves money and improves performance.
- ➢ Rational drug use requires more than drug information.
- ➢ Systematic assessment and monitoring are essential.

2.6.1 National Drug Policy (NDP) Providing a Sound Foundation for Managing Drug Supply

A national drug policy is a guide for action, containing the goals set by the government for the pharmaceutical sector, their relative importance, and the main strategies and approaches for attaining them. Through the development and implementation of a national drug policy, governments hope to guarantee availability and access to effective, high-quality essential drugs for the population and to ensure that they are properly used.

The South African national drug policy aimed at equity in the provision of health for all, with the goal being " to ensure adequate and reliable supply of safe, cost-effective drugs of acceptable

quality to all citizens of South Africa and the rational use by prescribers, dispensers and consumers". Specific objectives were set out in this framework in terms of health, economic, and national development (Department of Health, 1996:3), these are illustrated in table 2.5.

Table 2.5 Specific Objectives of the National Drug Policy (Department of Health, 1996:3)

Health objectives	***Economic Objectives***	***National Development objectives***
To ensure the availability and accessibility of essential drugs to all citizens.	To lower the cost of drugs in both the private and public sectors.	To improve the knowledge, efficiency and management skills of pharmaceutical personnel.
To ensure the safety efficacy and quality of all drugs.	To promote the cost-effective and rational use of drugs.	To reorientate medical, paramedical and pharmaceutical education towards the principles underlying the national drug policy.
To ensure good dispensing and prescribing practices.	To establish a complementary partnership between government bodies and private providers in the pharmaceutical sector	To support the development of the local pharmaceutical industry and the local production of essential drugs.
To promote the rational use of drugs by prescribers, dispensers, and patients through the provision of the necessary training, education and information.	To optimise the use of scarce resources through cooperation with international and regional agencies.	To promote the acquisition, documentation, and sharing of knowledge and experience through the establishment of advisory groups in rational drug use, pharmacoeconomics and other areas of the pharmaceutical sector.
To promote the concept of individual responsibility for health, preventive care and informed decision-making.	To lower the cost of drugs in both the private and public sectors.	

Components of a national drug policy are linked to key policy objectives (WHO, 2001:7); most components cannot be linked to one objective only as illustrated in table 2.6 below.

Table 2.6 Components of A National Drug Policy Linked To Key Policy Objectives (WHO, 2001:7)

Components:	*Objectives:*	*Access*	*Quality*	*Rational Use*
Selection of essential drugs		X	(X)	X
Affordability		X		
Drug financing		X		
Supply systems		X		(X)
Regulation and quality assurance			X	X
Rational use				X
Research		X	X	X
Human resources		X	X	X
Monitoring and evaluation		X	X	X

X = direct link; (X) = indirect link

This study mainly focuses on the monitoring and evaluation of the provision of the "top twenty" pharmaceutical products as indicators of drug usage. Other aspects that receive direct and indirect attention include:

- inventory control, prevention of theft and waste (supply systems)
- commitment to measures to improve efficiency and reduce waste (drug financing)
- regulatory and managerial strategies to promote rational drug use (rational use)
- the need for operational research in drug access, quality and rational use (research)
- monitoring of the pharmaceutical sector through regular indicator - based surveys

2.6.2 DUR and the National Drug Policy

Drug utilisation studies and reviews can be used as a managed health care tool to determine the objectives set out by the framework of the National Drug Policy (NDP) in the following ways:

- *Economic importance*: the NDP aims to ensure the availability of safe and effective drugs at the lowest possible cost, also to promote research that will focus particularly on the economics of drug supply and cost. DUR studies can be implemented to achieve these aims.
- *Clinical research:* DUR studies can serve as a tool, by which the health objective of the NDP regarding the importance of research in problems relating to prescribing and

dispensing at different levels of the health system can be achieved. DUR provides a means by which prescribing patterns of practioners/prescribers can be compared.

- *Quality assurance:* one of the aims of the NDP is to ensure that drugs reaching the patients are safe, effective and suitable to meet approved standards and specifications. DUR studies can provide a means of measurement for quality assurance analysis.
- *Importance to the management:* an important objective of the NDP is to promote the rational use of drugs. DUR can be used to determine the amount of drugs consumed, thus serving as an indication for the extent and nature of manufacturers and health care personnel available.

Couch (1998) identified the "8 P's" or goals necessary to achieve and maintain an effective drug policy. These goals can be seen in table 2.7.

Table 2.7 The "8 P's": Goals of Health Care Stake Holders Regarding the Medicine Policy (Couch, 1998:1).

Health care stake holder	*Goals*
Patient Goals	Maintain or improve health status and productivity. Decrease health care utilisation and out of pocket costs. Simplify and improve the effectiveness of selfcare. Emphasise prevention. Improve quality of life and functioning ability.
Practitioner Goals	Decrease health care utilisation where cost reimbursement is capitated. Rationalise and standardise diagnosis and treatment. Improve patient outcomes. Demonstrate superior value to purchasers, payers and patients.
Provider goals	Decrease resource utilisation. Accelerate patient disclosure. Decrease readmission. Rationalise diagnosis and treatment. Improve patient and outpatients outcomes. Smooth transition across the spectrum of care settings. Demonstrate superior value to purchasers and payers.

Table 2.7 (cont) The "8 P's": Goals of Health Care Stake Holders Regarding the Medicine Policy (Couch, 1998:1).

Health care stake holder	*Goals*
Purchaser goals	Manage overall health costs. Improve patient outcomes and employee health, productivity and satisfaction. Prosper in managed, perhaps capitated, health care environment. Demonstrate a favourable health benefits return on investment to senior management and shareholders.
Payer goals	Decrease per member or per month costs. Stay within capitation allowances. Improve members' health status and plan satisfaction. Maintain and increase plan enrolment and re-enrolment. Keep premiums at a competitive level. Demonstrate superior value to purchasers.
Pharmaceutical company goals	Improve production and processing efficiency. Stay within capitated allowances in risk sharing arrangements. Establish long term customer relationships or partnerships.
Pharmacy benefit manager goals	Evaluate the patterns of medicine utilisation across populations more cost effectively. Improve the efficiency in identifying instances of over-utilisation, under-utilisation or misutilisation.
Policy maker goals	Manage overall health costs. Improve, or at least not sacrifice quality of care. Function in more of a managed care environment. Demonstrate to taxpayers that value has been received or provided.

Whilst the study is involved in aspects to demonstrate to tax payers that volume has been received and provided, other objectives and perspectives are just as important.

2.6.3. The Pharmaceutical Supply System

The pharmaceutical supply system seems to be the most straightforward, however in reality this may be a more complex process due to the influence of external factors. It runs from the

manufacturer to the patient and passes through the medicine management cycle by means of four stages (Drummond *et al.*, 1998:2-3), namely

- ➔ procurement (purchase from manufacturers);
- ➔ distribution (routing through the pharmaceutical system);
- ➔ dispensing (delivery to patients); and
- ➔ utilisation(use of drugs).

In addition to these stages, the following functions are habitually involved:

- ➔ Selection (choice of drugs to be procured and distributed).
- ➔ Quantification, calculation and evaluation of the quantities required.
- ➔ Quality control (verification of compliance with standards).

2.6.4 Management of Drug Selection

Despite the potential health impact of essential drugs and despite substantial spending on drugs, lack of access to essential drugs, irrational drug use, and poor drug quality remain serious global public health problems (WHO, 2002:1). This is not a main aspect of this study and thus only a short overview will be provided.

Pharmaceuticals can provide great benefits but their cost is substantial. The selection of drugs has a considerable impact on the quality of care and the cost of treatment, and it is therefore one of the areas where intervention is most cost-effective (Quick *et al.*, 1997:122).

2.6.4.1 Implementation of the Essential Drugs Concept in South Africa

The essential drugs concept incorporates the need to update drug selections regularly to reflect new therapeutic options and changing therapeutic needs; the need to ensure drug quality; and the need for continued development of better drugs, drugs for emerging diseases, and drugs to meet changing resistance patterns.

More commonly, the selection and use of essential drugs are limited to public-sector health facilities. For each level of health care in the public sector a limited list of essential drugs is prepared as the basis for the supply of drugs, for prescribing in the public sector, and for the training of health workers (Quick *et al.*, 1997:122)

Essential drugs that are selected on the basis of safe and cost-effective clinical guidelines provide better quality of care and better value for money. The procurement of fewer items in larger quantities results in more price competition and economies of scale. Quality assurance, procurement, shortage, distribution and dispensing are all easier with a reduced number of drugs. Training of health workers and drug information in general can be more focused, and prescribers gain more experience with fewer drugs and are more likely to recognise drug interactions and adverse reactions (WHO, 2002:6).

The selection of a limited number of drugs improves the entire pharmaceutical system (Drummond *et al.*, 1998:7). In this study, the focus is on the selection and provision of medicine at hospital level.

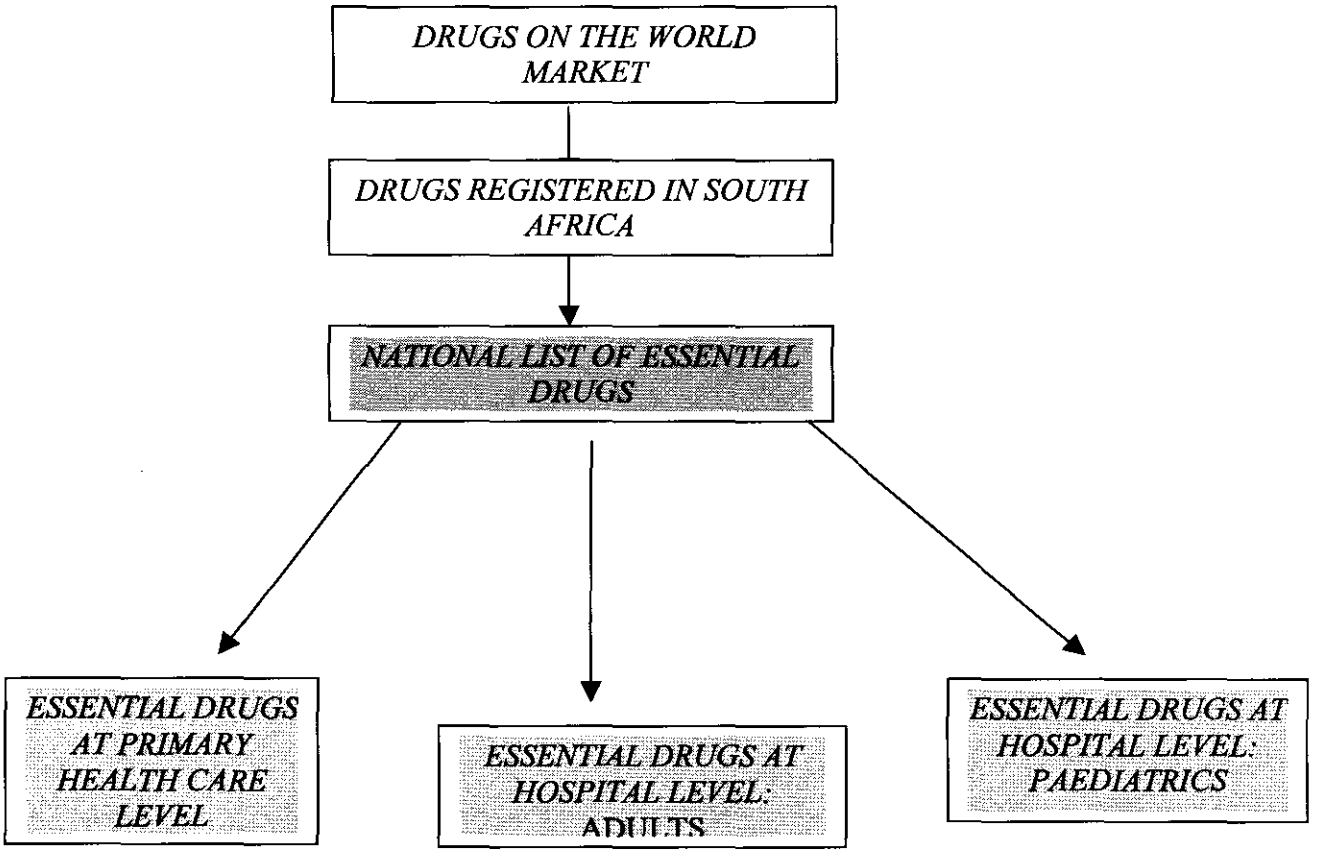


Figure 2.2. The Essential Drugs Target in South Africa (adapted from Quick *et al.*, 1997:128)

2.6.4.2 Selection Criteria

For a national essential drugs list to be credible and accepted, explicit criteria must be defined and published. The choice of drugs depends on many factors, such as (WHO, 1995:31):

- Pattern of prevalent diseases
- Treatment facilities

- The training and the experience of personnel
- The financial resources
- Pharmaco-genetic factors
- Demographic factors
- Environmental factors
- Evidence - based assessment of efficacy and safety.

South Africa based its selection of essential drugs on the World Health Organisation's criteria for the selection of essential drugs.

Another model for decision making for formulary purposes, the so-called *System of Objectified Judgement Analysis (SOJA)* system has its origins in Dutch Hospital formulary selection systems and has been applied to a number of drug groups. In the SOJA method, selection criteria for a given group of drugs are prospectively defined and the extent to which each drug fulfils requirements for each criterion is determined. Each criterion is given a relative weight, i.e. the more important a given selection criterion is considered, the higher the relative weight. Both the relative scores for each drug per selection criterion and the relative weight of each criterion are determined (Janknegt and Steenhoek, 1997:550).

The SOJA drug selection method makes provision for main and sub - criteria; this is illustrated below in table 2.8.

Table 2.8 Main and sub-criteria in drug selection (Adapted from Steenhoek *et al.,* 1989:186)

Main Criteria	*Sub-Criteria*	
		Packaging (manageable)
		Administration form
Pharmaceutical Phase		-solid/liquid
		-oral/parenteral
		-strength
	-Absorption	-Protein Binding
	-Distribution	-Dosage frequency
Pharmacokinetic Phase	-Metabolism	
	-Elimination	
	-Renal/hepatic impairment	
		Clinical efficacy
Pharmacodynamic Phase		Incidence and severity of adverse effects

Table 2.8 (cont) Main and sub-criteria in drug selection (Adapted from Steenhoek *et al.*, 1989:186)

Main Criteria	*Sub-Criteria*
Cost	Cost price of drug
	Additional costs associated with therapy
Documentation	Clinical efficacy/tolerability
	Clinical experience
	Dependency
Emotional Aspects	Supportive research
	Congresses visits etc.

Although it is in agreement that drug selection should be a rational process ('evidence-based medicine'), many other factors may play an important role in drug selection. The SOJA method should be used as a formulary decision-making model, and not for drug decision making in treating individual patients, as only drug-related selection criteria are taken into account, whereas patient -related factors (previous reaction to drug in question, age, renal or hepatic function, etc.) will play an important role in the individual patient. (Janknegt & Steenhoek, 1997:550).

The main advantage of the SOJA method is that drug decision-making processes are fully transparent. Potential drawbacks of the SOJA system are that it is time-dependant because new data on medicines are emerging constantly and there is some degree of subjectivity to the relative weighting of the selected criteria (Janknegt & Steenhoek, 1997:560).

From a public health standpoint, the selection of drugs should be based in the first instance on safety, efficacy, and sufficient quality, and only then on cost. According to the economic criterion for selection, efficiency assumes the ability to measure costs and to measure the efficacy (including the desired therapeutic effects and the risks inherent in any given quality) of drugs.

Economists seek to draw together all the effects of a drug into a single indicator that can be used to calculate a ratio. There are three methods for measuring these effects: effectiveness (as measured on natural scales such as life expectancy), benefits (as measured by monetary expenditures) and utility (as measured by well - being and quality of life). These pharmacoeconomic methods are discussed in paragraph 2.5.1.2.

According to WHO, (2000:29) a list of essential drugs is best developed for different levels of care, and on the basis of clinical guidelines for common diseases and complaints that can and should be diagnosed and treated at those levels. Together with a national list of essential drugs, treatment guidelines are powerful tools to promote the rational use of drugs. Figure 2.1 illustrates the EDL for different levels of care in South Africa.

According to Schrogie and Nash (quoted by Armstrong and Langley.1996: 55) treatment guidelines represent a consensus approach to the management of the majority of patients within a specific diagnosis. They identify different methods of disease management and make recommendations for initial and subsequent therapy. Armstrong *et al.* as quoted by (Armstrong & Langley, 1996: 55) stated that treatment guidelines should, when possible, encompass the clinical, economic, and humanistic outcomes of treatment.

The standard treatment guidelines and essential drugs lists are a core component of South Africa's efforts to address its major health problems.

The selection of essential drugs is thus one of the core principles of the national drug policy as it helps to set priorities for all aspects of the pharmaceutical system.

2.6.5. Management of Drug Procurement

Procurement may be defined as *"the process through which drugs may be acquired through purchase, donation, or manufacture"* (Quick *et al.*, 1997:165).

The main objective of procurement is thus to acquire the drugs that are strictly necessary at the least possible cost (Drummond *et al.*, 1998:13). An effective procurement process ensures the availability of the right drugs in the right quantities, at reasonable prices, and at recognised standards of quality (Quick *et al.*, 1997:165). This is not a main aspect of this study, and therefore only a short discussion of drug procurement will be given with specific reference to quantification methods to determine procurement requirements.

Limiting procurement to drugs on an essential drugs list, allows the health system to concentrate resources on the most cost-effective and affordable drugs to treat prevailing health conditions. An accurate quantification of procurement requirements is needed to avoid stock outs of some

drugs and overstock of others. Drug needs can be quantified by using one or a combination of these four standard methods, namely (Quick *et al.*, 1997:185):

- *Consumption method.* Uses records of past consumption of individual drugs (adjusted for stock outs and projected changes in drug utilisation) to project future need
- *Morbidity method.* Estimates the need for specific drugs based on the expected number of attendances, the incidence of common diseases, and standard treatment patterns for the diseases considered, i.e. drug requirements are estimated using standard treatment guidelines
- *Adjusted consumption method.* Uses data on disease incidence, drug consumption or utilisation, and/or drug expenditures from a "standard" or supply system and extrapolates the consumption or utilisation rates to the target supply systems, based on population coverage or service level to be provided.
- *Service-level projection of budget requirements.* Uses the average drug procurement cost per attendance or bed-day in different types of health facilities in a standard system to project drug costs in similar types of facilities in the target system. This method does not estimate quantities of individual drugs.

Past consumption is probably the most reliable way to predict and quantify future demand, providing that the supply pipeline has been consistently full and that consumption records are reasonably accurate. These aspects form a major part of this study. Such consumption data must be adjusted in the light of known or expected changes. The downside of basing quantification only on past consumption is that any existing patterns of irrational drug use will be perpetuated.

In cases where consumption data are incomplete or do not reflect real demand because the supply pipeline has not always been full and drug use has not always been rational, in such cases the morbidity-based and extrapolated consumption techniques should be used.

Larger procurement volume makes favourable prices and contract terms more likely, by increasing suppliers' interest in bidding and by providing them with an incentive to offer a competitive price. In decentralised procurement programmes, one way to sustain procurement volume is to negotiate prices centrally for a list of essential drugs and allow provinces, districts or health facilities to order the drugs as needed from the contract supplier. These strategies allow for optimal use of available storage and transport capacity, facilitate inventory management and ease cash flow constraints (Drummond *et al.*, 1998:21).

Possible strategies for procurement in an effort to optimise drug management are blind confidence, systematic distrust and cooperation (Drummond *et al.*, 1998:21).

A reliable management information system (MIS) is one of the most important elements in planning and managing procurement. The MIS should track the status of each order and payment, and compile information required for supplier monitoring. It is important that the MIS also track the number of orders placed, payments made, quantities actually purchased compared with estimates, purchases from all contract suppliers, and drug purchases from non-contract suppliers.

2.6.6. Management of Drug Distribution

According to Quick *et al*, (1997, 317), the primary management goal of a distribution system is *to maintain a steady supply of drugs and supplies to facilities where they are needed while ensuring that resources are being used in the most effective manner.* A good distribution system is a cost - effective system.

Dumoulin *et al.*, 1998:26 maintains that the objective of distribution is to enable patients who need drugs to have access to them. This includes geographical, physical and economical access.

The four major elements of a distribution system are as follows (Quick *et al.*, 1997:316):

- System design (*geographic or population coverage, number of levels in the system, push versus pull system, degree of centralisation).*
- Information system *(inventory control, records and forms, consumption reports, information flow).*
- Storage *(selection of sites, building design, materials handling systems, order picking).*
- Delivery (collection versus delivery, choice of transport, vehicle procurement, vehicle maintenance, routing and scheduling of deliveries).

A well-run distribution system should encompass the following:

- Maintain a constant supply of drugs through effective and efficient supply chain management.
- Keep drugs in a good condition; minimisation of drug losses due to spoilage and expiry.

- Reduce theft and fraud in the system.
- Ensure efficient clearance, storage, transport and stock control.
- Use of qualified staff to manage and operate the system.
- Use of an effective management information system to provide information and forecast drug needs.

The total cost of distribution comprises four elements: the expenses of the distributing units, the cost of delivery from the central procurement agencies to the pharmacies, the cost of losses through theft or expiry, and the monetary value of stock (Dumoulin *et al.*, 1998:30). Reducing the cost of losses in theory is the easiest. Stock levels should be carefully monitored to find both misappropriations and surpluses, as the latter are more likely to pass their expiry dates.

Stock turnover is the number of times stock is acquired and released in the course of a year. For a given quantity of drugs distributed, the more rapid the stock turnover, the less cash will be needed. Smaller stocks also require less storage space. However, rapid stock turnover may increase total transaction costs if each turnover involves a separate transaction to replenish stocks (Dumoulin *et al.*, 1998:30).

Outsourcing of the drug distribution is a way of managing the distribution process. There are various benefits gained from outsourcing of distribution, among them are reduction in cost of an organisation, less need to maintain an expensive internal infrastructure for providing a given service, the quality of service may be higher because of the competitive environment in which vendors operate. Efforts in improvement of drug distribution should occur in concert with efforts to improve the clinical use of drugs (Schneider, 1997:41). In the system investigated in this study the provincial authorities have outsourced the provincial medical stores to a private contractor.

The information required for the distribution process comprises the need to select and quantify drugs, and enough technical data to ensure proper conservation of drugs. The following may be distinguished regarding the information system from an economic point of view (Drummond, *et al.*, 1998):

➔ Information regarding supply

- availability of drugs (authorised drugs, drugs in stock)
- usefulness and efficacy of drugs (technical data)
- suppliers' prices and conditions of payment

➔ Information regarding demand

- drugs requested by prescribers and patients
- quantities required for procurement, distribution and dispensing
- quality of drugs; undesirable side-effects

➔ Information on the relationship between supply and demand

- actual consumption in volume and in value
- shortages
- current prices.

Effective drug distribution relies on a good system-design process and a compatible integrated information system and uniform national indicators on which management decisions may be based.

2.6.7. Management of Appropriate Drug Use

The aim of any drug management system is to deliver the correct drug to the patient who needs that medicine. The steps of selection, procurement, and distribution are necessary precursors to the appropriate use of drugs (Quick *et al.*, 1997:422).

2.6.7.1 Adverse Impact of Inappropriate Drug Use

Many of the gains of efficient selection, procurement and distribution can be lost by irrational prescribing and by lack of adherence to treatment by the patient (WHO, 2001:60).

Inappropriate drug use has both medical and economic consequences. In medical terms, inappropriate treatment may lead to unnecessary suffering and death, to iatrogenic disease and hospital admissions, and to increased microbial resistance. Inappropriate drug use also decreases public confidence in the health care system and attendance rates of curative and preventive

services. Economically, irrational drug use leads to an enormous waste of resources and to unavailability of essential drugs in other areas where they may be needed (WHO, 2001:60).

In Poland, the Consumer Federation compiled a list of the twenty most-sold drugs in Poland during 1994, based on sales data listing numbers of packages sold. An assessment of the twenty best-selling products, found 14 of the 20 to be irrational, ineffective, and potentially harmful, and felt the remaining six should have been used as frequently as sales data suggested (Mintzes, 1996:21).

There are many different factors that affect the irrational use of drugs. The major forces can be categorised as those deriving from patients, prescribers, the workplace, the supply system including industry influences, regulation, drug information and misinformation, and combinations of these factors (Boston University, 2002:6). Table 2.9 illustrates the interrelationship of factors and that problems rarely have a single cause. Aspects of information as part of the provider control systems are an important part of this study.

Table 2.9 Factors Underlying Irrational Use of Drugs (Boston University, 2002:6)

Patients	*Prescribers*	*Industry*	*Drug supply*	*Drug regulation*
drug misinformation	lack of education & training	promotion	inefficient management	availability of unsafe drugs
misleading beliefs	lack of drug information generalisation of limited beliefs and efficacy	misleading claims	non-availability of required drugs	informal prescribers etc.
inability to communicate problems	heavy patient load pressure to prescribe			

2.6.7.2 Measuring Drug Use: Quantitative Methods

Health managers and policy makers often need to know about the quantity and quality of drug use in a group of health facilities. Drug use indicators are intended to measure specific aspects of health providers and drug use in a hospital or health centre. Indicators provide information to health care managers concerning drug use, prescribing habits, and important aspects of patient care. They reflect the status of an important characteristic of the given health care service.

Indicators selected to assess a health care service should be relevant, easily generated and measured, valid, consistent, reliable, representative, sensitive to change, understandable, and action-orientated (MSH; 2002:1).

Indicator studies can serve useful purposes such as to:

- determine where drug use problems exist, (action can then be taken to improve this perhaps by comparing health facilities indicators to determine if a significant difference is exhibited);
- provide a monitoring mechanism, (repeating of indicator studies over periods of time will provide reliable information concerning the use of strategies to improve drug use problems); and
- motivate health care providers to improve and follow established health care standards.

To simplify and standardise the study of drug use, the WHO manual (WHO, 1993:9) defines twelve core and seven complementary drug use indicators (table 2.10) that measure key aspects of drug prescribing, patient care, and the availability of drugs and drug information at outpatient facilities.

The core indicators are highly standardised and do not require national adaptation. Although these indicators are not comprehensive, they provide a simple tool for quickly and reliably assessing a few critical aspects of drug use (WHO, 1993:9).

Complementary drug use indicators are less standardised than those of drug use indicators and require defining variables specific to the country or location. One important complementary indicator, for example, measures adherence to treatment guidelines. This indicator requires clear, explicit criteria to be reliable and informative (WHO, 1993:9).

Table 2.10 WHO Drug Use Indicators-Outpatient Facilities (WHO, 1993:9)

Core Drug Use Indicators	*Complementary Drug Use Indicators*
Prescribing Indicators	Percentage of patients treated without drugs.
Average number of days per encounter.	Average drug cost per encounter.
Percentage of drugs prescribed by generic name.	Percentage of drug costs spent on antibiotics.
Percentage of encounters with an antibiotic prescribed.	Percentage of drug costs spent on injections.
Percentage of encounters with an injection prescribed.	Prescription in accordance with treatment guidelines.

Table 2.10 WHO Drug Use Indicators-Outpatient Facilities (WHO, 1993:9)

Core Drug Use Indicators	*Complementary Drug Use Indicators*
Percentage of drugs prescribed from the essential drugs list or formulary.	Percentage of patients satisfied with the care they received.
	Percentage of health facilities with access to impartial drug information.
Patient Care Indicators	
Average consultation time.	
Core Drug Use Indicators	*Complementary Drug Use Indicators*
Average dispensing time.	
Percentage of drugs adequately labelled.	
Patient's knowledge of correct dosage.	
Health Facility Indicators	
Availability of the copy of EDL or formulary.	
Availability of key drugs.	

Indicator data from a study completed in the Kalahari District of the Northern Cape, South Africa as illustrated in table 2.11 identified that the number of items per prescription (2.1) was outside the target range (1.2-2.0). Comparisons with provincial baseline data, which had been collected using similar indicators, indicated that in the Kalahari Survey, prescribing of EDL drugs was more common (92.5 percent) than in the clinics visited in the provincial baseline survey (78 per cent). Prescribing by generic name was also more common (74.7 per cent compared to 33.9 per cent), but the use of antibiotics was similar, 40 per cent compared to 38 per cent).

Not only could more "rational" prescribing be demonstrated, but also that such changes (more EDL drugs, more use of generic medicines) are also associated with cost savings (Anon, 2002 b: 1).

Table 2.11 Indicator Data Results in Kalahari District (Anon, 2002 (b): 1).

Indicator	*Results in the Kalahari District*	*Ideal value (where possible)*
Average number of drugs per encounter	2.1	1.2 to 2.0
Percentage of drugs prescribed by generic name	74.7	100
Percentage of encounters with an antibiotic prescribed	40	<25%
Percentage of encounters with an analgesic prescribed	54	-
Percentage of encounters with an injection prescribed	0.4	-
Percentage of drugs prescribed from EDL	92.5	100
Percentage of drugs actually dispensed	99.5	100
Percentage of prescriptions which contained drug name, strength, dose and duration	48	100

An assessment of baseline studies conducted by the national and provincial departments of Health (Gray & Suleman, 1999:168) using indicators of rational drug use, included the degree of polypharmacy, prescribing by generic name, and accordance with the EDL. Collation of the results from seven provinces, assessed between April 1996 and March 1998, indicated the following:

- The average number of items per prescription were 2.5 at hospital level and 2.3 at clinic level (target 1.2 to 1.9)
- Thirty-five per cent of outpatients at hospital level and thirty-eight per cent of those at clinic level received at least one antibiotic (consensus on a target has not been reached, but figures in excess of twenty-five per cent are cause for concern)
- Thirty-one per cent of the drugs at hospital level are prescribed by generic name, and forty per cent of drugs at clinic level are prescribed by generic name.

The above results show that progress with regard to prescribing generics is slow. Although prescribing by generic name does not, in itself represent rational use of drugs, it is an important mechanism for reducing costs as well as the influence of drug marketing. The baselines studies also indicated that the Gauteng Province spent more on pharmaceuticals than the Northern Province and Mpumalanga Province. This is an indication that pharmaceutical budgets need to be carefully reviewed.

Another method to measure drug use is using aggregate data. Aggregate data on drug consumption are often readily available from drug procurement records, warehouse or pharmacy stock receipts, or even records from drug importers or manufacturers. When using aggregate data, similar products may not share a convenient unit of comparison. If the primary focus is cost, all drug consumption data can be converted to monetary equivalents, using either actual or average prices. On the other hand, if the focus were primarily clinical, the above-mentioned strategies would not work. Systems of therapeutic equivalence for particular drug classes have been established that may be applied.

One widespread system to deal with product equivalence is the system of the defined daily doses (DDD), see Par 2.5.2.4. Converting aggregate quantities to DDDs indicates trends of how potential daily treatment or consumption of the drug is procured. Drugs can then be compared on the basis of potential daily treatment. Because it is not known which drugs are actually used to treat a disease or in what dosages they are prescribed, these comparisons are inexact.

Nonetheless, it is possible to use these analyses to focus attention on important drug use problems (Quick *et al.*, 1997:438).

Angaran (1991:1931) states that an indicator is a quantitative measure that provides information and reveals ways in which care could be improved. Furthermore he states that indicators from a specific set of conditions whose presence signals that attention is needed to the care being provided. Also, indicators are used only as screens to detect potential problems in quality. The essential characteristic of an indicator is that it provides for opportunities to improve care with a reasonable degree of specificity and sensitivity.

The essence of this study is to determine the extent and the value of the top twenty drugs according to costs and usage as an instrument for management decision-making and evaluation of medicine consumption. The usage of cost and medicine indicators will assist in attaining the objectives set out in this study.

2.6.7.3. Core Strategies to Improve Drug Use

Strategies to promote rational drug use can be educational, managerial or regulatory. Options for managerial action to promote rational drug use can occur throughout the drug procurement cycle (WHO, 1995:47).

Clinical guidelines and essential drug list should be used to guide procurement and reimbursement. Adherence to the clinical guidelines should also be promoted by involving the end-users, by the introduction and training in their use, through supervision and medical audit (drug utilization reviews). The allocation of drugs at each level of the health care system should be matched to training and supervision of health practitioners at that level. (WHO, 2001:67).

Patient education is an important area. Drug studies show that people commonly use medicines without health practitioners' advice, that their drug use pattern is shaped by their own experiences with medicines, and that they obtain their medicines from various sources, including the informal sector (WHO, 2001:65).

A study carried out in Malawi during November/December 1994, to assess the ability of patients to follow drug regimens after receiving prescribed drugs, presented the following results. Of the 922 patients interviewed, the following percentages of patients were unable to answer these questions satisfactorily.

Table 2.12. Results from a study in Malawi (Futter & Maonga, 1996:1).

Percentage	*Did not know*
27	How often to take the dose for the day
18	How many tablets/capsules to take at a dose
72	For how many days they had to take the drug
55	The drug's name
62	Its therapeutic use
51	Of those who received ORT sachets did not know how to dissolve them to prepare oral rehydration therapy.

Only 118 patients (13%) answered all questions correctly. The survey also concluded that:

- Only thirteen per cent of the patients were able to make informed decisions about their medicine - taking behaviour;
- There was a high probability of non-compliance for eighty-seven per cent of the patients.

Given this situation, more attention should be paid to educating patients on the appropriate drug use by using adult education classes, as well as public health programmes.

An essential drug programme impact survey was carried out in the North West Province in 2003 to evaluate, among other specific objectives, the prescribing patterns on a primary level in the public sector; the availability of key EDL/provincial STG/formulary drugs on a primary level and the stock control system and procedures followed on a primary level in the public sector. Results from these indicators are presented in table 2.13.

The results showed that the prescriptions were not properly documented, thus indicating that documentation systems in the facilities are not adequate. Other conclusions included that compliance with the STG/provincial guidelines and the EDL needs to be improved.

It was recommended that documentation procedures, stock taking and patient counselling be improved as well.

Table 2.13 Summary of Prescription Analysis of the North West Province 2003 (John, 2003:11-12)

Evaluation criteria	*Number of health facilities*	*Individual results parameter*			
		Min	*Max*	*Average*	*Total number*
Number of prescriptions	20	573			
Patients in age group 0≤6yrs	19	0%	27%	15%	84
Patients in age group 7≤16yrs	19	3%	37%	14%-average	80-total
Patients in age group 17≤50yrs	20	23%	70%	46%	265
Patients in age group ≥51yrs	19	10%	43%	25%	142
Number of items/facility	20	9	115	62.2	1244
Number of items/prescription	20	1.5	3.83	2.2	574
Items with dosage regimen/quantity indicated	20	0%	100%	40.15%	674
Items which comply with STG /provincial guidelines	18	0%	100%	62%	305
Items which don't comply with STG or provincial guidelines	17	0-number	37-number	17.9 number	1075
Items on PHC EDL	20	22%	100%	85%	519
Items prescribed generically	20	11%	67%	42%	170
Prescriptions with antibiotics	20	7%	63%	30%	27
Prescription with injections	20	0%	33%	6%	

Table 2.13 (cont) Summary of Prescription Analysis of the North West Province 2003 (John, 2003:11-12)

Evaluation criteria	*Counted on shelves*	*Listed on stock sheet/list*
Number of pharmaceuticals from the national PHC EDL	2349	3039
Number of pharmaceuticals not on the national PHC EDL but on the provincial drug list	350	555
Other pharmaceuticals	61	61
Total number of pharmaceuticals	2760	3655
Percentage of compliance with National PHC EDL	77.29%	
Percentage of compliance with provincial drug list	63.06%	
Percentage of compliance with national PHC EDL and provincial drug list	75.51%	

2.7 "Top Twenty" Pharmaceutical Products and Managed Health Care Concepts

To incorporate the various aspects of health care researched in the literature review, components of the "top twenty" pharmaceutical products will be analysed in relationship to managed health care principles. Table 2.14 provides a summary of the various components of the "top twenty" products and its implications to managed health care tools.

Table 2.14 Summary of the "Top Twenty Products" Components Linked To Health Care Concepts

	[illegible] Drug Management	[illegible]	[illegible]	[illegible]	Pharmacoeconomics
Components of drug management	❖ Provides a means to assess the implemtation of the NDP and attaining of key policy objectives namely, access quality, rational use and economic aspect of drugs. This can be achieved using managed health care tools; EBM, disease management, pharmacoeconomics and DUR. ❖ As the top 20 products are based on the EDP, they can possibly serve as an indicator in assessing the procurement and distribution of these items, thereby enhancing drug supply management. ❖ Assessing consumption information serves as a means to enhance planning and budgeting, thereby increasing the availability of drugs as well as improving drug supply management. ❖ Top twenty products in conjunction with DUR may also serve as an indicator in assessing prescribing practices, thus having an impact on controlling the expenditure of these medicines involved.	❖ EBM focuses on the use of the best clinical (efficacy) evidence to inform decisions. ❖ The selection of essential drugs is based on EBM practices. ❖ Methods and information generated from evidence-based guideline efforts are critical inputs into health policy analysis and decision-making. ❖ The use of EBM techniques, to develop or select DUR criteria may standardize DUR criteria thus decreasing inconsistency and variations in criteria, thus improving the DUR process. ❖ Value of these products may be assessed using EBM in determining clinical efficacy.	❖ A tool used to achieve better health care outcomes in a cost-effective manner. ❖ Used in the development of therapeutic guidelines and protocols, through the evaluation of health outcomes of identified disease states, through evaluation of the economic impact of pharmacotherapeuctic options for given disease states and scientific evidence and protocols for baselines of care. ❖ Basing disease management decisions and initiatives on sound pharmacoeconomic data, ensures that quality care is optimised per monetary unit spent. ❖ Disease management may be applied in assessing the outcomes associated with the top twenty products, as well as standard treatment guidelines, which is closely associated with the top twenty products.	❖ The consumption information of these top twenty products can serve to estimate the prevalence of an illness in a specific area.. DUR studies can also be used to compare the prevalence of an illness in different areas or to investigate different prescribing practices.	❖ Pharmacoeconomic data are invaluable for supporting formulary management, as formulary 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. The objectives of pharmaco-economic analysis are to improve public health through better decision making and to determine relative values of alternative therapies. ❖ Pharmacoeconomic studies can help develop treatment guidelines on which treatment alternatives and dosage regimens are in the best interest of patient and organisation. ❖ Pharmacoeconomics can influence the development and implementing of drug policies, protocols, or guidelines on the use of high risk or high volume drugs or drugs with a high acquision cost; therefore phameacoeconomic studies can further enhance the impact of therapeutic guidelines. ❖ Can also serve as a tool to assess the economics of drug supply and use, which is the focus of the research and development objective of the national drug policy.

Table 2.14 (Cont.) Summary of the "Top Twenty" Pharmaceutical Products Components Linked to Health Care Concepts

	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Cost of drugs & treatment	❖ Provision of safe cost-effective drugs of acceptable quality to all citizens. ❖ The top twenty products may be evaluated to determine the cost associated with these products, thereby improving drug management processes.	❖ More concentrated on clinical efficacy than cost aspect.	❖ Viewed as a mechanism aimed at improving the cost-effectiveness of care. ● Through the evaluation of outcomes associated with these products.	❖ The use of the defined daily dose (DDD) methodology, as a measurement of the cost per day of treatment. DUR studies permit the approximate calculation of the cost of the drugs used to treat a particular illness. ❖ DUR studies serve as a means to detect costly therapy.	❖ The treatment cost per day, plus the remaining direct and indirect costs can be utilised in many types of pharmacoeconomic studies. Information obtained from DUR studies together with direct and indirect costs can be used to calculate the total cost of the illness.
Problems in drug use & therapeutic compliance	❖ The top twenty products can be used as a tool to assess compliance with the EDL. This can be obtained through analysing prescribing practices and drug usage in various regions or provinces. ❖ By determining their use relative to the expenditure of these products, inappropriate use of high cost-high volume products can be evaluated.	❖ Neglect in reviewing the best evidence available when prescribing medicine, may result in problems of drug use and therapeutic compliance. ❖ Information derived from EBM techniques may be used in educating the patient regarding medication use, thus promoting therapeutic compliance.	● Disease management can incorporate DUR efforts and focus on disease states where inappropriate drug therapy affects clinical outcomes and patient quality of life ❖ Health outcomes can assist with the selection of interventions by appropriately selecting levels of intervention.	● May be applied to identify patterns of drug consumption associated with these products, such as geographical differences in usage in over use, misuse, underuse, incorrect use, different prescribing practices, and groups of patients exhibiting high levels of therapeutic non-compliance.	❖ By using pharmacoeconomic studies it is possible to quantify the economic significance of drug misuse. ❖ Therapeutic non-compliance has important economic consequences. Pharmacoeconomic studies attempt to determine the economic efficiency of drugs. ❖ Used to discover the economic repercussions associated with problems in drug use and therapeutic compliance.

Table 2.14 (Cont) Summary of the "Top Twenty" Pharmaceutical Products Components Linked to Health Care Concepts

	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Adverse drug reactions	❖ Linked to therapeutic compliance, furthermore economic repercussion associated with non-compliance to medication due to adverse effects.	❖ Adverse drug effects can contribute significantly to morbidity and mortality, as well as add to the overall health care costs; EBM techniques can thus help prescribers from prescribing drugs incorrectly as many adverse-reactions are drug-induced.	❖ Disease management is patient -centered and outcome focused, thus, allowing for therapeutic intervention in the case of adverse drug reactions.	❖ DUR studies can be used to estimate the incidence of adverse reactions associated with drugs.	❖ Data and information obtained from DUR studies can subsequently be used in different types of pharmacoeconomic studies.
Effectiveness of drugs used	❖ An important criterion for the selection of essential drugs is the review of the effectiveness of these drugs; this effectiveness is determined using managed health care principles.	❖ EBM allows for medication evaluation based on safety, and efficacy.	❖ Disease management is a means of measuring the effectiveness of physicians' interventions. ❖ Reviewing of therapeutic guidelines based on a disease management approach, will enhance the effectiveness of drugs used in treatment of disease conditions.	❖ Determine the volume of drugs consumed, DUR studies can be used to evaluate overall quantity of such consumption in a geographical area e.g. drug therapy, different diseases/symptoms treated.	With information obtained from DUR studies, it is possible to conduct a study with economic repercussions on the quality of therapy for example in cost-minimization studies.
Comparator drugs for pharmaco-economic studies	❖ Essential drugs of the same class of drugs may be selected for pharmacoeconomic studies	❖ EBM promotes criteria such as safety and efficacy to use in comparative studies of medicines to be evaluated, using pharmacoeconomic studies.	❖ Studies on outcomes research, would enable for comparators drugs to be selected for analysis in pharmacoeconomic studies.	❖ Easy to obtain information about which drugs or drug groups have the highest consumption, and about which drugs are most commonly used for specific indications.	❖ The appropriateness of drug consumption, the therapeutic values of drugs and their clinical value can be used to select comparators in pharamcoeconomic studies.

2.8 Chapter Summary

The pharmacy benefit processes are often trying to determine whether new health care technology or any intervention is appropriate or whether it has value. Managed health care tools, such as pharmacoeconomics, disease management, DUR and evidenced - based medicine can be used to evaluate any health care technology, procedure, drug or medical management process in terms of a variety of measures, including patient outcomes and costs and thereby strengthening the decision-making process.

In this chapter, public health care in South Africa has been briefly discussed as well as pharmacoeconmomics, drug utilisation review, evidence-based medicine and management information systems as principles of the managed health care system. Drug management has also been briefly discussed in context of managed health care approaches.

Hereby, the second, third and fourth research questions have been answered and the first, second and third specific objectives have been attained.

Chapter 3

The "Top Twenty Pharmaceutical Products": A Summary

3.1 Introduction

In this chapter the value of pharmaceutical products will be reviewed as an indication of drug usage. The "top twenty" pharmaceutical products according to the monthly pharmaceutical purchasing reports to be analysed in the study, will be reviewed in terms of main indications as well as adverse/side effects that may occur.

3.2 Description of the ATC (Anatomical Therapeutic Chemical) Classification System

The "top twenty" pharmaceutical products to be analysed in this study are classified according to the Anatomical Therapeutic Chemical (ATC) classification system as the essential drugs list of South Africa is based on the ATC classification system. The ATC classification system is a valuable tool for measuring drug use and can be used both for estimating drug needs and consumption and for drug utilisation studies. In the ATC classification system, the drugs are divided into different groups according to the organ or system on which they act and their chemical, pharmacological and therapeutic properties (WHO, 2002c: 1).

In this system drugs are classified into groups at five different levels. These levels are explained below:

1st level: the first level of the code is based on a letter for the anatomical group; there are 14 main groups (one alpha character).

A	**Alimentary tract and metabolism**
B	**Blood and blood forming organs**
C	**Cardiovascular system**
D	**Dermatologicals**
G	**Genito urinary system and sex hormones**
H	**Systemic hormonal preparations, excluding sex hormones and insulins**
J	**Anti-infectives for systemic use**
L	**Anti-neoplastic and immuno-modulating agents**
M	**Musculo-skeletal system**
N	**Nervous system**

P	**Antiparasitic products, insecticides and repellents**
R	**Respiratory system**
S	**Sensory organs**
V	**Various**

2nd level: therapeutic main group (two numeric characters).

3rd level: therapeutic/pharmacological subgroup (one alpha character).

4th level: chemical/therapeutic/pharmacological subgroup (one alpha character).

5th level: subgroup for chemical substance (two numeric characters).

An example of the ATC code structure for metformin is illustrated below.

Level	Code	Content	
1	**A**	**Alimentary tract and metabolism**	**Anatomical main group**
2	**A10**	**Drugs used in diabetes**	**Therapeutic subgroup**
3	**A10B**	**Oral blood glucose lowering drugs**	**Pharmacological subgroup**
4	**A10BA**	**Biguanides**	**Chemical subgroup**
5	**A10BA02**	**Metformin**	**Chemical substance**

Medicinal products are classified according to the main therapeutic use of the main active ingredient. The basic principle is one ATC code for each pharmaceutical formulation (i.e. similar ingredients, strength and pharmaceutical form). A substance can be given more than one ATC code if it is available in two or more strengths or formulations with clearly different therapeutic uses. A medicinal product may be used for more than one equally important indication and the main therapeutic use of a drug may differ among countries (WHO, 2002c: 1)

3.3 Classification and Summary of Pharmaceutical Products to be Analysed

In this section the pharmaceutical products that have appeared over the study period (April 2000-February 2002) will be briefly summarised with regard to main indications, as well as possible side effects that may occur with usage. Specific EDL medicine indications (Dept of Health, 1998) with dosages for these products are presented in appendix B (see Appendix B).

3.3.1 A: Alimentary tract and metabolism

Items from therapeutic subgroup A 10 (drugs used in treatment of diabetes) were present as part of the "top twenty" products occurring over the study period.

Diabetes mellitus is a heterogeneous group of disorders characterised by varying degrees of insulin hypo secretion and/or insulin insensitivity. Regardless of cause, it is associated with hyperglycaemia. The two main types of diabetes are insulin dependent diabetes mellitus (IDDM) and non-insulin-dependent diabetes mellitus (NIDDM). The symptoms are similar in IDDM (type I) and NIDDM (type II), but may vary in their intensity. Common symptoms include polyuria and polydipsia. Other symptoms include blurred vision and weight loss (Cantrill, 2000:633).

The following anti – diabetic agents were present as "top twenty" products during the study period:

A10A Insulins and analogues

A10AD Insulins and anlogues, intermediate-acting combined with fast –acting

Insulin is indicated for type I or insulin-dependent diabetes, which is associated with HLA antigens and immunological selective β-cell destruction, in these patients ketosis is common and insulin is required. According to the EDL, insulin indicated for both type II diabetes and I is a biphasic insulin, which is a ready-mixed preparation containing a short-acting and intermediate acting insulin. The soluble component gives a rapid onset and the isophane insulin prolongs the action. Riddle (2000:15S) states that the addition of insulin therapy is eventually necessary to restore glycemic control for many patients with type II diabetes mellitus, having fasting plasma glucose levels well over 200mg/dL at diagnosis, as satisfactory glycemic control with initial monotherapy may not be achieved.

Adverse effects: hypoglycaemia due to insulin overdose or inadequate calorific intake is the most common and most serious complication of insulin treatment. Lipohypertrophy may result from repeated injection in the same site. Rare, allergic localised skin reactions as well as generalised allergic reactions. "Insulin – oedema" has been described in some patients at initiation of therapy. Insulin is contraindicated in hypoglycaemia (Neal, 2002:79).

A10B Oral blood glucose lowering drugs

A10B A Biguanides

A10B A02 Metformin

According to Lindberg *et al* (2003:1) diabetes mellitus is a metabolic disorder resulting from a defect in insulin secretion, insulin action, or both. Treatment of type II diabetes mellitus requires drug therapy with antihyperglycemic agents (Riddle, 2000:15S).

Metformin is a biguanide, which acts peripherally to reduce hepatic gluconeogenesis and promote the uptake and utilisation of glucose, although for this to occur the presence of some endogenous insulin is necessary. The biguanides are agents of first choice in the management of obese type II diabetics, but the risk of lactic acidosis demands that they be used with caution.

Adverse effects: nausea, vomiting, diarrhoea and, very occasionally, fatal lactic acidosis. A metallic taste in the mouth is common but usually transient; they respond well to lowering of dosage. Metformin is contraindicated in patients predisposed to lactic acidosis, and in those with brittle or unstable diabetes, and diabetes complicated by ketosis, acidosis and coma (Neal, 2002:79).

A10 B B Sulfonamides, urea derivatives

A10B B09 Gliclazide

Gliclazide is an oral anti-diabetic drug. It is used to control type II or non-insulin dependent diabetes of which the aetiology is unknown, but a strong genetic component is present. Gliclazide is a sulphonylurea, which is indicated in patients in whom diet fails to control the hyperglycaemia. These agents stimulate insulin release from the pancreatic islets and so the patient must have partially functional β-cells for this class of drugs to be used.

Adverse effects: gastrointestinal disturbances and skin rashes occur but are rare. Longer-acting drugs, especially in elderly patients, may induce hypoglycaemia and hypoglycaemic coma. Sulphonylureas are contraindicated in severe (especially ketotic) hyperglycaemia, surgery and major illness, when insulin should be given.

As type II diabetes mellitus is a progressive disorder, and although monotherapy is often successful, it is associated with a high secondary failure rate, that contributes to the development of long term diabetes complications resulting from persistent hyperglycemia. Furthermore for patients not using insulin, accumulating evidence suggests that combination therapy using oral antidiabetic agents with different mechanisms of action may be highly effective in achieving and maintaining target blood glucose levels. The best-studied combination is that of sulphonylurea compounds with metformin, a therapeutic approach that addresses both underlying defects in the disorder, being insulin deficiency and insulin resistance (Riddle, 2000:15S).

3.3.2 B: Blood and blood-forming organs

B05 A Blood and related products

B05AA01 Albumin solution 20% 100MI

Albumin is a protein synthesised in the liver. It has a half-life of about 20 days and compromises some 60% of total serum protein. The concentration in the serum is important in maintaining serum volume; a significant reduction in serum albumin concentration often results in oedema. Albumin has an important role in binding, amongst other, calcium, bilirubin and many drugs. A low serum albumin level may occur in patients with chronic liver dysfunction due to impaired synthesis, or in malnutrition states where there is an inadequate supply of amino acids to maintain albumin production. Other causes of hypoalbuminaemia include catabolic states associated with a variety of illnesses example nephrotic syndrome or psoriasis. An increase in serum albumin is rare and may be iatrogenic or the result of dehydration or shock (Walker & Edwards, 2000:55).

BO5 BB solutions affecting the electrolyte balance

B05 BB02 Intravenous Solutions Maintelyte and dextrose 5% 1000 MI & Ringers lactate 1000ml

Fluid and electrolyte balance within the body is necessary to maintain health and function in all body systems. The balance is maintained by the intake and output of water and electrolytes and their distribution in the body. Imbalances may result from many factors and are associated with many illnesses. In a situation of profound fluid loss, such as dehydration or hypovolemia, these patients require fluid resuscitation. Intravenous therapy is the definitive treatment for patients with fluid loss (Anon, 2003 (b): 1)

Maintelyte with dextrose is a hypertonic solution comprising of sodium chloride, potassium chloride, anhydrous dextrose and magnesium chloride. The glucose molecules cross the membranes of the body easily, talking water with them and the net effect is almost negligible on circulatory volume (Anon, 2003 (b): 1).

Lactated Ringers solution is an isotonic electrolyte solution containing sodium, chloride, potassium, calcium and lactate in water. Ringers Lactate (a crystalloid) is indicated for fluid replacement as crystalloids rapidly diffuse into the interstitial fluid space and can therefore correct hypovolemia even in massive injuries. Furthermore, the lactate is a source of base versus conversion to bicarbonate in the liver (Anon, 2003 (c): 9).

Adverse effects: tissue oedema, may lead to possible volume overload.

B05CB01: Sodium Chloride 0.9%

Sodium is the main extracellular cation and plays an important role in regulation of water balance in the body. A principle function is also the involvement of sodium in neuromuscular contractility. Symptoms of sodium deficiency include weakness, lethargy, confusion, convulsions, appetite, nausea and vomiting. A common source for sodium supplementation is sodium chloride. Chloride is the main extracellualr anion and plays an important role in regulation of the acid-base balance. Symptoms of chloride deficiency include acidosis (Malone, 2000:69). Normal saline is isotonic with extracelluar fluid and administered to replace fluid in hypovolemia or dehydration situations.

Adverse effects: excessive administration of sodium results in dehydration with water depletion rather than excess sodium. Excess chloride results in metabolic acidosis and respiratory alkalosis (Malone, 2000:69).

3.3.3 C: Cardiovascular System

Items from this therapeutic subgroup were present as "top twenty" products during the study period these include the following products:

C01D Vasodilators used in cardiac diseases

C01DA Organic nitrates

C01D A14 Isosorbide-5-Mononitrate 250mg

Angina pectoris is a symptomatic manifestation of ischaemic heart disease usually caused by atheromatous narrowing of one or more coronary arteries (Ciapponi *et al.*, 2003:1).
Organic nitrates are valuable in angina because they dilate veins (decreasing preload), dilate arteries to a much lesser extent (decreasing afterload) and promote flow in collateral coronary vessels, diverting blood flow from the epicardium to the endocardium (Walker & Edwards, 2002:268). Isosorbide-5-Mononitrate, a metabolite of isosorbide dinitrate is indicated according to the EDL for chronic stable angina pectoris

Adverse Effects: nitrates commonly cause headache, dizziness, transient flushing, reflex tarchycardia and some degree of hypotension.

C02 Anti–hypertensives

Items from this therapeutic subgroup were present during the two-year study period.

Hypertension is the most common chronic health problem; its importance lies in that it is the major risk factor for cerebrovascular accidents and cardiovascular events. The World Health Organization defines hypertension as a diastolic blood pressure reading greater than 95 mmHg, on more than one occasion. Diastolic blood pressure readings between 90 mmHg and 95 mmHg are described as mild or borderline. Raised systolic blood pressures can exist in the absence of raised diastolic blood pressures and, therefore, systolic blood pressures greater than 160 mmHg are also classed as hypertensive (Graham-Clarke & Hebron, 2000:247). Classification of hypertension is as follows:

- Primary/essential hypertension: has no single identifiable cause but may be affected by a number of factors namely, age, genetics, environment, weight and race.
- Secondary hypertension has an identifiable underlying cause. Some of the more common causes of secondary hypertension may be renal diseases, pregnancy or may be drug induced.
- Malignant or accelerated phase hypertension: this type of hypertension can occur in patients with primary or secondary hypertension and is often associated with renovascular disease.

C02A Antiadrenergic agents, centrally acting

C02AA02 Reserpine tab 0.25mg

Reserpine along with methyldopa is the main centrally acting antihypertensive drug used in clinical practice. High doses in the past has been associated with a high incidence of unwanted effects particularly on the central nervous system (mental depression), but the low doses now recommended have little toxicity potential while still providing good antihypertensive action, chiefly as a result of depletion of catecholamines in the periphery (SAMF, 2000:125).

Adverse effects: dizziness, drowsiness, lethargy, headache and depression (high doses).

C02AB01 Methyldopa tab 250mg

Methyldopa is a centrally acting antihypertensive drug that has a variety of mechanisms of actions in the brain. The exact mechanism of action is unknown. Peripheral vasodilation by indirect mechanisms may also be present. Methyldopa has been used extensively to treat hypertension associated with renal disease, renal failure and pregnancy.

Adverse Effects: drowsiness, dry mouth, sodium and water retention, and poor quality of life.

C03A Low-ceiling diuretics, thiazides

C03A A03Hydrochlorthiazide tab /25mg

Thiazides the most common group of diuretics; are used in the initial treatment of mild to moderate hypertension. Low doses are recommended in the long-term management of hypertension; higher doses have little additional hypertensive effect, but increase the risk of adverse effects. Thiazides are also used for the management of oedema associated with nephritic syndrome.

Adverse effects: thiazide diuretics may cause hypokalaemia, diabetes mellitus and gout and change the blood lipids in an atherogenic manner (Neal, 2002:37).

C08C Selective calcium channel blockers mainly with vascular effects

C08C A Dihydropyridine derivatives

C08 C A05 Nifedipine tabs 30mg & 60mg

Nifedipine is a calcium channel antagonist (blocker) and vascular selective agent thus its properties are dominated by vasodilating activity. The dominant applications of calcium channel antagonists are for angina in several forms, hypertension, some cardiac arrhythmias, and selected vascular disorders (Triggle, 1995:316).

Adverse effects: includes the following headaches, dizziness, flushing, postural hypotension, and ankle oedema (Graham-Clarke & Hebron, 2000: 252).

C 09: Agents acing on the renin-angiotensin system items from this therapeutic subgroup were present on top twenty lists during the study period.

C09A ACE (Angiotensin Converting Enzyme) inhibitors, plain

ACE-inhibitors are being increasinigly used as the initial medication in mild to moderate hypertension. Their primary mode of action is inhibition of the renin-angiotensin-aldosterone system, inhibition of bradykinin degenration, stimulation of vasodilating prostaglandin synthesis, and, sometimes reduction of sympathetic nervous system activity. The ACE – inhibitors appear to be more effective in younger hypertenive patients than the elderly. While as single therapy they achieve adequate antihypertensive control, the combination of an ACE – inhibitor, a diuretic or calcium channel blocker is potent (Massie, 2001:458).

C09A A01 Captopril tabs 50mg

Captopril, is a class I angiotensin-converting enzyme (ACE) inhibitors that acts by inhibiting the conversion of angiotensin I to angiotensin II (a powerful vasoconstrictor). Inhibition of angiotensin II in hypertensive subjects results lowering of blood pressure. ACE inhibitors may also be used in the treatment of congestive heart failure

Adverse effects: a common unwanted effect of ACE-Inhibitors is a dry cough, hypotension especially after first dose, skin rashes, angio-oedema, rare; proteinuria and neutropenia.

C09A A02 Enalapril tabs 5mg, 10mg and 20mg

Enalapril is a Class II ACE-Inhibitor prodrug and must be converted by hepatic metabolism to the active form. Its indication according to the EDL is secondary hypertension in paediatrics.

Adverse effects are the same as those for Captopril except the rash and taste disturbances are somewhat less common (Izzo, Jr & Case, 1995:278).

C09A A04 Perindropril tabs 4mg

Perindropril is a Class II Prodrug ACE-Inhibitor.

Adverse effects are the same as those for captopril and enalapril.

C10: Serum lipid modifying agents

Hyperlipidemia is defined as the elevation of one or more of the following: cholesterol, cholesterol esters, phospholipids, or triglycerides. Abnormalities of plasma lipids can result in a predisposition to coronary, cerebrovascular arterial disease (Wells *et al.*, 2000:71)
Primary lipoprotein disorders may involve cholesterol, triglycerides, or both. Secondary hyperlipidaemias are the result of another illness, e.g. diabetes mellitus, hypothyroidism. Hypercholesterolaemia is the most common disorder. The main therapy for hyperlipidaemias, except for severe and hereditary types, is dietary modification (Neal, 2002:47).

C10A Cholesterol and triglyceride reducers

C10A A HMG CoA reductase inhibitors

C10A A01Simvastatin tab 20 mg

Simvastatin a HMG CoA reductase (3-hydroxy-3-methyl-glutaryl coenzyme A) inhibitor is very effective in lowering total and LDL cholesterol and have been shown to reduce coronary events and total mortality. HMG CoA reductase inhibitors block the synthesis of cholesterol in the liver (which takes up most of the drug). This stimulates the expression of more enzymes, tending to restore cholesterol synthesis to normal even in the presence of the drug. However, this compensatory effect is incomplete and the reduction of cholesterol in the hepatocytes leads to an increased expression of LDL receptors, which increases the clearance of cholesterol from the plasma. However strong evidence suggests that the statins lower plasma cholesterol, mainly by increasing the number of LDL receptors, is the failure of the drugs to work in patients with homozygous familial hypercholesterolaemia. Statins should not be given during pregnancy because cholesterol is essential for normal foetal development (Neal, 2002:47).

Adverse effects: side effects appear mild and transient and include rashes and gastrointestinal symptoms (Walker, 2000:327). A main side effect is myopathy. The incidence of myopathy is increased in patients given combined therapy with nicotinic acid or fibrates (Neal, 2002:47).

3.3.4 D: Dermatologicals

Only one item from this therapeutic subgroup appeared on the "top twenty" list of pharmaceuticals during the study period.

D01A Antifungals for topical use

D01AC Imidazole and triazole derivatives

D01AC52 Miconazole nitrate2% gel

Miconazole is an imadazole that is indicated for topical treatment of fungal infections of the oropharynx including thrush caused by *Candida albicans*. Oral candidasis (thrush) is usually painful and looks like creamy – white curd-like patches overlying erythematous mucosa (Jackler & Kaplan, 2001:244)

Adverse effects: these include local irritation and sensitivity.

3.3.5 G: Genito-urinary system and sex hormones

The following items from this therapeutic subgroup were present as "top twenty" products during the study period.

G03A Hormonal contraceptives for systemic use

Levonorgestrel oestradiol tabs (triphasic)

Levonorgestrel oestradiol tabs are a combined oestrogen/progesterone oral contraceptive. Oestradiol is the main oestrogen released by the ovary and synthetic oestrogens are more effective following oral administration. Levonorgestrel is a progesterone analogue and is most frequently used in combination with oestrogen. According to the EDL levonorgestrel oestradiol tabs are indicated as an oral contraceptive and hirsutism associated with ovarian hyperandrogenism policystic syndrome (PCOS).

Adverse Effects: Nausea, headaches, migraine and changes in moods and libido may occur, weight gain and breakthrough bleeding may occur. When a progesten is given with an oestrogen, there is a decreased incidence of endometrial carcinomas.

G03A C Progestogens

G03A C01: Norethisterone inj 200 mg\ml long acting

Norethisterone is a 19-norstesterone derivative with some oestrogenic and anabolic activity and only mildly androgenic. As an oral contraceptive it is used in combination with an oestrogen or alone. : According to the EDL norethisterone is indicated as an injectable contraceptive.

Adverse Effects: same as for medroxyprogesterone acetate.

G03A C06: Medroxyprogesterone acetate injection 150mg/ml

Medroxyprogesterone acetate is used mainly as an injectable contraceptive.

Following IM injection, the progesterone remains in the tissues for several months, providing prolonged release from depot sites. According to the EDL medroxyprogesterone acetate is indicated as an injectable contraceptive.

Adverse Effects: shorter or longer menstrual cycles, spotting, weight gain, headaches, acne and dizziness.

3.3.6 J: General anti-infectives for systemic use

The following products from this anatomical group were present as "top twenty" pharmaceutical products during the study period. These products are described below according to different pharmacological subgroups, chemical subgroups and chemical substances.

J: 01 Antibacterials for systemic use

J01 C Beta-lactam antibacterials, penicillins

J01C A04 Amoxycillin Caps 250mg

Amoxycillin Suspension 125mg/5ml (100 ml) and 250mg/5ml (100ml)

Amoxycillin is a broad spectrum penicillin and remains one of the most useful antibiotics as it is active against non-β-lactamase-producing Gram-positive bacteria, and because they diffuse more readily into Gram-negative bacteria and are also active against many strains of *Escherichia coli*, *Haemophilus influenzae* and *Salmonella*. For oral absorption amoxycillin, is the drug of choice since it is better absorbed in comparison to ampicillin.

Adverse effects: serious anaphylactic reactions have occurred; also urticarial rashes are more likely to be associated with a penicillin allergy. Gastrointestinal intolerance frequently leads to diarrhoea.

J01C E Beta-lactamase sensitive penicillins

J01C E02 Phenoxymethylpenicllin tabs 250mg

Phenoxymethylpenicllin has the same spectrum as benzylpenicllin, but is less active against most benzylpenicillin-susceptible organisms. It is used to treat minor infections or to continue penicillin therapy after a severe infection has responded favourably to initial parenteral treatment.

Phenoxymethypenicllin is indicated in the treatment of streptococcal tonsillitis/pharyngitis, also is useful in the prophylaxis of rheumatic fever.

Adverse effects: doses up to 6g daily are usually well tolerated, with low incidence of side effects. Gastrointestinal reactions include nausea, vomiting, diarrhoea and a black hairy tongue. Candidiasis may occur and pseudomembrane colitis has been reported.

J01C F Beta-lactamase resistant penicillins

J01C F05 Flucloxacillin caps 250mg

Flucloxacillin a beta- lactamase- resistant penicillin are less effective than penicillin for treating infections due to penicillin-sensitive organisms and there use should only be restricted to infections due to penicillin-resistant staphylococci (which includes about 90 percent of hospital acquired staphyloccocal infections.

Adverse effects: the main side effects include mild gastrointestinal disturbances and hypersensitivity reactions. Cholestatic jaundice has also been reported in the elderly and women treated for longer than two weeks.

J01C R Combinations of penicillins, incl. beta-lactamase inhibitors

J01C R02 Amoxycillin Clavulanic Injection 1000mg/200mg

Many bacterial β-lactamases are inhibited by clavulanic acid, a mixture of this inhibitor with amoxycillin results in the antibiotic being effective against penicillinase-producing organisms. This combination is indicated in respiratory and urinary tract infections, which are confirmed

resistant to amoxycillin (Neal, 2002:83). According to the EDL amoxycillin clavulanic injection is only indicated for paediatric treatment of sinusitis, chronic and complicated, which is amoxicillin and ampicillin resistant.

J01D Other beta-lactam antibacterials

J01D A Cephalosporins and related substances

J01D A10 Cefotaxime Injection 500mg
Cefotaxime Injection 1g/15ml

The Cephalosporins are broad-spectrum antibiotics with a mechanism of action and pharmacology similar to penicillins. Individual drugs have different activity against certain bacteria. According to the SAMF (2000: 252) Cefotaxime has good activity against most Gram positive and negative organisms and it is useful in treating infections due to beta-lactamases producing strains of *H. influenzae* (causing paediatric meningitis).

Adverse effects: they may produce allergic reactions and cross-sensitivity to penicillin may occur. Headache, dizziness and vertigo may be more common. Gastro-intestinal reactions occur less frequently than with the penicillins.

J01D A13 Ceftriaxone Injection 1000mg/vial

Ceftriaxone is a third generation cephalosporin; with similar activity to Cefotaxime. Ceftriaxone has a longer half-life than other cephalosporins thus allowing for once or twice daily dosing. Because of good penetration into the cerebrospinal fluid, ceftriaxone is highly effective in the treatment of meningitis caused by susceptible organisms.

Adverse effects: Similar to Cefotaxime. Nephrotoxicity is less; broad spectrum of action and excretion of the drug in the bile may cause superinfection and diarrhoea, and increased incidence of cholelithiasis.

J01E E01Co-Trimoxazole (sulfamethoxazole and trimethoprim) tabs 480mg

Co-trimoxazole (trimethoprim combined with sulphamethoxazole) represents a good example of antibacteial synergy, in which the combination of the agents is more active than either agent administered singly. Theoretically, this is a result of a two-site inhibition of folic acid synthesis by these agents acting on the same biosynthetic pathway (Lesse, 1995: 386). Co-trimoxazole has

been used extensively as a broad spectrum antibiotic, but therapeutic effectiveness is reducing due to the emergence of widespread resistance especially among enterobacteriaceae (SAMF, 2000:265). Its use is now largely restricted to treating patients with *Pneumocystis carinii* pneumonia, *norcadiasis* and toxoplasmosis (Neal, 2002: 81).

Adverse effects: Same as for trimethoprim and suplhamethoxazole. More frequent side effects include nausea, vomiting, anorexia, diarrhoea, rash and urticaria.

J01F Macrolides and lincosamides

J01F A Macrolides

J01F A01 Erythromycin Stearate tabs/caps 250mg
Erythromycin estolate Suspension 125mg/5ml.

Macrolides (e.g. erythromycin) have a similar antimicrobial spectrum to benzylpenicillin (i.e. narrow spectrum, mainly active against Gram-positive organisms and can be used as an alternative drug in penicillin-sensitive patients, especially in infections caused by streptococci, staphylococci, pneumococci and clostridia. However, they are ineffective in meningitis because they do not penetrate the central nervous system adequately. Unlike penicillin, the macrolides are effctive against several unusual organisms and are specifically indicated in *Mycoplasma* pneumonia and legionnaires' disease (Neal, 2002:85).

Adverse effects: the most common adverse effect associated with oral administration of erythromycin is gastrointestinal distress including epigastric pain or discomfort, diarrhea. Erythromycin in high doses may cause nausea and vomiting. Allergic reactions may rarely occur (Reynard, 1995:385).

J01M Quinolone antibacterials

J01M A Fluoroquinolones

J01M A02 Ciprofloxacin tab 500mg.

Ciprofloxacin is a fluoroquinolone; with a 6-fluoro substituent that confers greatly enhanced antibacterial potency against both Gram-positive and especially Gram-negative organisms; including *E.coli, P. aerugonosa,* salmonella and campylobacter. Ciprofloxacin is well absorbed orally.

Adverse effects: infrequent, but include nausea, vomiting, rashes, dizziness and headache. Convulsions may also occur.

J:04 Antimycobacterials

J04 A Drugs for the treatment of tuberculosis

J04A M combinations of drugs for the treatment of tuberculosis

Rifampicin 300mg/ Isoniazid 150mg and

Rifampicin 120mg/ Isoniazid 60mg/ Pyrazinamide 300mg/ Ethambutol 225mg.

J04A B02 Rifampicin

Rifamipicin is bactericidal and mycobacterial as a result of interference with bacterial protein synthesis. Its spectrum of activity includes mycobacteria, most Gram-positive bacteria and many Gram-negative organisms. The major indication for rifampicin is in the treatment of tuberculosis (in combination with other agents), non-tuberculous mycobacteria (NTM), leprosy, brucellosis, resistant staphylococci infections; prophylaxis of meningococcal meningitis.

Adverse effects: the major adverse effect is hepatotoxicity. Gastrointestinal symptoms such as nausea, vomiting, diarrhoea, and abdominal pain may be seen with rifampicin (Lesse, 1995: 397).

J04A C01 Isoniazid

Isoniazid is a synthetic antitubercular agent derivative. Although the exact mechanism of action is not fully defined, isoniazid inhibits mycolic acid synthesis. Isoniazid is bactericidal for intra- and extra cellular mycobacteria, and is one of the most effective antituberculosis agents available.

Adverse effects: many adverse effects can be seen with isoniazid. Nausea, vomiting and other gastrointestinal side effects are common adverse reactions. Heptotoxicity is a major adverse reaction to isoniazid. Central nervous system complications of isoniazid include ataxia, seizures and psychosis (Lesse, 1995: 397).

J04A K01 Pyrazinamide

Pyrazinamide, an analogue of nicotinamide, has been recognised as an important first-line agent in the therapy of tuberculosis, especially in regimens of short duration. The major indication of pyrazinamide is tuberculosis therapy in combination with other agents (Lesse, 1995: 398).

Adverse effects: the major adverse reaction of pyrazinamide is hepatotoxicity. Frequent side effects includes dose related hepatotoxicity , acute gout, arthralgia and gastrointestinal side effects.

J04A K02 Etambutol

Ethambutol is a synthetic agent that appears to act by inhibiting mycobacterial RNA synthesis in actively dividing mycobacteria. It is chiefly bacteriostatic, but maybe bactericidal at high doses (SAMF, 2000: 283). Resistance to ethambutol, like that to all antituberculous agents, develops when the agent is used as a single drug to treat clinical disease (Lesse, 1995: 399). The major indication of ethambutol is tuberculosis therapy in combination with other agents.

Adverse effects: the primary toxicity of ethambutol is neuropathy. The major form of this is retrobulbar neuritis, which results in alteration of colour vision, potentillay leading to decreased visual fields and blindness. The neuropathy is frequently reversible on discontinuance of the medication. Acute gout may also be precipitated in susceptible patients (Lesse, 1995: 399).

J 07 Vaccines

Items from this therapeutic subgroup were present as top twenty products during the two-year study period. These vaccines are described briefly below:

Vaccination is the most efficacious and cost-efective method of preventing many viral and bacterial diseases (SAMF, 2000:302).

J07C Bacterial and viral vaccines, combined

J07A C02 Diphtheria tetanus pertusis 10MI

Diphtheria toxoid is prepared from formaldehyde-inactivated toxins produced by *Corynebacterium diphteriae.* It is available as a single component, in combination with tetanus

toxoid (DT), or as the triple combination, diphtheria, tetanus and pertusis (DTP). Pertusis vaccine contains killed *Bordetella pertusis* bacilli. Tetanus vaccines are prepared from the toxoids of tetanus bacilli, which stimulate the production of protective antitoxin in the host.
Adverse effects: hypersensitivity reactions (including anaphylaxis) may occur when vaccines are administered by injection. Pertussis vaccine may cause, fever, local pain and swelling. Neurological complications may include hypotonic episodes, convulsions, persistent high-pitched screaming and encephalopathy.

J07A G *Hemophilus influenzae B* vaccines

J07A G01 *Haemophilus influenzae B*, conjugated vaccine
J04A G52 *Haemophilus influenzae B*, combinations with pertusis and toxoids

The vaccines are usually preparations of polysaccharide form *Haemophilus influenzae* type b, covalently bound to a protein carrier. They are indicated for use in children 2 months to 5 years of age for prevention of invasive Haemophilus disease (SAMF, 2000:306).

Adverse effects: hypersensitivity reactions, local erythema, warmth or swelling is occasionally reported at the site of injection.

J07B C Hepatitis vaccines
J07B C01 Hepatitis B, purified antigen
Hepatitis B vaccine is derived from hepatitis B virus surface antigen. Immunity lasts for 5-7 years, when a single booster is recommended, given after three years when challenged. Immunisation is recommended for those at high risk of infection namely:

- Health care personnel (including hospital domestics) at risk of exposure;
- Patients undergoing haemodialysis (generally more refractory to immunisation);
- Regular sexual partners of chronic carriers and
- Individuals at high risk owing to their sexual practices.

The principle indication is for pre-exposure prophylaxis.

Adverse effects: usually mild, includes local swelling, redness and swelling at the site of injection.

3.3.7 M: Musculo-skeletal system

An item from this anatomical group were present as a "top twenty" product during the study period, this item is discussed below.

M 01: Anti-inflammatory and anti-rheumatic products

M01A E Propionic acid derivatives

M01A E01 Ibuprofen tab 200mg

Ibuprofen is a non-steroidal anti-inflammatory drug (NSAID). These drugs have analgesic, antipyretic and, at higher doses, anti-inflammatory actions. Ibuprofen is widely regarded as the drug of choice for the treatment of inflammatory joint disease, because they have the lowest incidence of side effects (Neal, 2002:71).

Adverse effects: frequent gastric effects ranging from mild irritation and peptic ulceration other adverse effects include bronchospasm, especially in asthmatics, skin rashes, other allergies, as well as headache and dizziness (Neal, 2002:71).

Items from therapeutic subgroups M02 to M09, which includes the following products, topical products for joint and muscular pain, muscle relaxants, antigout preparations, drugs for the treatment of bone diseases also other drugs for the disorders of the musculo-skeletal system were not present on the top twenty lists during the study period.

3.3.8 N: Central Nervous System

Products from this anatomical group were present on the top twenty lists during the study period. These products are as follows:

N02: Analgesics

N02B Other analgesics and antipyretics

N02B E Anilides

N02B E01 Paracetamol tabs 500mg

Suspension 120mg/5ml 50MI

Paracetamol is a weak prostaglandin synthetase inhibitor. Paracetamol has no significant anti-inflammatory action, but is widely used as a mild analgesic when pain has no inflammatory component. The antipyretic effect may result from direct action centrally on the hypothalamic heat-regulating centre. Paracetamol is indicated for the relief of headache, dysmenorrhea, myalgias, neuralgias, fever, pyrexia or mild to moderate pain (Lee & Lee, 1995:147).

Adverse effects: hypersensitivity skin reactions, neutropenia, and thrombocytopenia. Nephro- or hepatotoxicity is likely to occur with over dosage (Neal, 2002:71 & SAMF, 2000:369).

N 03: Antiepileptics

Epilepsy refers to a group of central nervous system disorders characterised by sudden, transitory, and recurring seizures that are accompanied by elementary or complex impairment of one or more of the following functions: motor (convulsion), sensory, autonomic, and psychic (Chan, 1995:193). The seizures are classified empirically (Neal, 2002:56). Partial (focal) seizures begin at a specific locus in the brain and may be limited to clonic jerking of an extremity. However the discharge may spread and become more generalised (secondarily generalised seizure). Generalised seizures are those in which there is no evidence of localised onset, both cerebral hemispheres being involved from the onset. They include tonic-clonic attacks (*grand mal*–periods of tonic rigidity followed later by massive jerking of the body) and absences (*petit mal*-changes in consciousness usually lasting less than 10 seconds)

N03A B Hyadantoin derivatives

N03A B02 Phenytoin caps 100mg

Phenytoin is a hydantoin derivative with a broad range of anti-epileptic action against most types of seizures. It is a drug of first choice for tonic-clonic, tonic and partial seizures, and a second-line drug for atonic seizures and atypical absences. It is not effective in typical generalised absences and myoclonic seizures. Tolerance to its anti-epileptic action does not usually occur (Dhillon & Sander, 2000: 446).

Adverse effects: central nervous system toxicity (e.g. ataxia and nystagmus) occurs at the high end or above the therapeutic range of plasma phenytoin levels; nausea, gigival hyperplasia, sedation, gastrointestinal disturbances, rash, folate deficiency, anaemia, and vitamin K deficiency (particularly in pregnant epileptic patients) may occur (Chan, 1995:196).

N03A F Carboxamide derivatives

N03A F01 Carbamazepine tab 200mg

Carbamazepine is a drug of first choice in tonic-clonic and partial seizures, and may be of benefit in all other seizure types except generalised absence seizures and myoclonic seizures (Dhillon & Sander, 2000: 435). While not primarily an analgesic it may be of benefit in the pain problems such as trigeminal neuralgia, the neuralgic states associated with multiple sclerosis and nerve trauma, and diabetic and post-herpetic neuralgias (SAMF, 2000:380). Tolerance to its beneficial effect does not usually develop.

Adverse effects: skin rash, gastrointestinal disturbances or hyponatraemia. Dose-related adverse reactions including ataxia, dizziness, blurred vision and diplopia are common (Dhillon & Sander, 2000: 435). Carbamezepine shows auto-induction, i.e. induces its own metabolism as well as inducing the metabolism of other drugs (Dhillon & Sander, 2000: 435).

3.3.9 P: Anti parasitic products.

Items from therapeutic sub group P 02; antihelmintics agents were present during the study period.

The helminths are parasitic worms that can be divided into three groups: nematodes (round worms), trematodes (flukes), amd cestodes (flatworms and tapeworms). The lifecycles of many of the parasitic helmiths are quite complex, offering a formidable challenge to disease eradication and even drug treatment (Vande Waa, 1995:419). The nervous system in helminths has important differences from that in vertebraes and this form the basis of the selective toxicity of most drugs (antihelminths) used to treat infections with worms (Neal, 2002:88).

P02C Antinematodal agents

P02C A Benzimidazole derivatives

P02C A01 Mebendazole Syrup 30MI

Mebendazole acts by selectively inhibiting microtubule synthesis in nematodes. It is the drug of choice for pinworm and whipworm infections, for combined infections with ascarids and hookworm, and for the treatment of hydatid disease. It is also used in certain cestode and trematode infections (Goldsmith, 1998:869).

Adverse effects: the bioavailability of the drug is responsible for a number of systemic side effects associated with its use. These include gastrointestinal irritation, nausea, vomiting, headache, as well as dizziness (Vande Waa, 1995:419).

3.3.9 R: Respiratory system

Items from therapeutic subgroups R03 (drugs for obstructive airway diseases), R05 (cough and cold preparations) and R06 (antihistamines for systemic use), were present during the two – year study period.

Asthma has been defined as a chronic inflammatory disorder of the airways in which many cells play a role, including mast cells and eosinophils. In susceptible individuals this inflammation causes symptoms which are usually associated with widespread but variable airflow obstruction that's is often reversible either spontaneously or with treatment, and causes an associated increase in airway responsiveness to a variety of stimuli (Gibbs & Portlock, 2000: 347).

Since asthma involves inflammation and bronchoconstriction, treatment should be directed towards reducing inflammation and increasing bronchodilation. Restoration of normal airway function and prevention of severe acute attacks are the main goals of treatment. The lowest, effective doses of drugs should be given to minimise short-term and long-term side effects (Gibbs & Portlock, 2000: 347).

R 03: Anti-asthmatic agents

R03A Adrenergic, inhalants

R03A C Selective beta-2-adrenoreceptor agonists

R03A C02 Salbutamol metered dose inhaler 100mcg/actuation

Salbutamol is a selective is a long acting beta2-adrenoreceptor stimulant. Salbutamol given by the inhalation route decreases the systemic dose (and adverse effects) while delivering a locally effective dose to the airway smooth muscle. Salbutamol has a duration of action of twelve hours or more (Katzung & Trevor, 1995:152). It is clearly advantageous for the patient with nocturnal asthma and for patients whose symptoms are not well controlled by the use of anti-inflammatory agents (Stempel, 1995: 176).

Adverse effects: by inhalation adverse drug reactions are uncommon. Fine tremor, headache, nervous tension, tachycardia are present mostly by nebulisation, orally or parentally.

R03A C04 Feneterol Inhaler complete 100mcg/inhl

Feneterol is a selective beta2-adrenoreceptor agonist. The advantage of beta-adrenergic medications is their rapid onset of effect in relief of acute bronchospasm. This action is achieved via relaxation smooth muscle relaxation and increased mucociliary clearance. Inhaled bronchodilators are the primary drugs used to treat acute bronchospasm and to prevent exercise-induced bronchospasm. The frequency of bronchodilator use may be applied as a criterion for implementing or increasing anti-inflammatory therapy (Stempel, 1995:176).

Adverse effects: same as for salbutamol.

R03B Other Anti-asthmatics, inhalants

R03B A Glucocorticoids

R03B A01 Beclomethasone Metered Dose Inhaler

Inhaled corticosteroids (e.g. beclomethasone) have become common as a first or second line therapy for individuals with moderate to severe asthma (Katzung & Trevor, 1995:155). The inhaled glucocorticoids are effective on topical administration, and systemic side effects can be

reduced when delivered by this route (Stemple, 1995:173). The mechanism of action may be to block the synthesis of arachidonic acid by phospholipase A2. It has also been suggested that corticosteroids increase responsiveness of beta adrenoreceptors in the airway (Katzung & Trevor, 1995:155).

Adverse effects: Adrenal suppression may occur at high doses; oropharyngeal side effects such as candidiases occurs frequently. Other adverse effects include laryngeal myopathy and hoarseness, and sore throat (SAMF, 2000:456).

R 05: Cough and Cold preparations

R05CA Expectorants

Mist Expect Stim Adult 200MI

Mist expectect stim is a cough mixture that is indicated in the treatment of a dry irritating cough. Mist expect stim contains ammonium chloride which is the active ingredient. Ammoniumsalts are sometimes employed as expectorants; thus amonium chloride provides the expectorant effects, therefore useful in treating dry, coughs (SAMF, 2000:462).

Mist Tussi Infans 100MI

Mist tussin infans, a simple linctus indicated in the treatment of dry cough in paediatrics. With the active ingredient being citric acid monohydrate.

R 06: Antihistamines for systemic use

R06A Antihistamines for systemic use

R06A A Aminoalkyl ethers

R06A A06 Chlorpheniramine tab 4 mg

Chlorpheniramine is considered a prototype antihistaminic H1 blocker (Katzung & Trevor, 1995:134). H1-histamine antagonists are used in the treatment of allergic conditions such as hay fever, urticaria, drug sensitivity rashes, pruritis and insect bites and stings (Neal, 2002:29).

Adverse effects: H_1-receptor antagonists may cause sedation, impairment of cognitive function, diminished alertness, slowed reaction time, dizziness as well as dry mouth, blurred vision and urinary retention.

3.3.10 S: Sensory Organs

A product from this anatomical group that have appeared on the top twenty lists was as follows:

S01 Othalmologicals

S01A A Antibiotics

S 01A A30 Combinations of different antibiotics

Oxytetracycline Polymixine eye ointment

Tetracyclines are broad-spectrum antibiotics and are more suitable for most infections. Tetracycline are indicated for superficial eye infections e.g. conjunctivitis, keratitis, blepharitis, caused by susceptible organisms, trachoma, prophylaxis of opthalmia neonatorum. Also tetracyclines are the drug of choice in treating chlamydial infections and ocular rosaceae (Neal, 2002:85, SAMF, 2000:473).

Adverse effects: local stinging or burning may occur, but it is usually well tolerated and seldom leads to sensitisation. Overgrowth with *Candida albicans* in the mouth or bowel sometimes leads to thrush. Tetracyclines cause discoloration of the teeth in young and should be avoided in children up to 8 years of age and in pregnant and lactating women. (Neal, 2002:85).

3.4 Chapter Summary

In this chapter the top twenty products appearing on the monthly purchasing reports for the period 1 April 2000 to 28 February 2002 were reviewed in terms of main indications and significant adverse/side effects that may occur with use of these medicines. Hereby the first research question and the fourth specific objective, namely the review of the nature of these pharmaceutical products from the literature have been accomplished.

The empirical investigation of this study will be discussed in chapter 4.

Chapter 4:

Empirical Investigation

4.1 Introduction

In this chapter the empirical research methodology will be discussed. The procedures followed in acquiring the relevant information and the subsequent analysis of the data will also be discussed.

The empirical research included the following steps:

- Selection and construction of the study population.
- Selection of measuring instruments.
- Data analysis.
- Report and discussion of results of the empirical investigation.
- Conclusion and recommendations.

4.2 Objectives of the Empirical Research

The general objective of this study was to review and analyse the costs and usage of the "top twenty" pharmaceutical products according to the monthly pharmaceutical purchasing reports of the Department of Health in the North West Province.

The specific research objectives of the empirical research are as follows:

- To assemble a general analysis and cost associated with the "top twenty" pharmaceutical products.
- To determine the prevalence of the each individual drug appearing as a "top twenty" product as well as determining the prevalence of the classes of the drugs.
- To identify using the database, the utilisation patterns of the "top twenty" pharmaceutical products.
- To identify possible diagnosis ("diseases") from the occurrence of these pharmaceutical products.
- To identify using the database the cost associated with these pharmaceutical products.
- To determine the differences between the cost and usages of different therapeutic classes of the "top twenty" pharmaceutical products."

❖ To determine the utilisation patterns of the different dosage forms of the "top twenty" pharmaceutical products as well as the associated cost.

❖ To form recommendations regarding the cost and patterns of drug utilisation of these pharmaceutical products.

4.3 Research Design/Method

The research design of this study may be classified as retrospective and quantitative, since the data was derived from the pharmaceutical purchasing reports of the Department of Health in the North West province, thus allowing for research and evaluation of the cost and usage of the "top twenty" pharmaceutical products.

4.4 The Data Source

The data used for the analysis was retrospectively obtained in the form of monthly pharmaceutical purchasing reports. Data was obtained over a period of two years (1 April 2000 to 28 February 2002). The monthly report for March 2002, was not printed due to the financial year ending, therefore the "top twenty" products for the period March 2002 was not available for analysis, thus this may be seen as a limitation of this study.

4.5 The Study Population

The study population consisted of all the top twenty products present on the monthly pharmaceutical purchasing reports for the period 1 April 2000 to 28 February 2002. According to the pharmaceutical purchasing reports obtained, the total number of "top twenty" products appearing during the study period amounted to 460 different pharmaceutical products.

4.6 The Database

4.6.1 Editing and coding of data

Each product that appeared as a "top twenty" pharmaceutical product was classified according to the Anatomical Therapeutic Chemical (ATC) classification system (refer to Par 3.2) and coded accordingly. Furthermore these variables were used in the statistical calculations.

After all the data had been coded, the following process involved entering the data into a database program.

4.6.2 Entering and Analysis of Data

A *Statistical Analysis System*® SAS 8.1® (SAS institute Inc., 1999-2001) program was set up to manage the data set. The statistical analysis was carried out using the SAS® system. *Microsoft Excel 2000* and *Microsoft Word 2000* were used for the basic analysis and word processing. The analaysis was done on a Compaq Deskpro EP Series with a Microsoft Windows 2000 Professional ® server, version 5.0 operating system.

4.7 Measuring Instruments / Criterion For The Data Analysis

As a means in attaining the objectives set out in this study, the following criteria were selected for use:

- The defined daily dose (DDD);
- Prevalence of different therapeutic classes of the "top twenty drugs" and
- Costs.

4.7.1 The Defined Daily Dose (DDD)

The defined daily dose (DDD) methodology was developed in response to the need to convert and standardise readily available volume data from sales statistics or pharmacy inventory data (quantity of packages, tablets, or other dosage forms) into medically meaningful units, to make crude estimates of number of persons exposed to a particular drug or class of drugs. Through the conversion of consumption units to DDDs, it is possible to estimate drug consumption, carry out trend analysis and receive and estimate of the cost of treatment (Lee & Bergman, 1996:386). Therefore the DDD can be used as a measure of the intensity of use and cost of pharmaceuticals.

The DDD is defined as the assumed average maintenance dose for the main indication of a particular drug (refer to Par 2.5.2.3). The DDD methodology has been useful in describing and comparing patterns of drug utilisation, providing denominator data for the estimation of adverse drug reactions, performing epidemiological screening for problems in drug utilisation, and monitoring of effects of informational and regulatory activities. The advantages of the DDD methodology include, its usefulness for working with readily available gross statistics at various

levels of the health chain; as a standardised unit of measurement, it allows comparisons between drugs in the same therapeutic class and between different health care settings or geographic areas, and evaluation of trends over time; and it is relatively easy and inexpensive to use(Lee & Bergman, 1996:386).

There are several important points to be considered concerning the use of DDD methodology. These are summarised as follows:

- The DDD is a technical unit of measurement and not always the dose prescribed or used. What is prescribed can vary from according to both the illness treated and national treatment guidelines. Dosages may vary widely (antibiotics), when one drug is used for more than one indication, or when drugs are used in combination with other drugs for the same disease. When what is actually prescribed differs significantly from the DDD, the reasons and implications should be understood for a correct interpretation.
- ❖ DDD is nearly always a compromise dose, not the actual dose used. It is based on a review of available information, including doses used in various countries when this information is available. Therefore, it is more an average of two or more commonly used dose sizes.
- ❖ The DDD does not take into account paediatric uses. Since paediatric doses are substantially lower than the established DDDs, this situation will lead to an underestimation of population exposures, which may be significant in countries with a large paediatric population.
- Furthermore the DDD has not been established for topical drugs, vaccines, general/local anaesthetics, contrast media, and allergen extracts.

The DDD was obtained from the official list published periodically by the WHO collaborating Centre for Drugs Statistics Methodology in Oslo, Norway.

4.7.2 Prevalence

Prevalence may be defined as "the proportion of people in the entire population who are found to be with a certain disease at a specific point in time, irregardless to when they first got the disease (Anon (a), 2003:1).

As a measuring instrument prevalence was used in the data analysis as follows:

- ❖ Prevalence of each individual top twenty drug/product over a two-year period on the database, these based on the active ingredients of the products.
- ❖ Prevalence of the classes of the drugs, thus giving an estimation to the possible use of these drugs as well as in determining the
- ❖ Prevalence of a disease condition as predicted from these products.
- ❖ Prevalence of the dosage forms of the top twenty products.
- ❖ Prevalence of the usage of these products individually as well as per therapeutic class.
- ❖ Prevalence of combination products as appearing as a top twenty product.

4.7.3 Cost

According to the literature cost may be defined as the value of health care resources (e.g. test, drugs, supplies, health care personnel, and medical facilities) consumed in the provision of an intervention (treatment programme) or in dealing with the side effects or other current and future consequences linked to it (Gold *et al.*, 1996:396).

In this study the top twenty products will be analysed cost-wise using the total costs, the average costs, minimum and maximum treatment costs also the cost index (a calculation in determining the costs of treatments). These cost concepts will be applied to the analysis of the top twenty products as follows:

- ❖ The total cost of the top twenty products as on the database and well as per total issue value for the two-year period.
- ❖ Cost of the individual top twenty products on the database.
- ❖ The cost of the different therapeutic classes and the difference in cost associated with them.
- ❖ Cost of the dosage forms in the case of vaccinations.

4.8 Statistical Analysis Implemented During Data Analysis

Various statistical methods were applied to analyse the data these are discussed as follows:

4.8.1 Arithmetic Mean (Average)

An average that uses the exact value of each observation is the mean. To compute the mean, the values of all the observations are added and then divided by the number of observations (Brase & Brase, 1999:94)

The most popular and useful measure of central location is the arithmetic mean. Widely known as the average, the mean of a set of observations is defined as follows (Brase & Brase, 1999:94):

$$Mean = \frac{Sum\ of\ the\ observations}{Number\ of\ observations}$$

Mathematicallyexpressed as

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

Where:

- x = the values of the variable
- $\sum$ = the sum of.
- n = the number of observations

4.8.2 Range

The range of a set of observations is defined as the numerical difference between the largest and smallest observations (Keller & Warrack, 1999:103). The range indicates the variation between the smallest and largest entries, but does not indicate how much other values vary from one another. For this purpose a different measure of variation the standard deviation (see par 4.8.3) needs to be used.

4.8.3 Standard Deviation

A standard deviation is a statistical measure that measures variability. According to Brase & Brase (1999:103) the standard deviation is a measurement that indicates how the data entries differ from the mean.

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

Where:

s = standard deviation

n = the number of observations

$\bar{x}$ = the arithmetic mean

x = any value in the data set

During the analysis carried out in this study the standard deviation was calculated with the aid of a SHARP ADVANCED D.A.L scientific pocket calculator, EL-531LH and SAS 8.1® (SAS Institute Inc., 1999-2001).

4.8.4 Cost Index

Serfontein defines cost index (1989:180) as follows:

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

For the purpose of this study the cost index is an indicator of the relative expensiveness of the top twenty drugs will be analysed as follows:

- If cost index < 1 then the drug utilised is relatively inexpensive.
- If cost index = 1 then there is an equilibrium between the cost and prevalence of the drug.
- If cost index > 1 then the drug utilised is relatively expensive.

4.8.5 Effect sizes / d-values

Cohen (1988:3) defines effect sizes as " the degree to which the phenomenon is present in the population". Effect sizes (d – value) can be classified according to small, medium and large differences apparent.

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

Where:

- d = effect size
- $\overline{x}_a$ = mean (average treatment cost of drug)
- $\overline{x}_b$ = mean (average medicine treatment cost of b)
- s_{max} = maximum standard deviation between a and b

Small effect:	d = 0.2 (small effect with no practical significant difference).
Medium effect:	d = 0.5 (medium effect which is observable and may be significant).
Large effect:	d = 0.8 (large effect which is significant and of practical importance).
	d > 0.8 (assumed to have practical significant value)

4.9 Reliability And Validity

The data was obtained from the Department of Health in the North West province in the form of monthly reports. . The research was conducted from the viewpoint that all values printed on the monthly pharmaceutical purchasing reports were correct and accurate; this may be regarded as a limitation of the study.

4.10 Report And Discussion

The results of the empirical investigation will be discussed in chapter 5.

4.11 Conclusions and recommendations

The conclusions will be discussed in chapter 5 with recommendations of the empirical investigation in chapter 6.

4.12 Chapter Summary

In this chapter the empirical research was discussed. The objectives, study population, criteria and classification systems, as well as the research method were discussed.

In the following chapter 5, the analysis, together with the results of the empirical investigation will be reported.

Chapter 5:

Results and Discussions

5.1 Introduction

In this chapter the results of the empirical investigation obtained through analysis of the data from the period 1 April 2000 to 28 February 2002 will be discussed.

Annotations that may be relevant for the interpretation of the results:

- The period of the study was broken up into two years with year one representing the period (1 April 2000 - 31 March 2001) and year two (1 April 2001 – 28 February 2002). It is important to note that analyses were not carried out regarding the "top twenty" products for March 2002, as the respective pharmaceutical purchasing report was not printed for the month due to stocktaking, only a total purchasing cost total per region was available for that period.
- The "top twenty" pharmaceutical products were determined on the bases "cost" and not quantity according to the pharmaceutical purchasing reports as obtained from Department of Health in the North West Province.
- Pharmaceutical product, refers to a drug / medicine item that is intended to modify or explore physiological systems or pathological states for the benefit of the recipient. For the purpose of this study pharmaceutical product refers to that product which contains at least one pharmaceutical active ingredient therefore excluding non-medical surgical products (e.g. swabs, bandages, needles etc).
- Dosage form refers to the form of the completed pharmaceutical product, e.g. tablet, capsule, injection, elixir, suppository.
- Quantity refers to the amount of pharmaceuticals purchased by hospitals in the North West Province and as issued by the provincial medical stores.
- Prevalence and frequency refers to the number of times a particular product had appeared as a "top twenty" product during the two-year study period.
- It is further important to note that all values that have appeared on the monthly pharmaceutical purchasing reports were considered to be correct.
- All amounts have been "rounded off"; therefore the sum of the percentage will not always add up to one hundred per cent.

- With regard to the cost index values indicated in the results, only values higher than one were considered to be relatively expensive treatment cost.
- For the purpose of this study effect sizes (d value ≥ 0.8) will be considered to have practically significant difference between the average medicine costs.

5.2 Demographic Information

The following demographic information was derived from analysis of the data as obtained from the database for the study period commencing 1 April 2000 to 28 February 2002.

5.2.1 General Demographic Analysis

The top twenty products that were identified from monthly pharmaceutical purchasing reports during the study period are summarised according to the ATC classification system (refer to par 3.2).

The results of the general demographic analysis are tabulated in table 5.1. Since age and gender of patients were not available on the reports, specific demographic analyses in this regard were not possible. Therefore the absences of these two factors are seen as a limitation in the analysis of the database and particularly of this study.

Table 5.1 Results of general demographic analysis (1 April 2000-28 February 2002).

Description	*Total Study Population*
Number of potential patients utilising public health care services	2,935,479 (Approximately 80% of the total North West population of 3,669,349 inhabitants using public health care services; Serfontein, 2003)
Total number of products appearing as a "top twenty product" during the study period	460
Total purchasing cost including *both* pharmaceutical and surgical products	R 201,275,350.42
Total purchasing cost of *all* pharmaceuticals	R 178,163,061.50
Total purchasing cost of *exclusively* "top twenty pharmaceuticals products"	R 66,263,674.51

It can be determined from table 5.1 that the total number of patients used in the analysis for the data, amounted to 2,935,479 people (representing approximately 80% of the total population of the North West Province utilising public health care services). The total number of "top twenty" products present during the study period (1 April 2000 to 28 February 2002) amounted to 460 products.

According to the purchasing reports the total purchasing cost including both pharmaceutical and surgical products during the study period amounted to R 201,275,350.42. The total purchasing costs of *all pharmaceuticals* amounted to R 178,163,061.50 constituting 88.5 % of the total purchasing cost (n = R 201,275,350.42) of all products on the database.

The total purchasing cost of the *"top twenty"* products over the two-year period amounted to R 66,263,674.51, constituting 37.2% of the total pharmaceutical purchasing costs (n = R 178,163,061.50) and 33.0% of total purchasing cost of all products inclusive of both surgical and pharmaceutical products (n = R 201,275,350.42).

5.2.2 Summary Of Pharmaceutical Purchases By Hospitals In The North West Province For The Period 1 April 2000 to 31 March 2002

The consolidated hospital purchases of pharmaceuticals during the study period will be analysed according to three-month quarterly periods as of 1 April 2000 to 31 March 2002. These quarterly results are tabulated in table B.1 (see Appendix B), with a summary of these results presented in table 5.2 below. 2,935,479.

Table 5.2 Yearly Pharmaceutical Purchasing Costs Per Region In The North West Province.

Provincial Region	*Pharmaceutical Purchasing Cost: 1 April 2000- 31 March 2001*	*Pharmaceutical Purchasing Cost: 1 April2001- 31 March2002*
Odi	R 13,015,583.40 (15.0%)	R 15,744,164.54 (16.1%)
Klerksdorp	R 26,326,511.85 (30.3%)	R 29,144,282.29 (30.2%)
Rustenburg	R 17,614,004.52 (20.1%)	R 19,008,268.25 (19.4%)
Molopo	R 16,802,124.28 (19.4)	R 18,855,042.20 (19.3%)
Vryburg	R 13,049,905.28 (15.0%)	R 15,093,911.15 (15.4%)
Regional yearly total	***R 86,808,129.33***	***R 97,845,668.43***

According to table 5.2, it may be concluded that the Klerksdorp Region (mainly known as the Southern District Municipality) comprising of formerly the following districts, Klerksdorp, Potchefstroom, Ventersdorp and Wolmaranstad (Maquassi Hills Municipality including Wolmaranstad), had the highest purchasing costs per region for both years 2000 (30.3%; n = R 86,808,129.33) and 2001 (30.2%; n = R 97,845,668.43) respectively. Various reasons may account for this relatively high purchasing cost. Whilst the population being served (including provision and distribution to primary health care clinics where appropriate), the size of the hospitals serving the population in terms of hospital beds; these beds been classified according to authorised beds (beds officially recognised as part of the bed complement of a hospital by the Department of Health) and available beds (beds that are occupied or, if unoccupied, are available for use almost immediately i.e. available for inpatient care) with the total number of active/available beds often being higher than the authorised bed number, as beds have been added to meet demand (Department of Health, 2002: vi) , furthermore the extent and level of services being rendered by hospitals may be the reasons supporting these high purchasing costs. The size of the population as divided according to the above regions/districts indicates that the total population of the Southern Region amounted to 599665 inhabitants representing 16.34% (n = 3669349) of the total population of the North West Province (Census, 2001). The Klerksdorp/ Tshepong/ Potchefstroom/ Witrand Hospital Complex is situated in the Southern District Municipality of the North West Province, in total seven hospitals are registered with the South African Pharmacy Council with the object of delivering of pharmaceutical services within this district.

The Klerksdorp/Tshepong Hospital complex is a tertiary service provincial hospital serving a large population of the Klerksdorp, Orkney, Stilfontein, and Hartebeesfontein area, and serves as a referral hospital for the Vryburg Region. Klerksdorp/Tshepong Complex is a hospital complex with a total of 1015 authorised (total approved) and 873 available beds (Senne, 2003:1, Anon (b), 2004:1, Anon (c) 2004:1).

Potchefstroom hospital is an acute hospital with 335 authorised and 310 available beds, serving the community around Potchefstroom and taking the flow of patients from Fochville, Ventersdorp and Parys.

Witrand Hospital situated in Potchefstroom, consists of 1152 available beds, catering for the mentally chronic ill patients and intellectually handicapped patients and thereby rendering comprehensive hospital based mental health services to the North West Province (Anon (b), 2004:1, Anon (c) 2004:1).

The Ventersdorp hospital has 21 authorised beds and 38 available beds serving a population of 430821, with referral of second level services to the Potchefstroom Hospital; and Wolmaranstad Hospital is a 158 totally authorised and 118 available bed hospital serving a population of approximately 69 038 inhabitants (Anon (c) 2004:1).

Rustenburg Region comprising of Moreteletsi, George Stegmann and Rustenburg district hospitals accounted for the second largest purchasing cost representing 21.0% (n = R86, 808,129.33) and 19.3% (n = R 97,845,668.43) respectively. . With the Rustenburg Provincial hospital having 350 authorised beds and 295 available beds and the George Stegmann hospital classified under Rustenburg district, has a total of 323 authorised and available beds, similarly Moretletsi Hospital also classified under Rustenburg district has a total of 166 authorised and 122 available beds. These districts form part of the Bonjanala District Municipality and provide state pharmaceutical services to a population of approximately 1,185,332 making it the largest population of the five district municipalities within the North West Province. A total of seven public hospitals and six community health/clinic centres are registered with the South African Pharmacy Council for rendering of pharmaceutical services, however due this district being a mining area, the state hospitals are supported by four hospitals serving the mining community (Census, 2001:1, Anon (c) 2004:1).

The Odi region presented with a relatively low pharmaceutical purchasing cost of 15.0% (n = R 86,808,129.33) and 16.1% (n = R 97,845,668.43) for 2000 and 2001. The Odi region consists of the following district hospitals, the Odi hospital, and Jubilee hospital in Moretele and the Brits Hospital in Madibeng district. The Jubilee Hospital has a total of 551 authorised and 549 available beds. The Brits hospital serves around 300 000 patients, mainly from the rural areas and surrounding farms and mines. Parts of these regions are situated in the Bojanala Health District, and the City of Tshwane Metropolitan Municipality but latter is still controlled by the North West Department of Health (Census, 2001:1, Anon (c) 2004:1)..

Of all the regions, Vryburg region had the lowest pharmaceutical purchasing cost representing 15.0% (n = R 86,808,129.33) and 15.4% (n = R 97,845,668.43) for the two-year study period respectively. This region is also known as the Bophirima District Municipality, inclusive of six municipalities, having ten hospitals and six community health/ clinic centres registered with the South African Pharmacy Council thereby providing pharmaceutical services to 439,680 people. Ganyesa district hospital has a total of 60 authorised and available beds, Taung District hospital has 434 authorised and 290 available beds, Schweizer Reneke district hospital consists of 68

authorised and available beds, with Vryburg District hospital having a total of 67 authorised and available beds and also the Bloemhof community hospital having 15 available beds, Christiana hospital having a total of 51 authorised and available beds and Tshwaragano district hospital in Kudumane having 250 authorised and 214 available beds. This area also forms part of the latter part of the Northern Cape Province, but pharmaceutical services are managed by the North West Department of Health (Census, 2001:1, Anon (c) 2004:1).

Therefore it may be concluded that the two highest percentage cost contributors were the Molopo subregions and Klerksdorp region (southern district municipality), which amounted to 60.5%, and 69% respectively of the total cost of medicine purchased and dispensed within the province over the two-year period.

The aspects of medicine usage per district municipality or individual hospital within the province according to the "top twenty" pharmaceutical products were not further investigated as this was outside the scope of this study.

5.3 Analysis Of The "Top Twenty" Pharmaceutical Products Based On The ATC (Anatomical Therapeutic Classification) System.

Through analysis of the monthly pharmaceutical purchasing reports as issued by a private provider operating the medical stores of the Department of Health in the North West Province, it was possible to obtain the quantities of the "top twenty" pharmaceutical products purchased as well as the costs associated with these medicines during the two year study period as from 1st April 2000 to 28 February 2002.

Medicines that have appeared as a "top twenty product" during the study period have been classified according to the ATC classification system. The quantity of these "top twenty" medicines and the respective costs will be analysed simultaneously for the two years.

5.3.1 Quantities and Costs Of "Top Twenty Pharmaceutical" Products Based On The ATC Therapeutic Main Group Classification System.

Table 5.3 summarises the quantities as well as the costs of the "top twenty" pharmaceutical products classified according to the ATC therapeutic main group classification system. Thus allowing for a general overview and analysis concerning the quantities and cost associated with specific medicine groups, further giving an indication of the cost associated with treating certain disease conditions.

Table 5.3 Quantities And Cost Of The "Top Twenty" Pharmaceutical Products Based On The ATC Therapeutic Main Group Classification System

ATC Therapeutic Main Group	*Year 1 (1 Apr2000-31Mar 2001)*				*Year 2 (1 Apr 2001—28 Feb 2002)*			
	Quantity per group (items)	*Quantity per group (n= 134515640) %*	*Cost per group (R)*	*Cost per group % (n = R 35568221.31)*	*Quantity per group (items)*	*Quantity per group (n= 103567031) %*	*Cost per group (R)*	*Cost per group (n =R31370435.51) %*
Drugs used in diabetes *(A10)*	1719585	1.28	1472880.15	4.14	541093	0.52	1414647.04	4.51
Blood substitutes & perfusion solutions *(B05)*	227532	0.17	1874643.08	5.27	301398	0.29	2032597.48	6.48
Cardiac therapy *(C01)*	104700	0.08	123041.04	0.35	-	-	-	-
Antihypertensives *(C02)*	27831484	20.69	3853676.50	10.83	8900188	8.59	1444097.83	4.60
Diuretics *(C03)*	27255148	20.26	2210983.90	6.22	18849196	18.20	1831695.82	5.84
Calcium channel blockers *(C08)*	1657276	1.23	1237880.58	3.48	2169640	2.09	1405775.20	4.48
Agents acting on the renin-angiotensin system *(C09)*	8095480	6.02	4172510.36	11.73	8263360	7.98	3761690.47	11.99
Serum lipid reducing agents *(C10)*	27832	0.02	147509.60	0.41	-	-	-	-

Table 5.3 (cont) Quantities and Cost of the "Top Twenty" Pharmaceutical Products Based on the ATC Therapeutic Main Group Classification System

ATC Therapeutic Main Group	*Year 1 (1 Apr2000-31Mar 2001)*				*Year 2 (1 Apr 2001—28 Feb 2002)*			
	Quantity per group	*Quantity per group (n= 134515640) %*	*Cost per group (R)*	*Cost per group (n = R35568221.31) %*	*Quantity per group*	*Quantity per group (n= 103567031) %*	*Cost per group (R)*	*Cost per group (n =R31370435.51) %*
Anti-mycotics for dermatological use *(D01)*	18104	0.01	538783.44	1.51	2890	0.01	92017.60	0.29
Sex hormones and modulators of the genital system *(G03)*	1134355	0.84	4086946.37	11.49	1222029	1.18	4810521.48	15.33
Antibacterials for systemic use *(J01)*	17071182	12.69	7356985.70	20.68	7214409	6.97	5245668.26	16.72
Anti-mycobacterials *(J04)*	6482100	4.82	3524315.87	9.91	4764960	4.60	3131283.80	9.98
Vaccines *(J07)*	21955	0.02	1042117.59	2.93	38264	0.04	3296134.15	10.51
Anti-inflammatory & anti-rheumatic products. *(M01)*	12243700	9.10	516790.82	1.45	3844425	3.71	231341.80	0.74
Analgesics *(N02)*	7414846	5.51	910901.95	2.56	1947983	1.88	179969.06	0.57

Table 5.3 (cont) Quantities and Cost of the "Top Twenty" Pharmaceutical Products Based on the ATC Therapeutic Main Group Classification System

ATC Therapeutic Main Group	*Year 1 (1 Apr2000-31Mar 2001)*				*Year 2 (1 Apr 2001—28 Feb 2002)*			
	Quantity per group (items)	*Quantity per group (n= 134515640) %*	*Cost per group (R)*	*Cost per group (n = R35568221.31) %*	*Quantity per group (items)*	*Quantity per group (n= 103567031) %*	*Cost per group (R)*	*Cost per group (n= R31370435.51) %*
Anti-epileptics *(N03)*	6711990	4.99	1698263.05	4.77	3222190	3.11	1085689.31	3.46
Anti-helmintics *(P02)*	16326	0.01	129791.70	0.36	-	-	-	-
Anti-asthmatic agents *(R03)*	34735	0.03	411213.18	1.16	66706	0.06	840288.89	2.68
Cough and Cold preparations *(R05)*	16432400	12.22	165202.50	0.46	41997100	40.55	370370.52	1.18
Antihistamines for systemic use *(R06)*	-	-	-	-	221200	0.21	196646.80	0.63
Opthalmologicals *(S01)*	14910	0.01	93783.90	0.26	-	-	-	-
Total	***134515640***	***100.00***	***35568221.31***	***100.00***	***103567031***	***99.99****	***31370435.51***	***100.00***

**The sum of the percentage column does not amount to 100 due to the fact that amounts have been rounded off to two decimal places.*

For simplification of the amounts indicated in table 5.3, the quantities of medicines purchased per group as well as their respective costs, are represented as percentages of the total quantity and cost of all *"top twenty medicine items"* purchased for that specific period 1 Apr 2000-31 Mar 2001 (i.e. year one) and 1 Apr 2000 –28 Feb 2002 (i.e. year two).

It is indicative from table 5.3 that anti-hypertensives (group C02) had the highest quantity purchased of all therapeutic main groups, representing 20.69% of the total quantity of all the "top twenty" pharmaceuticals purchased (n = 134,515,640) for year one. Group C03 – diuretic agents was the group with the second highest quantity purchased totalling 27,255,148 (20.26% n =134,515,640) for the year, with the third highest group in terms of quantity purchased being the antibacterials for systemic use (group J01) representing 12.69% (n = 134,515,640) of the total quantity of all "top twenty" pharmaceuticals purchased during the first year.

Analysis with regard to the cost percentage as per therapeutic main group, indicated that anti-bacterials for systemic use (group J01) presented with the highest cost percentage for the first year (20.68%; n = R 35,568,221.31), followed by agents acting on the rennin-angiotensin system (group C09) having had the second highest cost per therapeutic main group for the year representing 11.73% (n = R35, 568,221.31) of the total cost of the top twenty pharmaceuticals for year one and lastly therapeutic main group G03 (sex hormones and modulators of the genital system) presenting with the third highest cost percentage for the year totalling 11.49% (n = R 35,568,221.31).

A comparison with year two indicated that the therapeutic main group with the highest quantity pharmaceuticals purchased was group R05 (cough and cold preparations), representing 40.55% (n = 103,567,031) and a representative cost percentage of 1.18% (n = R 31,370,435.51). Diuretics (group C03), in comparison to year one similarly represented the second highest purchasing quantity of "top twenty" pharmaceuticals totalling 18.20% (n =103,567,031), with an associated cost percentage of 5.84% (n = R31, 370,435.51). Anti-hypertensives (group C02) had the third highest quantity purchased of all therapeutic main groups for year two representing 7.98% (n=103,567,031), this quantity percentage being significantly much lower than the 20.69% (n =134,515,640) for year one. Regarding the cost percentages for year two, it is indicative from table 5.3, that anti-bacterials for systemic use (group J01) similarly represented the highest cost of "top twenty" pharmaceuticals purchased for year two, with a cost percentage of 16.72% (n= R31, 370,435.51). Group G03 (sex hormones and modulators of the genital system) had a relatively higher cost percentage for year two totalling 15.33% (n = R31,

370,435.51) in comparison to the cost percentage of year one (11.49%; n = R35, 568,221.31). Agents acting on the renin-angiotensin system (group C09) presented with the third highest cost of all "top twenty" pharmaceuticals purchased for year two, totalling R 3761690.47 (11.99%; n = R31, 370,435.51).

It is significant to note the quantity and cost differences apparent between the two years, purchasing with regard to drugs used in the treatment of hypertension (group C02), presenting with a significantly higher purchasing quantity in year one 20.69% (n =134,515,640) in comparison to year two's quantity percentage of 8.59% (n = 103,567,031).

Vaccines (group J07) presented with a relatively higher purchasing quantity percentage for year two, with a quantity percentage difference totalling 0.02%; a significant cost difference is apparent between the years, with the second year having a higher cost percentage of 10.51% (n = R 31,370,435.51) in comparison to year one's cost percentage of 2.93% (n = R 35,568,221.31). Anti-inflammatory and anti-rheumatic products (group M01) showed a decrease in the purchasing quantity between years one and two, having a quantity percentage difference of 5.39% and a cost percentage difference of 0.71%.

Furthermore it is indicative from table 5.3, that group R05 (cough and cold preparations) showed an increase in the purchasing quantity of these products, with a quantity percentage difference of 28.33% and a cost percentage difference of 0.72% over the two year study period. These differences may possibly be due to price changes or "usage" changes associated with the relevant products.

5.3.2 Quantities and Costs of the "Top Twenty" Pharmaceutical Products Based on the ATC Classification System according to Pharmacological Subgroup, Chemical Subgroup and Chemical Substance

Table 5.4 depicts the respective yearly quantities and costs; also cost indexes of all pharmaceutical products appearing as "top twenty" products during the two-year study period. These products are classified according to the ATC classification system based on pharmacological subgroup, chemical subgroup and chemical substance.

Table 5.4 Quantities and Cost of the "Top Twenty" Pharmaceutical Products Based on the ATC Classification System According to Pharmacological Subgroup, Chemical Subgroup and Chemical Substance

ATC Classification System			*Drug Description*	*Dosage Form*	*No of months appearing as top 20 product*	*Year one (1 Apr 2000-31 Mar 2001)*			*Year two (1 Apr 2001-28 Feb 2002)*		
Pharmaco-logical Subgroup	*Chemical Subgroup*	*Chemical Substance*				*Quantity Purchased (Items)*	*Cost (R)*	*Cost index*	*Quantity Purchased (Items)*	*Cost (R)*	*Cost index*
A10A Insulins & analogues	**A10AD** Intermediate acting comb with fast-acting	**A10AD01**	Insulin Actraphane Hm 10ml 100Iu/ml	Inj	23	52129 (0.04%)	1241472.61 (3.49%)	87.2	44709 (0.04%)	1312418.80 (4.18%)	104.5
A10B Oral blood glucose lowering drugs	**A10BB** Sulfonamides, urea derivatives	**A10BB02**	Gliclazide 80mg	Tab	2	432656 (0.32%)	77351.66 (0.22%)	0.7	496384 (0.48%)	102228.24 (0.33%)	0.7
	A10BD Biguanides	**A10BD03**	Metformin 850mg	Tab	2	1234800 (0.92%)	154055.88 (0.43%)	0.5	-	-	-
B05A Blood & related products	**B05AA** Blood Substitutes & Plasma protein fractions	**B05AA01**	Albumin sol 20%100ml	Inj	1	-	-	-	331 (0.01%)	83286.22 (0.27%)	27.0

Table 5.4 (cont) Quantities and Cost of the "Top Twenty" Pharmaceutical Products Based on the ATC Classification System According to Pharmacological Subgroup, Chemical Subgroup and Chemical Substance

ATC Classification System			*Drug Description*	*Dosage Form*	*No of months appearing as top 20 product*	*Year one (1 Apr 2000-31 Mar 2001)*			*Year two (1 Apr 2001-28 Feb 2002)*		
Pharmaco-logical Subgroup	*Chemical Subgroup*	*Chemical Substance*				*Quantity Purchased (Items)*	*Cost (R)*	*Cost index*	*Quantity Purchased (Items)*	*Cost (R)*	*Cost index*
B05B Intravenous Solutions	**B05BB** Electrolytes with carbohydrates	**B05BB02**	Maintelyte & dextrose 1000 ml	Inj	2	13800 (0.01%)	133353.60 (0.37%)	37.0	-	-	-
			Ringers lactate Sol 1000ml	Inj	23	177552 (0.13%)	1559468.78 (4.38%)	33.7	198840 (0.19%)	1440240.92 (4.59%)	24.1
B05C Irrigation solutions	**B05CB** Sodium Chloride	**B05CB01**	Sodium Chl 0.9% 50 ml	Inj	3	28080 (0.02%)	117093.60 (0.33 %)	16.5	54262 (0.05%)	175522.52 (0.56%)	11.2
			Sodium Chl 0.9% 1000ml	Inj	5	8100 (0.01%)	64727.10 (0.18%)	18.0	47965 (0.05%)	333547.82 (1.06%)	21.2
C01D Vasodilators used in cardiac diseases	**C01DA** Organic nitrates	**C01DA14**	Isosorbide-5-mononitrate 20mg	Tabs	1	104700 (0.08%)	123041.04 (0.35%)	4.4	-	-	-

Table 5.4 (cont) Quantities and Cost of the "Top Twenty" Pharmaceutical Products Based on the ATC Classification System According to Pharmacological Subgroup, Chemical Subgroup and Chemical Substance

ATC Classification System			*Drug Description*	*Dosage Form*	*No of months appearing as top 20 product*	*Year one (1 Apr 2000-31 Mar 2001)*			*Year two (1 Apr 2001-28 Feb 2002)*		
Pharmaco-logical Subgroup	*Chemical Subgroup*	*Chemical Substance*				*Quantity Purchased (Items)*	*Cost (R)*	*Cost index*	*Quantity Purchased (Items)*	*Cost (R)*	*Cost index*
C02A Antiadrenergic agents;centrally acting	**C02AA** Rauwolfia alkaloids	**C02AA02**	Reserpine 0.25mg	Tabs	8	1106560 (0.82%)	417855.00 (1.17%)	1.4	1007524 (0.97%)	316230.28 (1.01%)	1.0
	C02AB Methyldopa	**C02AB01**	Methyldopa 250mg	Tabs	15	26724924 (19.87%)	3435821.50 (9.66%)	0.5	7892664 (7.62%)	1127867.55 (3.60%)	0.5
C03A Low-ceiling diuretics	**C03AA** Thiazides- plain	**C03AA03**	Hydrochloro-thiazide 25mg	Tabs	22	27255148 (20.26%)	2210983.90 (6.22%)	0.3	18849196 (18.20%)	1831695.82 (5.84%)	0.3
C08C Selective calcium channel blockers with mainly vascular effects	**C08CA** Dihydropyridine derivatives	**C08CA05**	Nifedipine 30mg	Tabs	18	1535196 (1.14)	1036968.58 (2.92%)	2.6	2169640 (2.09%)	1405775.20 (4.48%)	2.14

Table 5.4 (cont) Quantities and Cost of the "Top Twenty" Pharmaceutical Products Based on the ATC Classification System According to Pharmacological Subgroup, Chemical Subgroup and Chemical Substance

ATC Classification System			*Drug Description*	*Dosage Form*	*No of months appearing as top 20 product*	*Year one (1 Apr 2000-31 Mar 2001)*			*Year two (1 Apr 2001-28 Feb 2002)*		
Pharmaco-logical Subgroup	*Chemical Subgroup*	*Chemical Substance*				*Quantity Purchased (Items)*	*Cost (R)*	*Cost index*	*Quantity Purchased (Items)*	*Cost (R)*	*Cost index*
C08C Selective calcium channel blockers with mainly vascular effects	**C08CA** Dihydropyridine derivatives	**C08CA05**	Nifedipine 60mg	Tabs	2	122080 (0.09%)	200912.00 (0.56%)	6.2	-	-	-
C09A ACE inhibitors plain	**C09AA** ACE inhibitors plain	**C09AA01**	Captopril 50mg	Tabs	1	300000 (0.22%)	95000.00 (0.27%)	1.2	-	-	-
		C09AA02	Enalapril 5mg	Tabs	1	463316 (0.34%)	108634.35 (0.31%)	0.9	-	-	-
			Enalapril 10mg	Tabs	22	4291840 (3.19%)	1974609.61 (5.55%)	1.7	3795708 (3.66%)	1067120.10 (3.40%)	0.9
			Enalapril 20mg	Tabs	4	313880 (0.23%)	416339.40 (1.17%)	5.1	-	-	-
		C09AA04	Perindropil 4mg	Tabs	23	2726444 (2.03%)	1577927.00 (4.44%)	2.2	4467652 (4.31%)	2694570.37 (8.59%)	2.0

Table 5.4 (cont) Quantities and Cost of the "Top Twenty" Pharmaceutical Products Based on the ATC Classification System According to Pharmacological Subgroup, Chemical Subgroup and Chemical Substance

ATC Classification System			*Drug Description*	*Dosage Form*	*No of months appearing as top 20 product*	*Year one (1 Apr 2000-31 Mar 2001)*			*Year two (1 Apr 2001-28 Feb 2002)*		
Pharmaco-logical Subgroup	*Chemical Subgroup*	*Chemical Substance*				*Quantity Purchased (Items)*	*Cost (R)*	*Cost index*	*Quantity Purchased (Items)*	*Cost (R)*	*Cost index*
C10A Cholesterol and Triglycerides reducers	**C10AA** HMG CoA reductase inhibitors	**C10AA01**	Simvastatin 20mg	Tabs	1	27832 (0.02%)	147509.60 (0.41%)	20.5	-	-	-
D01A Antifungals for topical use	**D01AC** Imidazole & triazole derivatives	**D01AC52**	Miconazole nitrate gel 2% (30g)	Topical	6	18104 (0.01%)	538783.44 (1.51%)	151.0	2890 (0.01%)	92017.60 (0.29%)	29.0
G03A Hormonal contraceptives for systemic use	**G03AB** Progestogens& estrogens, sequential preparations	**G03AB03**	Levonorgestrel oestradiol	Tabs	12	310600 (0.23%)	587840.60 (1.65%)	7.2	338100 (0.33%)	751407.00 (2.40%)	7.3
	G03AC Progestogens	**G03AC01**	Medroxy-progesterone 150mg/ml	Inj	22	378455 (0.28%)	1508884.83 (4.24%)	15.1	405450 (0.39%)	1762939.60 (5.62%)	14.4

Table 5.4 (cont) Quantities and Cost of the "Top Twenty" Pharmaceutical Products Based on the ATC Classification System According to Pharmacological Subgroup, Chemical Subgroup and Chemical Substance

ATC Classification System			*Drug Description*	*Dosage Form*	*No of months appearing as top 20 product*	*Year one (1 Apr 2000-31 Mar 2001)*			*Year two (1 Apr 2001-28 Feb 2002)*		
Pharmaco-logical Subgroup	*Chemical Subgroup*	*Chemical Substance*				*Quantity Purchased (Items)*	*Cost (R)*	*Cost index*	*Quantity Purchased (Items)*	*Cost (R)*	*Cost index*
G03A Hormonal contraceptives for systemic use	**G03AC** Progestogens	**G03AC06**	Norethisterone 200mg/ml	Inj	23	445300 (0.33%)	1990220.94 (5.60%)	17.0	478479 (0.46%)	2296174.88 (7.32%)	16.0
J01C Beta-lactam antibacterials , penicillins	**J01CA** Penicillins with extended spectrum	**J01CA04**	Amoxycillin 250mg	Caps	11	5818010 (4.33%)	848169.68 (2.38%)	0.5	2911545 (2.81%)	419753.11 (1.34%)	0.5
			Amoxycillin Susp 125mg/5ml	Liq	3	46440 (0.03%)	138897.56 (0.39%)	13.0	25006 (0.02%)	72017.28 (0.23%)	11.5
	J01CR Comb of penicillins, incl beta-lactamase inhibitors	**J01CR02**	Amox/Clav 1000/200mg	Inj	7	54705 (0.04%)	816769.60 (2.30%)	57.5	20870 (0.02%)	353827.20 (1.13%)	56.5

Table 5.4 (cont) Quantities and Cost of the "Top Twenty" Pharmaceutical Products Based on the ATC Classification System According to Pharmacological Subgroup, Chemical Subgroup and Chemical Substance

ATC Classification System			*Drug Description*	*Dosage Form*	*No of months appearing as top 20 product*	*Year one (1 Apr 2000-31 Mar 2001)*			*Year two (1 Apr 2001-28 Feb 2002)*		
Pharmaco-logical Subgroup	*Chemical Subgroup*	*Chemical Substance*				*Quantity Purchased (Items)*	*Cost (R)*	*Cost index*	*Quantity Purchased (Items)*	*Cost (R)*	*Cost index*
J01C Beta-lactam antibacterials , penicillins	**J01CE** Beta-lactamase sensitive penicllins	**J01CE02**	Phenoxymethyl -penicillin 250mg	Tabs	1	5942840 (4.42%)	519622.20 (1.46%)	0.3	-	-	-
	J01CF Beta-lactamase resistant penicillins	**J01CF05**	Flucloxacillin 250mg	Caps	8	450300 (0.33%)	257366.18 (0.72%)	2.2	1054180 (1.02%)	621817.28 (1.98%)	1.9
J01D Other beta-lactam anti-bacterials	**J01DA** Cephalosporins & related substances	**J01DA10**	Cefotaxime 500mg	Inj	2	8471 (0.01%)	139771.50 (0.39%)	39.0	-	-	-
			Cefotaxime 1g	Inj	3	10746 (0.01%)	234155.34 (0.66%)	66.0	15517 (0.01%)	253547.78 (0.81%)	81.0
		J01DA13	Ceftriaxone 250mg	Inj	1	3467 (0.01%)	77972.44 (0.22%)	22.0	-	-	-
			Ceftriaxone 1g	Inj	16	15443 (0.01%)	1086957.53 (3.06%)	306.0	13558 (0.01%)	902900.97 (2.88%)	288.0

Table 5.4 (cont) Quantities and Cost of the "Top Twenty" Pharmaceutical Products Based on the ATC Classification System According to Pharmacological Subgroup, Chemical Subgroup and Chemical Substance

ATC Classification System			*Drug Description*	*Dosage Form*	*No of months appearing as top 20 product*	*Year one (1 Apr 2000-31 Mar 2001)*			*Year two (1 Apr 2001-28 Feb 2002)*		
Pharmaco-logical Subgroup	*Chemical Subgroup*	*Chemical Substance*				*Quantity Purchased (Items)*	*Cost (R)*	*Cost index*	*Quantity Purchased (Items)*	*Cost (R)*	*Cost index*
J01E Sulphonamides & trimethoprim	**J01E** Comb, incl derivatives	**J01EE01**	Co-Trimoxazole 480mg	Tabs	1	1027540 (0.76%)	75262.82 (0.21%)	0.2	-	-	-
J01F Macrolides & Lincosamides	**J01FA** Macrolides	**J01FA01**	Erythromycin 250mg	Tabs	12	3257660 (2.42%)	871631.47 (2.45%)	0.8	2828460 (2.73%)	862752.52 (2.75%)	1.0
			Erythromycin suspension 125mg/5ml	Liq	5	42670 (0.03%)	329785.63 (0.93%)	23.7	14183 (0.01%)	91338.52 (0.29%)	29.0
J01M Quinolone antibacterials	**J01MA** Fluoro-quinolones	**J01MA02**	Ciprofloxacin 500mg	Tabs	20	392890 (0.29%)	1960623.75 (5.51%)	14.4	331090 (0.32%)	1667713.60 (5.32%)	16..6

Table 5.4 (cont) Quantities and Cost of the "Top Twenty" Pharmaceutical Products Based on the ATC Classification System According to Pharmacological Subgroup, Chemical Subgroup and Chemical Substance

ATC Classification System			*Drug Description*	*Dosage Form*	*No of months appearing as top 20 product*	*Year one (1 Apr 2000-31 Mar 2001)*			*Year two (1 Apr 2001-28 Feb 2002)*		
Pharmaco-logical Subgroup	*Chemical Subgroup*	*Chemical Substance*				*Quantity Purchased (Items)*	*Cost (R)*	*Cost index*	*Quantity Purchased (Items)*	*Cost (R)*	*Cost index*
J04A Drugs used for the treatment of Tuberculosis	**J04AM** Comb of drugs for treatment of tuberculosis	**J04AM02**	Rifam 150mg & Inh 100mg	Tabs	5	760200 (0.57%)	452674.10 (1.27%)	2.2	376520 (0.36%)	250788.74 (0.80%)	2.2
			Rifam 300mg & Inh 150mg	Tabs	14	411000 (0.31%)	367623.90 (1.03%)	3.3	909640 (0.88%)	888295.46 (2.83%)	3.2
		J04AM03	RHZE (Rifam120mg, Pza 300mg Inh 60mg Etham 200mg)	Tabs	21	4201300 (3.12%)	2133602.67 (6.00%)	1.9	3250000 (3.14%)	1833870.00 (5.85%)	1.9
			RHZE (Rifam120mg, Pza 300mg Inh 60mg Etham 225mg)	Tabs	6	1109600 (0.82%)	570415.20 (1.60%)	2.0	228800 (0.22%)	158329.60 (0.50%)	2.3

* Rifam = Rifampicin * Inh = Isoniazid * Pza = pyrazinamide * Etham = Ethambutol

Table 5.4 (cont) Quantities and Cost of the "Top Twenty" Pharmaceutical Products Based on the ATC Classification System According to Pharmacological Subgroup, Chemical Subgroup and Chemical Substance

ATC Classification System			*Drug Description*	*Dosage Form*	*No of months appearing as top 20 product*	*Year one (1 Apr 2000-31 Mar 2001)*			*Year two (1 Apr 2001-28 Feb 2002)*		
Pharmaco-logical Subgroup	*Chemical Subgroup*	*Chemical Substance*				*Quantity Purchased (Items)*	*Cost (R)*	*Cost index*	*Quantity Purchased (Items)*	*Cost (R)*	*Cost index*
J07A Bacterial and viral vaccines combined	**J07AG** Haemophilus influenzae B vaccines	**J07AG52**	Vacc Hib-Dtp 1 dose	Inj	2	7850 (0.01%)	87321.35 (0.25%)	25.0	10490 (0.01%)	226475.80 (0.72%)	72.0
			Vacc Hib-Dtp 10 dose	Inj	13	4470 (0.01%)	748337.40 (2.10%)	210	16706 (0.02%)	2735607.85 (8.72%)	436.0
	J07AJ Pertusis vaccines & Combinations	**J07AJ52**	Vacc Dtp 10 dose	Inj	1	4800 (0.01%)	71346.00 (0.20%)	20.0	-	-	-
J07B Viral vaccines	**J07BC** Hepatitis vaccines	**J07BC02**	Vacc Hep B (paed) 10 doses	Inj	6	4835.00 (0.01%)	135112.84 (0.38%)	38.0	11068 (0.01%)	334050.50 (1.06%)	106.0

Table 5.4 (cont) Quantities and Cost of the "Top Twenty" Pharmaceutical Products Based on the ATC Classification System According to Pharmacological Subgroup, Chemical Subgroup and Chemical Substance

ATC Classification System			*Drug Description*	*Dosage Form*	*No of months appearing as top 20 product*	*Year one (1 Apr 2000-31 Mar 2001)*			*Year two (1 Apr 2001-28 Feb 2002)*		
Pharmaco-logical Subgroup	*Chemical Subgroup*	*Chemical Substance*				*Quantity Purchased (Items)*	*Cost (R)*	*Cost index*	*Quantity Purchased (Items)*	*Cost (R)*	*Cost index*
M01A Anti-inflammatory & anti-rheumatic products, non-steroids	**M01AE** Propionic acid derivatives	**M01AE01**	Ibuprofen 200mg	Tabs	4	12243700 (9.10%)	516790.82 (1.45%)	0.2	3844425 (3.71%)	231341.80 (0.74%)	0.2
N02B Other analgesics & antipyretics	**N02BE** Anilides	**N02BE01**	Paracetamol 500mg	Tabs	5	6441500 (4.79%)	287082.17 (0.81%)	0.2	1893190 (1.83%)	87190.21 (0.28%)	0.1
			Paracetamol syrup 120mg/5ml	Liq	6	973346 (0.72%)	623819.78 (1.75%)	2.4	54793 (0.05%)	92778.85 (0.30%)	6.0
N03A Anti-epileptics	**N03AB** Hydantoin derivatives	**N03AB02**	Phenytoin 100mg	Caps	1	1356000 (1.01%)	168606.00 (0.47%)	0.5	-	-	-
	N03AF Carboxamide derivatives	**N03AF01**	Carbamazepine 200mg	Tabs	14	5355990 (3.98%)	1529657.05 (4.30%)	0.32	2743210 (2.65%)	795746.75 (2.54%)	0.9

Table 5.4 (cont) Quantities and Cost of the "Top Twenty" Pharmaceutical Products Based on the ATC Classification System According to Pharmacological Subgroup, Chemical Subgroup and Chemical Substance

ATC Classification System			*Drug Description*	*Dosage Form*	*No of months appearing as top 20 product*	*Year one (1 Apr 2000-31 Mar 2001)*			*Year two (1 Apr 2001-28 Feb 2002)*			*Year two (1 Apr 2001-28 Feb 2002)*		
Pharmaco-logical Subgroup	*Chemical Subgroup*	*Chemical Substance*				*Quantity Purchased (Items)*	*Cost (R)*	*Cost index*	*Quantity Purchased (Items)*	*Cost (R)*	*Cost index*	*Quantity Purchased (Items)*	*Cost (R)*	*Cost index*
N03A Anti-epileptics	**N03AF** Carboxamide derivatives	**N03AF01**	Carbamazepine 400mg	Tabs	3	-	-	-	478980 (0.46%)	289942.56 (0.92%)	2.0	41956600 (40.51%)	302735.52 (0.97%)	0.1
P02C Anti-nematodal agents	**P02CA** Benzimidazole derivatives	**P02CA01**	Mebendazole syrup 30ml	Liq	2	16326 (0.01%)	129791.70 (0.36%)	36.0	-	-	-	40500 (0.04%)	67635 (0.22%)	5.5
R03A Adrenergics, inhalants	**R03AC** Selective beta-2-adreno-receptor agonists	**R03AC02**	Salbutamol MDI	Inhaler	4	9586 (0.01%)	70335.98 (0.20%)	20.0	36204 (0.03%)	252782.96 (0.81%)	27.0	221200 (0.21%)	196646.80 (0.63%)	3.0
		R03AC04	Feneterol inhaler complete	Inhaler	1	6180 (0.01%)	51108.60 (0.14%)	14.0	-	-	-	-	-	-
R03B Other anti-asthmatics, inhalants	**R03BA** Glucocorticoids	**R03BA01**	Beclo-methasone MDI	Inhaler	10	18969 (0.01%)	289768.63 (0.81%)	81.0	30502 (0.03%)	587505.93 (1.87%)	62.3	***103567031***	***31370435.51***	-

Table 5.4 (cont) Quantities and Cost of the"Top Twenty" Pharmaceutical Products Based on the ATC Classification System According to Pharmacological Subgroup, Chemical Subgroup and Chemical Substance

ATC Classification System			*Drug Description*	*Dosage Form*	*No of months appearing as top 20 product*	*Year one (1 Apr 2000-31 Mar 2001)*			*Year two (1 Apr 2001-28 Feb 2002)*		
Pharmaco-logical Subgroup	*Chemical Subgroup*	*Chemical Substance*				*Quantity Purchased (Items)*	*Cost (R)*	*Cost index*	*Quantity Purchased (Items)*	*Cost (R)*	*Cost index*
R05C Expectorant			Mist expect stim adult 200ml	Liq	5	16432400 (12.22%)	165202.50 (0.46%)	0.1	41956600 (40.51%)	302735.52 (0.97%)	0.1
			Mist tussi infans 100ml	Liq	1	-	-	-	40500 (0.04%)	67635 (0.22%)	5.5
R06A Antihistamines for systemic use	**R06AB** Substituted alkylamines	**R06AA04**	Chlorpheni-ramine 4mg	Tabs	1	-	-	-	221200 (0.21%)	196646.80 (0.63%)	3.0
S01A Anti-infectives	**S01AA** Antibiotics, Combinations	**S01AA30**	Oxtetracycline polymixine eye oint 5g	Topical	1	14910 (0.01%)	93783.90 (0.26%)	26.0	-	-	-
Total						*134515640*	*35568221.31*	-	*103567031*	*31370435.51*	-

Results from table 5.4 will be discussed in the following manner: medicine items will be explained in relation to their individual ATC pharmacological subgroup and chemical subgroup and chemical substance.

- **Insulin And Analogues: Intermediate Acting Combined With Fast Acting**

As shown in table 5.4, Insulin Actraphane Hm was the only insulin product that had appeared as a "top twenty" product during the two-year study period. Insulin Actraphane Hm presented with significantly higher cost percentages for both years (3.49%; n = R 35, 568,221.31 for year one and 4.18%; n = R 31,370,435.51 for year two) in relation to its quantity percentages (0.04%; n = 134,515,640 for year one and 0.04%; n = 103567031 for year two) for the two-year study period. Thus Insulin Actraphane is seen as a relatively expensive product. This statement is emphasised by the high cost index values 87.2 and 104.5 respectively. Also it is significant to note that this product has occurred as a "top twenty" product for twenty-three months of study period indicating that the product is a significant cost driver.

- **Oral Blood Glucose Lowering Drugs: Sulphonamide Urea Derivatives and Biguanides,**

According to table 5.4 Metformin (a biguanide) and Gliclazide (a sulphonamide urea derivative) were the two groups that constituted the oral blood glucose lowering drugs used in the treatment of diabetes during the two-year study period.

Of these two products, Metformin had the largest prevalence and cost, the prevalence being 1234800 (0.92%; n = 134,515,640) with a respective cost of R 154,055.88 (0.43%; n = R 35, 568,221.31). It is important to note that the prevalence percentage of both Meformin and Gliclazide exceed their cost percentage with 0.49% and 0.1% respectively for the first year. Analysis of the cost and percentage of these agents for year two, indicated that Gliclazide was the only drug that had appeared as an oral blood glucose lowering agent with its prevalence exceeding its cost by 0.15%. According to the cost index values for both Metformin and Gliclazide, both these drugs have a cost index value of below one (fig 5.1), thus indicating that their prevalence is higher than the cost and that they are considered as relatively inexpensive drugs.

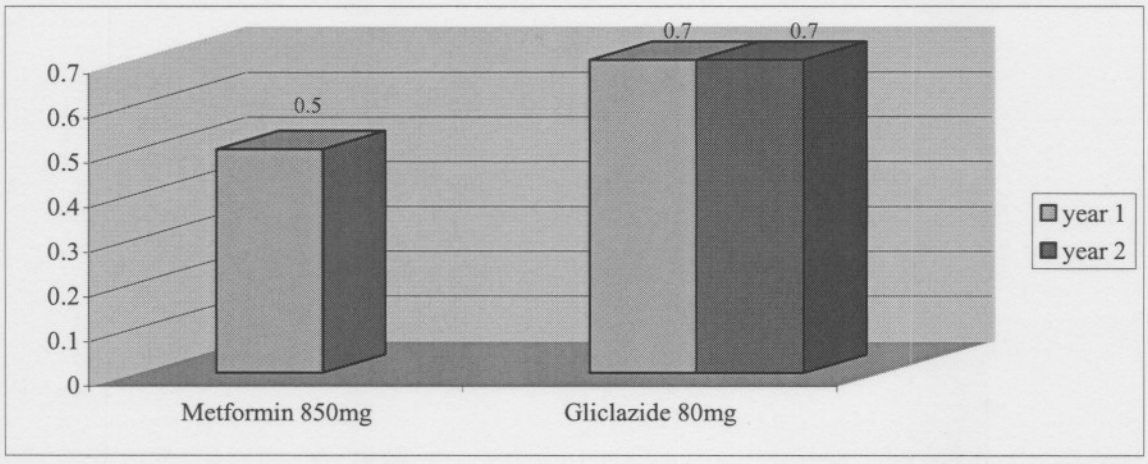


Figure 5.1 Cost index values of oral blood glucose lowering agents

❋ **Irrigation solutions: Sodium Chloride 0.9%**

Sodium Chloride 0.9% presented as a "top twenty" product during both years of the study period. As shown in table 5.4, Sodium Chloride 0.9% presented with relatively high cost index values for both years, indicating the cost associated is relatively higher than the prevalence associated with this pharmaceutical product.

❋ **Intravenous Solutions: electrolytes with carbohydrates**

Regarding intravenous solutions that had presented as "top twenty" pharmaceutical products, Ringers Lactate solution presented with a high observation frequency; occurring twenty-three months as a "top twenty" product over the study period. However, Maintelyte and Dextrose presenting only twice as a "top twenty" product, both occurring in year one, had a relatively high cost index value of 37.0, thus indicating that the cost of this product exceeds its respective prevalence. Furthermore it is important to note that Ringers Lactate presented with relatively high cost index values over the two-year period, having 33.7 and 24.1 respectively, therefore indicating the purchasing cost of this product was relatively high for both years in relation to the purchasing quantity thereof.

❋ Vasodilators Used In The Treatment Of Cardiac Diseases: Organic Nitrates

Isosorbide-5-monitrate 20ng tablets were present only once as a "top twenty" cardiac agent, occurring during the first year of the study period. This product is seen as relatively expensive having a cost index value of 4.4, thus indicating that the cost exceeds the prevalence thereof.

❋ Anti-Adrenergic Agents Centrally Acting: Rauwolfia Alkaloids And Methyldopa

Anti-adrenergic centrally acting agents used in the treatment of hypertension during the two-year study period that had presented as "top twenty" pharmaceutical products were Methyldopa and reserpine (rauwolfia alkaloid). It is important to note Methyldopa presented with a significantly higher purchasing quantity in year one, with quantity and cost differences of 12.25% and 6.06% respectively over the two year period. It is important to note, although presenting with the highest cost and prevalence, Methyldopa presented with a cost-index value of 0.5 in relation to the total prevalence and costs of all "top twenty" items for year one, and therefore is considered relatively inexpensive. This may account for the possible high use of this drug having occurred fifteen months of the twenty-three month study period as a "top twenty" pharmaceutical product, indicating widespread usage. The "high usage" may have been an indication that the EDL was not adhered to by prescribers as Methyldopa is only indicated for the treatment of hypertension during pregnancy.

Reserpine presented with the second highest cost and prevalence when comparing centrally acting anti-adrenergic agents during the two-year period. Having occurred eight times during the two year period and presenting with a cost index value of 1.4 for year one and 1.0 for year two, it is apparent that the cost of this product exceeds its prevalence.

❋ Low Ceiling Diuretic Agents: Thiazides Plain

Hydrochlorothiazide 25mg tablet was the only low ceiling diuretic agent that had presented as a "top twenty" product over the two-year period. Table 5.4 indicates that Hydrochlorothiazides prevailed with a relatively high prevalence of 27255148 (20.26%; n = 134515640) and 18849196 (18.20%n = 103567031) for both the years respectively. This may be due to the fact that Hydrochlorothiazide is the only low ceiling diuretic agent occurring as an essential drug. Although presenting with a high prevalence percentage, Hydrochlorothiazide is relatively

inexpensive as the prevalence thereof exceeds the cost, this is indicative from the cost index value below one.

- **Selective Calcium Channel Blockers With Mainly Vascular Effects: Dihydropyridin Derivatives**

Nifedipine, a selective calcium channel blocker, occurring in two different strengths namely a 30mg and 60mg tablet presented as "top twenty" products during year one and two. Nifedipine 30mg occurred 18 months of the twenty-three month period, with Nifedipine 60mg only occurring for two months, both of these in year one. Regarding the cost index values of Nifedipine 30mg it is apparent from table 5.4, that Nifedipine 30mg may be considered as a relatively expensive drugs, presenting with a value of above one for both years. It is also indicative from table 5.5 that the cost percentage was significantly higher than year one together with an increase in purchasing quantity. Concerning Nifedipine 60mg, although only presenting twice as a "top twenty" product the cost percentage (0.56%; n =R 35568221.31) exceeds the purchasing quantity percentage (0.09%; n = 134515640) with a difference of 0.47%. This is further emphasised by a cost index value of 6.2.

- **ACE (Angiotensin – converting enzyme)- Inhibitors: Plain**

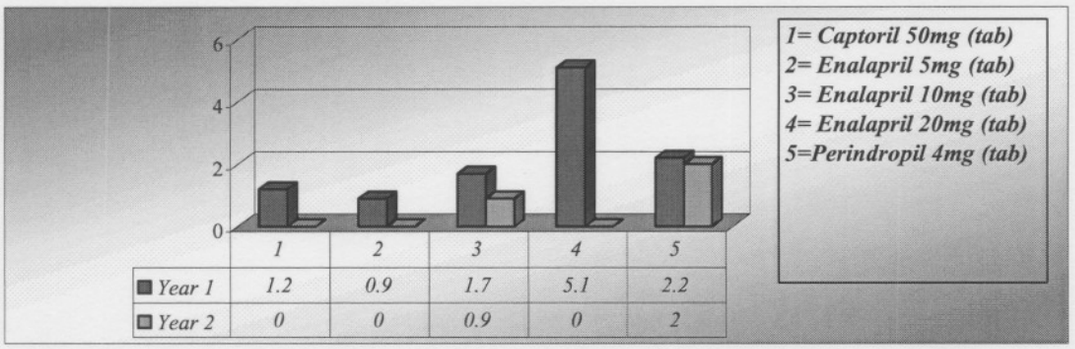
Analysis of the data for year one and two indicated that the ACE- presented with a frequency of 51 months (see table 5.4 for individual breakdown of frequencies) as a "top twenty" product. The total quantity of all ACE-inhibitors purchased during year one amounted to 8095480 (6.02%; n =134515640) of all "top twenty" items purchased, with a cost of R 4,172,510.36 (25% n = R 46,740,921.31).

Of the ACE-Inhibitors, Enalapril 10mg tablets had the highest prevalence and cost representing 3.19% (n= 134515640) and 5.5% (n =R 35568221.31) respectively. Concerning the frequency of the number of months appearing as a "top twenty" product, Enalapril 10mg presented with a high frequency of twenty-two months over the two-year period, thus indicating wide-spread usage of this product.

Regarding the cost index values, Enalapril 20mg tablets, had the highest value of 5.1 (Figure 5.2), indicating the cost is relatively higher than the associated prevalence associated thereof.

Although presenting with the highest cost index value of all ACE-inhibitors, Enalapril 20mg appeared only four times as a "top twenty" product exclusively during year one.

From table 5.4 it is indicative that Perindopril 4mg tablets are highly used, presenting with an observation frequency of twenty-three months as a "top twenty" product over the two-year period. Analysis regarding Perindropril 4mg indicated the purchasing cost of this product was relatively high for both years in relation to the purchasing quantity thereof. This statement is further emphasised by the cost index values above one for both years (Fig 5.2).



	1	2	3	4	5
Year 1	1.2	0.9	1.7	5.1	2.2
Year 2	0	0	0.9	0	2

Figure 5.2 Cost index values of ACE-Inhibitors according to chemical substance

❋ **Cholesterol and Triglycerides Reducers: HMG CoA (3-hydroxy-3-methylglutaryl co-enzyme A) Reductase Inhibitors**

Simvastatin (HMG CoA reductase inhibitor) 20mg tablet was the only anti –hyperlipidemic agent present as a "top twenty product" for both years, occurring in year one.

This serum lipid reducing agent presented with a prevalence of 27832 (0.02%; n = 134515640) and a respective cost of 147509.60 (0.41%; n = R 35,568,221.31). Simvastatin 20mg had a cost index value of 20.5, thus indicating that the cost exceeds its prevalence with a difference of 1.14% and therefore be considered relatively expensive.

❋ **Antifungals For Topical Use: Imidazole and Triazole Derivatives**

Only one item from this group was present as a "top twenty" item occurring in year one of the two-year study period. Miconazole nitrate gel 2% presented six times over the two year period as a "top twenty product" with a prevalence percentage of 0.01% (n= 134515640) and respective cost percentage of 1.51% (n = R 35,568,221.31) for year one. As shown in table 5.4, Miconazole nitrate gel 2%, presented with a significant decrease in cost for year two R 92017.60 (0.29%), and thereby presenting with a relatively lower cost index value of 29.0 in comparison to

the respective 151.0 for year one. The relatively high cost index values above one, support the statement that this anti-fungal is seen as an expensive product and a significant cost driver.

- **Hormonal Contraceptives For Systemic Use: Progestogens & Estrogens, Sequential Preparations And Progestogens Only Preparations**

Three individual items from this group presented as "top twenty" products for the study period. These items comprised of Levonorgestrel Oestradiol tablets and Medroxyprogesterone, and Norethisterone injections.

Levonorgestrel Oestradiol tablets; a progestogen and estrogen sequential preparation occurred twelve times as a "top twenty" product over the two-year study period, with cost-index values of 7.2 and 7.3 respectively. These values are relatively high and therefore Levonorgestrel Oestradiol tablets are considered as relatively expensive.

Of these three contraceptives, Norethisterone injection had the highest quantity purchased of 445300.00 (0.331%; n = 134515640) with the cost thereof R 1990220.94 (n = R 46740921.31). The cost index values for these items all exceed one; therefore all of the above items are regarded as relatively expensive.

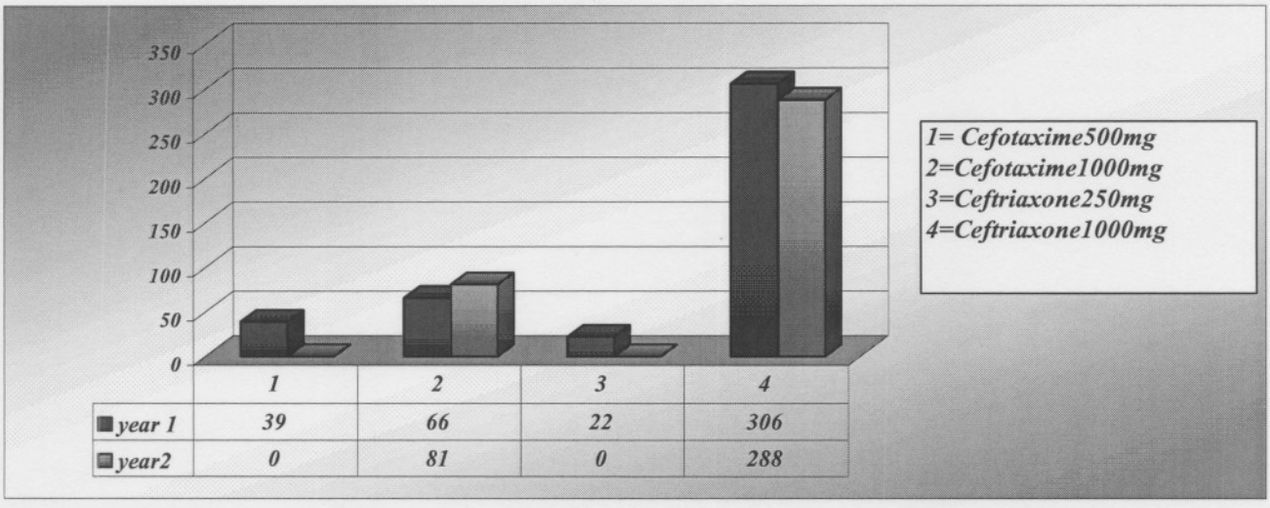
- **Beta-Lactam Antibacterials Penicillins: Beta-Lactamase Resistant Penicillins And Beta-Lactamase Sensitive Penicillins**

Flucloxacillin 250mg capsules represented the beta-lactamse resistant penicillins and Phenoxymethyl-peniclin 250mg tablets the beta-lactamase sensitive penicillins. It can be seen from table 5.4 over the two-year period, the cost of Flucloxacillin 250mg exceeds the prevalence thereof and this is indicative from the cost index values above 1. The prevalence percentage of Phenoxymethyl-penicillin, however, exceeds the cost percentage with 2.96%, thus indicating that of the two products, Phenoxymethyl-penicillin affects the cost of treatment to a lesser degree.

- **Other Beta-Lactam Anti-Bacterials: Cephalosporins And Related Substances**

As shown in table 5.4, Cefotaxime 1g represents the cephalosporin with the highest purchasing quantity 15517 (0.01%; n = 103567031) for the twenty-three month period. Ceftriaxone 1g represents the highest prevalence 15443 (0.01%; n = 134515640) and also constitutes the highest

cost 1086957.53 (3.06%; n =R 35568221.31) for the first year. When comparing the cost-indexes of the different cephalosporins occurring as "top twenty" products during the two year period, as illustrated in figure 5.3, it is indicative that Ceftriaxone 1g has the highest cost index value for both years one and two. Also it is significant to note that this product has occurred as a "top twenty" product for sixteen months of the twenty- three month study period indicating that the product is a significant cost driver.



	1	2	3	4
year 1	39	66	22	306
year2	0	81	0	288

Figure 5.3 Cost index values of Cephalosporins according to chemical substance

❋ **Sulphonamides And Trimethoprim: Combinations, Including Derivatives**

Co-Trimoxazole 480mg, a combination of Trimethoprim and Sulfamethoxazole, was present only once as a "top twenty" product, i.e. during the first year of the two-year period. As indicated in table 5.5, co-trimoxazole 480mg tablets have a cost index value 0.2, indicating that the prevalence exceeds the associated cost by a difference of 0.55%.

❋ **Macrolides & Lincosamides: Macrolides**

Erythromycin was the only macrolide present as a "top twenty" product over the two-year period. Occurring in two different strengths and dosage forms i.e. 250mg tablets and 125mg/5ml suspensions; totalled a purchasing quantity for both the years of 3300330 (2.5%; n = 134,515,640) and 2842643 (2.7%; n = 103,567,031) respectively. As illustrated in table 5.4, the purchasing cost of this product over the twenty-three month period totalled 1201417.10 (4.3%; n = 35,568,221.31) and 954091.04 (3.0%; n = 31,370,435.87). Erythromycin 250mg tablets appeared twelve times as a "top twenty" product with a cost index value below one for both

years, whereas Erythromycin 125mg/5ml presented for five months of the twenty-four month period as a "top twenty" product, having cost index values of 23.7 and 29.0 respectively for years one and year two. It can thus be deduced that Erythromycin 125/5ml suspension is relatively expensive as the cost thereof exceeds the associated prevalence thereof.

- **Quinolone Antibacterials:Fluoro-Quinolones**

Ciprofloxacin (Fluoro-quinolone) 500mg tablet was the only quinolone antibacterial agent that had presented as a "top twenty" product over the two-year period. This fluoro-quinolone agent presented with a significantly higher cost than prevalence for both years and this statement is emphasised by the high cost index values of 14.4 and 16.6 for both years respectively. Thus Ciprofloxacin 500mg tablets may be considered as relatively expensive, exercising a significant influence on the cost of treatment.

- **Drugs Used in the Treatment of Tuberculosis: Combination of Drugs Used in the Treatment of TB**

As shown in table 5.4, no individual drugs used in the treatment of tuberculosis appeared as "top twenty" products, but four different combinations of anti-tuberculostatic agents were present (see table5.5). The combination containing the following drugs, namely Rifampicin 120mg, Pyrazinamide 300mg, Isoniazid 60mg and Ethambutol 200mg) presented with the highest prevalence for both years, occurring for twenty-one months of the twenty-three month study period.

As illustrated in figure 5.4 below Rifampicin 300mg and Isoniazide 150mg had the highest cost index values for both years i.e. 3.3 and 3.2 respectively. It is important to note all four combinations presented with cost index values exceeding one, thus drugs used in the treatment of tuberculosis may be considered relatively expensive as they have a significant effect on the cost of treatment.

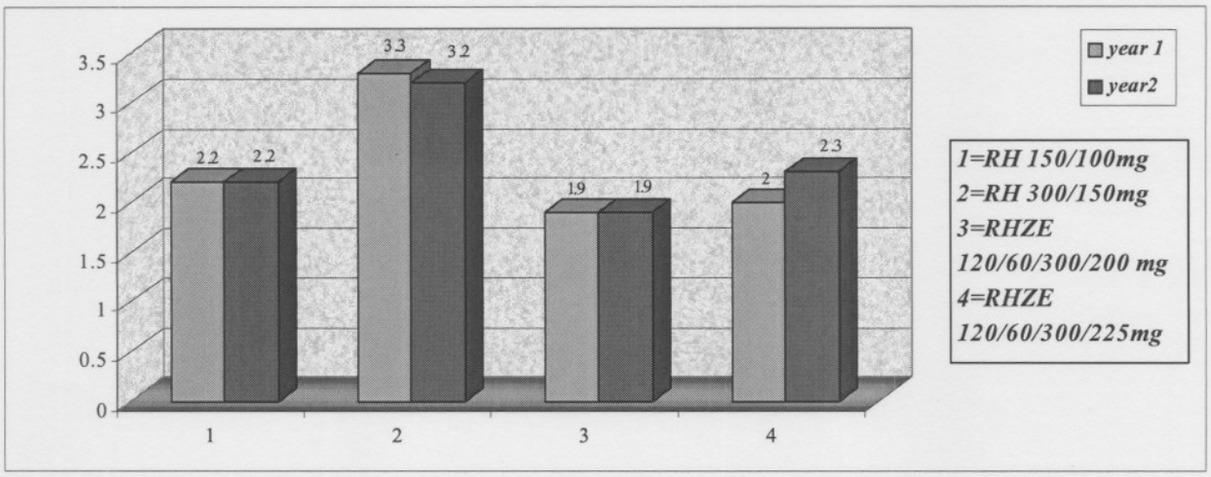


Figure 5.4. Cost index values of anti-tuberculostatic agents

❋ Bacterial Vaccines: Pertusis Vaccines, *Haemophilus Influenzae B* Vaccines And Combinations

According to table 5.4, bacterial vaccines comprised out of the pertusis vaccine, and *Haemophilus influenzae B* vaccines in combination with diphtheria and tetanus. These combination vaccines occurred in total sixteen times among the "top twenty" products. As presented in table 5.5, Hib-DPT (*Haemophilus influenzae* type b in combination with diphtheria, pertusis and tetanus) presented with two different dosages i.e. a single dose vial and a ten-doses vial. Hib-DTP single dose had a relatively higher purchasing cost percentage in year one (2.10%; n = 35,568,221.31) than in year two (0.72%; n = R31, 370,435.51). However, Hib-DTP ten-dose vial presented with a significantly higher cost percentage for year two (8.72%; n = R31370435.51) respective to the cost percentage (1.60%; n = 35,568,221.31) for year one.

As illustrated in figure 5.5 below, both doses had significantly high cost index values, therefore result in a high cost inset and may be regarded as significant cost drivers. Pertusis vaccine in combination with diphtheria and tetanus had a significant cost index value of 20.0; this may be explained by the large differences between the prevalence and cost percentages totalling 0.19%.

❋ Viral Vaccines: Hepatitis B

Hepatitis was the only viral vaccine that had appeared as a "top twenty" product over the twenty-three month period. Occurring six times as a "top twenty" product, hepatitis vaccine presented with relatively high cost percentages over the two-year period (0.38%; n = R35, 568,221.31) and (1.06%; n =R 31,370,435.51) in relation to the respective prevalence percentages (0.01%; n = 134,515,640) and (0.01%; n = 103,567,031) respectively. However, when comparing the cost

index values over the two - year period, presented in table 5.4, it was found that year two had a significantly higher value (106.0) than year one (38.0), thus indicating there was a significant increase in the purchasing cost of hepatitis vaccine in year two respective to the increases in purchasing quantity of this viral vaccine.

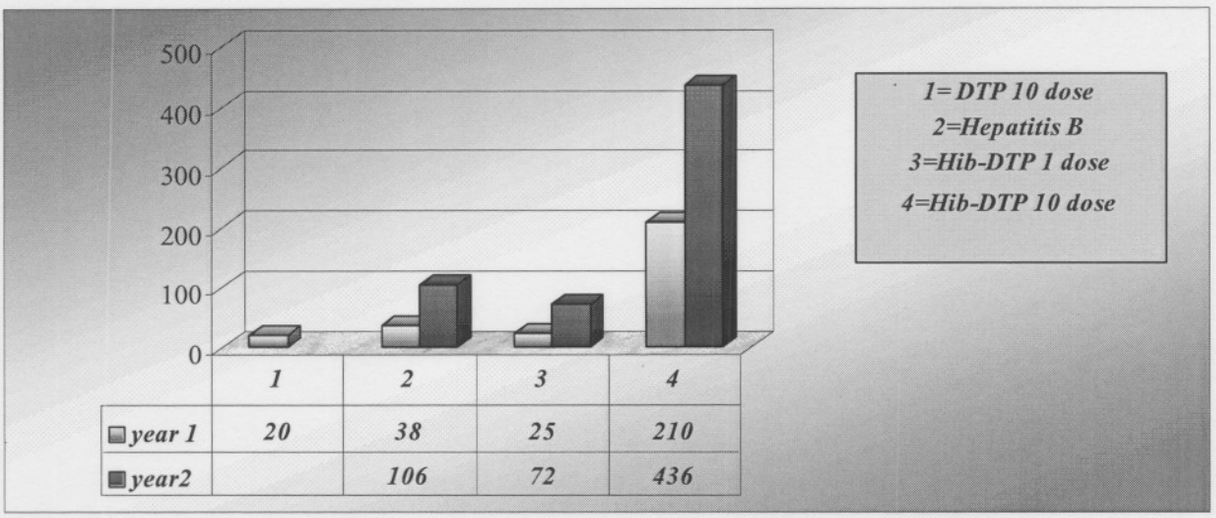


Figure 5.5 Cost index values of bacterial, viral and combinations vaccines.

❋ **Anti-Inflammatory And Anti-Rheumatic Products, Including Non-Steroidal Anti-Inflammatory Agents: Propionic Acid Derivatives**

Ibuprofen 200mg tablets, a non-steroidal anti-inflammatory agent, occurred four times as a "top twenty" product of the twenty-three month study period. Regarding the cost index values, it is apparent from table 5.4, that the cost index values of Ibuprofen (0.2 for both years) does not exceed one, thus indicating that Ibuprofen is relatively inexpensive.

❋ **Other Analgesics And Antipyretics: Anilides**

Paracetamol 500mg tablets and Paracetamol syrup 120mg/5ml were the only two products from this group that were represented eleven times as "top twenty" products during the two-year study period. Paracetamol 500mg tablets presented with a higher purchasing quantity in year one 6441500 4.79%; n = 134,515,640) in relation to the second year's purchasing quantity of 18,93,190 (1.83%; n = 103,567,031). Concerning the cost index values, analysis indicated that Paracetamol 500mg tablets had cost index values below one and could therefore be considered to be relatively inexpensive.

As shown in table 5.4 Paracetamol syrup 120mg/5ml had significantly higher cost percentages for both years respective to the prevalence percentages. This statement is accentuated by the cost index values exceeding one for both years.

❋ **Anti Epileptics: Carboxamide Derivatives And Hydantoin Derivatives**

According to table 5.4, anti-epileptic agents were represented by two different chemical subgroups, these being the carboxamide derivatives; comprising of Carbamazepine 200mg and 400mg tablets and the hydantoin derivatives comprising of Phenytoin 100mg capsules.

The total quantity of all anti-epileptic agents purchased during the first year of the study period totalled 6711990 (5.0%; n = 134,515,640) of all "top twenty" products purchased, with a respective cost of R 1,698,263.05 (4.8%; n = R 35,568,221.31). Of these products, Carbamazepine (200mg) materialised fourteen times as a "top twenty product" during the twenty –three month period; presenting with as high a prevalence as 5,355,990 (3.98%; n =134,515,640) and cost R 1,529,657.05 (1.0%; n = R35, 568,221.31) respectively.

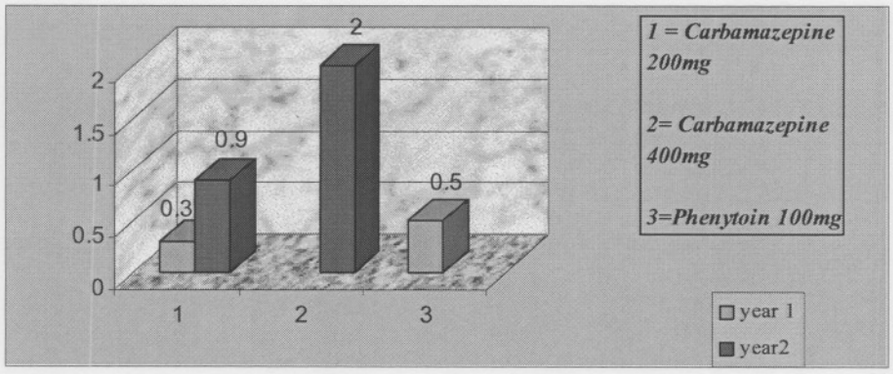


Fig 5.6 Cost index values of anti-epileptic agents

With regard to the cost index values of these anti-epileptic drugs in relation to all "top twenty" products, Carbamazepine 400mg was the only product having a cost index value above one, indicating the cost of this product exceeds the prevalence and could therefore be considered relatively expensive.

❋ **Anti-Nematodal Agents: Benzimidazole Derivatives**

Mebendazole suspension presented twice as a "top twenty" product, exclusively during the first year of the twenty-four month study period. This anti-nematodal product has a cost index value of 36.0, indicating the cost of this product R 129,791.70 (0.36%; n = 35,568,221.31) exceeds the respective prevalence thereof 16326 (0.01%; n = 134,515,640) with a difference of 0.35% and is regarded as relatively expensive.

❋ **Anti-Tussive Agents: Expectorants**

Mist Expect Stim (200ml) and Mist Tussi Infans were the only cough mixtures that appeared as "top twenty" products for both years. As shown in table 5.4, the prevalence of Mist expect Stim (indicated for adult use) far exceeded its respective cost with a percentage difference of 11.76% for year one and 39.54% for year two. However, Mist Tussi Infans only occurred for one month of the twenty-four month period as a "top twenty" product with a cost index value exceeding one indicating the product is relatively expensive in relation to the prevalence thereof.

❋ **Adrenergic Inhalants: Selective Beta-2-Adreno-Receptor Agonists**

Two individual items from this class of drugs were present as "top twenty" products for year one. These items consisted of Feneterol inhaler complete and Salbutamol metered dose inhaler. Of these products, Salbutamol (MDI) had the highest observation frequency, occurring four months as a "top twenty" product, also presenting with the highest purchasing quantity and cost for both years. This statement is emphasised by the respective cost index values of 27.0 and 20.0 for both years of the study period. Feneterol inhaler complete occurred only one month of the twenty-four month period with a high cost index value of 14.0, thus indicating that the cost of this product exceeds the prevalence associated with this product. Figure 5.7, graphically represents the cost index values of selective beta-2-adreno-receptor agonists that had appeared as "top twenty" products during the two year study period.

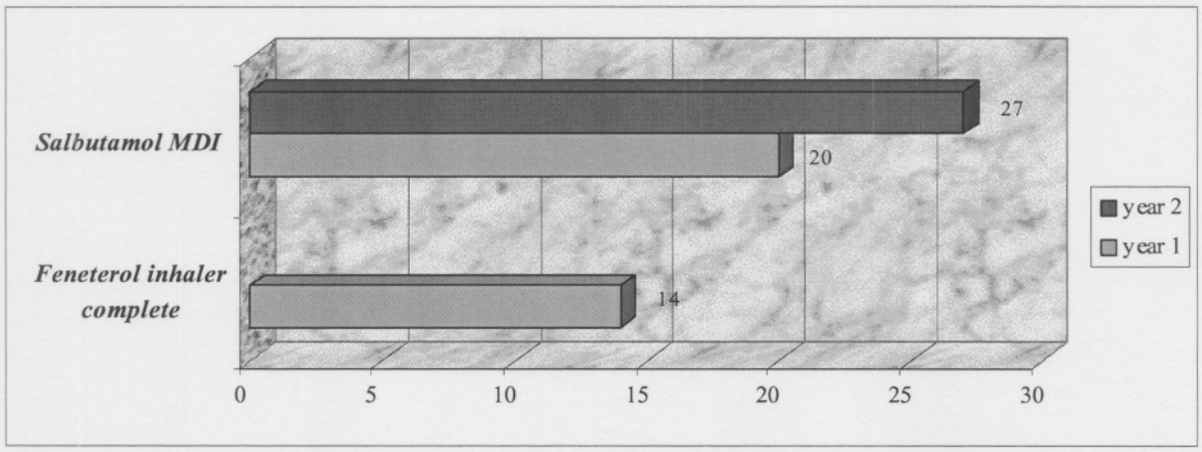


Figure 5.7 Cost index values of selective beta-2-adreno-receptor receptor agonists

❋ Other Anti-Asthmatics Inhlants:Glucocorticoids

Beclomethasone metered dose inhaler, represented the glucocorticoid group of anti-asthmatic agents. Having occurred ten months over the two-year period as a "top twenty" product, Beclomethasone MDI presented with relatively high purchasing costs in relation to the purchasing quantities of this product for both years. This statement is accentuated by the relatively high cost index values exceeding one for both years as illustrated below in figure 5.8. This product has a high cost inset and therefore may be regarded as a significant cost driver.

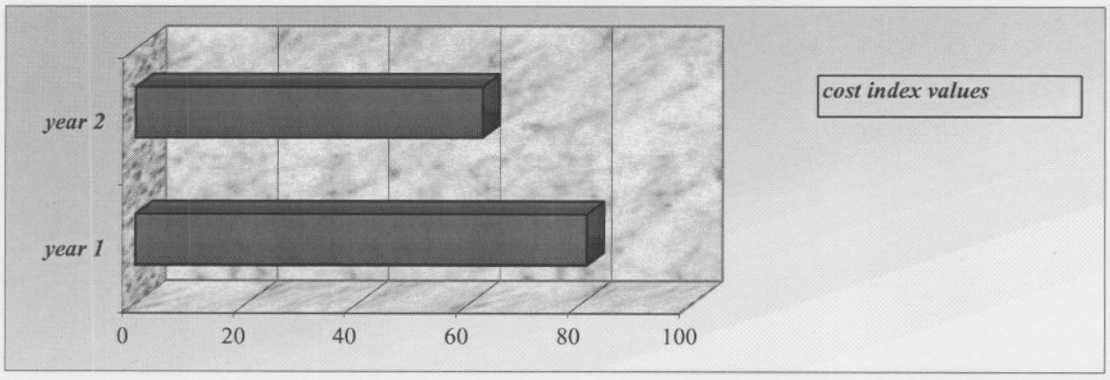


Figure 5.8 Cost index values of glucocorticoids

❋ **Anti-Histamines For Systemic Use: Substituted Alkylamines**

Chlorpheniramine (4mg tablet) was the only antihistamine that had presented as a "top twenty" product over the twenty-three month period. Table 5.4 indicates that Chlorpheniramine prevailed with a relatively high prevalence of 221200 (20.21%; n = 103,567,031) and cost 196,646.80 (3.0%n = 31,370,435.51) respectively. Chlorpheniramine 4mg had a cost index value of 3.0, thus indicating that the cost exceeds its prevalence with a difference of 0.42% and therefore could be considered relatively expensive.

❋ **Anti-Infectives: Opthalmological Antibiotics And Combinations**

Oxytetracycline polymixine eye ointment (5g) was the only ophthalmologic item present as a "top twenty" product occurring in year one of the two-year study period. This item presented with a cost percentage of 0.26% (n = R 31,370,435.51) exceeding the associated prevalence percentage of 0.01% (n = 134,515,640). This statement is further emphasised by the relatively high cost index value of 26.0, indicating that Oxytetracycline polymixine eye ointment is regarded as a relatively expensive product.

5.4 Cost Analysis of the "Top Twenty" Pharmaceutical Products Based on the Average Cost According to the ATC Classification System

5.4.1 Average Cost Analysis Of The "Top Twenty" Pharmaceutical Products According To Pharmacological Subgroup, Chemical Subgroup And Chemical Substance

Table 5.5 represents the cost analysis of the "top twenty" pharmaceutical items according to the ATC classification system. In table 5.5 the frequency of items, together with the average costs and standard deviations are indicated based on different pharmacological and chemical subgroups as well as chemical substances.

Table 5.5 Cost Analyses of the "Top Twenty" Pharmaceutical Products Based on the ATC Classification System According to Pharmacological Subgroup, Chemical Subgroup and Chemical Substance

ATC Classification System			*Drug Description*	*Dosage Form*	*Year one (1 Apr 2000-31 Mar 2001)*			*Year two (1 Apr 2001-28 Feb 2002)*		
Pharmaco-logical Subgroup	*Chemical Subgroup*	*Chemical Substance*			*Quantity purchased (items)*	*Average cost per item (R)*	*Standard deviation (R)*	*Quantity purchased (items)*	*Average cost per item (R)*	*Standard deviation (R)*
A10A Insulins & analogues	**A10AD** Intermediate acting comb with fast-acting	**A10AD01**	Insulin Actraphane Hm 10ml 100Iu/ml	Inj	52129	26.29	3.56	44709	29.32	1.71
A10B Oral blood glucose lowering drugs	**A10BD** Biguanides	**A10BD03**	Metformin 850mg	Tab	1234800	0.12	0.01	-	-	-
	A10BB Sulfonamides, urea derivatives	**A10BB02**	Gliclazide 80mg	Tab	-	-	-	496384	0.20	0
B05A Blood & related products	**B05AA** Blood Substitutes & Plasma protein fractions	**B05AA01**	Albumin sol 20%100ml	Inj	-	-	-	331	251.62	0

Table 5.5 (cont) Cost Analyses of the "Top Twenty" Pharmaceutical Products Based on the ATC Classification System According to Pharmacological Subgroup, Chemical Subgroup and Chemical Substance

ATC Classification System			*Drug Description*	*Dosage Form*	*Year one (1 Apr 2000-31 Mar 2001)*			*Year two (1 Apr 2001-28 Feb 2002)*		
Pharmaco-logical Subgroup	*Chemical Subgroup*	*Chemical Substance*			*Quantity purchased (items)*	*Average cost per item (R)*	*Standard deviation (R)*	*Quantity purchased (items)*	*Average cost per item (R)*	*Standard deviation (R)*
B05B Intravenous Solutions	**B05BB** Electrolytes with carbohydrates	**B05BB02**	Maintelyte & dextrose 1000 ml	Inj	1380	9.67	0.03	-	-	-
		B05BB02	Ringers lactate Sol 1000ml	Inj	177552	8.83	0.44	198840	7.37	1.46
B05C Irrigation solutions	**B05CB** Sodium Chloride	**B05CB01**	Sodium Chl 0.9% 50 ml	Inj	28080	4.17	0	54262	3.22	0.22
			Sodium Chl 0.9% 1000ml	Inj	8100	7.99	0	47965	6.98	0.83
C01D Vasodilators used in cardiac diseases	**C01DA** Organic nitrates	**C01DA14**	Isosorbide-5-mononitrate 20mg	Tabs	104700	1.18	0	-	-	-

Table 5.5 (cont) Cost Analyses of the "Top Twenty" Pharmaceutical Products Based on the ATC Classification System According to Pharmacological Subgroup, Chemical Subgroup and Chemical Substance

ATC Classification System			*Drug Description*	*Dosage Form*	*Year one (1 Apr 2000-31 Mar 2001)*			*Year two (1 Apr 2001-28 Feb 2002)*		
Pharmaco-logical Subgroup	*Chemical Subgroup*	*Chemical Substance*			*Quantity purchased (items)*	*Average cost per item (R)*	*Standard deviation (R)*	*Quantity purchased (items)*	*Average cost per item (R)*	*Standard deviation (R)*
C02A Antiadrenergic agents;centrally acting	**C02AB** Methyldopa	**C02AB01**	Methyldopa 250mg	Tabs	26724924	0.13	0.01	7892664	0.15	0.01
	C02AA Rauwolfia alkaloids	**C02AA02**	Reserpine 0.25mg	Tabs	1106560	0.38	0.02	1007524	0.32	0.02
C03A Low-ceiling diuretics	**C03AA** Thiazides- plain	**C03AA03**	Hydrochloro-thiazide 25mg	Tabs	27255148	0.08	0.01	18849196	0.10	0.01
C08C Selective calcium channel blockers with mainly vascular effects	**C08CA** Dihydropyridin e derivatives	**C08CA05**	Nifedipine 30mg	Tabs	1535196	0.68	0.06	2169640	0.65	0.01

Table 5.5 (cont) Cost Analyses of the "Top Twenty" Pharmaceutical Products Based on the ATC Classification System According to Pharmacological Subgroup, Chemical Subgroup and Chemical Substance

ATC Classification System			*Drug Description*	*Dosage Form*	*Year one (1 Apr 2000-31 Mar 2001)*			*Year two (1 Apr 2001-28 Feb 2002)*		
Pharmaco-logical Subgroup	*Chemical Subgroup*	*Chemical Substance*			*Quantity purchased (items)*	*Average cost per item (R)*	*Standard deviation (R)*	*Quantity purchased (items)*	*Average cost per item (R)*	*Standard deviation (R)*
C08C Selective calcium channel blockers with mainly vascular effects	**C08CA** Dihydropyridine derivatives	**C08CA05**	Nifedipine 60mg	Tabs	122080	1.67	0.08	-	-	-
C09A ACE inhibitors plain	**C09AA** ACE inhibitors plain	**C09AA01**	Captopril 50mg	Tabs	300000	0.32	0	-	-	-
		C09AA02	Enalapril 5mg	Tabs	463316	0.23	0	-	-	-
			Enalapril 10mg	Tabs	4291840	0.46	0.16	3795708	0.28	0.04
			Enalapril 20mg	Tabs	313880	1.33	0	-	-	-
		C09AA04	Perindropil 4mg	Tabs	2726444	0.58	0.01	4467652	0.60	0.01

Table 5.5 (cont) Cost Analyses of the "Top Twenty" Pharmaceutical Products Based on the ATC Classification System According to Pharmacological Subgroup, Chemical Subgroup and Chemical Substance

ATC Classification System			*Drug Description*	*Dosage Form*	*Year one (1 Apr 2000-31 Mar 2001)*			*Year two (1 Apr 2001-28 Feb 2002)*		
Pharmaco-logical Subgroup	*Chemical Subgroup*	*Chemical Substance*			*Quantity purchased (items)*	*Average cost per item (R)*	*Standard deviation (R)*	*Quantity purchased (items)*	*Average cost per item (R)*	*Standard deviation (R)*
C10A Cholesterol and Triglycerides reducers	**C10AA** HMG CoA reductase inhibitors	**C10AA01**	Simvastatin 20mg	Tabs	27832	5.3	0	-	-	-
D01A Antifungals for topical use	**D01AC** Imidazole & triazole derivatives	**D01AC52**	Miconazole nitrate gel 2% (30g)	Topical	18104	29.76	0.01	2890	31.84	0
G03A Hormonal contraceptives for systemic use	**G03AB** Progestogens& Estrogens, sequential preparations	**G03AB03**	Levonorgestrel oestradiol	Tabs	310600	1.93	0.06	338100	2.23	0.07
	G03AC Progestogens	**G03AC01**	Medroxy-progesterone 150mg/ml	Inj	378455	4.00	0.15	405450	4.37	0.15

Table 5.5 (cont) Cost Analyses of the "Top Twenty" Pharmaceutical Products Based on the ATC Classification System According to Pharmacological Subgroup, Chemical Subgroup and Chemical Substance

ATC Classification System			*Drug Description*	*Dosage Form*	*Year one (1 Apr 2000-31 Mar 2001)*			*Year two (1 Apr 2001-28 Feb 2002)*		
Pharmaco-logical Subgroup	*Chemical Subgroup*	*Chemical Substance*			*Quantity purchased (items)*	*Average cost per item (R)*	*Standard deviation (R)*	*Quantity purchased (items)*	*Average cost per item (R)*	*Standard deviation (R)*
G03A Hormonal contraceptives for systemic use	**G03AC** Progestogens	**G03AC06**	Norethisterone 200mg/ml	Inj	445300	4.50	0.16	478479	4.81	0.11
J01C Beta-lactam antibacterials , penicillins	**J01CA** Penicillins with extended spectrum	**J01CA04**	Amoxycillin 250mg	Caps	5818010	0.15	0.01	2911545	0.14	0.01
			Amoxycillin Susp 125mg/5ml	Liq	46440	2.99	0.01	25006	2.88	0
	J01CR Comb of penicillins, incl beta-lactamase inhibitors	**J01CR02**	Amox/Clav 1000/200mg	Inj	54705	14.31	1.32	20870	17.78	3.71

Table 5.5 (cont) Cost Analyses of the "Top Twenty" Pharmaceutical Products Based on the ATC Classification System According to Pharmacological Subgroup, Chemical Subgroup and Chemical Substance

ATC Classification System			*Drug Description*	*Dosage Form*	*Year one (1 Apr 2000-31 Mar 2001)*			*Year two (1 Apr 2001-28 Feb 2002)*		
Pharmaco-logical Subgroup	*Chemical Subgroup*	*Chemical Substance*			*Quantity purchased (items)*	*Average cost per item (R)*	*Standard deviation (R)*	*Quantity purchased (items)*	*Average cost per item (R)*	*Standard deviation (R)*
J01C Beta-lactam antibacterials , penicillins	**J01CE** Beta-lactamase sensitive penicllins	**J01CE02**	Phenoxymethyl -penicillin 250mg	Tabs	5942840	0.09	0	-	-	-
	J01CF Beta-lactamase resistant penicillins	**J01CF05**	Flucloxacillin 250mg	Caps	450300	0.57	0.01	1054180	0.60	0.04
J01D Other beta-lactam anti-bacterials	**J01DA** Cephalosporins & related substances	**J01DA10**	Cefotaxime 500mg	Inj	8471	16.5	0	-	-	-

Table 5.5 (cont) Cost Analyses of the "Top Twenty" Pharmaceutical Products Based on the ATC Classification System According to Pharmacological Subgroup, Chemical Subgroup and Chemical Substance

ATC Classification System			*Drug Description*	*Dosage Form*	*Year one (1 Apr 2000-31 Mar 2001)*			*Year two (1 Apr 2001-28 Feb 2002)*		
Pharmaco-logical Subgroup	*Chemical Subgroup*	*Chemical Substance*			*Quantity purchased (items)*	*Average cost per item (R)*	*Standard deviation (R)*	*Quantity purchased (items)*	*Average cost per item (R)*	*Standard deviation (R)*
J01D Other beta-lactam anti-bacterials	**J01DA** Cephalosporins & related substances	**J01DA1**	Cefotaxime 1g	Inj	10746	21.79	0	15517	16.34	0
		J01DA13	Ceftriaxone 250mg	Inj	3467	22.49	0	-	-	-
			Ceftriaxone 1g	Inj	15443	70.80	2.50	13558	66.87	6.32
J01E Sulphonamides & trimethoprim	**J01E** Comb, incl derivatives	**J01EE01**	Co-Trimoxazole 480mg	Tabs	1027540	0.07	0	-	-	-
J01F Macrolides & Lincosamides	**J01FA** Macrolides	**J01FA01**	Erythromycin 250mg	Tabs	3257660	0.28	0.03	2828460	0.30	0.01
			Erythromycin susp 125mg/5ml	Liq	42670	7.91	0.67	14183	6.44	0

Table 5.5 (cont) Cost Analyses of the "Top Twenty" Pharmaceutical Products Based on the ATC Classification System According to Pharmacological Subgroup, Chemical Subgroup and Chemical Substance

ATC Classification System			*Drug Description*	*Dosage Form*	*Year one (1 Apr 2000-31 Mar 2001)*			*Year two (1 Apr 2001-28 Feb 2002)*		
Pharmaco-logical Subgroup	*Chemical Subgroup*	*Chemical Substance*			*Quantity purchased (items)*	*Average cost per item (R)*	*Standard deviation (R)*	*Quantity purchased (items)*	*Average cost per item (R)*	*Standard deviation (R)*
J01M Quinolone antibacterials	**J01MA** Fluoro-quinolones	**J01MA02**	Ciprofloxacin 500mg	Tabs	392890	4.98	0.11	331090	5.04	0.01
J04A Drugs used for the treatment of Tuberculosis	**J04AM** Comb of drugs for treatment of tuberculosis	**J04AM02**	Rifam 150mg & Inh 100mg	Tabs	760200	0.61	0.06	376520	0.67	0.01
			Rifam 300mg & Inh 150mg	Tabs	411000	0.90	0.06	909640	0.98	0.06
J04A Drugs used for the treatment of Tuberculosis	**J04AM** Comb of drugs for treatment of tuberculosis	**J04AM03**	RHZE (Rifam120mg, Pza 300mg Inh 60mg Etham 200mg)	Tabs	4201300	0.51	0.04	3250000	0.56	0.04

Table 5.5 (cont) Cost Analyses of the "Top Twenty" Pharmaceutical Products Based on the ATC Classification System According to Pharmacological Subgroup, Chemical Subgroup and Chemical Substance

ATC Classification System			*Drug Description*	*Dosage Form*	*Year one (1 Apr 2000-31 Mar 2001)*			*Year two (1 Apr 2001-28 Feb 2002)*		
Pharmaco-logical Subgroup	*Chemical Subgroup*	*Chemical Substance*			*Quantity purchased (items)*	*Average cost per item (R)*	*Standard deviation (R)*	*Quantity purchased (items)*	*Average cost per item (R)*	*Standard deviation (R)*
J04A Drugs used for the treatment of Tuberculosis	**J04AM** Comb of drugs for treatment of tuberculosis	**J04AM03**	RHZE (Rifam120mg, Pza 300mg Inh 60mg Etham 225mg)	Tabs	1109600	0.59	0.12	228800	0.69	0
J07A Bacterial vaccines	**J07AG** *Hemophilus influenzae B* vaccines	**J07AG52**	Vacc Hib-Dtp Single dose	Inj	7850	11.12	0	10490	21.59	0
J07A Bacterial vaccines	**J07AG** *Hemophilus influenzae B* vaccines	**J07AG52**	Vacc Hib-Dtp 10doses	Inj	4470	174.25	18.18	16706	163.75	0.01

Table 5.5 (cont) Cost Analyses of the "Top Twenty" Pharmaceutical Products Based on the ATC Classification System According to Pharmacological Subgroup, Chemical Subgroup and Chemical Substance

ATC Classification System			*Drug Description*	*Dosage Form*	*Year one (1 Apr 2000-31 Mar 2001)*			*Year two (1 Apr 2001-28 Feb 2002)*		
Pharmaco-logical Subgroup	*Chemical Subgroup*	*Chemical Substance*			*Quantity purchased (items)*	*Average cost per item (R)*	*Standard deviation (R)*	*Quantity purchased (items)*	*Average cost per item (R)*	*Standard deviation (R)*
J07A Bacterial vaccines	**J07AJ** Pertusis vaccines & combinations	**J07AJ52**	Vacc Dtp 10 dose	Inj	4800	14.86	0	-	-	-
J07B Viral vaccines	**J07BC** Hepatitis vaccines	**J07BC02**	Vacc Hep B (paed)	Inj	4835.00	27.86	0.57	11068	30.28	1.13
M01A Anti-inflammatory & anti-rheumatic products, non-steroids	**M01AE** Propionic acid derivatives	**M01AE01**	Ibuprofen 200mg	Tabs	12243700	0.05	0.01	3844425	0.06	0.01

Table 5.5 (cont) Cost Analyses of the "Top Twenty" Pharmaceutical Products Based on the ATC Classification System According to Pharmacological Subgroup, Chemical Subgroup and Chemical Substance

ATC Classification System			*Drug Description*	*Dosage Form*	*Year one (1 Apr 2000-31 Mar 2001)*			*Year two (1 Apr 2001-28 Feb 2002)*		
Pharmaco-logical Subgroup	*Chemical Subgroup*	*Chemical Substance*			*Quantity purchased (items)*	*Average cost per item (R)*	*Standard deviation (R)*	*Quantity purchased (items)*	*Average cost per item (R)*	*Standard deviation (R)*
N02B Other analgesics & antipyretics	**N02BE** Anilides	**N02BE01**	Paracetamol 500mg	Tabs	6441500	0.05	0.01	1893190	0.05	0
			Paracetamol syrup 120mg/5ml	Liq	973346	1.87	1.25	54793	1.69	0
N03A Anti-epileptics	**N03AB** Hydantoin derivatives	**N03AB02**	Phenytoin 100mg	Caps	1356000	0.12	0	-	-	-
	N03AF Carboxamide derivatives	**N03AF01**	Carbamazepine 200mg	Tabs	5355990	0.28	0.04	2743210	0.30	0.04
			Carbamazepine 400mg	Tabs	-	-	-	478980	0.61	0

Table 5.5 (cont) Cost Analyses of the "Top Twenty" Pharmaceutical Products Based on the ATC Classification System According to Pharmacological Subgroup, Chemical Subgroup and Chemical Substance

ATC Classification System			*Drug Description*	*Dosage Form*	*Year one (1 Apr 2000-31 Mar 2001)*			*Year two (1 Apr 2001-28 Feb 2002)*		
Pharmaco-logical Subgroup	*Chemical Subgroup*	*Chemical Substance*			*Quantity purchased (items)*	*Average cost per item (R)*	*Standard deviation (R)*	*Quantity purchased (items)*	*Average cost per item (R)*	*Standard deviation (R)*
P02C Anti-nematodal agents	**P02CA** Benzimidazole derivatives	**P02CA01**	Mebendazole syrup 30ml	Liq	16326	7.95	0	-	-	-
R03A Adrenergics, inhalants	**R03AC** Selective beta-2-adreno-receptor agonists	**R03AC02**	Salbutamol MDI	Inhaler	9586	7.33	0	36204	7.00	0.01
R03A Adrenergics, inhalants	**R03AC** Selective beta-2-adreno-receptor agonists	**R03AC04**	Feneterol inhaler complete	Inhaler	6180	8.27	0	-	-	-
R03B Other anti-asthmatics, inhalants	**R03BA** Glucocorticoids	**R03BA01**	Beclo-methasone MDI	Inhaler	18969	15.21	1.16	30502	19.29	1.74

ccording to Pharmacological

Year two (1 Apr 2001-28 Feb 2002)		
ntity ased ns)	*Average cost per item (R)*	*Standard deviation (R)*
600	0.01	0
00	1.67	0
00	0.89	0
	-	-

Table 5.7 Utilisation of the "Top Twenty" Pharmaceutical Products Based on the Estimated Number of Patients Utilising the Defined Daily Dose and Respective Utilisation Cost

Drug Description	*Dosage Form*	*Defined Daily Dose (DDD)*	*Year one (1 Apr 2000-31 Mar 2001)*				*Year two (1 Apr 2001-28 Feb 2002)*			
			Quantity Purchased (items)	*Total Cost (R)*	*Approximate number of patients (n = 2,935,479)*	*Cost per Patient per day (R)*	*Quantity Purchased (items)*	*Total Cost (R)*	*Approximate number of patients (n = 2,935,479)*	*Cost per Patient per day (R)*
Insulin Actraphane Hm 10ml 100Iu/ml	Inj	40 u	52129	1241472.61	130323 (4.4%)	9.53	44709	1312418.80	111773 (3.8%)	11.74
Metformin 850mg	Tab	2000mg	1234800	154055.88	536870 (18.3%)	0.29	-	-	-	-
Gliclazide 80mg	Tab	160mg	432656	77351.66	216328 (7.4%)	0.36	496384	102228.24	248192 (8.5%)	0.42
Albumin sol 20%100ml	Inj	N/I	-	-	-	-	331	83286.22	N/C	N/C

* N/I = DDD not assigned

*N/C = Not calculated

Table 5.7 (cont) Utilisation of the "Top Twenty" Pharmaceutical Products Based on the Estimated Number of Patients Utilising the Defined Daily Dose and Respective Utilisation Cost

Drug Description	*Dosage Form*	*Defined Daily Dose (DDD)*	*Year one (1 Apr 2000-31 Mar 2001)*				*Year two (1 Apr 2001-28 Feb 2002)*			
			Quantity Purchased (items)	*Total Cost (R)*	*Approximate number of patients (n = 2,935,479)*	*Cost per Patient per day (R)*	*Quantity Purchased (items)*	*Total Cost (R)*	*Approximate number of patients (n = 2,935,479)*	*Cost per Patient per day (R)*
Sodium Chl 0.9% 50 ml	Inj	N/I	28080	117093.60	N/C	N/C	54262	175522.52	N/C	N/C
Sodium Chl 0.9% 1000ml	Inj	N/I	8100	64727.10	N/C	N/C	47965	333547.82	N/C	N/C
Maintelyte & dextrose 1000 ml	Inj	N/I	13800	133353.60	N/C	N/C	-	-	N/C	N/C
Ringers lactate Sol 1000ml	Inj	N/I	177552	1559468.78	N/C	N/C	198840	1440240.92	N/C	N/C

* N/I = DDD not assigned

*N/C = Not calculated

Table 5.7 (cont) Utilisation of the "Top Twenty" Pharmaceutical Products Based on the Estimated Number of Patients Utilising the Defined Daily Dose and Respective Utilisation Cost

Drug Descripion	*Dosage Form*	*Defined Daily Dose (DDD)*	*Year one (1 Apr 2000-31 Mar 2001)*				*Year two (1 Apr 2001-28 Feb 2002)*			
			Quantity Purchased (items)	*Total Cost (R)*	*Approximate number of patients (n = 2,935,479)*	*Cost per Patient / day (R)*	*Quantity Purchased (items)*	*Total Cost (R)*	*Approximate number of patients (n = 2,935,479)*	*Cost per Patient /day (R)*
Isosorbide-5-mononitrate 20mg	Tabs	40mg	104700	123041.04	52350 (1.8%)	2.36	-	-	-	-
Reserpine 0.25mg	Tabs	0.5mg	1106560	417855.00	553280 (18.8%)	0.76	1007524	316230.28	503762 (17.2%)	0.62
Methyldopa 250mg	Tabs	1000mg	26724924	3435821.50	6681231 (227.6%	0.52	7892664	1127867.55	1973166 (67.2%)	0.52
Hydrochloro-thiazide 25mg	Tabs	25mg	27255148	2210983.90	27255148 (928.5%)	0.08	18849196	1831695.82	18849196 (642.1%)	0.10
Nifedipine 30mg	Tabs	30mg	1535196	1036968.58	1535196 (52.3%)	0.68	2169640	1405775.20	2169640 (73.9%)	0.65

* N/I = DDD not assigned

*N/C = Not calculated

Table 5.7 (cont) Utilisation of the "Top Twenty" Pharmaceutical Products Based on the Estimated Number of Patients Utilising the Defined Daily Dose and Respective Utilisation Cost

Drug Description	*Dosage Form*	*Defined Daily Dose (DDD)*	*Year one (1 Apr 2000-31 Mar 2001)*				*Year two (1 Apr 2001-28 Feb 2002)*			
			Quantity Purchased (items)	*Total Cost (R)*	*Approximate number of patients (n = 2,935,479)*	*Cost per Patient / day (R)*	*Quantity Purchased (items)*	*Total Cost (R)*	*Approximate number of patients (n = 2,935,479)*	*Cost per Patient /day (R)*
Nifedipine 60mg	Tabs	30mg	122080	200912.00	244160 (8.3%)	0.80	-	-	-	-
Captopril 50mg	Tabs	50mg	300000	95000.00	300000 (10.2%)	0.32	-	-	-	-
Enalapril 5mg	Tabs	10mg	463316	108634.35	231658 (7.9%)	0.46	-	-	-	-
Enalapril 10mg	Tabs	10mg	4291840	1974609.61	4291840 (146.2%)	0.46	3795708	1067120.10	3795708 (129.3%)	0.28
Enalapril 20mg	Tabs	10mg	313880	416339.40	627760 (21.4%)	0.46	-	-	-	-
Perindropil 4mg	Tabs	4mg	2726444	1577927.00	2726444 (92.9%)	0.58	4467652	2694570.37	4467652 (152.2%)	0.60

* N/I = DDD not assigned

*N/C = Not calculated

Table 5.7 (cont) Utilisation of the "Top Twenty" Pharmaceutical Products Based on the Estimated Number of Patients Utilising the Defined Daily Dose and Respective Utilisation Cost

Drug Description	*Dosage Form*	*Defined Daily Dose (DDD)*	*Year one (1 Apr 2000-31 Mar 2001)*				*Year two (1 Apr 2001-28 Feb 2002)*			
			Quantity Purchased (items)	*Total Cost (R)*	*Approximate number of patients (n = 2,935,479)*	*Cost per Patient / day (R)*	*Quantity Purchased (items)*	*Total Cost (R)*	*Approximate number of patients (n = 2,935,479)*	*Cost per Patient /day (R)*
Simvastatin 20mg	Tabs	15mg	27832	147509.60	37109 (1.3%)	3.97	-	-	-	-
Miconazole nitrate gel 2% (30g)	Topical	200mg	18104	538783.44	18104 (0.6%)	29.76	2890	92017.60	2890 (0.1%)	31.84
Levonorgestrel oestradiol	Tabs	N/I	310600	587840.60	N/C	N/C	338100	751407.00	N/C	N/C
Medroxy-progesterone 150mg/ml	Inj	1.67mg	378455	1508884.83	378455 (12.9%)	3.99	405450	1762939.60	405450 (13.8%)	4.35
Norethisterone 200mg/ml	Inj	2.5mg	445300	1990220.94	445300 (15.2%)	4.47	478479	2296174.88	478479 (16.3%)	4.80

* N/I = DDD not assigned

*N/C = Not calculated

Table 5.7 (cont) Utilisation of the "Top Twenty" Pharmaceutical Products Based on the Estimated Number of Patients Utilising the Defined Daily Dose and Respective Utilisation Cost

Drug Description	*Dosage Form*	*Defined Daily Dose (DDD)*	*Year one (1 Apr 2000-31 Mar 2001)*				*Year two (1 Apr 2001-28 Feb 2002)*			
			Quantity Purchased (items)	*Total Cost (R)*	*Approximate number of patients (n = 2,935,479)*	*Cost per Patient /day (R)*	*Quantity Purchased (items)*	*Total Cost (R)*	*Approximate number of patients (n = 2,935,479)*	*Cost per Patient /day (R)*
Amoxycillin 250mg	Caps	1000mg	5818010	848169.68	1454503 (49.5%)	0.60	2911545	419753.11	727886 (24.8%)	0.56
Amoxycillin Susp 125mg/5ml	Liq	N/I	46440	138897.56	N/C	N/C	25006	72017.28		
Amox/Clav 1000/200mg	Inj	1000mg	54705	816769.60	68381 (2.3%)	11.94	20870	353827.20	26088 (0.9%)	13.56
Flucloxacillin 250mg	Caps	2000mg	450300	257366.18	56288 (1.9%)	4.56	1054180	621817.28	131773 (4.5%)	4.72
Phenoxy-methylpenicillin 250mg	Tabs	2000mg	5942840	519622.20	742855 (25.3%)	0.72	-	-	-	-

* N/I = DDD not assigned

*N/C = Not calculated

Table 5.7 (cont) Utilisation of the "Top Twenty" Pharmaceutical Products Based on the Estimated Number of Patients Utilising the Defined Daily Dose and Respective Utilisation Cost

Drug Description	*Dosage Form*	*Defined Daily Dose (DDD)*	*Year one (1 Apr 2000-31 Mar 2001)*				*Year two (1 Apr 2001-28 Feb 2002)*			
			Quantity Purchased (items)	*Total Cost (R)*	*Approximate number of patients (n = 2,935,479)*	*Cost per Patient /day (R)*	*Quantity Purchased (items)*	*Total Cost (R)*	*Approximate number of patients (n = 2,935,479)*	*Cost per Patient / day (R)*
Cefotaxime 500mg	Inj	4000mg	8471	139771.50	1059 (0.04%)	132.00	-	-	-	-
Cefotaxime 1g	Inj	4000mg	10746	234155.34	2687 (0.1%)	87.16	15517	253547.78	3897 (0.1%)	65.36
Ceftriaxone 250mg	Inj	2000mg	3467	77972.44	433 (0.1%)	179.92	-	-	-	-
Ceftriaxone 1g	Inj	2000mg	15443	1086957.53	7722 (0.3%)	631.74	13558	902900.97	6779 (0.2%)	133.20
Erythromycin 250mg	Tabs	1000mg	3257660	871631.47	814415 (27.7%)	1.08	2828460	862752.52	707115 (24.1%)	1.24
Erythromycin susp 125mg/5ml	Liq	N/I	42670	329785.63	N/C	N/C	14183	91338.52	N/C	N/C

* N/I = DDD not assigned

*N/C = Not calculated

Table 5.7 (cont) Utilisation of the "Top Twenty" Pharmaceutical Products Based on the Estimated Number of Patients Utilising the Defined Daily Dose and Respective Utilisation Cost

Drug Description	*Dosage Form*	*Defined Daily Dose (DDD)*	*Year one (1 Apr 2000-31 Mar 2001)*				*Year two (1 Apr 2001-28 Feb 2002)*			
			Quantity Purchased (items)	*Total Cost (R)*	*Approximate number of patients (n = 2,935,479)*	*Cost per Patient /day (R)*	*Quantity Purchased (items)*	*Total Cost (R)*	*Approximate number of patients (n = 2,935,479)*	*Cost per Patient /day (R)*
Ciprofloxacin 500mg	Tabs	1000mg	392890	1960623.75	196445 (6.7%)	9.98	331090	1667713.60	165545 (5.6%)	10.08
Rifam 150mg & Inh 100mg	Tabs	900mg	760200	452674.10	211167 (7.2%)	2.16	376520	250788.74	104589 (3.6%)	2.41
Rifam 300mg & Inh 150mg	Tabs	900mg	411000	367623.90	205500 (7.0%)	1.78	909640	888295.46	454820 (15.5%)	1.96
RHZE (Rifam120mg, Pza 300mg Inh 60mg Etham 200mg)	Tabs	3600mg	4201300	2133602.67	792698 (27.0%)	2.70	3250000	1833870.00	613208 (20.9%)	2.96

* N/I = DDD not assigned

*N/C = Not calculated

Table 5.7 (cont) Utilisation of the "Top Twenty" Pharmaceutical Products Based on the Estimated Number of Patients Utilising the Defined Daily Dose and Respective Utilisation Cost

Drug Description	*Dosage Form*	*Defined Daily Dose (DDD)*	*Year one (1 Apr 2000-31 Mar 2001)*				*Year two (1 Apr 2001-28 Feb 2002)*			
			Quantity Purchased (items)	*Total Cost (R)*	*Approximate number of patients (n = 2,935,479)*	*Cost per Patient/day (R)*	*Quantity Purchased (items)*	*Total Cost (R)*	*Approximate number of patients (n = 2,935,479)*	*Cost per Patient/day (R)*
RHZE (Rifam120mg, Pza 300mg Inh 60mg Etham 225mg)	Tabs	3600mg	1109600	570415.20	217569 (7.4%)	2.60	228800	158329.60	44863 (1.5%)	3.52
Vacc Hib-Dtp 1 dose	Inj	N/I	7850	87321.35	N/C	N/C	10490	226475.80	N/C	N/C
Vacc Hib-Dtp 10 dose	Inj	N/I	4470	748337.40	N/C	N/C	16706	2735607.85	N/C	N/C
Vacc Dtp 10 dose	Inj	N/I	4800	71346.00	N/C	N/C	-	-	-	-
Vacc Hep B (paed)	Inj	N/I	4835	135112.84	N/C	N/C	11068	334050.50	N/C	N/C

* N/I = DDD not assigned

*N/C = Not calculated

Table 5.7 (cont) Utilisation of the "Top Twenty" Pharmaceutical Products Based on the Estimated Number of Patients Utilising the Defined Daily Dose and Respective Utilisation Cost

Drug Description	*Dosage Form*	*Defined Daily Dose (DDD)*	*Year one (1 Apr 2000-31 Mar 2001)*				*Year two (1 Apr 2001-28 Feb 2002)*			
			Quantity Purchased (items)	*Total Cost (R)*	*Approximate number of patients (n = 2,935,479)*	*Cost per Patient/day (R)*	*Quantity Purchased (items)*	*Total Cost (R)*	*Approximate number of patients (n = 2,935,479)*	*Cost per Patient/day (R)*
Ibuprofen 200mg	Tabs	1200mg	12243700	516790.82	2040617 (69.5%)	0.24	3844425	231341.80	640738 (21.8%)	0.36
Paracetamol 500mg	Tabs	3000mg	6441500	287082.17	1073583 (36.6%)	0.24	1893190	87190.21	315532 (10.7%)	0.30
Paracetamol syrup 120mg/5ml	Liq	N/I	973346	623819.78	N/C	N/C	54793	92778.85	N/C	N/C
Carbamazepine 200mg	Tabs	1000mg	5355990	1529657.05	1071198 (36.5%)	1.45	2743210	795746.75	548642 (18.7%)	1.45
Carbamazepine 400mg	Tabs	1000mg	-	-	-	-	478980	289942.56	95796 (3.3%)	3.05
Phenytoin 100mg	Caps	300mg	1356000	168606.00	452000 (15.4%)	0.36	-	-	-	-

* N/I = DDD not assigned

*N/C = Not calculated

Table 5.7 (cont) Utilisation of the "Top Twenty" Pharmaceutical Products Based on the Estimated Number of Patients Utilising the Defined Daily Dose and Respective Utilisation Cost

Drug Description	*Dosage Form*	*Defined Daily Dose (DDD)*	*Year one (1 Apr 2000-31 Mar 2001)*				*Year two (1 Apr 2001-28 Feb 2002)*			
			Quantity Purchased (items)	*Total Cost (R)*	*Approximate number of patients (n = 2,935,479)*	*Cost per Patient/day (R)*	*Quantity Purchased (items)*	*Total Cost (R)*	*Approximate number of patients (n = 2,935,479)*	*Cost per Patient/day (R)*
Mebendazole syrup 30ml	Liq	N/I	16326	129791.70	N/C	N/C	-	-	-	-
Mist expect stim adult 200ml	Liq	N/I	16432400	165202.50	N/C	N/C	41956600	302735.52	N/C	N/C
Mist tussi infans 100ml	Liq	N/I	-	-	-	-	40500	67635	N/C	N/C
Feneterol inhaler complete	Inhaler	0.6mg	6180	51108.60	1030 (0.1%)	49.62	-	-	-	-
Salbutamol MDI	Inhaler	0.8mg	9586	70335.98	1198 (0.1%)	58.72	36204	252782.96	4526 (0.2%)	55.84

* N/I = DDD not assigned

*N/C = Not calculated

Table 5.7 (cont) Utilisation of the "Top Twenty" Pharmaceutical Products Based on the Estimated Number of Patients Utilising the Defined Daily Dose and Respective Utilisation Cost

Drug Description	*Dosage Form*	*Defined Daily Dose (DDD)*	*Year one (1 Apr 2000-31 Mar 2001)*				*Year two (1 Apr 2001-28 Feb 2002)*			
			Quantity Purchased (items)	*Total Cost (R)*	*Approximate number of patients (n = 2,935,479)*	*Cost per Patient (R)*	*Quantity Purchased (items)*	*Total Cost (R)*	*Approximate number of patients (n = 2,935,479)*	*Cost per Patient/day (R)*
Beclomethasone MDI	Inhaler	0.8mg	18969	289768.63	2371 (0.1%)	0.61	30502	587505.93	3813 (0.1%)	0.77
Chlorpheni-ramine 4mg	Tabs	12mg	-	-		-	221200	196646.80	7367 (0.3%)	26.70
Oxtetracycline polymixine eye oint 5g	Topical	N/I	14910	93783.90	N/C	N/C	-	-	-	-

* N/I = DDD not assigned

*N/C = Not calculated

The following is a summarised discussion of those "top twenty" pharmaceutical products, which had presented with utilisation figures in terms of the approximate number of patients representing more than twenty per cent of the population. These utilisation figures render an indication with regard to the prevalence of certain disease states prominent within the population. Where age may be an applicable factor of consideration, it is important to take note that according to the community profile for the North West Province, approximately twenty per cent of the possible patients utilising public health care services (n = 2,935,479) are approximately 45 years or older thus presenting with a high risk of cardiovascular diseases.

According to table 5.7, it may be concluded that drugs used in the treatment of hypertension and cardiac failure were the most utilised in comparison to other "top twenty" products during the study period. Of these agents, Hydrochlorothiazide 25mg, indicated in the Essential Drugs List and Standard Treatment Guidelines (see Appendix A) as a first line therapy for all hypertensive patients, as well as treatment of hypertension associated with different disease states was utilised by approximately 27255148 patients representing 928.5% (n = 2935479) of the total population for year one, it is important to note that this figure is significantly nine times higher than expected for year one, however a quantity percentage decrease in the purchasing quantity of Hydrochlorothiazide is noted between the two years of the study period, with a purchasing quantity percentage difference of 2.06% (table 5.5). This decrease in purchasing quantity accounts for the lower number of patients 18849196 utilising Hydrochlorothiazide in year two. Although year two presents with a lower consumption figure in relation to year one, it is significant to note that the number of patients using Hydrochlorothiazide is still six times larger (642.1%; n =2935479) than that of the total population utilising public health care services.

From table 5.7, it may be concluded, that Methyldopa 250mg presented with the second largest percentage of the population (227.6% n = 2935479) utilising this anti-hypertensive agent for year one. It is significant to note, according to table 5.8, that the estimated number of patients utilising methlydopa 250mg, (consuming a defined daily dose of 1000mg) was double than that of the total population. Regarding the approximate number of patients utilising Methyldopa 250mg, it is apparent from table 5.8 that there is a relatively large decrease with a percentage difference of 160.4% between the two years. According to the Essential Drugs List and Standard Treatment Guidelines (see Appendix A) Methyldopa 250mg is primarily indicated for treatment of hypertension during pregnancy and pre-eclampsia/eclampsia syndrome.

Nifedipine 30mg presented with an increase in the approximate number of patients consuming nifedipine 30mg as a daily dose over the two-year period, having an approximate number of patients percentage difference of 21.6% between the two years. With regard to other anti-hypertensive agents and agents used in the treatment of cardiac failure that had presented as "top twenty" products over the two year study period, the ACE-Inhibitors i.e. enalapril 10mg and 20 mg tablets and perindropil 4mg accounted for a total of 7646044 of patients utilising ACE-Inhibitors for year one and 8263360 for year two. With regard to enalapril 10mg, a decrease in the number of patients was noted, having a percentage difference of 16.9%, however perindropril 4 mg presented with an increase in the number of patients between year one and two, with year one presenting with 92.9% (n = 2935479) and year two 152.2% (n=2935479).

According to Chrysant, 1998:370) the goal of treating hypertension is to maximise therapeutic efficacy without untoward side effects. The accepted approach is to start treatment with a low dose of a single drug and titrate upward as needed to achieve better therapeutic effect. A rational combination of individual drugs administered in low doses is preferable because it is associated with a high degree of efficacy, low incidence or severity of side effects, and high patient compliance. The most commonly used drug combinations are as follows: (1) diuretics with potassium sparing agents; (2) beta-adrenergic blockers with diuretics; (3) angiotensin-converting enzyme diuretics; (4) angiotensin II receptor blockers with diuretics and (5) angiotensin-converting inhibitors with calcium channel blockers. Therefore it may be concluded regarding the anti-hypertensive drugs that the majority of anti-hypertensives are used in combination where appropriate in accordance to treatment guidelines.

According to the population figure of possible patients utilising public healthcare services about 587,095 (20%; n = 2935479) patients (maximum), with regard to Enalapril 10mg, utilisation figures indicate that more than 3.7 million people are described as "potential users" and more than 1 million "potential users" for Perindopril 4 mg for year one. For year two, Enalapril 10mg utilisation figures, indicated more than 2.9 million "potential users" and more than 4 million "possible users".

Utilisation analysis of year one indicated that 69.5% (n = 2935479) of the population utilised Ibuprofen 200mg at a defined daily dose of 1200mg, this percentage is significantly higher than the respective 21.8% (n = 2935479) of year two. Furthermore, Paracetamol 500mg tablets also presented with relatively higher utilisation in year one than year two, with an utilisation percentage difference of 25.9% over the two –year period.

Regarding the utilisation of Amoxycillin 250mg capsules, it may be noted that the approximate number of patients decreased from year one to year two, this being apparent from the percentage difference of 24.8% between the two years.

According to table 5.7, significant differences were also observed with regard to Carbamazepine 200mg. This anti-epileptic agent presented with a decrease in the approximate number of patients, with year one having 1071198 patients utilising Carbamazepine at a defined daily dose of 1000mg in comparison to 548642 patients in year two utilising the anti-epileptic agent at the same defined daily dose.

Differences in the utilisation of anti-tuberculosis agents were also noted over the two-year period, with the combination RHZE (Rifampicin 1230mg/Pyrazinamide 300mg/Isoniazide 60mg/Ethambutol 200mg) presenting with a significant difference of 6.1% in the approximate number of patients utilising this combination of anti-tuberculostatic agents.

According to table 5.7, Erythromycin 250mg, presented with an increase in the approximate number of patients consuming Erythromycin 250mg at a daily-defined dose over the two-year period) having an approximate number of patients percentage difference of 3.6% between the two years of the study period.

Phenoxymethylpenicillin, a narrow spectrum antibiotic, occurring only once as a "top twenty" product, according to the Essential Drugs List and Standard Treatment Guidelines (see Appendix A) is indicated for treatment of rheumatic fever, valvular heart disease as well as bacterial tonsillitis, presented with a utilisation percentage of 25.3% (n= 2935479).

From the utilisation figures illustrated in table 5.7, the relatively high usage of the majority of the "top twenty" products may be accounted to the possible reasons such as:

- The non – adherence to the EDL prescribing guidelines, as in the case of Methyldopa, which indicated as mentioned previously, for the treatment of hypertension during pregnancy only.
- Relative high utilisation of the "top twenty" products may entail that patients are using higher dosages than the DDD that was used to calculate the number of patients, as the DDD is only a recommended dose.
- The high utilisation figure may be due to possible misappropriatation of stock and stock hauling.

- Where age may play an important role e.g. cardiovascular disease, it seems that serious problems exist, through high utilisation figures obtained by the use of the defined daily dose (DDD). These aspects require further investigation.
- Lastly the high utilisation figures for Hydrochlorothiazide and other " top twenty" products presenting with utilisation figures above hundred per cent may possibly be due to misprinting of figures in the pharmaceutical purchasing reports.

5.7 Chapter Summary

In this chapter the results of the empirical investigation have been discussed. Analyses of the "top twenty" pharmaceutical products according to the ATC Classification System based on quantities and respective costs have also been discussed. The respective dosage forms of the "top twenty" pharmaceutical products and drug utilisation based on the estimated number of patients utilising the DDD together with respective utilisation costs have also been addressed.

Recommendations and limitations regarding the study conducted will be discussed in chapter 6.

Chapter 6:

Recommendations and Limitations

6.1 Introduction

In this chapter, recommendations and limitations based on the results of the literature review and empirical investigation will be discussed. Recommendations regarding future research studies will also be made.

In order to ensure that the study has achieved the specific objectives as stated in Chapter one, conclusions were made with reference to the specific objectives set out (refer to paragraphs 2.7, 3.4, 4.12, 5.7).

6.2 Recommendations

6.2.1 Recommendations regarding the study and future studies

The following recommendations could be made after analysis of the data and research study, regarding the value of the "top twenty" pharmaceutical products:

- It was concluded that the re-evaluation of drugs used in the treatment of hypertension and cardiac failure is necessary, as anti-hypertensive agents presented with "abnormal" high quantity and cost totals for both years one and two (refer to paragraph 5.3.1 and paragraph 5.5.1). Furthermore, a change in the usage patterns of ACE-Inhibitors during the study period, had an impact on cost increases (see paragraphs 5.3.2 and 5.5.1).
- When considering the fluctuation in purchasing quantities within the two years of the study period, with regard to anti - hypertensive agents and diuretics, vaccines and cough and cold preparations (refer to paragraph 5.3.1), it is recommended that purchasing patterns be further investigated.
- Re-evaluation of anti-bacterial agents for systemic use needs attention especially as far as cost and effective usage are concerned (refer to paragraph 5.5.1).
- Implementation of financial analyses of pharmaceutical expenditure should be launched on a regular basis in order to identify areas that are not adequately cost-effective.
- A uniform database should be developed taking into consideration purchasing quantities of "high cost" medications per hospital, as this will serve as a " tool " for effective decision

making and future pharmacoeconomic and drug utilisation studies (see Paragraphs 2.5.1.3, 2.5.2 and 2.5.4.7).

- Monitoring of the frequency of specific diseases and evaluation of drugs used in their treatment should be undertaken, thereby aiding planning and interventions by decision makers based on managed health care concepts such as evidence- based approaches (refer to paragraph 2.5.3).
- Training of health care managers and workers should take place within the public sector, especially with regard to drug management aspects, such as quantification, cost, procurement, distribution as well as inventory control and management, thereby, enforcing the essential drugs programme.
- Attention should be paid to the development and implementation of medicine management and monitoring systems within the public health sector thereby improving areas of drug handling, stock – control and record keeping.
- As this was a pilot study, results from this study indicate that it is essential that further studies be conducted regarding the "top twenty" pharmaceutical products for subsequent years, which thereby would assist in the identification of problem areas within the drug management cycle.

6.3 Limitation and Shortcomings of the Research Study Conducted

The following limitations and shortcomings should be taken into consideration when evaluating the results and the conclusions:

- All information printed on the pharmaceutical purchasing reports was considered to be correct and accurate.
- No patient demographic information such as age and gender was available.
- The absence of information regarding diagnosis could have provided a means to evaluate specific prescribing according to the EDL.
- The defined daily dose (DDD) is not the average dose or the dose actually prescribed and ingested, therefore the results must be evaluated accordingly.

6.4 Chapter Summary

The recommendations and limitations of the study conducted were discussed in this chapter. Hereby the last research question has been answered.

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Appendix A

A 10: Drugs used in Diabetes

A10AD01 Insulin Actraphane: 100 iu/ml 10 MI

A10BB02 Glicazide tab 80 mg

A10BD03 Metformin: 850mg

Indication: Diabetes Mellitus

Def: a syndrome caused by a relative or absolute deficiency of insulin.

Pathogenesis: insulin deficiency can be either primary or secondary.

Types:

Non-insulin dependant diabetes mellitus (NIDDM) Type 2.

Insulin dependant diabetes mellitus (IDDM) Type 1

Pancreatic diabetes mellitus

Dosages: Glicazide Oral, 40 mg once to twice daily, upto 320 mg/day.

Treatment Guidelines: Gliclazide

Use if glycemic targets are not reached after lifestyle modification for 3 months OR in newly diagnosed patients with very high blood glucose levels (15-20 mmol/L) who are not dehydrated or in keto-acidosis.

These drugs stimulate insulin secretion.

Hypoglycaemia can be a problem.

NB: Not to be used in pregnancy or in impaired renal or hepatic function. Caution with long-acting drugs in elderly people.

DDD- 0.16g

Admin Route: Oral

Treatment Guidelines: Metformin

Use if glycemic targets are not reached after lifestyle modification for 3 months OR in newly diagnosed patients with very high blood glucose levels (15-20 mmol/L) who are not dehydrated or in keto-acidosis.

They enhance insulin action peripherally.

They are useful in obese patients.

Treatment Guidelines: Insulin Actraphane

Used for:

All type 1 diabetics (IDDM).

Type 2 diabetics (NIDDM) with poor glycaemic control on oral agents; or during stress or intercurrent illness or infections or peri-operative; after trauma, during pregnancy, with pancreatitis; severe organ failure and in hyperglycaemic emergencies.

Titrate dose according to blood glucose response.

Drug	*Indication*	*EDL Dosages*	*DDD*	*Route Of Admin*
Gliclazide	IDDM	40 mg once to twice daily, upto 320mg/day.	0.16 g	Oral
Insulin Actraphane	NIDDM IDDM	100 iu/ml 10MI	40 u	Intamuscular
Metformin	DM	500 /850 mg 1-3 daily. Total max daily dose: 3000 mg	2g	Oral

B05: Blood substitutes and perfusion solutions

B05A Blood and related products

B05AA01 Albumin solution 20% 100ml

- ***Indicated for the treatment of:***
- ***Cirrhosis, portal hypertension and chronic liver failure.***
- ***Nephritic syndrome associated with severe oedema***
- ***Renal failure if shock is evident***
- ***Early congenital syphilis associated with hypoalbuminaemia***
- ***Shock associated with fluid loss other than blood***
- ***Burns associated with hypoalbuminaemia***

Appendix A

B05B Intravenous solutions

B05BB02 Maintelyte and dextrose 5%

B05BB02 Ringers lactate 1000ml

Maintelye and dextrose 5%

Indications:

- Hyperglycaemic non ketotic hyperosmolar disorder
- Hypoglycaemia in Diabetes Mellitus.
- Total parenteral nutrition solution – carbohydrate solution.
- Hyperkalaemia.

Ringers-lactate solution

Indications:

- Severe dehydration associated with acute diarrhoea in children.
- Anaphylactic shock in adults in children.
- Burns
- Cardiac arrest in adults and kids.
- Cholera
- Cyanotic congenital heart disease with hypoxaemic attacks/spells (cyanotic spells).
- Shock.

Indication	*EDL dosages*	*Route of admin*	*DDD*
Severe dehydration associated with acute diarrhoea in children.	100ml/kg	Intravenous	Not indicated
Anaphylactic shock	20 ml/kg	Intravenous	
Burns	1-1.5 ml/kg x % body surface area burned	Intravenous	
Cardiac arrest	Drip Solution	Intravenous	
Cholera	20 ml/kg	Rapid IV	
Cyanotic congenital heart disease with hypoxaemic attacks/spells (cyanotic spells).	20 ml/kg	Intravenous	
Shock	20 ml/kg	Intravenous	

B05 C Irrigation Solutions

B05CB01 Sodium Chloride 0.9% Inj 50 MI & 1000 MI

Indications:

- Immediate same-day referral for diabetic emergencies or acute diabetic complications.
- Pregnancy induced hypertension (severe eclampsia).
- Acute bronchospasm associated with asthma and chronic obstructive bronchitis.
- Common colds and influenza.
- Anaphylactic shock
- Envenomation (Snake-bite).
- Burns.
- Cardiac arrest.
- Eye injuries or embedded foreign bodies.
- Moderate and severe hypercalcaemia
- Dehydration & hyponatraemia
- Ketosis
- Hyperglycaemic non ketotic hyperosmolar disorder
- Hyperparathyroidism primary.
- . Pituitary disorders/hypopituitarism-chronic
- Eye burns, chemical.

B05CB01 Sodium Chloride 0.9% Inj 50 MI & 1000 MI

Indication	*EDL Dosages*	*Route of admin*	*DDD*
Diabetic emergencies/acute diabetic complications	0.9% solution	IV infusion	1 g
Severe eclampsia	0.9%	Intravenous	
Acute bronchospasm	0.03 ml/kg 0.5%salbutamol in 2-3 ml 0.9% solution	Intranasal	
Common colds and influenza	0.9% solution	Intranasal	
Anaphylactic shock	Adrenaline 1ml diluted with 0.9%	Slow IV	
Envenomation	100 ml antivenom in 300 ml 0.9% solution	Infusion	
Burns	0.9%	Topical	
Cardiac arrest	0.9% solution	Intravenous	
Eye injuries/foreign bodies	0.9%	Irrigation	
Hypocalcaemia: moderate and severe	4-6 L/24 hours 0.9% solution	IV infusion	

Appendix A

B05CB01 Sodium Chloride 0.9% Inj 50 MI & 1000 MI

Indication	*EDL Dosages*	*Route of admin*	*DDD*
Dehydration and hyponatraemia	0.9% solution	IV infusion	
Ketosis	1-2L initially 0.9% solution	Intravenous	
Hyperglycaemic non ketotic hyperosmolar disorder	1-2L initially 0.9% solution	Intravenous	
Hyperparathyroidism primary	4-6 L/24 hours 0.9% solution	IV infusion	
Pituitary disorders/hypopituitarism-chronic	0.9% solution	IV infusion	
Eye burns, chemical	0.9% solution	Irrigation	

C 01 Cardiac Therapy

C01D Vasodilators used in cardiac diseases

C01DA14 Isosorbide-5-Mononitrate20 mg Tabs

Indications:

- Chronic stable angina pectoris

Indications	*EDL dosage*	*Route of admin*	*DDD*
Chronic stable angina pectoris	10-20 mg twice daily	Oral	40mg

C 02 Antihypertensives

C02A Anti-adrenergic agents; centrally acting

C02AA02 Reserpine tab 0.25 mg

Indications:

- Hypertension

Dosages: 0.1 mg daily

Route of Admin: oral

DDD: 0.5mg

C02AB01 Methyldopa tab 250 mg

Indications:

- Hypertension in pregnancy
- Pre-eclampsia/eclampsia syndrome

Indication	*EDL dosages*	*Route of admin*	*DDD*
Hypertension in pregnancy	250 mg twice daily increase to 500 mg thrice daily (max 1500 mg/day)	Oral	1g (levorotatory) 1g (racemic)
Pre-eclampsia/eclampsia syndrome	250 mg twice daily increase to 500 mg thrice daily (max 1500 mg/day)	Oral	

C03 Diuretics

C03A Low ceiling diuretics

C03AA03 Hydrochlorthiazide tab 12.5 mg/ 25 mgf

Indications:

- Essential Hypertension (P)
- Nephrotic syndrome (P)
- Hypertension in adults.
- Cardiac failure syndrome
- Cardiomyopathy, idiopathic dilated
- Hypertension associated with dyslipdaemia & Diabetes Mellitus type 2
- Hypertension associated with prostatic hypertrophy.
- Malignant hypertension in association with other drug treatments.
- Hypertension in pregnancy.
- Pre-eclampsia/severe syndrome.
- Renal calculi

Hydrochlorthiazide tab 12.5 mg/ 25 mgf

Indications	*EDL dosages*	*Route of admin*	*DDD*
Essential Hypertension (P)	0.5 – 1 mg/kg	Oral	25mg
Nephrotic syndrome (P)	1-2 mg/kg/24hrs in 2 divided doses	Oral	
Hypertension in adults	12.5mg/d –moderate 25 mg /d - severe	Oral	
Cardiac failure syndrome	50-100 mg per day	Oral	
Cardiomyopathy,Idiopathic dilated	50-100 mg/day	Oral	
Hypertension associated with dyslipdaemia & Diabetes Mellitus type 2	12.5 mg daily (low dose)	Oral	
Hypertension associated with prostatic hypertrophy	Low dose	Oral	
Malignant hypertension	12.5 mg daily	Oral	
Hypertension in pregnancy	12.5 mg daily	Oral	
Pre-eclampsia/eclampsia syndrome	12.5 mg daily	Oral	
Renal calculi	50 mg daily for 1 month	Oral	

C 08 Calcium channel blockers

C08C selective calcium channel blockers with mainly vascular effects

C08CA05 Nifedipine tab 30/60 mg

Indications:

- Severe hypertension or hypertension emergencies (G/Y)
- Acute pulmonary oedema due to hypertensive crisis or significant systolic hypertenion (G)
- Secondary hypertension (P)
- Hypertensive crisis (P)
- Renal failure with associated hypertension (Y)
- Hypertension associated with diabetes, general (Y)
- Raynaud's phenomenon- vascular disease, peripheral (Y)
- Systemic lupus erythematosus (Y).

Nifedipine tab 30/60 mg

Indications	*EDL dosages*	*Route of admin*	*DDD*
Severe hypertension or hypertension emergencies-short term use	5 mg	Oral	0.3 g
Hypertension	30-90 mg daily	Oral	
Acute pulmonary oedema due to hypertensive crisis or significant systolic hypertension.	5 mg	Oral	
Secondary hypertension (P)	0.2-1 mg/kg/24 hrs in 3-4 divided doses (6-8 hr)	Oral	
Hypertensive crisis (P)	0.2-0.5 mg/kg/dose 4 hr	Sublingually	
Renal failure with associated hypertension	0.2-0.5 mg/kg 6-8 hourly	Oral	
Hypertensionassociated with diabetes, general	30-90 mg daily	Oral	
Raynaud's phenomenon	5-10 mg tid	Oral	
Systemic lupus erythematosus	5-10 mg tid	Oral	

C 09 agents acting on renin-angiotensin

C09A ACE-Inhibitors plain

C09AA01 Captopril tabs 50 mg

C09AA2 Enalapril tabs 5,10 and 20 mg

C09AA04 Perindropril 4mg

C09AA01 Captopril tabs 50 mg

Indications:

- Heart failure (P).
- Secondary hypertension (P)
- Myocarditis (P)
- Nephritic syndrome associated with urine protein loss

Appendix A

C09AA01 Captopril tabs 50 mg

Indication	*EDL dosages*	*Route of admin*	*DDD*
Heart failure (P).	0.5mg/kg/24 hrs in 3 divided doses (8 hourly) for 24-48 hrs. Increase every 24-48 hrs by 0.5mg /kg/24 hrs until maintenance dose of 3-5 mg/kg/24 hrs is reached.	Oral	50 mg
Secondary hypertension	1-6 mg\kg\24 hrs in 3 divided doses. (Neonates: 0.03-2 mg\kg\24 hrs)	Oral	
Myocarditis	0.5mg/kg/24 hrs in 3 divided doses (8 hourly) for 24-48 hrs. Increase every 24-48 hrs by 0.5mg /kg/24 hrs until maintenance dose of 3-5 mg/kg/24 hrs is reached.	Oral	
Nephritic syndrome associated with urine protein loss	1-5 mg\kg\24 hrs in 2-3 divided doses	Oral	

C09AA04 Perindropril 4mg

Indications:

- Hypertension (G)
- Hypertension with associated diabetes (G)
- Cardiac failure syndrome
- Cardiomyopathy, idiopathic dilated
- Hypertension with associated dyslipidaemia (Y)
- Hypertension malignant
- Nephrotic syndrome associated with hypertension

C09AA04 Perindropril 4mg

Indications	*EDL dosages*	*Route of admin*	*DDD*
Hypertension	4 mg daily	Oral	4 mg
Hypertension with associated diabetes	4 mg once daily	Oral	
Hypertension with associated dyslipidaemia	4 mg once daily	Oral	
Cardiac failure syndrome	4 mg daily	Oral	
Cardiomyopathy, idiopathic dilated	4 mg daily	Oral	
Hypertension malignant	2-4mg daily.	Oral	
Nephrotic syndrome associated with hypertension	4 mg daily	Oral	

C09AA2 Enalapril tabs 5,10 and 20 mg

Indication:

Hypertension in adults Step 6 in step wise treatement, addition to lifestyle modofication, hydrochlorothiazide oral 12.5mg daily, reserpine 0.1mg daily, beta-adrenergicclocking agent 50mg daily. ACE-inhibitor to be initiated by a doctor.

secondary hypertension: Paediatrics

EDL dosages: 0.2-1 mg\kg\24 hrs in 2 divided doses.

Route of admin: oral

DDD : 10mg

C10 Serum lipid reducing agents

C10A Chloesterol and triglycerides reducers

C10AA01 Simvastatin 20mg

Not indicated in the EDL

mild cases	500 mg 6 hourly	Oral	1 g
Pelvic inflammatory disease	250 mg 8 hours for at least 3 days	Oral	
Pyogenic bone infections	500 mg 8 hourly for 2-4 weeks	Oral	
Septic arthritis, acute	500 mg 8 hourly for 2-4 weeks	Oral	

Appendix A

Amoxycillin Caps 250 mg

Indications	*EDL dosages*	*Route of admin*	*DDD*
Asthma, chronic persistent assoc with intercurrent bacterial infections	500 mg 8 hourly for 7-10 days	Oral	1g
Bronchiectasis	500 mg 8 hourly for 14 days	Oral	
Lung abscess	500 mg 8 hourly until infection has clinically resolved	Oral	
Dental abscess in children over 20 kg and adults	250 mg 8 hourly for 5 days	Oral	
Acute necrotising ulcerative gingivitis in children over 20 kg and adults	250 mg 8 hourly for 5 days	Oral	
Otitis media acute in children over 20 kg and adults	250 mg 8 hourly for 5 days	Oral	
Sinusitis acute in children over 20 kg and adults	250 mg 8 hourly for 5 days	Oral	
Bacillary dysentery (shingellosis) in children over 10 years and adults	250mg 8 hourly for 5 days	Oral	
Measles in children over 10 years and adults	250mg 8 hourly for 5 days	Oral	
Bronchitis acute	250mg 8 hourly for 5 days	Oral	
Pneumonia in adults	500 mg 8 hourly for 7 days	Oral	
Severe pneumonia in children	250 mg 8 hourly for 10 days	Oral	
Impetigo in children over 10 years and adults	250 mg 8 hourly for 10 days	Oral	
Animal and human bites in children over 10 years and adults	250 mg 8 hourly for 5 days	Oral	

Appendix A

J01CA04 Amoxycillin suspension 125mg/5ml 100 MI

Indications	*EDL dosages*	*Route of admin*	*DDD*
Typhoid fever	<20 kg, 20-40 mg/kg/24 hrs in 3 divided doses (8 hourly) for 21 days; > 20 kg, 250-500 mg 8 hourly for 21 days.	Oral	Not Indicated
Protein energy malnutrition associated with infection	125 mg 3 times daily for 7 days	Oral	
Prophylactic treatment of infective endocarditis in children undergoing dental, oral or upper respiratory tract procedures	50 mg/kg (max 3g) 1 hour before the procedure the half the dose after 6 hours	Oral	
Cellulitis	<20 kg, 20-40 mg/kg/24 hrs in 3 divided doses (8 hourly) > 20 kg, 250-500 mg 8 hourly for 5 days	Oral	
Erythema multiforme/Stevens-Johnson Syndrome	<20 kg, 20-40 mg/kg/24 hrs in 3 divided doses > 20 kg, 250-500 mg 8 hourly for 10 days	Oral	
Epitaxis	125-250 mg 8 hourly for 7 days	Oral	
Otitis media, complications	<20 kg, 20-40 mg/kg/24 hrs in 3 divided doses for 7-14 days > 20 kg, 250-500 mg 8 hourly for 7-14 days	Oral	
Sinusitis, chronic complicated	<20 kg, 20-40 mg/kg/24 hrs in 3 divided doses > 20 kg, 250-500 mg 6 hourly	Oral	

Appendix A

Amoxycillin suspension 125mg/5ml 100 MI

Indications	*EDL dosages*	*Route of admin*	*DDD*
Tonsillitis, complicated	<20 kg, 20-40 mg/kg/24 hrs in 3 divided doses for 7 days. >250 mg 8 hourly for 7 days	Oral	Not Indicated
Pyelonephritis and obstructive/reflux nephropathy	<20 kg, 20-40 mg/kg/24 hrs in 3 divided doses > 20 kg, 250-500 mg 8 hourly for 7-14 days	Oral	
Urinary tract infection	<20 kg, 20-40 mg/kg/24 hrs in 3 divided doses > 20 kg, 250-500 mg 8 hourly for 7-14 days	Oral	
Ascariasis	<20 kg, 20-40 mg/kg/24 hrs in 3 divided doses (8 hourly) for 7 days > 20 kg, 250-500 mg 8 hourly for 7days	Oral	
Varicella (chicken pox) assoc with a secondary skin infection	<20kg, 20-40 mg/kg/24 hrs in 3 divided doses (8 hourly) for 5 days > 20kg, 250 mg 8 hourly for 5 days	Oral	
Osteomyelitis	<20kg, 20-40 mg/kg/24 hrs in 3 divided doses > 20kg, 250 mg 8 hourly for 4-6 weeks	Oral	
Septic (pyogenic) arthritis	<20kg, 20-40 mg/kg/24 hrs in 3 divided doses > 20kg, 250 mg 8 hourly for 3 weeks	Oral	
Bronchiectasis	<20kg, 20-40 mg/kg/24 hrs in 3 divided doses > 20kg, 250 mg 8 hourly for 14 days	Oral	

Amoxycillin suspension 125mg/5ml 100 MI

Indications	*EDL dosages*	*Route of admin*	*DDD*
Bronchiolitis	<20kg, 20-40 mg/kg/24 hrs in 3 divided doses for 7 days >20kg, 125-250 mg 8 hourly for 7 days.	Oral	Not indicated
Lung abscess	<20kg, 20-40 mg/kg/24 hrs in 3 divided doses for 14 days >20kg, 125-250 mg 8 hourly for 14 days	Oral	
Pneumonia	<20kg, 20-40 mg/kg/24 hrs in 4 divided doses (6 hourly) for 7 days >20kg, 250mg-500mg for 7days	Oral	
Paraffin poisoning	<20kg, 20-40 mg/kg/24 hrs in 3 divided doses for 5 days >20kg, 250-500 mg 8 hourly for 5 days	Oral	
Evenomation snake bite	<20kg, 20-40 mg/kg/24 hrs in 3 divided doses >20kg, 250-500 mg 8 hourly for 5 days	Oral	

J01CR02 Amoxycillin Clav Inj 1000mg/200 mg

Indicated for paediatric treatment of sinusitis, chronic and complicated, which is amoxicillin and ampicillin resistant. Consideration of amoxicillin with clavulanic acid where there is evidence that the micro-organism sensitivity patterns for ampicillin and amoxicillin are becoming less favourable and higher doses are required for treatment.

Dosages indicated: oral

Amoxicillin 20-40mg/kg/24 hours + clavulanic acid 5 mg/kg/24 hours in 3 divided doses for 10-14 days.

DDD: 1g

Appendix A

J01CE02 Phenoxymethylpenicillin tabs 250mg

Indications	*Edl dosages*	*Route of admin*	*DDD*
Valvular heart disease	250 mg 12 hourly	Oral	2 g
Tonsillitis bacterial in children over 30 kg	250 mg 6 hourly for 10 days	Oral	
Tonsillitis bacterial in adults	500 mg 6 hourly for 10 days	Oral	
Rheumatic fever: prevention of recurrent rheumatic fever	250 mg twice daily	Oral	
Cellulites, Erysipelas, Pyoderma (impetigo)	250 mg 3 time daily for a total of at least 10 days after the acute phase has cleared	Oral	

J01CF05 Flucloxacillin Caps 250 mg

Indications	*Edl dosages*	*Route of admin*	*DDD*
Cystic fibrosis-prophylactic treatment of respiratory tract infections	250mg 8 hourly	Oral	2 g
Cystic fibrosis assoc with established infections: *S.aureus*	500mg 6 hourly	Oral	
Cellulitis in areas with a high prevalence of penicillin-resistant staphylococci	500 mg 6 hourly	Oral	
Pyogenic bone infections *S.aureus*	500 mg 6 hourly for 2-4 weeks	Oral	
Septic arthritis acute *S.aureus*	500 mg 6 hourly for 2-4 weeks	Oral	
Boil abscess in children over 10 years and adults	250 mg 6 hourly for 5 days	Oral	
Impetigo-second line treatment for staphylococcal infections in children over 10 years and adults	500 mg 6 hourly for 10 days	Oral	

Appendix A

J01CF05 Flucloxacillin Caps 250 mg

Indications	*Edl dosages*	*Route of admin*	*DDD*
Acute, moist or weeping eczema assoc with staphylococcal infection in children over 10 years and adults	250mg 6 hourly for 5 days	Oral	2 g
Cystic fibrosis *S.aureus* in children over 5 years of age	250mg 6 hourly for 10-14 days	Oral	
Cellulitis if staphylococci are suspected in children over 10 years	250 mg 6 hourly for 7 days	Oral	
Otitis media complications in children over 2 years	125-500 mg 6 hourly for 7-14 days	Oral	
Sinusitis, chronic complicated in less severe cases in children over 2 years	125-500 mg 6 hourly	Oral	
Tonsillitis, complicated assoc with Staphylococci in children over 5 years	250mg 6 hourly for 7 days	Oral	
Varicella(chicken pox) assoc with a secondary skin infection in children aged 2-10 yrs	125-250mg 6 hourly for 5 days	Oral	
Osteomyelitis in children over 2 years	12-250 mg 6 hourly for 4-6 weeks	Oral	
Septic/pyogenic arthritis in children over 2 years	12-250 mg 6 hourly for 3 weeks	Oral	
Bronchiectasis in children over 2 years	250-500 mg 6 hourly for 14 days	Oral	
Lung abscess in children ≥2 years	125-500mg 6 hourly for 14 days	Oral	2 g

Appendix A

J01D Other beta lactam antibacterials

J01DA10 Cefotaxime inj 500mg and 1g/vial +diluent

Indications	*EDL dosages*	*Route of admin*	*DDD*
Peritonitis	1-2g 8 hourly (up to 12g per day in life-threatening disease)	IV	4g (adult)
Endocarditis assoc with G- organisms: *Enterobacteriaceae*	12g/day in 2 divided doses for 6 weeks	IV	
Pneumonia nosocomial/ventilator acquired	2g 12 hourly	IV	
Nosocomial burn wounds infections	2g 12 hourly	IV	
Noscomial UTI	2g 12 hourly	IV	
Bacterial meningitis, bacterial aetiology unknown, community acquired	8-12g/day in 4 divided doses 6 hourly	IV	
Meningitis bacterial, *streptococcus pneumonia*	8-12g/day in 4 divided doses 6 hourly	IV	
Meningitis bacterial, hospital acquired, organism unknown	8-12g/day in 4 divided doses 6 hourly	IV	
Cystic fibrosis *H.Influenzae*	50-100 mg/kg 8 hourly for 10-14 days	IV	
Epiglottitis	100mg/kg/24 hours in 3 divided doses (8 hourly) for 7 days	IV	
Tonsillitis, complicated *H.influenzae* assoc with penicillin allergy	50-100mg/kg/24 hrs in 3 divided doses for 7 days	IV	
Pyelonephritis and obstructive/reflux nephropathy	50-100mg/kg/24 hrs in 2-3 divided doses for 7-14 days	IV	
Urinary tract infections in neonates and infants<3 months	50-100mg/kg/24 hrs in 3 divided doses	IV	
Acute bacterial meningitis in children 3 months-16 years	200 mg/kg/24 hours in 3 divided doses (8hourly) for 10-14 days	IV	

Appendix A

J01DA10Cefotaxime inj 500mg and 1g/vial +diluent

Indications	*EDL dosages*	*Route of admin*	*DDD*
Acute bacterial meningitis in neonates and infants <3 months	200 mg/kg/24 hours in 3 divided doses (8hourly) for 14 days (G- organisms, 21 days)	IV	4g (adult)
Septicaemia complicated by meningitis	50-100 mg/kg/24hrs in 3 divided doses for7-10 days. Meningitis: 200 mg/kg/24 hrs in 3 divided doses for 14 days	IV	
Septic/pyogenic arthritis: ampicillin resistant *H.Influenzae*	50-100 mg/kg/24 hrs in 3 divided doses for 10-14 days	IV	
Pneumonia: Penicillin-resistant *S.Pneumoniae*	50 mg/kg 8 hourly for 7-10 days	IV	
Respiratory distress in the newborn associated with an infection	50 mg/kg 8 hourly for 7-10 days	IV	
Hypoxia/asphyxia (newborn) with suspected infection	50-100mg/kg/24 hrs in 2-3 divided doses for 10 days	IV	
Shock	200mg/kg/24 hours in 4 divided doses for 10 days	IV	
Burns>50% BSA, inhalation injury with respiratory tract damage, proven burn wound sepsis, septicaemia or other infections	50-100 mg/kg/24 hrs in 4 divided doses for 5-14 days	IV	
Surgical prophylaxis	50mg/kg after 12 hours (1 dose)	IV	
Neonates<1 week			
Neonates 1-4 weeks	50mg/kg after 8 hours (1 dose)		
Infants and children 4 weeks-12 years	50-100mg/kg after 8 hours (1dose)		

Appendix A

J01DA13 Ceftriaxone inj 250mg and 1g/vial +diluent

Indication	*Edl dosages*	*Route of admin*	*DDD*
Dysentery bacillary (Shigellosis) (P)	20-80 mg/kg/24 hrs as a single dose for 5 days	IV	2g (adult)
Typhoid fever (P)	20-80 mg/kg/24 hrs as a single dose for 7-14 days	IV	
Otitis media complications; suspected meningitis or brain abscess (P)	20-80 mg/kg/24 hrs as a single dose or in 2 divided doses for 14 days	IV	
Sinusitis, chronic with intracranial complications (P)	80-mg/kg/24 hrs as a single dose. Max 4 g per 24 hours	IV	
Sinusitis, with orbital complications (P)	80-mg/kg/24 hrs as a single dose. Max 4 g per 24 hours	IV	
Acute bacterial meningitis: 3 months-16 years (P)	80 mg/kg/24 hrs as a single dose (max 4g/24 hours)	IV	
Acute bacterial meningitis: neonates and infants <3 months (P)	80 mg/kg/24 hrs as a single dose for 10-14 days	IV	
Pneumonia: penicillin allergy (P)	20-50 mg/kg/24 hours as single or divided doses for 7 days	IV	
Pneumonia: penicillin resistant *S.Pneumoniae* (P)	20-50 mg/kg/24 hours as single or divided doses for 7 days	IV	
Acute meningitis in adults in areas of high penicillin resistance	1-2g single dose	IV	
Infective bacterial infections	2g/day in divided doses for 10-14 days	IV	
Typhoid fever	2g/day in divided doses for 10-14 days	IV	
Endocarditis: G-organisms, *Entereobacteriaceae*	4g/day in 2 divided doses for 6 weeks	IV	

J01DA13 Ceftriaxone inj 250mg and 1g/vial +diluent

Indication	*Edl dosages*	*Route of admin*	*DDD*
Gonorrhoea assoc with meningitis and endocarditis	1-2g every 12 hours for 10-14days (meningitis) or for 4 weeks (endocarditis)	IV	2g (adult)
Hospital acquired infections: brain abscess post surgical	2g 12 hourly	IV	
Pneumonia nosocomial/ventilator acquired; adult; any age	2g 12 hourly	IV	
Nosocomial burn wound infections	2g 12 hourly	IV	
Meningitis bacterial *S.Pneumonia*	4g/day divided in 12 hourly doses for at least 10-14 days	IV	
Meningitis bacterial: *H.influenzae*	4g/day divided in 12 hourly doses for at least 7 days	IV	
Meningitis bacterial *P.aeruginosa*	4g/day divided in 12 hourly doses	IV	

J01E Sulphonamides and trimethoprim

J01EE01 Co-Trimoxazole tabs 480mg

Indications	*EDL dosages*	*Route of admin*	*DDD*
Otitis media, acute in children aged 5-12 yrs	1 tablet (80/400mg) 12 hourly for 5 days	Oral	Trimethoprim 0.4g Sulfamethoxazole 2g
Otitis media, acute in children over 12 yrs and adults	2 tablets (80/400mg) 12 hourly for 5 days	Oral	
Sinusitis, acute in children aged 5-12 yrs	1 tablet (80/400mg) 12 hourly for 5 days	Oral	
Sinusitis, acute in children over 12 yrs and adults	2 tablets (80/400mg) 12 hourly for 5 days	Oral	
Cholera in children 6-12 yrs	1 tab 12 hourly for 5 days	Oral	
Cholera in children over 12 yrs and adults	2 tabs 12 hourly for 5 days	Oral	

Appendix A

J01EE01 Co-Trimoxazole tabs 480mg

Indications	*Edl dosages*	*Route of admin*	*DDD*
Urinary tract infection, uncomplicated (acute uncomplicated cystitis) in adults	2 tabs 12 hourly daily (twice daily) for 5 days	Oral	Trimethoprim 0.4g Sulfamethoxazole 2g
Invasive bacterial infections Shigella *S.dysenteriae* (A), *S.flexneri* (B), *S.boydii* (C)	2 tabs twice daily for 5 days (80/400mg)	Oral	
Invasive bacterial infections Salmonella (other) *S.enteritidis* *S.typhimurium* *S.choleraesuis*	2 tabs twice daily for 5 days (80/400mg)	Oral	
Complicated UTI mild cases	2 tablets twice daily for 7-10 days	Oral	
Pneumocystis Carinii pneumonia (PCP) prophylactic treatment	2 tablets daily (80/400mg)	Oral	
Prophylactic treatment in immunocompromised; induction chemotherapy for malignancy transplantation, patient expected to have <100 WBC/microlitre for 1 week	80/400mg 4 tablets twice daily	Oral	
Prophylactic treatment Parasitic PCP in HIV + patients with a +CD4 count of less than 200	80/400mg 2 tablets 3 times a week, long term	Oral	
Asthma, chronic persistent associated with intercurrent bacterial infections	80/400mg 1 tablet twice daily	Oral	
Bronchiectasis mild	2 tablets twice daily	Oral	

Appendix A

J01F Macrolides and lincosamides

J01FA01 Erythromycin Stearate tabs/caps 250mg

Indications	*Edl dosages*	*Route of admin*	*DDD*
Valvular heart disease in adults	250 mg 12 hourly	Oral	1g
Dental abscess in penicillin-allergic patients: children over 15 kg	250 mg 12 hourly for 6 days	Oral	
Dental abscess in penicillin-allergic patients: adults	250 mg 12 hourly for 6 days	Oral	
Acute necrotising ulcerative gingivitis in penicillin-allergic patients: children over 16kg	250mg 6 hourly for 5 days	Oral	
Acute necrotising ulcerative gingivitis in penicillin-allergic patients: adults	250mg 6 hourly for 5 days	Oral	
Tonsilitis bacterial in penicillin-allergic patients: children over 15kg	250mg 6 hourly for 10 days	Oral	
Tonsilitis bacterial in penicillin-allergic patients: adults	250mg 6 hourly for 10 days	Oral	
Trachoma in children over 15kg	250 mg 6 hourly for 10 days	Oral	
Trachoma in pregnant women	500 mg 6 hourly for 10 days	Oral	
Vaginal discharge/lower abdominal pain in pregnant women and no pain on moving the cervix	500 mg 6 hourly for 7 days	Oral	
Measles in penicillin-allergic patients: children over 15 kg	250 mg 6 hourly for 5 days	Oral	
Measles in penicillin-allergic patients: adults	250 mg 6 hourly for 5 days	Oral	
Community acquired pneumonia in penicillin-allergic patients	500 mg 6 hourly for 10 days	Oral	

Appendix A

J01FA01 Erythromycin Stearate tabs/caps 250mg

Indications	*Edl dosages*	*Route of admin*	*DDD*
Bronchitis acute in penicillin-allergic patients: children over 15 kg	250 mg 6 hourly for 5 days	Oral	1 g
Bronchitis acute in penicillin-allergic patients: adults	250 mg 6 hourly for 5 days	Oral	
Pneumonia in penicillin-allergic children over 15kg	250mg 6 hourly for 10 days	Oral	
Pneumonia in penicillin-allergic adults	500 mg 6 hourly for 10 days	Oral	
Boil, abscess (bacterial infections of the skin) in children over 15 kg and adults	250 mg 6 hourly for 5 days	Oral	
Impetigo in children over 15 kg and adults	250 mg 6 hourly for 10 days	Oral	
Acute, moist or weeping eczema in children over 15 kg and adults	250 mg 6 hourly for 7 days	Oral	
Animal and human bites in children over 15 kg and adults	250 mg 6 hourly for 5 days	Oral	
Invasive bacterial infections *Campylobacter jejuni*	250-500 mg 8 hourly	Oral	
Prophylaxis against endocarditis, dental, oral, upper respiratiory preocedures	1 g 2 hours before and 500 mg 6 hours after procedure	Oral	
Prevention of recurrent rheumatic fever	250 mg twice daily	Oral	
Cellulitis, erysipelas, pyoderma (impetigo) in penicillin allergic patients	500 mg 3 times daily for 7 days	Oral	
Infected eczema	500 mg 3 times daily for 5 days	Oral	
Gonorrhoea empiric treatment for chlamydia	If necessary 500 mg 6 hourly for 10 days	Oral	
Primary and secondary syphilis	500 mg 4 times daily for 2 weeks	Oral	

Appendix A

J01FA01 Erythromycin Estolate Susp 125mg/5ml

Indications	EDL dosages	Route of admin	DDD
Rheumatic fever in penicillin-allergic patients	25-50mg/kg/24 hrs in 4 divided doses for 10 days	Oral	Not indicated
Cellulitis in penicillin-allergic patients	30-50mg/kg/24 hrs in 4 divided doses for 5 days	Oral	
Erythema multiforme/Stevens-Johnson Syndrome	30-50mg/kg/24 hrs in 4 divided doses for 10 days	Oral	
Epistaxis	30-50mg/kg/24 hrs in 4 divided doses for 7 days	Oral	
Otitis media, complications in penicillin-allergic patients	25-50mg/kg/24 hrs in 4 divided doses for 14 days	Oral	
Sinusitis, less severe and severe without complications in patients with a penicillin/cephalosporins allergy	25-50mg/kg/24 hrs in 4 divided doses for 10-14 days	Oral	
Tonsillitis complicated: streptococci in penicillin-allergic patients	25-50mg/kg/24 hrs in 4 divided doses for7 days	Oral	
Ophthalmia neonatorum (septic conjunctivitis) assoc with a chlamydial infection	25-50mg/kg/24 hrs in 4 divided doses for10-14 days	Oral	
Glomerulonephritis in penicillin-allergic patients	25-50mg/kg/24 hrs in 4 divided doses for10 days	Oral	
Diphtheria in penicillin-allergic patients	25-50mg/kg/24 hrs in 4 divided doses for10 days	Oral	
Diphtheria carriers	25-50mg/kg/24 hrs in 4 divided doses for10 days	Oral	
Measles in penicillin-allergic patients	25-50mg/kg/24 hrs in divided doses (6 hourly) for 10 days	Oral	
Pertusis prophylactic treatment: close contacts under 2 years of age	50 mg/kg/24 hrs in 4 divided doses for 14 days	Oral	
Septicaemia (of the newborn) for *Chlamydia* and *Mycoplasma pneumoniae* infections	5-10 mg/kg 6 hourly for 7-10 days	Oral	
Tetanus prevention	25-50mg/kg/24 hrs in divided doses (6 hourly) for 7days	Oral	
Tick-bite fever alternative therapy for children <8 years	25-50mg/kg/24 hrs in 4 divided doses for 7 days	Oral	

J01FA01 Erythromycin Estolate Susp 125mg/5ml

Indications	Edl dosages	Route of admin	DDD
Pneumonia assoc with Mycoplasmal or chlamydial infection	25-50mg/kg/24 hrs in 4 divided doses (6 hourly) for 7 days	Oral	Not indicated
Pneumonia in penicillin-allergic patients	25-50mg/kg/24 hrs in 4 divided doses (6hourly) for 7 days	Oral	
Febrile neutropenia	50/mg/kg/24 hrs divided 6 hourly	Oral	
Prophylactic treatment against bacterial infections in children receiving chemotherapy for malignant disease	<3 years: 125 mg twice daily > 3 years 250mg twice daily	Oral	

J01M Quinolone bacterials

J01MA02 Ciprofloxacin tab 500mg

Indications	*EDL dosages*	*Route of admin*	*DDD*
Resistant cases-typhoid fever	500 mg twice daily	Oral	1g
Gonorrhoea assoc with the empiric treatment of chlamydia	500 mg as a single dose	Oral	
Vaginal discharge/lower abdominal pain in non-pregnant women	500 mg	Oral	

J 04 Antimycobacterials

J04A Drugs used for the treatment of tuberculosis

Rifampicin 150mg/Inh 100 mg
Rifampicin 300 mg\, INH150 mg

Rifampicin 120 mg\INH 60 mg\pyrazinamide 300 mg\ ethambutol 225 mg
Rifampicin 120mg\INH 60 mg\pyrazinamide 300 mg\ ethambutol 200 mg

Indications:

- Tuberculosis.

Appendix A

Rifampicin 300mg\ INH 150 mg (RH)

Dosages : Adult

Indication	*Edl dosages*	*Route of admin*	*DDD*
New smear- or culture-+ Adults: regimen 1 4 months continuation phase.	Pre-treatment body weight <50kg-RH 150/100mg: **3 tabs** >50 kg.-RH 300\150mg: **2 tablets** Treatment given 5 times\week.	Oral	Rifampicin 0.6g Isoniazide 0.3g
Extra pulmonary TB. Adults: regimen 1. 4 months continuation phase (G).	Pre-treatment body weight > 50 kg. Combination tablet **2 tabs RH** +3 tabs isoniazid. Treatment given 3 times\week.	Oral	
Re-treatment adult. Smear + re-treatment cases. Regimen 2: 5 months continuation phase. (G)	Pre-treatment body weight > 50 kg. **2 tabs RH** +3 tabs ethambutol. Treatment given 5 times\week.	Oral	
Re-treatment adult cases. 5 months continuation phase (G).	Pre-treatment body weight > 50 kg. **2 tabs RH** +3 tabs ethambutol. Treatment given 3 times\week.	Oral	

Rifampicin 120mg\ INH 60mg\pyrazinamide300mg\ethambutol 225 mg and 200mg

Dosages: Adult

Indication	EDL dosages	Route of admin	DDD
New smear- or culture-+ Adults: regimen 1 2 months initial phase	Combination tab. Pre-treatment body weight <50 kg: 4 tabs. Pre-treatment body weight >50 kg: 5 tabs. Treatment given 5 times\week.	Oral	Rifampicin 0.6g Isoniazide 0.3g Ethambutol 1.2g pyrazinamide

Appendix A

Rifampicin 120mg\ INH 60mg\pyrazinamide300mg\ethambutol 225 mg and 200mg
Dosages: Adult

Indication	*EDL dosages*	*Route of admin*	*DDD*
Extra pulmonary TB. Adults: regimen 1. 2 months initial phase.	Combination tab. Pre-treatment body weight <50 kg: 4 tabs. Pre-treatment body weight >50 kg: 5 tabs. Treatment given 3 times\week.	Oral	Rifampicin 0.6g Isoniazide 0.3g Ethambutol 1.2g pyrazinamide
Re-treatment adult. Smear + re-treatment cases. Regimen 2: 2 months initial phase. (G)	Combination tab Pre-treatment body weight <50 kg: 4 tabs. Pre-treatment body weight >50 kg: 5 tabs. Treatment given 5 times\week.	Oral	
Re-treatment adult cases. 2 months initial phase (G).	Combination tab Pre-treatment body weight <50 kg: 4 tabs. Pre-treatment body weight >50 kg: 5 tabs. Treatment given 3 times\week.	Oral	

J 07 Vaccines

J07A Bacterial and viral vaccines, combinations

J07AG52 *Haemophilus influevzae* vaccine
Protects against Hib disease (meningitis, pneumonia, otitis media).

Indications:

- Over 65 years. (Y)
- Chronic pulmonary and cardiac disease (Y).
- Diabetes mellitus (Y).
- Chronic renal failure (Y).
- Immunosuppression(Y).
- Medical personnel (Y).
- Children:
    - ❖ 6 weeks
    - ❖ 10 weeks
    - ❖ 14 weeks

- Cystic fibrosis – routine immunisations Hib, influenza vaccine yearly. Preventative measures reduce the risk of certain infections.
- Prophylactic treatment of haemolytic anaemia associated with Sickle-cell disease & pre-splenectomy.
- Prophylaxis against bacteria in splenectomized children.

Dosages:

- Booster every 5 years. (Y)
- Dose: SC or IM 0.5 ml (Y).

J07AG52 *Haemophilus influevzae* vaccine

Indications	*EDL dosages*	*Route of admin*	*DDD*
Immunisation	0.5 ml	SC /IM	Not indicated
Cystic fibrosis	0.5 ml MI	IM	
Prophylactic treatment of haemolytic anaemia associated with Sickle-cell disease & pre-splenectomy	0.5 ml MI	IM	
Prophylaxis against bacteria in splenectomized children.	0.5 ml MI for infants ≥ 2 years; Children under 12-15 months require a course of 2-3 injections.	IM	

J07AJ52 Diphtheria tetanus pert 10 MI

Indication:

Immunisation: Diphteria toxoid combined with pertusis and tetanus toxoid.

Dosing schedule (EDL G)

- 6 weeks
- 10 weeks
- 14 weeks
- 18 months
- Catch-up doses: 4 weeks apart.

Dosage/ administration:

- Sterile IM 0.5 ml
- Under 1 year: outer side of thigh
- Over 1 year: upper arm.

J07B viral vaccines

Appendix A

J07BC02 Hepatitis B Vaccine Paed 10 Dose

Indications:

- Viral hepatitis: neonatal transmission
- Viral Hepatitis-paediatrics
- Viral hepatitis- prophylaxis Hep B
- Hepatoma: prevention by immunisation against Hep B infection.

J07BC02 Hepatitis B Vaccine Paed 10 Dose

Indications	*EDL dosages*	*Route of admin*	*DDD*
Viral hepatitis: neonatal transmission	0.5 ml first dose within 12 hrs of delivery	IM	Not indicated
Viral Hepatitis-paediatrics	0.5 ml paediatric vaccine	IM	
Viral hepatitis-prophylaxis Hep B	1 ml immediately, 1 ml after 1 month and 1 ml 6 months after first dose	IM	
Hepatoma	1 ml immediately, 1 ml after 1 month and 1 ml 6 months after first dose	IM	

MO1 Anti-inflammatory and anti – rheumatic products

M01A Anti-inflammatory , anti-rheumatic products & non-steroidal products

M01AE01 Ibuprofen tab 200 mg

Indications:

- Dysmenorrhoea and dysfunctional bleeding
- Abnormal vaginal bleeding during fertile years.
- Gout, acute.
- Pain assoc with trauma or inflammation.
- Chronic pain control in advanced or incurable cancer.
- Sprains and strains.
- Migraine severe attacks with a defined aura
- Thyroiditis.
- Varicella and herpes zoster (shingles).
- Osteo-arthrosis & osteo-arthritis.
- Rheumatoid arthritis
- Spider and scorpion evenomation
- Analgesia-peri-post operatively

Appendix A

M01AE01 Ibuprofen tab 200 mg

Indication	*EDL dosages*	*Route of admin*	*DDD*
Dysmenorrhoea and dysfunctional bleeding	200-400 mg thrice daily when needed for 2-3 days	Oral	1.2 g (adult)
Abnormal vaginal bleeding during fertile years.	200-400 mg thrice daily when needed for 2-3 days	Oral	
Gout, acute	800 mg immediately, then 200-400mg 6-8 hourly (max dose 2400 mg per day) for 2-3 days	Oral	
Pain assoc with trauma or inflammation	200-400mg 6-8 hourly to a max of 1200 mg/day.	Oral	
Chronic pain control in advanced or incurable cancer	Adults: 200-600mg to a max of 2400mg/day.disc if not effective after 2-3 days. Children: max 500mg\day. 4-6 hourly with food.	Oral	
Sprains and strains	200-400 mg, 6-8 hourly	Oral	
Migraine-severe attacks with a defined aura	600-1200mg/day in 2-3 divided doses	Oral	
Thyroiditis	600-1200mg/day in divided doses as needed	Oral	
Varicella and herpes zoster (shingles)	400 mg 3 times daily for 14 days	Oral	
Osteo-arthrosis & osteo-arthritis	600-1200 mg\day in divided doses as needed	Oral	
Rheumatoid arthritis	400-800 mg 3 times daily	Oral	
Spider and scorpion evenomation	600-1200 mg\day in 2-3 divided doses. Max daily dose 2400mg.	Oral	
Gingivostomatitis (P)	20 mg/kg/24 hrs in 3 divided doses for 3 days	Oral	
Cystic fibrosis (P)	20mg/kg/24 hrs in 3 divided doses	Oral	
Otitis media complications (P)	20mg/kg/24 hrs in 3 divided doses for 5 days. (Under 30 kg, max 500mg/day)	Oral	
Sinusitis, chronic and complicated (P)	20mg\kg\24 hrs in 3-4 divided doses for 5 days. (Under 30 kg, max 500mg/day)	Oral	
7Tonsillitis complicated (P)	20-mg\kg\24 hrs in 3 divided doses for 3-5 days. (Under 30 kg, max 500mg/day)	Oral	
Osteomyelitis (P)	20mg\kg\24 hrs in 3-4 divided doses for 5 days. (Under 30 kg, max 500mg/day)	Oral	

Appendix A

M01AE01 Ibuprofen tab 200 mg

Indication	*EDL dosages*	*Route of admin*	*DDD*
Septic/pyogenic arthritis (P)	20mg\kg\24 hrs in 3-4 divided doses for 5 days. (Under 30 kg, max 500mg/day)	Oral	1.2g (adult)
Febrile convulsions (P)	20mg\kg\24 hrs in 4 divided doses until fever subsides.	Oral	
Snake bite envenomation (P)	20mg\kg\24 hrs in 3 divided doses for 3-5 days (Under 30 kg, max 500mg/day)	Oral	

N: 02 Analgesics

N02B Other analgesics and antipyretics

N02BE01 Paracetamol Tab 500 mg

Indication	*EDL dosages*	*Route of admin*	*DDD*
Dental abscess	1-2 tabs 4-6 hourly when needed to a max of four doses daily	Oral	3g
Dental caries/toothache	1-2 tabs 4-6 hourly when needed to a max of four doses daily	Oral	
Herpes stomatitis/colds/fever blisters	1-2 tabs 4-6 hourly when needed to a max of four doses daily	Oral	
Mouth ulcers	1-2 tabs 4-6 hourly when needed to a max of four doses daily	Oral	
Tonsillitis, bacterial	1-2 tabs 4-6 hourly when needed to a max of four doses daily	Oral	
Sinusitis, acute	1-2 tabs 4-6 hourly when needed to a max of four doses daily	Oral	
Chicken pox	1-2 tabs 4-6 hourly when needed to a max of four doses daily	Oral	
Measles	1-2 tabs 4-6 hourly when needed to a max of four doses daily	Oral	
Mumps	1-2 tabs 4-6 hourly when needed to a max of four doses daily	Oral	
Rubella (german measles)	1-2 tabs 4-6 hourly when needed to a max of four doses daily	Oral	
Tick-bite fever	1-2 tabs	Oral	
Common cold and influenza	1-2 tabs	Oral	
Croup (laryngotracheobronchitis)	1-2 tabs	Oral	
Pneumonia	1000 mg 4-6 hourly (max 4 doses per day)	Oral	
Arthralgia	1-2 tabs 4-6 hourly when needed to a max of four doses daily	Oral	
Fever	1-2 tabs 4-6 hourly when needed to a max of four doses daily	Oral	

Appendix A

N02BE01 Paracetamol Tab 500 mg

Indication	*EDL dosages*	*Route of admin*	*DDD*
Headache, mild, non-specific	1-2 tabs 4-6 hourly when needed to a max of four doses daily	Oral	3g
Pain control	1-2 tabs 4-6 hourly when needed to a max of four doses daily	Oral	
Chronic pain control in advanced or incurable cancer	1-2 tabs 4-6 hourly when needed to a max of four doses daily	Oral	
Insect bites and stings	1-2 tabs 4-6 hourly when needed to a max of four doses daily	Oral	
Burns	1-2 tabs 4-6 hourly when needed to a max of four doses daily	Oral	
.Injuries	1-2 tabs 4-6 hourly when needed to a max of four doses daily	Oral	
Sprains and strains	1-2 tabs 4-6 hourly when needed to a max of four doses daily	Oral	
Migraine	500-1000 mg 4-6 hourly	Oral	
Cellulitis	500-1000 mg 6 hourly as required	Oral	
Dysmenorrhoea	500-1000 mg up to 4 times daily	Oral	
Tetanus assoc with hypertension	500-1000 mg 6 hourly	Oral	
Varicella and herpes zoster (shingles)	1000 mg 4-6 hourly	Oral	
Osteo-arthrosis and osteo arthritis	500-1000 mg as needed (4-6 times daily)	Oral	
Pyogenic bone infections	500-1000 mg as needed (4-6 times daily)	Oral	
Rheumatoid arthritis	500-1000 mg as needed (4-6 times daily)	Oral	
Septic arthritis, acute	500-1000 mg as needed (4-6 times daily)	Oral	
Snake bites	500-1000 mg as needed (4-6 times daily)	Oral	

N02BE01 Paracetamol syrup 120mg/5 ml 50 MI

Indication	*EDL dosages*	*Route of admin*	*DDD*
Gingivostomatitis (P)	10 mg\kg\24 hrs in 3 divided doses for 3 days	Oral	Not indicated
Status epilepticus (P)	10 mg\kg 4-6 hourly	Nasogastric	
Cellulitis(P)	10 mg\kg 6 hourly	Oral	
Ertythema multiforme\Stevens-Johnson syndrome (P)	10 mg\kg 6 hourly as needed.	Oral	
Acute viral laryngothracheobronchitis (CROUP) (P)	10 mg\kg 4-6 hourly until fever subsides	Oral	

Appendix A

N02BE01 Paracetamol syrup 120mg/5 ml 50 MI

Indication	*EDL dosages*	*Route of admin*	*DDD*
Otitis media complications (P)	10 mg\kg 6 hourly	Oral	Not indicated
Sinusitis, chronic and complicated (P)	10 mg\kg6 hourly until fever subsides	Oral	
Tonsillitis, complicated (P)	10 mg\kg 6 hourly	Oral	
Pyelonephritis and obstructive/reflux nephropathy(P)	10 mg\kg/dose 4-6 hourly	Oral	
Urinary tract infection (P)	10 mg\kg 4-6 hourly	Oral	
Malaria (P)	10 mg\kg 6 hourly as needed	Oral	
Measles (P)	10 mg\kg6 hourly until fever subsides	Oral	
Acute bacterial meningitis (incl neonatal meningitis) (P)	10 mg\kg6 hourly until fever subsides	Oral	
Acute viral meningo-encephalitis/ Encephalitis (P)	10 mg\kg6 hourly until fever subsides	Oral	
Mumps (P)	10 mg\kg6 hourly until fever and pain subsides	Oral	
Tick-bite fever (P)	10 mg\kg 6 hourly as needed	Oral	
Varicella (chicken pox)	10 mg\kg6 hourly until fever subsides	Oral	
Pneumonia (P)	10 mg\kg 6 hourly	Oral/naso-gastric	
Febrile convulsions (P)	10 mg\kg 4-6 hourly until fever subsides 3 mon-1 year= 2.5 ml 1-5 years = 5-10 ml	Oral	
Dental abscess	5-10 ml	Oral	
Insect bites and stings	3 months-1 year: 2.5 ml 1-5 years: 5-10 ml 4-6 hourly when needed to a max of four doses daily	Oral	
Burns	3 months-1 year: 2.5 ml 1-5 years: 5-10 ml 4-6 hourly when needed to a max of four doses daily	Oral	
Injuries	3 months-1 year: 2.5 ml 1-5 years: 5-10 ml 4-6 hourly when needed to a max of four doses daily	Oral	
Sprains and strains	3 months-1 year: 2.5 ml 1-5 years: 5-10 ml 4-6 hourly when needed to a max of four doses daily	Oral	

Appendix A

N 03 Ant epileptics

N03A anti-epileptics

N03AB02 Phenytoin 100mg caps

Indications	*EDL dosages*	*Route of admin*	*DDD*
Generalised tonic clonic in children	4-7 mg/kg daily	Oral	0.3 g (adult)
Generalised tonic clonic in adults	4.5-5 mg/kg daily on lean body mass max dose 400mg at night.	Oral	
Status epilepticus in children	10-20 mg/kg at arate of 1-3 mg/kg/min	Oral	
Status epilepticus in adults	15-20 mg/kg at a rate not exceeding 50 mg/kg/min	Oral	
Neonatal seizures	Loading dose: 15 mg/kg in 0.9% sodium chloride solution. Maintenance dose: 5-10 mg/kg per 24 hours in 3 divided doses	Loading dose: slow IV. Maintenance Dose: Oral or IV	
Hypoxia/asphyxia (newborn)	Loading dose: 15 mg/kg. Maintenance dose: 5-10 mg/kg per 24 hours as a single dose or 2 divided doses.	Oral	

N03AF01 Carbamazepine Tab 200 and 400 mg

Indications	*EDL dosages*	*Route of admin*	*DDD*
Generalised tonic clonic partial: adults	200 mg twice daily for first 2 weeks then 300mg twice daily max dose 900 mg twice daily	Oral	1g (adult)
Tonic clonic, partial focal or partial complex seizures with and without secondary generalisation	600 –1800 mg/day in 2 divided doses.	Oral	

P 02 Antihelmentics:

P02C Anti – Nematodal agents

P02CA01 Mebendalzole Syrup 30 MI

Indications	EDL dosages	Route of admin	DDD
Protein energy malnutrition associated with helminthiasis in children	100 mg twice daily for 3 days or 500 mg as a single dose. Tapeworms: treat for 6 days (same dose)	Oral	Not indicated (0.2g adult)
Ascariasis	100 mg twice daily for 3 days	Oral	

Appendix A

R 03 Anti-asthmatics agents

R03A Adrenergic inhalants

R03AC02 Salbutamol MDI 100µg/actuation

Indications	*EDL dosage*	*Route of admin*	*DDD*
Moderate to severe asthma in children	100-200µg (1-2 puffs depending on age)	Inhalation	0.8 mg inhalation aerosol/powder
Moderate to severe asthma in adults	200µg (2 puffs) 4-6 hourly	Inhalation	
Severe asthma attack in children	100-200µg (1-2 puffs depending on age)	Inhalation	
Severe asthma attack in adults	200 µg (2 puffs)	Inhalation	
Asthma, chronic and persistent	100-200µg, 4-6 hourly as necessary	Inhalation	
Chronic obstructive airway disease (COPD)	200µg 4-6 hourly as necessary	Inhalation	
Cystic fibrosis (P)	2 inhalations (100µg/inhalation) 6-8 hourly as needed	Inhalation	
Mild asthma in children	100µg 3-4 times daily until symptoms are relieved	Inhalation	

R03AC04 Feneterol Inhaler Complete 100µg/inhl

Indication	*EDL dosages*	*Route of admin*	*DDD*
Asthma, acute	200 µg 4-6 hourly	Inhalation	0.6 mg aerosol/powder
Asthma, chronic and persistent	100-200 µg 4-6 hourly as necessary	Inhalation	
Chronic obstructive airway disease (COPD)	200 µg 4-6 hourly as needed	Inhalation	

R03B other anti-asthmatics, inhalants

R03BA01 Beclomethasaone MDI

Indications	*EDL dosages*	*Route of admin*	*DDD*
Asthma chronic in children	100 µg inhaled 2-4 times daily according to response	Inhalation	0.8 mg aerosol/powder
Moderate to severe asthma in children	Max dose 200 µg per day in PHC clinics where PEFR can be monitored otherwise 100µg per day	Inhalation	
Moderate to severe asthma in adults	Max dose 400µg per day in PHC clinics where PEFR can be monitored, otherwise 200µg per day.	Inhalation	

R03BA01 Beclomethasaone MDI

Indications	*EDL dosages*	*Route of admin*	*DDD*
Severe sthma in children	50-100µg twice daily	Inhalation	0.8 mg aerosol/powder
Severe asthma in adults	100-200µg twice daily	Inhalation	

R05 Cough and cold preparations

R05C expectorants

Mist expect stim 200ml not indicated on EDL

Mist tussin infans 100ml not indicated on EDL

R 06 Antihistmines for systemic use

R06A Antihistamines for systemic use

R06AA04 Chlorpheniramine tab 4 mg

R06AA04 Chlorpheniramine tab 4 mg

Indications	*EDL dosages*	*Route of admin*	*DDD*
Eczema	4 mg 3 times daily as needed	Oral	12 mg (adult)
Anaphylactic shock	4-8 mg immediately	Oral	
Bites and bee stings	4-8 mg immediately	Oral	
Spider and scorpion envenomation	4-8 mg as a single dose	Oral	
Allergic conjunctivitis in children aged 5-12 years	2-4 mg 3-4 times daily	Oral	
Allergic conjunctivitis in children over 12 years and adults	4 mg 3-4 times daily	Oral	
Chickenpox in children aged 5-12 years	2-4 mg 3-4 times daily	Oral	
Chickenpox in children over 12 years and adults	4 mg 3-4 times daily	Oral	
Acute, moist or weeping eczema in children aged 5-12 years	2-4 mg 3-4 times daily	Oral	

R06AA04 Chlorpheniramine tab 4 mg

Indications	*EDL dosages*	*Route of admin*	*DDD*
Acute, moist or weeping eczema in children over 12 years and adults	4 mg 3-4 times daily	Oral	12 mg (adult)
Urticaria in children aged 5-12 years	2-4 mg 3-4 times daily	Oral	
Urticaria in children aged over 12 years and adults	4 mg 3-4 times daily	Oral	
Itching in children aged 5-12 years	2-4 mg 3-4 times daily	Oral	
Itching in children aged over 12 years and adults	4 mg 3-4 times daily	Oral	
Snake bite in children aged 5-12 years	2-4 mg 3-4 times daily	Oral	
Snake bite in children aged over 12 years and adults	4 mg 3-4 times daily	Oral	

S 01 opthalmologicals

S01A Anti-infectives

SO1AA03 Oxytetracycline polymixine eye oint

Indicated for complicated eye infections including trachoma, 12 hourly for 6 weeks.

Appendix B

Table B.1 Consolidated Hospital Purchases for April-June 2000

Yearly Quarter	*Region*	*Hospital*	*Pharmaceutical Cost*	*Pharmaceutical cost as % of regional total*	*Regional total*
April-June 2000	***Odi Region***	Brits	814,815.73	21.5	***3,785,776.82*** (17.5%)
		Odi	1,479,351.85	39.0	
		Jubilee	1,491,609.24	39.4	
	Klerksdorp Region	Klerksdorp	2,450,795.19	40.1	***6,109,449.02*** (28.2%)
		Tshepong	1,394,124.53	23.0	
		Witrand	144,631.69	2.4	
		Potchefstroom	2,119,753.77	35.0	
		Ventersdorp	143.84	0.01	
	Rustenburg Region	Rustenburg	2,215,165.81	53.0	***4,181,234.14*** (19.3%)
		Moreteletsi	429,558.88	10.3	
		George Stegmann	536,363.68	13.0	
		Rustenburg district	1,000,145.77	24.0	
	Molopo Region	Thusong	237,753.86	5.5	***4,306,607.78*** (20.0%)
		Gelukspan	448,912.08	10.4	
		Bophelong	1,798,640.83	42.0	
		Delareyville	202,315.17	4.7	
		Zeerust	464,579.16	10.8	
		Lehurutshe	480,010.89	11.1	
		Lichtenburg	674,395.79	15.7	
	Vryburg Region	Vryburg	388,446.97	11.9	***3,262,612.85*** (15.1%)
		Genyesa Community	337,322.30	10.3	
		Taung Community	1,171,802.03	35.9	
		Tshwaragano	1,035,822.93	31.7	
		Schweizer - Reneke	329,218.62	10.09	
Provincial Total					***21,645,680.61***

Table B.1 Consolidated Hospital Purchases for July-September 2000

Yearly Quarter	*Region*	*Hospital*	*Pharmaceutical Cost*	*Pharmaceutical cost as % of regional total*	*Regional total*
July-September 2000	***Odi Region***	Brits	665,063.07	21.08	***3,188,938.02*** (14.4 %)
		Odi	1,401,622.17	44.0	
		Jubilee	1,122,252.78	35.2	
	Klerksdorp Region	Klerksdorp	2,613,846.01	44.0	***5,941,552.06*** (27.0%)
		Tshepong	1,361,920.72	23.0	
		Witrand	111,611.55	1.9	
		Potchefstroom	1,854,173.78	31.2	
		Ventersdorp	0.00	-	
	Rustenburg Region	Rustenburg	2,471,886.43	52.4	***4,711,827.84*** (21.3%)
		Moreteletsi	639,975.22	13.6	
		George Stegmann	1,112,707.44	24.0	
		Rustenburg district	487,258.75	10.3	
	Molopo Region	Thusong	205,168.19	4.8	***4,259,588.6*** (19.3%)
		Gelukspan	622,235.12	15.0	
		Bophelong	1,629,203.45	38.2	
		Delareyville	274,813.75	6.4	
		Zeerust	363,917.15	8.5	
		Lehurutshe	442,240.90	10.4	
		Lichtenburg	722,010.05	17.0	
	Vryburg Region	Vryburg	531,300.50	13.3	***3,990,685.62*** (18.1%)
		Genyesa Community	423,585.51	11.0	
		Taung Community	1,341,301.58	34.0	
		Tshwaragano	1,418,485.49	36.0	
		Schweizer - Reneke	276,012.54	7.0	
Provincial Total					***22,092,592.15***

Table B.1 Consolidated Hospital Purchases for October To December 2000

Yearly Quarter	*Region*	*Hospital*	*Pharmaceutical Cost*	*Pharmaceutical cost as % of regional total*	*Regional total*
October-December 2000	***Odi Region***	Brits	790,459.77	24.5	***3,226,547.04*** (14.0%)
		Odi	981,153.57	30.4	
		Jubilee	1,454,933.70	45.1	
	Klerksdorp Region	Klerksdorp	3,378,353.96	41.3	***8,181,159.45*** (35.0%)
		Tshepong	2,149,082.30	26.2	
		Witrand	149,409.76	1.8	
		Potchefstroom	2,504,313.43	31.0	
		Ventersdorp	0.00	-	
	Rustenburg Region	Rustenburg	2,726,524.64	52.4	***5,198,323.18*** (22.0%)
		Moreteletsi	798,044.69	15.4	
		George Stegmann	1,034,997.48	20.0	
		Rustenburg district	638,756.37	12.3	
	Molopo Region	Thusong	222,246.49	5.4	***4,098,254.22*** (17.3%)
		Gelukspan	500,872.85	12.2	
		Bophelong	1,462,294.16	36.0	
		Delareyville	451,938.78	11.0	
		Zeerust	426,595.52	10.4	
		Lehurutshe	407,256.80	10.0	
		Lichtenburg	627,049.62	15.3	
	Vryburg Region	Vryburg	301,394.09	10.2	***2,955,470.63*** (12.5%)
		Genyesa Community	512,166.50	17.3	
		Taung Community	855,525.27	29.0	
		Tshwaragano	885,410.28	30.0	
		Schweizer - Reneke	400,974.49	14.0	
Provincial Total					*23,659,754.52*

Table B.1 Consolidated Hospital Purchases for January to March 2001

Yearly Quarter	*Region*	*Hospital*	*Pharmaceutical Cost*	*Pharmaceutical cost as % of regional total*	*Regional total*
January-March 2001	***Odi Region***	Brits	801,952.04	29.0	***2,814,321.52*** (15.0%)
		Odi	1,175,854.09	42.0	
		Jubilee	836,515.39	30.0	
	Klerksdorp Region	Klerksdorp	3,209,173.36	53.0	***6,094,351.32*** (32.0%)
		Tshepong	824,433.92	14.0	
		Witrand	157,880.80	2.6	
		Potchefstroom	1,902,863.96	31.2	
		Ventersdorp	0.00	-	
	Rustenburg Region	Rustenburg	1,629,406.68	46.2	***3,522,619.36*** (18.1%)
		Moreteletsi	572,813.60	16.3	
		George Stegmann	602,162.16	17.1	
		Rustenburg district	718,236.92	20.4	
	Molopo Region	Thusong	161,623.52	39.1	***4,137,673.67*** (21.3%)
		Gelukspan	552,919.74	13.4	
		Bophelong	1,158,022.46	28.0	
		Delareyville	140,747.57	3.4	
		Zeerust	345,449.18	8.3	
		Lehurutshe	566,906.89	14.0	
		Lichtenburg	1,212,004.31	30.0	
	Vryburg Region	Vryburg	443,210.09	16.0	***2,841,136.18*** (15.0%)
		Genyesa Community	417,714.90	15.0	
		Taung Community	970,890.30	34.2	
		Tshwaragano	777,082.45	28.0	
		Schweizer - Reneke	232,238.44	8.2	
Provincial Total					***19,410,102.05***

Table B.1 Consolidated Hospital Purchases for April to June 2001

Yearly Quarter	*Region*	*Hospital*	*Pharmaceutical Cost*	*Pharmaceutical cost as % of regional total*	*Regional total*
April-June 2001	***Odi Region***	Brits	911,607.73	24.0	***3,843,316.60*** (15.3%)
		Odi	1,613,593.12	42.0	
		Jubilee	1,318,115.75	34.3	
	Klerksdorp Region	Klerksdorp	4,266,912.10	54.3	***7,859,645.56*** (31.2%)
		Tshepong	1,333,286.11	17.0	
		Witrand	178,127.26	2.3	
		Potchefstroom	2,081,320.09	26.4	
		Ventersdorp	0.00	-	
	Rustenburg Region	Rustenburg	2,694,629.00	56.0	***4,814,192.17*** (19.1%)
		Moreteletsi	726,220.00	15.1	
		George Stegmann	685,893.55	14.2	
		Rustenburg district	707,449.62	14.7	
	Molopo Region	Thusong	128,175.49	3.0	***4,680,219.63*** (19.0%)
		Gelukspan	617,040.94	13.2	
		Bophelong	1,670,488.96	36.0	
		Delareyville	370,681.11	8.0	
		Zeerust	603,132.91	13.0	
		Lehurutshe	552,348.47	12.0	
		Lichtenburg	738,351.75	16.0	
	Vryburg Region	Vryburg	466,508.06	12.0	***3,969,279.88*** (16.0%)
		Genyesa Community	651,213.80	16.4	
		Taung Community	1,177,626.23	30.0	
		Tshwaragano	874,596.43	22.0	
		Schweizer - Reneke	342,082.69	9.0	
		Bloemhof	248,766.20	6.3	
		Cristiana	208,486.47	5.3	
Provincial Total					***25,166,653.84***

Table B.1 Consolidated Hospital Purchases For July to September 2001

Yearly Quarter	*Region*	*Hospital*	*Pharmaceutical Cost*	*Pharmaceutical cost as % of regional total*	*Regional total*
July – September 2001	***Odi Region***	Brits	983,259.08	27.0	***3,688,511.04*** (16.0%)
		Odi	1,259,197.31	34.1	
		Jubilee	1,446,054.65	39.2	
	Klerksdorp Region	Klerksdorp	3,390,897.22	47.0	***7,277,092.20*** (31.0%)
		Tshepong	1,063,868.02	15.0	
		Witrand	227,687.06	3.1	
		Potchefstroom	2,388,621.85	33.0	
		Ventersdorp	0.00	-	
		Wolmaranstad	206,018.05	3.0	
	Rustenburg Region	Rustenburg	2,913,877.07	64.3	***4,530,757.65*** (19.3%)
		Moreteletsi	349,578.78	8.0	
		George Stegmann	716,371.15	16.0	
		Rustenburg district	550,930.65	12.2	
	Molopo Region	Thusong	100,939.97	2.2	***4,516,942.60*** (19.2%)
		Gelukspan	603,091.74	13.4	
		Bophelong	1,705,507.85	38.0	
		Delareyville	382,815.57	8.5	
		Zeerust	497,542.48	11.0	
		Lehurutshe	498,429.74	11.0	
		Lichtenburg	728,615.25	16.1	
	Vryburg Region	Vryburg	485,783.04	14.0	***3,484,280.09*** (15.0%)
		Genyesa Community	685,891.39	20.0	
		Taung Community	916,848.71	26.3	
		Tshwaragano	733,659.76	21.1	
		Schweizer - Reneke	355,219.76	10.2	
		Bloemhof	244,888.50	7.0	
		Cristiana	61,988.93	2.0	
Provincial Total	-				***23,497,583.58***

Table B.1 Consolidated Hospital Purchases for October to December 2001

Yearly Quarter	*Region*	*Hospital*	*Pharmaceutical Cost*	*Pharmaceutical cost as % of regional total*	*Regional total*
October-December 2001	***Odi Region***	Brits	1,255,366.16	27.2	***4,620,026.74*** (18.0%)
		Odi	1,937,741.37	42.0	
		Jubilee	1,426,919.21	31.0	
	Klerksdorp Region	Klerksdorp	2,783,930.30	40.0	***7,118,158.40*** (28.0%)
		Tshepong	1,409,774.10	20.0	
		Witrand	241,568.48	3.4	
		Potchefstroom	2,503,852.41	35.2	
		Ventersdorp	0.00	-	
		Wolmaranstad	179,033.11	3.0	
	Rustenburg Region	Rustenburg	2,874,446.18	55.0	***5,231,418.20*** (20.2%)
		Moreteletsi	635,677.81	12.2	
		George Stegmann	788,861.34	15.1	
		Rustenburg district	932,432.87	18.0	
	Molopo Region	Thusong	131,447.30	2.6	***5,122,460.13*** (20.0%)
		Gelukspan	695,632.11	14.0	
		Bophelong	1,847,740.12	36.1	
		Delareyville	489,950.34	10.0	
		Zeerust	568,384.28	11.1	
		Lehurutshe	700,145.10	14.0	
		Lichtenburg	689,160.88	13.5	
	Vryburg Region	Vryburg	422,261.03	11.2	***3,772,594.93*** (15.0%)
		Genyesa Community	771,761.98	20.5	
		Taung Community	880,419.67	23.3	
		Tshwaragano	960,156.61	26.0	
		Schweizer - Reneke	356,462.84	9.4	
		Bloemhof	263,856.04	7.0	
		Cristiana	117,676.76	3.1	
Provincial Total					***25,864,658.40***

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Table B.1 Consolidated Hospital Purchases for January to March 2002

Yearly Quarter	*Region*	*Hospital*	*Pharmaceutical Cost*	*Pharmaceutical cost as % of regional total*	*Regional total*
January-March 2002	***Odi Region***	Brits	536,764.52	15.0	***3,592,310.16*** (15.4%)
		Odi	1,401,975.86	39.0	
		Jubilee	1,653,569.78	46.0	
	Klerksdorp Region	Klerksdorp	3,409,529.97	50.0	***6,889,386.13*** (30.0%)
		Tshepong	1,378,621.08	20.0	
		Witrand	193,359.41	3.0	
		Potchefstroom	1,643,063.83	24.0	
		Ventersdorp	135,347.58	2.0	
		Wolmaranstad	129,464.26	2.0	
	Rustenburg Region	Rustenburg	2,294,468.43	52.0	***4,431,900.23*** (19.0%)
		Moreteletsi	567,233.97	13.0	
		George Stegmann	736,133.01	17.0	
		Rustenburg district	834,064.82	19.0	
	Molopo Region	Thusong	127,765.75	3.0	***4,535,419.84*** (19.5%)
		Gelukspan	456,896.78	10.1	
		Bophelong	1,698,998.58	38.0	
		Delareyville	426,111.91	10.0	
		Zeerust	539,073.72	12.0	
		Lehurutshe	571,306.95	13.0	
		Lichtenburg	715,266.15	16.0	
	Vryburg Region	Vryburg	545,992.19	14.1	***3,867,756.25*** (17.0%)
		Genyesa Community	635,991.03	16.4	
		Taung Community	999,842.62	26.0	
		Tshwaragano	844,389.29	22.0	
		Schweizer - Reneke	427,617.94	11.1	
		Bloemhof	231,279.43	6.0	
		Christiana	179,151.25	5.0	
		NW Head Office	3,492.50	0.1	
Provincial total					***23,316,772.61***

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Table B.1 Consolidated Hospital Purchases for April-June 2000

Yearly Quarter	*Region*	*Hospital*	*Pharmaceutical Cost*	*Pharmaceutical cost as % of regional total*	*Regional total*
April-June 2000	***Odi Region***	Brits	814,815.73	21.5	***3,785,776.82*** (17.5%)
		Odi	1,479,351.85	39.0	
		Jubilee	1,491,609.24	39.4	
	Klerksdorp Region	Klerksdorp	2,450,795.19	40.1	***6,109,449.02*** (28.2%)
		Tshepong	1,394,124.53	23.0	
		Witrand	144,631.69	2.4	
		Potchefstroom	2,119,753.77	35.0	
		Ventersdorp	143.84	0.01	
	Rustenburg Region	Rustenburg	2,215,165.81	53.0	***4,181,234.14*** (19.3%)
		Moreteletsi	429,558.88	10.3	
		George Stegmann	536,363.68	13.0	
		Rustenburg district	1,000,145.77	24.0	
	Molopo Region	Thusong	237,753.86	5.5	***4,306,607.78*** (20.0%)
		Gelukspan	448,912.08	10.4	
		Bophelong	1,798,640.83	42.0	
		Delareyville	202,315.17	4.7	
		Zeerust	464,579.16	10.8	
		Lehurutshe	480,010.89	11.1	
		Lichtenburg	674,395.79	15.7	
	Vryburg Region	Vryburg	388,446.97	11.9	***3,262,612.85*** (15.1%)
		Genyesa Community	337,322.30	10.3	
		Taung Community	1,171,802.03	35.9	
		Tshwaragano	1,035,822.93	31.7	
		Schweizer - Reneke	329,218.62	10.09	
Provincial Total					***21,645,680.61***

Table B.1 Consolidated Hospital Purchases for July-September 2000

Yearly Quarter	*Region*	*Hospital*	*Pharmaceutical Cost*	*Pharmaceutical cost as % of regional total*	*Regional total*
July-September 2000	***Odi Region***	Brits	665,063.07	21.08	***3,188,938.02*** (14.4 %)
		Odi	1,401,622.17	44.0	
		Jubilee	1,122,252.78	35.2	
	Klerksdorp Region	Klerksdorp	2,613,846.01	44.0	***5,941,552.06*** (27.0%)
		Tshepong	1,361,920.72	23.0	
		Witrand	111,611.55	1.9	
		Potchefstroom	1,854,173.78	31.2	
		Ventersdorp	0.00	-	
	Rustenburg Region	Rustenburg	2,471,886.43	52.4	***4,711,827.84*** (21.3%)
		Moreteletsi	639,975.22	13.6	
		George Stegmann	1,112,707.44	24.0	
		Rustenburg district	487,258.75	10.3	
	Molopo Region	Thusong	205,168.19	4.8	***4,259,588.6*** (19.3%)
		Gelukspan	622,235.12	15.0	
		Bophelong	1,629,203.45	38.2	
		Delareyville	274,813.75	6.4	
		Zeerust	363,917.15	8.5	
		Lehurutshe	442,240.90	10.4	
		Lichtenburg	722,010.05	17.0	
	Vryburg Region	Vryburg	531,300.50	13.3	***3,990,685.62*** (18.1%)
		Genyesa Community	423,585.51	11.0	
		Taung Community	1,341,301.58	34.0	
		Tshwaragano	1,418,485.49	36.0	
		Schweizer - Reneke	276,012.54	7.0	
Provincial Total					***22,092,592.15***

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Table B.1 Consolidated Hospital Purchases for October To December 2000

Yearly Quarter	*Region*	*Hospital*	*Pharmaceutical Cost*	*Pharmaceutical cost as % of regional total*	*Regional total*
October-December 2000	***Odi Region***	Brits	790,459.77	24.5	***3,226,547.04*** (14.0%)
		Odi	981,153.57	30.4	
		Jubilee	1,454,933.70	45.1	
	Klerksdorp Region	Klerksdorp	3,378,353.96	41.3	***8,181,159.45*** (35.0%)
		Tshepong	2,149,082.30	26.2	
		Witrand	149,409.76	1.8	
		Potchefstroom	2,504,313.43	31.0	
		Ventersdorp	0.00	-	
	Rustenburg Region	Rustenburg	2,726,524.64	52.4	***5,198,323.18*** (22.0%)
		Moreteletsi	798,044.69	15.4	
		George Stegmann	1,034,997.48	20.0	
		Rustenburg district	638,756.37	12.3	
	Molopo Region	Thusong	222,246.49	5.4	***4,098,254.22*** (17.3%)
		Gelukspan	500,872.85	12.2	
		Bophelong	1,462,294.16	36.0	
		Delareyville	451,938.78	11.0	
		Zeerust	426,595.52	10.4	
		Lehurutshe	407,256.80	10.0	
		Lichtenburg	627,049.62	15.3	
	Vryburg Region	Vryburg	301,394.09	10.2	***2,955,470.63*** (12.5%)
		Genyesa Community	512,166.50	17.3	
		Taung Community	855,525.27	29.0	
		Tshwaragano	885,410.28	30.0	
		Schweizer - Reneke	400,974.49	14.0	
Provincial Total					*23,659,754.52*

Table B.1 Consolidated Hospital Purchases for January to March 2001

Yearly Quarter	*Region*	*Hospital*	*Pharmaceutical Cost*	*Pharmaceutical cost as % of regional total*	*Regional total*
January-March 2001	***Odi Region***	Brits	801,952.04	29.0	***2,814,321.52*** (15.0%)
		Odi	1,175,854.09	42.0	
		Jubilee	836,515.39	30.0	
	Klerksdorp Region	Klerksdorp	3,209,173.36	53.0	***6,094,351.32*** (32.0%)
		Tshepong	824,433.92	14.0	
		Witrand	157,880.80	2.6	
		Potchefstroom	1,902,863.96	31.2	
		Ventersdorp	0.00	-	
	Rustenburg Region	Rustenburg	1,629,406.68	46.2	***3,522,619.36*** (18.1%)
		Moreteletsi	572,813.60	16.3	
		George Stegmann	602,162.16	17.1	
		Rustenburg district	718,236.92	20.4	
	Molopo Region	Thusong	161,623.52	39.1	***4,137,673.67*** (21.3%)
		Gelukspan	552,919.74	13.4	
		Bophelong	1,158,022.46	28.0	
		Delareyville	140,747.57	3.4	
		Zeerust	345,449.18	8.3	
		Lehurutshe	566,906.89	14.0	
		Lichtenburg	1,212,004.31	30.0	
	Vryburg Region	Vryburg	443,210.09	16.0	***2,841,136.18*** (15.0%)
		Genyesa Community	417,714.90	15.0	
		Taung Community	970,890.30	34.2	
		Tshwaragano	777,082.45	28.0	
		Schweizer - Reneke	232,238.44	8.2	
Provincial Total					***19,410,102.05***

Table B.1 Consolidated Hospital Purchases for April to June 2001

Yearly Quarter	*Region*	*Hospital*	*Pharmaceutical Cost*	*Pharmaceutical cost as % of regional total*	*Regional total*
April-June 2001	***Odi Region***	Brits	911,607.73	24.0	***3,843,316.60*** (15.3%)
		Odi	1,613,593.12	42.0	
		Jubilee	1,318,115.75	34.3	
	Klerksdorp Region	Klerksdorp	4,266,912.10	54.3	***7,859,645.56*** (31.2%)
		Tshepong	1,333,286.11	17.0	
		Witrand	178,127.26	2.3	
		Potchefstroom	2,081,320.09	26.4	
		Ventersdorp	0.00	-	
	Rustenburg Region	Rustenburg	2,694,629.00	56.0	***4,814,192.17*** (19.1%)
		Moreteletsi	726,220.00	15.1	
		George Stegmann	685,893.55	14.2	
		Rustenburg district	707,449.62	14.7	
	Molopo Region	Thusong	128,175.49	3.0	***4,680,219.63*** (19.0%)
		Gelukspan	617,040.94	13.2	
		Bophelong	1,670,488.96	36.0	
		Delareyville	370,681.11	8.0	
		Zeerust	603,132.91	13.0	
		Lehurutshe	552,348.47	12.0	
		Lichtenburg	738,351.75	16.0	
	Vryburg Region	Vryburg	466,508.06	12.0	***3,969,279.88*** (16.0%)
		Genyesa Community	651,213.80	16.4	
		Taung Community	1,177,626.23	30.0	
		Tshwaragano	874,596.43	22.0	
		Schweizer - Reneke	342,082.69	9.0	
		Bloemhof	248,766.20	6.3	
		Cristiana	208,486.47	5.3	
Provincial Total					***25,166,653.84***

Table B.1 Consolidated Hospital Purchases For July to September 2001

Yearly Quarter	*Region*	*Hospital*	*Pharmaceutical Cost*	*Pharmaceutical cost as % of regional total*	*Regional total*
July – September 2001	***Odi Region***	Brits	983,259.08	27.0	***3,688,511.04*** (16.0%)
		Odi	1,259,197.31	34.1	
		Jubilee	1,446,054.65	39.2	
	Klerksdorp Region	Klerksdorp	3,390,897.22	47.0	***7,277,092.20*** (31.0%)
		Tshepong	1,063,868.02	15.0	
		Witrand	227,687.06	3.1	
		Potchefstroom	2,388,621.85	33.0	
		Ventersdorp	0.00	-	
		Wolmaranstad	206,018.05	3.0	
	Rustenburg Region	Rustenburg	2,913,877.07	64.3	***4,530,757.65*** (19.3%)
		Moreteletsi	349,578.78	8.0	
		George Stegmann	716,371.15	16.0	
		Rustenburg district	550,930.65	12.2	
	Molopo Region	Thusong	100,939.97	2.2	***4,516,942.60*** (19.2%)
		Gelukspan	603,091.74	13.4	
		Bophelong	1,705,507.85	38.0	
		Delareyville	382,815.57	8.5	
		Zeerust	497,542.48	11.0	
		Lehurutshe	498,429.74	11.0	
		Lichtenburg	728,615.25	16.1	
	Vryburg Region	Vryburg	485,783.04	14.0	***3,484,280.09*** (15.0%)
		Genyesa Community	685,891.39	20.0	
		Taung Community	916,848.71	26.3	
		Tshwaragano	733,659.76	21.1	
		Schweizer - Reneke	355,219.76	10.2	
		Bloemhof	244,888.50	7.0	
		Cristiana	61,988.93	2.0	
Provincial Total	-				***23,497,583.58***

Table B.1 Consolidated Hospital Purchases for October to December 2001

Yearly Quarter	*Region*	*Hospital*	*Pharmaceutical Cost*	*Pharmaceutical cost as % of regional total*	*Regional total*
October-December 2001	***Odi Region***	Brits	1,255,366.16	27.2	***4,620,026.74*** (18.0%)
		Odi	1,937,741.37	42.0	
		Jubilee	1,426,919.21	31.0	
	Klerksdorp Region	Klerksdorp	2,783,930.30	40.0	***7,118,158.40*** (28.0%)
		Tshepong	1,409,774.10	20.0	
		Witrand	241,568.48	3.4	
		Potchefstroom	2,503,852.41	35.2	
		Ventersdorp	0.00	-	
		Wolmaranstad	179,033.11	3.0	
	Rustenburg Region	Rustenburg	2,874,446.18	55.0	***5,231,418.20*** (20.2%)
		Moreteletsi	635,677.81	12.2	
		George Stegmann	788,861.34	15.1	
		Rustenburg district	932,432.87	18.0	
	Molopo Region	Thusong	131,447.30	2.6	***5,122,460.13*** (20.0%)
		Gelukspan	695,632.11	14.0	
		Bophelong	1,847,740.12	36.1	
		Delareyville	489,950.34	10.0	
		Zeerust	568,384.28	11.1	
		Lehurutshe	700,145.10	14.0	
		Lichtenburg	689,160.88	13.5	
	Vryburg Region	Vryburg	422,261.03	11.2	***3,772,594.93*** (15.0%)
		Genyesa Community	771,761.98	20.5	
		Taung Community	880,419.67	23.3	
		Tshwaragano	960,156.61	26.0	
		Schweizer - Reneke	356,462.84	9.4	
		Bloemhof	263,856.04	7.0	
		Cristiana	117,676.76	3.1	
Provincial Total					***25,864,658.40***

Table B.1 Consolidated Hospital Purchases for January to March 2002

Yearly Quarter	*Region*	*Hospital*	*Pharmaceutical Cost*	*Pharmaceutical cost as % of regional total*	*Regional total*
January-March 2002	***Odi Region***	Brits	536,764.52	15.0	***3,592,310.16*** (15.4%)
		Odi	1,401,975.86	39.0	
		Jubilee	1,653,569.78	46.0	
	Klerksdorp Region	Klerksdorp	3,409,529.97	50.0	***6,889,386.13*** (30.0%)
		Tshepong	1,378,621.08	20.0	
		Witrand	193,359.41	3.0	
		Potchefstroom	1,643,063.83	24.0	
		Ventersdorp	135,347.58	2.0	
		Wolmaranstad	129,464.26	2.0	
	Rustenburg Region	Rustenburg	2,294,468.43	52.0	***4,431,900.23*** (19.0%)
		Moreteletsi	567,233.97	13.0	
		George Stegmann	736,133.01	17.0	
		Rustenburg district	834,064.82	19.0	
	Molopo Region	Thusong	127,765.75	3.0	***4,535,419.84*** (19.5%)
		Gelukspan	456,896.78	10.1	
		Bophelong	1,698,998.58	38.0	
		Delareyville	426,111.91	10.0	
		Zeerust	539,073.72	12.0	
		Lehurutshe	571,306.95	13.0	
		Lichtenburg	715,266.15	16.0	
	Vryburg Region	Vryburg	545,992.19	14.1	***3,867,756.25*** (17.0%)
		Genyesa Community	635,991.03	16.4	
		Taung Community	999,842.62	26.0	
		Tshwaragano	844,389.29	22.0	
		Schweizer - Reneke	427,617.94	11.1	
		Bloemhof	231,279.43	6.0	
		Christiana	179,151.25	5.0	
		NW Head Office	3,492.50	0.1	
Provincial total					***23,316,772.61***

Appendix C

Table C.1 Effect sizes (d-values) of the "top twenty" pharmaceutical products according to ATC Classification System with values larger than 0.8

"Top Twenty" Pharmaceutical Product	*Effect size (d-value)*
Insulin Actraphane Hm 10 ml	0.8
Sodium Chloride 0.9% 50ml	4.3
Sodium Chloride 0.9% 1000ml	1.2
Ringers Lactate Solution 1000ml	1.0
Methyldopa 250mg	2.0
Reserpine 0.25mg	3.0
Hydrochlorothiazide 25mg	2.0
Enalapril 10mg	1.1
Perindopril 4mg	2.0
Miconazole Nitrate gel 2%	208.0
Levonorgestrel Oestradiol tablets	4.3
Medroxyprogesterone 150mg/ml	2.5
Norethisterone 200mg/ml	1.9
Amoxycillin 250mg	1.0
Amoxycillin 125mg/5ml	11.0
Amoxycillin/Clavulanic acid 1200mg	0.9
Erythromycin 125mg/5ml	2.2
RI (150/100)	1.0
RI (300/150)	1.3
RHZE (120/300/60/200)	1.2
RHZE (120/300/60/225)	7.1
Vaccine Hepatitis B 10 dose vial	2.1
Ibuprofen 200mg	1.0
Salbutamol (100µg/dose) 100 doses MDI	33.0
Beclomethasone (100µg/dose) 200 doses MDI	2.3

Appendix D

Data utilised in the study is presented in the following purchasing reports depicting the "top twenty" drugs per month for the two-year study period

PURCHASES BY HOSPITALS

Top 20 Pharmaceutical Items

1	2286, 0636, 2374	Methyldopa Tabs 250Mg (Tablet of 250.00 Mgs)	4,252,904	528,053.90	16.49%
2	2455, 0034, 2974	Erythromycin Tabs 250 Mg 20 (Capsule of 250.00 Mgs)	1,655,060	402,096.37	12.56%
3	0137	Norethisterone Inj 200 Mg/ml Long Acting (Vial of 200.00 Mgs)	85,200	357,993.36	11.18%
4	2278, 0608,0609	Hydrochlorothiazide Tabs 25 Mg (Tablet of 25.00 Mgs)	4,383,424	326,614.40	10.20%
5	0535, 3983	Carbamazepine Tabs 200 Mg (Tablet of 200.00 Mgs)	757,490	250,118.70	7.81%
6	3320, 2638	Amoxycillin Caps 250 Mg (Capsule of 250.00 Mgs)	1,489,600	217,020.44	6.78%
7	2897, 0566	Rifam 120Mg Pza 300Mg Inh 60 Mg Etha 225 Mg (Tablet of 1.00 Tablet)	397,000	189,694.30	5.92%
8	2766, 0674	Phenytoin Caps 100Mg (Capsule of 100.00 Mgs)	1,356,000	168,606.00	5.27%
9	0136	Medroxyprogesterone Inj 150 Mg/ml 1 Ml (Vial of 150.00 Mgs)	38,030	136,054.17	4.25%
10	2058	Ringers Lactate Sol. 1000 Ml (Vacoliter of 1000.00 Ml)	12,180	102,884.46	3.21%
11	2407, 3901	Reserpine Tabs 0.25Mg (Tablet of 0.25 Mgs)	225,400	89,100.00	2.78%
12	0247	Perindopril Tabs 4Mg (Tablet of 4.00 Mgs)	156,828	89,055.90	2.78%
13	0210	Insulin Actraphane Hm 100Iu/ml 10 Ml (Vial of 10.00 Mls)	3,030	80,628.30	2.52%
14	3154	Enalapril Tabs 10Mg (Tablet of 10.00 Mgs)	112,000	72,280.00	2.26%
15	3429	Amoxycillin Clavulan Inj 1000 Mg/200 Mg(Vial of 1.00 Vial)	4,510	59,378.66	1.85%
16	0004	Amoxycillin Susp 125 Mg/5 Ml 100 Ml (Bottle of 100.00 Mls)	19,480	58,260.20	1.82%
17	0093	Beclomethasone M.D.I 100 Mcg 200 Dose (Unit of 200.00 Doses)	4,210	56,724.02	1.77%
18	0584	Enalapril Tabs 20Mg (Tablet of 20.00 Mgs)	42,560	56,452.80	1.76%
19	0281	Vaccine Hepatitis B Paed 10 Dose Vial (Vial of 10.00 Doses)	1,879	51,587.18	1.61%
20	0100	Fenoterol Inhaler Complete (300.00 Units)	6,199	51,109.00	1.60%

Primary Health Care

Adult

Paediatric

	3,343,711.76
TOTAL ISSUE VALUE: (Excl. VAT & Service Fee)	[redacted]
% of TOTAL ISSUE VALUE:	[redacted]

PURCHASES BY HOSPITALS

Top 20 Pharmaceutical Items

1	0535, 3983	Carbamazepine Tabs 200Mg (Tablet of 200.00 Mgs)	973,990	319,658.50	9.56%
2	0636, 2374, 2286	Methyldopa Tabs 250Mg 500 (Tablet of 250.00 Mgs)	2,326,320	297,353.80	8.89%
3	2278, 0608, 0609	Hydrochlorothiazide Tabs 25Mg (Tablet of 25.00 Mgs)	3,795,620	284,628.40	8.51%
4	0566, 2897	Rifam 120Mg Pza 300Mg Inh 60Mg Etha (Single Tablets)	531,000	255,053.70	7.63%
5	2310	Cefotaxime Inj 1G/15 Ml (Vial of 1.00 Gram)	10,746	234,155.34	7.00%
6	3154	Enalapril Tabs 10Mg (Tablet of 10.00 Mgs)	348,236	224,736.59	6.72%
7	2668	Nifedipine Tabs 30Mg Slow Release (Tablet of 30.00 Mgs)	255,000	195,330.00	5.84%
8	2058	Ringers Lactate Sol. 1000 Ml (Vacoliter of 1000.00 Ml)	19,188	162,081.04	4.85%
9	2716	Ciprofloxacin Tabs 500Mg (Tablet of 500.00 Mgs)	32,700	157,450.50	4.71%
10	0080	Ceftriaxone Inj 1G/vial + Diluent (Vial of 1.00 Gram)	2,234	150,080.12	4.49%
11	0016	Cefotaxime Inj 500Mg (Vial of 500.00 Mgs)	8,471	139,771.50	4.18%
12	0247	Perindopril Tabs 4Mg (Tablet of 4.00 Mgs)	210,840	119,727.00	3.58%
13	0476	Miconazole Nitrate Gel 2% Gm (Tube of 30.00 Gms)	4,000	119,040.00	3.56%
14	0136	Medroxyprogesterone Inj 150Mg/ml 1Ml (Vial of 150.00 Mgs)	27,470	113,588.93	3.40%
15	0137	Norethisterone Inj 200 Mg/ml Long Acting (Vial of 200.00 Mgs)	26,700	112,188.06	3.36%
16	2407, 3901	Reserpine Tabs 0.25Mg (Tablet of 0.25 Mgs)	267,260	105,545.00	3.16%
17	0534	Captopril Tabs 50Mg (Tablet of 50.00 Mgs)	300,000	95,000.00	2.84%
18	0070	Oxytetracycline Polymixin Eye Oint 5 Gm (Tube of 5.00 Gms)	14,910	93,783.90	2.81%
19	0210	Insulin Actraphane Hm 100 Iu/ml 10Ml (Vial of 10.00 Mls)	3,100	82,491.00	2.47%
20	0584	Enalapril Tabs 20Mg (Tablet of 20.00 Mgs)	61,600	81,708.00	2.44%

Primary Health Care 3,343,371.38

Paediatric

TOTAL ISSUE VALUE: (Excl. VAT & Service Fee) 10,027,100.73

% of TOTAL ISSUE VALUE: 33.34%

PURCHASES BY HOSPITALS

Top 20 Pharmaceutical Items

	Stock No	Description	Quantity	Net Issue Value	% of Total
1	2374, 0636, 2286	Methyldopa Tabs 250Mg (Tablet of 250.00 Mgs)	8,317,888	1,077,454.98	23.49%
2	2897, 0566	Rifam 120Mg Pza 300Mg Inh 60 Mg Etha 200 Mg (Tablet of 1.00 TABLET)	1,194,100	598,495.87	13.05%
3	3194, 3445, 2323, 0073	Phenoxymethyl Penicillin Tabs 250 Mg (Tablet of 250.00 milligrams)	5,942,840	519,622.20	11.33%
4	2278, 0608, 0609	Hydrochlorothiazide Tabs 25 Mg (Tablet of 25.00 Mgs)	3,997,184	301,014.40	6.56%
5	3154	Enalapril Tabs 10Mg (Tablet of 10.00 Mgs)	379,764	245,083.41	5.34%
6	0210, 2379	Insulin Actraphane Hm 100Iu/ml 10 Ml (Vial of 10.00 Mls)	15,331	235,109.70	5.13%
7	0137	Norethisterone Inj 200 Mg/ml Long Acting (Vial of 200.00 Mgs)	44,800	199,999.70	4.36%
8	0247	Perindopril Tabs 4Mg (Tablet of 4.00 Mgs)	298,760	169,653.00	3.70%
9	0383, 3265, 0381	Paracetamol Syr 120Mg/5 ml 50 Ml (Bottle of 50.00 Mls)	741,810	161,771.78	3.53%
10	3378	Simvastatin Tabs 20Mg (Tablet of 20.00 Mgs)	27,832	147,509.60	3.22%
11	2716	Ciprofloxacin Tabs 500 Mg (Tablet of 500.00 Mgs)	25,300	121,819.50	2.66%
12	3485	Sodium Chl 0.9% Inj 50 Ml (Bag of 50.00 Mls)	28,080	117,093.60	2.55%
13	0136	Medroxyprogesterone Inj 150 Mg/ml 1 Ml (Vial of 150.00 Mgs)	26,800	111,407.40	2.43%
14	0584	Enalapril Tabs 20Mg (Tablet of 20.00 Mgs)	76,160	101,020.80	2.20%
15	0093	Beclomethasone M.D.I 100 McG 200 Dose (Unit of 200.00 DOSEs)	5,929	93,618.91	2.04%
16	0004	Amoxycillin Susp 125 Mg/5 ml 100 Ml (Bottle of 100.00 Mls)	26,960	80,637.36	1.76%
17	0324	Mist Expect Stim Adult 200 Ml (Single Mls) 1	2,522,400	78,265.00	1.71%
18	2058	Ringers Lactate Sol. (Vacoliter of 1000.00 Ml	9,264	78,253.01	1.71%
19	2668	Nifedipine Tabs 30Mg Slow Release (Tablet of 30.00 Mgs)	98,010	75,082.02	1.64%
20	0476	Miconazole Nitrate Gel 2% 30 Gm (Tube of 30.00 Gms)	2,500	74,407.50	1.62%

Primary Health Care 4,587,319.74

Adult

Paediatric

TOTAL ISSUE VALUE: (Excl. VAT & Service Fee) 8,278,622.07

% of TOTAL ISSUE VALUE: 55.41%

PURCHASES BY HOSPITALS

Top 20 Pharmaceutical Items

1	2374, 2286, 0636, 2286	Methyldopa Tabs 250Mg (Tablet of 250.00 Mgs)	2,303,120	301,955.20	13.65%
2	3154	Enalapril Tabs 10Mg (Tablet of 10.00 Mgs)	403,368	260,316.42	11.77%
3	2716	Ciprofloxacin Tabs 500Mg (Tablet of 500.00 Mgs)	52,620	255,551.70	11.55%
4	0476	Miconazole Nitrate Gel 2% 30Gm (Tube of 30.00 Gms)	6,924	206,059.14	9.32%
5	2897, 0566	Rifam 120Mg Pza 300Mg Inh 60Mg Etha 200Mg Tab (Tablet of 1.00 TABLET)	427,600	197,701.52	8.94%
6	0136	Medroxyprogesterone Inj 150Mg/ml 1Ml (Vial of 150.00 Mgs)	41,000	168,439.00	7.61%
7	0247	Perindopril Tabs 4Mg (Tablet of 4.00 Mgs)	264,880	153,824.38	6.95%
8	0080	Ceftriaxone Inj 1G/vial + Diluent (Vial of 1.00 Gram)	2,279	153,103.22	6.92%
9	2407, 3901	Reserpine Tabs 0.25Mg (Tablet of 0.25Mgs)	376,740	139,357.00	6.30%
10	0137	Norethisterone Inj 200 Mg/ml Long Acting (Vial of 200.00 Mgs)	31,400	137,852.62	6.23%
11	0535, 3983	Carbamazepine Tabs 200Mg (Tablet of 200.00 Mgs)	412,190	133,473.30	6.03%
12	3953	Rifam 150Mg Inh 100Mg Tabs (Tablet of 1.00 TABLET)	222,200	120,400.60	5.44%
13	2058	Ringers Lactate Sol. 1000 Ml (Vacoliter of 1000.00 Ml)	13,224	113,833.61	5.15%
14	3429	Amoxycillin Clavulan Inj 1000Mg/200Mg (Vial of 1.00 VIAL)	8,340	109,804.44	4.96%
15	2278, 0608, 0609	Hydrochlorothiazide Tabs (Tablet of 25.00 Mgs)	1,387,900	110,013.50	4.97%
16	0139	Levonorgestrel Oestradiol Tabs (Packet of 28.00 Tablets)	54,900	105,969.00	4.79%
17	3195, 2334, 0664	Paracetamol Tabs 500Mg (Tablet of 500.00 Mgs)	2,667,500	102,410.61	4.63%
18	0210	Insulin Actraphane Hm 100Iu/ml 10Ml (Vial of 10.00 Mls)	3,773	100,399.53	4.54%
19	0093	Beclomethasone M.D.I 100 McG 200 Dose (Unit of 200.00 DOSEs)	5,570	87,950.60	3.98%
20	0279	Vaccine Diphtheria Tetanus/pert. 10Ml (Vial of 10.00 Doses)	4,800	71,346.00	3.23%

Primary Health Care 2,211,937.77

Paedriatic

TOTAL ISSUE VALUE: (Excl. VAT & Service Fee) 8,398,601.21

% of TOTAL ISSUE VALUE: 26.34%

PURCHASES BY HOSPITALS

Top 20 Pharmaceutical Items

1	3975, 3214, 0613	Ibuprofen Tabs 200Mg (Tablet of 200.00 Mgs)	9,719,540	380,544.46	10.85%
2	2278, 0608, 0609	Hydrochlorothiazide Tabs 25 Mg (Tablet of 25.00 Mgs)	4,573,304	375,232.40	10.70%
3	0139	Levonorgestrel Oestradiol Tabs (Packet of 28.00 Tablets)	184,000	340,622.60	9.71%
4	3154	Enalapril Tabs 10Mg (Tablet of 10.00 Mgs)	478,632	308,888.58	8.80%
5	3320, 2638	Amoxycillin Caps 250Mg (Capsule of 250.00 MGs)	1,962,700	286,670.48	8.17%
6	2897, 0566	Rifam 120Mg Pza 300Mg (Tablet of 1.00 TABLET)	437,400	212,503.38	6.06%
7	0584	Enalapril Tabs 20Mg (Tablet of 20.00 Mgs)	133,560	177,157.80	5.05%
8	0137	Norethisterone Inj 200 Mg/ml Long Acting (Vial of 200.00 Mgs)	33,700	154,885.20	4.42%
9	0136	Medroxyprogesterone Inj 150 Mg/ml 1Ml (Vial of 150.00 Mgs)	36,600	144,796.00	4.13%
10	2058	Ringers Lactate Sol. 1000 Ml (Vacoliter of 1000.00 Ml)	15,792	141,723.26	4.04%
11	0034, 2974	Erythromycin Tabs 250 Mg 20 (Tablet of 250.00 Mgs)	471,500	138,423.30	3.95%
12	2455	Erythromycin Tabs 250 Mgs 20 (Capsule of 250.00 mgs)	388,700	122,051.80	3.48%
13	0247	Perindopril Tabs 4Mg (Tablet of 4.00 Mgs)	201,040	117,105.80	3.34%
14	3953	Rifam 150Mg Inh 100Mg Tabs (Tablet of 1.00 TABLET)	193,800	109,400.10	3.12%
15	3153	Enalapril Tabs 5Mg (Tablet of 5.00 Mgs)	463,316	108,634.35	3.10%
16	0324	Mist Expect Stim Adult 200 Ml (Single Mls)	13,910,000	86,937.50	2.48%
17	3435	Ceftriaxone Inj 250Mg (Vial of 250.00 MGs)	3,467	77,972.44	2.22%
18	3954	Rifam 300Mg Inh 150Mg Tabs (Tablet of 1.00 TABLET)	96,000	75,456.00	2.15%
19	3158	Metformin Tabs 850Mg (Tablet of 850.00 Mgs)	600,000	74,860.00	2.13%
20	0210	Insulin Actraphane Hm 100Iu/ml 10Ml (Vial of 10.00 Mls)	2,790	74,241.90	2.12%

Primary Health Care **3,508,107.35**

Adult

Paediatric

TOTAL ISSUE VALUE: (Excl. VAT & Service Fee) **9,132,679.98**

% of TOTAL ISSUE VALUE: **38.41%**

PURCHASES BY HOSPITALS

Top 20 Pharmaceutical Items

1	2716	Ciprofloxacin Tabs 500Mg (Tablet of 500.00 Mgs)	168,330	849,835.35	26.26%
2	0535, 3983	Carbamazepine Tabs 200Mg (Tablet of 200.00 Mgs)	1,027,510	267,830.65	8.28%
3	2058	Ringers Lactate Sol.1000Ml (Vacoliter of 1000.00 Ml)	24,732	228,869.93	7.07%
4	0080	Ceftriaxone Inj 1G/vial + Diluent (Vial of 1.00 Gram)	2,825	195,745.48	6.05%
5	3154	Enalapril Tabs 10Mg (Tablet of 10.00 Mgs)	486,080	189,167.20	5.85%
6	2668	Nifedipine Tabs 30Mg (Tablet of 30.00 Mgs)	286,800	182,890.00	5.65%
7	0136	Medroxyprogesterone Inj 150Mg/ml 1 Ml (Vial of 150.00 Mgs)	36,905	147,706.05	4.56%
8	2897, 0566	Rifam 120Mg Pza 300Mg Inh 60Mg Etha 200Mg Tab (Tablet of 1.00 TABLET)	270,200	126,587.70	3.91%
9	0137	Norethisterone Inj 200Mg/ml Long Acting (Vial of 200.00 Mgs)	26,200	120,415.20	3.72%
10	2374, 2286, 0636	Methyldopa Tabs 250Mg (Tablet of 250.00 Mgs)	855,232	110,274.28	3.41%
11	0247	Perindopril Tabs 4Mg (Tablet of 4.00 Mgs)	183,680	106,993.60	3.31%
12	0036	Erythromycin Susp 125Mg/5 ml 100Ml (Bottle of 100.00 Mls)	14,654	104,477.32	3.23%
13	0383	Paracetamol Syr 120Mg/5 ml 50Ml (Bottle of 50.00 Mls)	27,080	89,288.00	2.76%
14	2278, 0608, 0609	Hydrochlorothiazide Tabs 25Mg (Tablet of 25.00 Mgs)	959,276	84,695.60	2.62%
15	3158	Metformin Tabs 850Mg (Tablet of 850.00 Mgs)	634,800	79,195.88	2.45%
16	3973, 3977	Co-Trimoxazole Tabs Tabs 480Mg (Tablet of 480.00 Mgs)	1,027,540	75,262.82	2.33%
17	0122	Salbutamol M.D.I Complete 100 McG 300 Dose (Unit of 300.00 DOSEs)	9,586	70,335.98	2.17%
18	3953	Rifam 150Mg Inh 100Mg Tabs (Tablet of 1.00 TABLET)	114,000	69,560.20	2.15%
19	0210	Insulin Actraphane Hm 100Iu/ml 10Ml (Vial of 10.00 Mls)	2,593	68,999.73	2.13%
20	3945	Nifedipine Tabs 60Mg (Tablet of 60.00 Mgs)	39,200	67,564.00	2.09%

Primary Health Care **3,235,694.97**

Paediatric

TOTAL ISSUE VALUE: (Excl. VAT & Service Fee) **9,204,044.20**

% of TOTAL ISSUE VALUE: **35.16%**

PURCHASES BY HOSPITALS

Top 20 Pharmaceutical Items

1	2374, 2286, 0636	Methyldopa Tabs 250Mg (Tablet of 250.00 Mgs)	2,106,680	272,047.20	2.78%
2	3429	Amoxycillin Clavulan Inj 1000Mg/200Mg (Vial of 1.00 VIAL)	11,735	180,726.50	1.84%
3	0137	Norethisterone Inj 200Mg/ml Long Acting (Vial of 200.00 Mgs)	38,900	178,801.20	1.82%
4	2897	Rifam 120Mg Pza 300Mg Inh60Mg Etha200Mg Tab (Tablet of 1.00 TABLET)	344,000	171,016.20	1.74%
5	2455, 0034, 2974	Erythromycin Tabs 250Mg 20 (Capsule of 250.00 Mgs)	517,200	160,726.40	1.64%
6	0247	Perindopril Tabs 4Mg (Tablet of 4.00 Mgs)	263,760	153,640.20	1.57%
7	0080	Ceftriaxone Inj 1G/vial + Diluent (Vial of 1.00 Gram)	1,964	142,488.20	1.45%
8	3320	Amoxycillin Caps 250Mg (Capsule of 250.00 MGs)	963,750	141,661.88	1.45%
9		Enalapril Tabs 10Mg	434,000		1.43%
10	3975, 3214, 0613	Ibuprofen Tabs 200Mg (Tablet of 200.00 Mgs)	2,524,160	136,246.36	1.39%
	2385	(Tablet of 20.00 Mgs)		123,041.04	
12	0535, 3983	Carbamazepine Tabs 200Mg (Tablet of 200.00 Mgs)	461,200	120,411.60	1.23%
13	2668	Nifedipine Tabs 30Mg Slow Release(Tablet of 30.00 Mgs)	170,250	113,500.00	1.16%
14	2278, 0608, 0609	Hydrochlorothiazide Tabs 25Mg (Tablet of 25.00 Mgs)	1,217,160	107,546.40	1.10%
15	0036	Erythromycin Susp 125Mg/5 ml 100Ml (Bottle of 100.00 Mls)	13,452	101,909.81	1.04%
16	2058	Ringers Lactate Sol. 1000Ml (Vacoliter of 1000.00 Ml)	10,392	94,192.04	0.96%
17	0210	Insulin Actraphane Hm 100Iu/ml 10Ml (Vial of 10.00 Mls)	3,489	92,842.29	0.95%
18	3953	Rifam 150Mg Inh 100Mg Tabs (Tablet of 1.00 TABLET)	135,200	90,043.20	0.92%
19	0136	Medroxyprogesterone Inj 150Mg/ml 1Ml (Vial of 150.00 Mgs)	21,875	88,777.15	0.91%
20	0281	Vaccine Hepatitis B (Vial of 10.00 Doses)	2,956	83,525.66	0.85%

Primary Health Care **2,692,994.01**

Paediatric

TOTAL ISSUE VALUE: (Excl. VAT & Service Fee) 9,801,910.13

% of TOTAL ISSUE VALUE: 27.47%

PURCHASES BY HOSPITALS

Top 20 Pharmaceutical Items

1	3429	Amoxycillin Clavulan Inj 1000Mg/200Mg (Vial of 1.00 VIAL)	30,120	466,860.00	17.95%
2	2374, 0636, 2286	Methyldopa Tabs 250Mg (Tablet of 250.00 Mgs)	1,320,640	171,444.64	6.59%
3	2716	Ciprofloxacin Tabs 500Mg (Tablet of 500.00 Mgs)	29,960	151,447.80	5.82%
4	2058	Ringers Lactate Sol. 1000Ml (Vacoliter of 1000.00 Ml)	15,288	138,918.58	5.34%
5	2897	Rifam 120Mg Pza 300Mg Inh 60Mg Etha 200Mg Tab (Tablet of 1.00 TABLET)	251,000	133,281.00	5.12%
6	2278, 0609, 0608	Hydrochlorothiazide Tabs 25Mg (Tablet of 25.00 Mgs)	1,462,280	129,557.60	4.98%
7	0247	Perindopril Tabs 4Mg (Tablet of 4.00 Mgs)	221,200	128,849.00	4.95%
8	0383	Paracetamol Syr 120Mg/5 ml 50Ml (Bottle of 50.00 Mls)	95,956	125,654.00	4.83%
9	0137	Norethisterone Inj 200Mg/ml Long Acting (Vial of 200.00 Mgs)	26,900	123,645.85	4.75%
10		Enalapril Tabs 10Mg	364,000		4.62%
11	0136	Medroxyprogesterone Inj 150Mg/ml 1Ml (Vial of 150.00 Mgs)	28,100	111,938.50	4.30%
12	0535, 3983	Carbamazepine Tabs 200Mg (Tablet of 200.00 Mgs)	427,500	110,310.90	4.24%
13	3270, 0038	Flucloxacillin Caps 250Mg 20 (Capsule of 250.00 Mgs)	186,000	104,456.50	4.02%
14	2549	Vaccine Hib-Dtp 10Dose (Vial of 1.00 VIAL)	520	101,524.90	3.90%
15	0210	Insulin Actraphane Hm 100Iu/ml 10Ml (Vial of 10.00 Mls)	3,400	90,474.00	3.48%
16	2545	Vaccine Hib-Dtp Single Dose (Vial of 1.00 VIAL)	7,850	87,321.35	3.36%
17	2668	Nifedipine Tabs 30Mg (Tablet of 30.00 Mgs)	136,156	87,266.56	3.35%
18	3954	Rifam 300Mg Inh 150Mg Tabs (Tablet of 1.00 TABLET)	79,000	73,272.50	2.82%
19	2052	Maintelyte & Dextrose 5% 1000Ml (Afb 3731) (Vacoliter of 1000.00 Ml)	7,560	72,925.44	2.80%
20	0080	Ceftriaxone Inj 1G/vial + Diluent (Vial of 1.00 Gram)	995	72,189.37	2.77%

Primary Health Care **2,601,426.82**

Paediatric

TOTAL ISSUE VALUE: (Excl. VAT & Service Fee) **10,964,929.28**

% of TOTAL ISSUE VALUE: **23.72%**

PURCHASES BY HOSPITALS

Top 20 Pharmaceutical Items

1	2549	Vaccine Hib-Dtp 10 Dose (Vial of 1.00 VIAL)	1,270	207,962.50	8.41%
2	2374, 0636, 2286	Methyldopa Tabs 250MG (Tablet of 250.00 Mgs)	1,435,720	184,954.56	7.48%
3	0080	Ceftriaxone Inj 1G/vial + Diluent (Vial of 1.00 Gram)	2,390	173,398.22	7.01%
4	0136	Medroxyprogesterone Inj 150Mg / ml 1Ml(Vial of 150.00 Mgs)	39,775	158,577.63	6.41%
5	2897	Rifam 120Mg Pza 300Mg Inh 60Mg Etha 200Mg Tab (Tablet of 1.00 TABLET)	269,000	142,839.00	5.78%
6	2058	Ringers Lactate Sol. 1000 Ml (Vacoliter of 1000.00 Ml)	14,940	138,061.08	5.58%
7	3945	Nifedipine Tabs 60Mg (Tablet of 60.00 Mgs)	82,880	133,348.00	5.39%
8	2278, 0609, 0608	Hydrochlorothiazide Tabs 25Mg (Tablet of 25.00 Mgs)	1,413,160	125,174.67	5.06%
9	2716	Ciprofloxacin Tabs 500 Mg (Tablet of 500.00 Mgs)	24,300	122,836.50	4.97%
10	0137	Norethisterone Inj 200 Mg/ml Long Acting (Vial of 200.00 Mgs)	26,100	119,968.65	4.85%
11	2668	Nifedipine Tabs 30Mg (Tablet of 30.00 Mgs)	178,410	118,940.00	4.81%
12	0247	Perindopril Tabs 4Mg (Tablet of 4.00 Mgs)	202,776	118,117.02	4.78%
13	0210	Insulin Actraphane Hm 100Iu/ml 10Ml (Vial of 10.00 Mls)	3,753	106,784.65	4.32%
14	3154	Enalapril Tabs 10Mg (Tablet of 10.00 Mgs)	304,920	98,227.80	3.97%
15	0535, 3983	Carbamazepine Tabs 200 Mg (Tablet of 200.00 Mgs)	360,710	93,379.40	3.78%
16	2407	Reserpine Tabs 0.25Mg (Tablet of 0.25 Mgs)	237,160	83,853.00	3.39%
17	0383	Paracetamol Syr 120Mg/5 ml 50 Ml (Bottle of 50.00 Mls)	52,400	82,952.00	3.36%
18	0139	Levonorgestrel Oestriol Tabs (Triphasil) (Packet of 28.00 Tablets)	41,300	81,361.00	3.29%
20	0566	Rifam 120Mg Pza 300Mg Inh 60 Mg Etha 225Mg (Single Tablets)	95,200	65,878.40	0.91%

Primary Health Care 2,433,965.74

Paediatric

TOTAL ISSUE VALUE: (Excl. VAT & Service Fee) 8,553,051.91

% of TOTAL ISSUE VALUE: 28.46%

PURCHASES BY HOSPITALS

Top 20 Pharmaceutical Items

1	2897	Rifam 120Mg Pza 300Mg Inh 60Mg Etha 200Mg Tab (Tablet of 1.00 TABLET)	369,000	195,939.00	11.26%
2	2286, 0636, 2374	Methyldopa Tabs 250Mg (Tablet of 250.00 Mgs)	1,264,880	162,218.60	9.32%
3	0137	Norethisterone Inj 200Mg/ml Long Acting (Vial of 200.00 Mgs)	32,800	150,765.20	8.67%
4	0247	Perindopril Tabs 4Mg (Tablet of 4.00 Mgs)	215,040	125,260.80	7.20%
5	0080	Ceftriaxone Inj 1G/vial + Diluent (Vial of 1.00 Gram)	1,373	99,613.71	5.73%
6	2278, 0608, 0609	Hydrochlorothiazide Tabs 25Mg (Tablet of 25.00 Mgs)	1,016,400	92,427.89	5.31%
7	0136	Medroxyprogesterone Inj 150Mg/ml 1Ml (Vial of 150.00 Mgs)	20,100	80,400.00	4.62%
8	2058	Ringers Lactate Sol. 1000Ml (Vacoliter of 1000.00 Ml)	8,340	77,178.36	4.44%
9	3270, 0038	Flucloxacillin Caps 250Mg 20 (Capsule of 250.00 Mgs)	131,200	76,062.60	4.37%
10	0210	Insulin Actraphane Hm Iu/ml 10Ml (Vial of 10.00 Mls)	2,660	75,738.18	4.35%
11	2716	Ciprofloxacin Tabs 500 Mg (Tablet of 500.00 Mgs)	13,840	69,961.20	4.02%
12	0476	Miconazole Nitrate Gel 2% 30Gm (Tube of 30.00 Gms)	2,340	69,638.40	4.00%
13	3154	Enalapril Tabs 10Mg (Tablet of 10.00 Mgs)	204,400	65,846.00	3.78%
14	0369	Mebendazole Susp 30Ml (Bottle of 30.00 Mls)	7,998	63,584.10	3.65%
15	3320	Amoxycillin Caps 250Mg (Capsule of 250.00 Mgs)	426,855	61,751.69	3.55%
16	0139	Levonorgestrel Oestradiol Tabs (Triphasil) (Packet of 28.00 Tablets)	30,400	59,888.00	3.44%
17	0036	Erythromycin Susp 125Mg/5 ml 100Ml (Bottle of 100.00 Mls)	6,922	58,639.25	3.37%
18	3195	Paracetamol Tabs 500Mg (Tablet of 500.00 Mgs)	1,087,000	54,198.90	3.12%
19	0093	Beclomethasone M.D.I 100 McG 200 Dose (Unit of 200.00 DOSEs)	3,260	51,475.40	2.96%
20	3954	Rifam 300Mg Inh 150Mg Tabs (Tablet of 1.00 TABLET)	53,000	49,157.50	2.83%

Primary Health Care 1,739,744.78

Paediatric

TOTAL ISSUE VALUE: (Excl. VAT & Service Fee) 7,502,984.70

% of TOTAL ISSUE VALUE: 23.19%

PURCHASES BY HOSPITALS

Top 20 Pharmaceutical Items

1	2897	Rifam 120Mg Pza 300Mg Inh 60Mg Etha 200Mg Tab (Tablet of 1.00 TABLET)	414,000	219,834.00	9.82%
2	0247	Perindopril Tabs 4Mg (Tablet of 4.00 Mgs)	335,440	195,393.80	8.73%
3	2058	Ringers Lactate Sol. 1000Ml (Vacoliter of 1000.00 Ml)	18,888	174,789.55	7.81%
~~11~~	2286, 0636, 2374	Methyldopa Tabs 250Mg (Tablet of 250.00 Mgs)	1,305,900	170,107.74	7.60%
~~4~~	0137	Norethisterone Inj 200Mg/ml Lomg Acting (Vial of 200.00 Mgs)	35,000	160,877.50	7.19%
~~5~~	3154	Enalapril Tabs 10Mg (Tablet of 10.00 Mgs)	446,040	143,688.60	6.42%
~~7~~	2278, 0608, 0609	Hydrochlorothiazide Tabs (Tablet of 25.00 Mgs)	1,500,520	135,026.66	6.03%
~~6~~	0210	Insulin Actraphane Hm 100Iu/ml 10Ml (Vial of 10.00 Mls)	4,420	125,850.66	5.62%
~~8~~	0136	Medroxyprogesterone Inj 150Mg / ml 1Ml (Vial of 150.00 Mgs)	26,100	104,400.00	4.67%
~~9~~	2716	Ciprofloxacin Tabs 500 Mg (Tablet of 500.00 Mgs)	20,440	103,324.20	4.62%
~~10~~	0080	Ceftriaxone Inj 1G/vial + Diluent (Vial of 1.00 Gram)	1,383	100,339.21	4.48%
~~15~~	3270, 0038	Flucloxacillin Caps 250Mg (Capsule of 250.00 Mgs)	133,100	76,847.08	3.43%
~~12~~	0476	Miconazole Nitrate Gel 2% 30Gm (Tube of 30.00 Gms)	2,340	69,638.40	3.11%
~~13~~	3954	Rifam 300Mg Inh 150Mg Tabs (Tablet of 1.00 TABLET)	73,000	67,707.89	3.03%
~~14~~	3320	Amoxycillin Caps 250Mg (Capsule of 250.00 Mgs)	465,855	67,393.69	3.01%
~~16~~	3195	Paracetamol Tabs 500Mg (Tablet of 500.00 Mgs)	1,363,000	66,363.30	2.97%
17	0369	Mebendazole Susp 30Ml (Bottle of 30.00 Mls)	8,328	66,207.60	2.96%
18	0036	Erythromycin Susp 125Mg / 5 ml 100Ml (Bottle of 100.00 Mls)	7,642	64,759.25	2.89%
19	2061	Sodium Chl 0.9% 1000Ml (Vacoliter of 1000.00 Ml)	8,100	64,727.10	2.89%
20	2052	Maintelyte & Dextrose 5% 1000Ml (Afb 3731) (Vacoliter of 1000.00 Ml)	6,240	60,428.16	2.70%

Primary Health Care 2,237,704.39

Paediatric

TOTAL ISSUE VALUE: (Excl. VAT & Service Fee) 7,502,984.70

% of TOTAL ISSUE VALUE: 29.82%

PURCHASES BY HOSPITALS

Top 20 Pharmaceutical Items

1	2549	Vaccine Hib-Dtp 10 Dose (Vial of 1.00 VIAL)	2,680	438,850.00	15.30%
2	2668	Nifedipine Tabs 30 Mg (Tablet of 30.00 Mgs)	410,570	263,960.00	9.20%
3	0535, 3983	Carbamazepine Tabs 200 Mg (Tablet of 200.00 Mgs)	935,400	234,474.00	8.17%
4	0137	Norethisterone Inj 200 Mg/ml Long Acting (Vial of 200.00 Mgs)	37,600	172,828.40	6.02%
5	0383	Paracetamol Syr 120 Mg/5 ml 50 Ml (Bottle of 50.00 Mls)	56,100	164,154.00	5.72%
6	2286, 0636, 2374	Methyldopa Tabs 250 Mg (Tablet of 250.00 Mgs)	1,235,640	159,956.60	5.58%
7	0136	Medroxyprogesterone Inj 150 Mg/ml 1 Ml (Vial of 150.00 Mgs)	35,700	142,800.00	4.98%
8	2058	Ringers Lactate Sol. 1000 Ml (Vacoliter of 1000.00 Ml)	15,324	141,808.31	4.94%
9	2278, 0608, 0609	Hydrochlorothiazide Tabs 25 Mg (Tablet of 25.00 Mgs)	1,548,920	139,052.38	4.85%
10	2897	Rifam 120 Mg Pza 300 Mg Inh 60 Mg Etha 200 Mg Tab (Tablet of 1.00 TABLE	255,000	135,405.00	4.72%
11	2716	Ciprofloxacin Tabs 500 Mg (Tablet of 500.00 Mgs)	25,400	128,397.00	4.48%
12	0210	Insulin Actraphane Hm 100Iu/ml 10 Ml (Vial of 10.00 Mls)	3,790	107,912.67	3.76%
13	3154	Enalapril Tabs 10 Mg (Tablet of 10.00 Mgs)	330,400	106,436.00	3.71%
14	3954	Rifam 300 Mg Inh 150 Mg Tabs (Tablet of 1.00 TABLET)	110,000	102,030.01	3.56%
15	0247	Perindopril Tabs 4 Mg (Tablet of 4.00 Mgs)	172,200	100,306.50	3.50%
16	3320	Amoxycillin Caps 250 Mg (Capsule of 250.00 Mgs)	509,250	73,671.50	2.57%
17	2455, 2974, 0034	Erythromycin Tabs 250 Mg 20 (Capsule of 250.00 Mgs)	225,200	69,651.10	2.43%
18	3195	Paracetamol Tabs 500 Mg (Tablet of 500.00 Mgs)	1,324,000	64,109.36	2.23%
19	3953	Rifam 150 Mg Inh 100 Mg Tabs (Tablet of 1.00 TABLET)	95,000	63,270.00	2.21%
20	0566	Rifam 120 Mg Pza 300 Mg Inh 60 Mg Etha 200 Mg Tab (Single Tablets)	86,400	59,788.80	2.08%

Primary Health Care **2,868,861.63**

Paediatric

TOTAL ISSUE VALUE: (Excl. VAT & Service Fee) **8,172,885.40**

% of TOTAL ISSUE VALUE: **35.10%**

PURCHASES BY HOSPITALS

Top 20 Pharmaceutical Items

1	2549	Vaccine Hib-Dtp 10 Dose (Vial of 1.00 VIAL)	1,680	275,100.35	9.72%
2	0137	Norethisterone Inj 200Mg/ml Long Acting (Vial of 200.00 Mgs)	46,685	214,587.90	7.58%
3	0136	Medroxyprogesterone Inj 150 Mg/ml 1 Ml (Vial of 150.00 Mgs)	50,000	200,000.00	7.07%
4	2278, 0608, 0609	Hydrochlorothiazide Tabs 25 Mg (Tablet of 25.00 Mgs)	2,175,070	193,737.86	6.85%
					6.44%
6	0247	Perindopril Tabs 4Mg (Tablet of 4.00 Mgs)	296,968	172,857.17	6.11%
7	3154	Enalapril Tabs 10Mg (Tablet of 10.00 Mgs)	491,344	158,282.96	5.59%
8	2716	Ciprofloxacin Tabs 500Mg (Tablet of 500.00 Mgs)	30,520	154,278.60	5.45%
9	535, 3983	Carbamazepine Tabs 200 Mg (Tablet of 200.00 Mgs)	539,980	140,900.90	4.98%
10	3954	Rifam 300Mg Inh 150M g Tabs(Tablet of 1.00 TABLET)	134,880	125,101.20	4.42%
11	0080	Ceftriaxone Inj 1G/vial + Diluent (Vial of 1.00 Gram)	1,689	122,536.95	4.33%
12	3270, 0038	Flucloxacillin Caps 250Mg (Capsule of 250.00 Mgs)	202,000	115,956.87	4.10%
13	2897	Rifam 120Mg Pza 300Mg Inh 60Mg Etha 200Mg Tab (Tablet of 1.00 TABLET)	208,500	110,713.50	3.91%
14	2058	Ringers Lactate Sol. 1000 Ml (Vacoliter of 1000.00 Ml)	11,400	105,495.60	3.73%
15	0281	Vaccine Hepatitis B Paed. 10 Dose Vial (Multidose) (Vial of 10.00 Doses)	3,498	102,500.40	3.62%
16	0383	Paracetamol Syr 120Mg/5 ml 50 Ml (Bottle of 50.00 Mls)	54,793	92,778.85	3.28%
17	0210	Insulin Actraphane Hm 100Iu/ml 10Ml (Vial of 10.00 Mls)	3,254	92,651.15	3.27%
18	3953	Rifam 150Mg Inh 100Mg Tabs (Tablet of 1.00 TABLET)	138,720	92,387.52	3.26%
19	0122	Salbutamol M.D.I Complete 100 McG 200 Dose (Unit of 300.00 DOSEs)	12,909	90,130.65	3.18%
20	2668	Nifedipine Tabs 30Mg (Tablet of 30.00 Mgs)	132,150	88,100.00	3.11%

Primary Health Care **2,830,289.43**

Paediatric

TOTAL ISSUE VALUE: (Excl. VAT & Service Fee) **10,305,008.74**

% of TOTAL ISSUE VALUE: **27.47%**

PURCHASES BY HOSPITALS

Top 20 Pharmaceutical Items

1	2549	Vaccine Hib-Dtp 10 Dose (Vial of 1.00 VIAL)	2,385	390,543.75	11.46%
2	2716	Ciprofloxacin Tabs 500Mg (Tablet of 500.00 Mgs)	50,680	256,187.40	7.52%
3	0137	Norethisterone Inj 200Mg/ml Long Acting (Vial of 200.00 Mgs)	51,600	237,179.40	6.96%
4	2374, 0636, 2286	Methyldopa Tabs 250Mg (Tablet of 250.00 Mgs)	1,779,092	231,660.17	6.80%
5	0247	Perindopril Tabs 4Mg (Tablet of 4.00 Mgs)	389,536	226,904.72	6.66%
6	0136	Medroxyprogesterone Inj 150Mg/ml 1 Ml (Vial of 150.00 Mgs)	48,400	216,325.06	6.35%
7	2058	Ringers Lactate Sol. 1000 Ml (Vacoliter of 1000.00 Ml)	23,280	215,433.12	6.32%
8	2668	Nifedipine Tabs 30Mg (Tablet of 30.00 Mgs)	291,540	194,360.00	5.70%
9	2897	Rifam 120Mg Pza 300Mg Inh 60Mg Etha 200Mg Tab (Tablet of 1.00 TABLET)	352,500	187,177.50	5.49%
10	2278, 0608, 0609	Hydrochlorothiazide Tabs 25Mg (Tablet of 25.00 Mgs)	1,971,000	173,044.56	5.08%
11	2455, 2974, 0034	Erythromycin Tabs 250Mg 20 (Capsule of 250.00 Mgs)	515,100	159,464.31	4.68%
12	0535, 3983	Carbamazepine Tabs 200Mg (Tablet of 200.00 Mgs)	479,470	128,286.30	3.77%
13	3270, 0038	Flucloxacillin Caps 250Mg 20 (Capsule of 250.00 Mgs)	236,700	127,155.60	3.73%
14	3154	Enalapril Tabs 10Mg (Tablet of 10.00 Mgs)	392,000	126,280.00	3.71%
15	0139	Levonorgestrel Oestradiol Tabs (Triphasil) (Packet of 28.00 Tablets)	52,700	108,649.00	3.19%
16	0210	Insulin Actraphane Hm 100iu/ml 10 Ml (Vial of 10.00 Mls)	3,632	103,413.93	3.04%
17	0080	Ceftriaxone Inj 1G/vial + Diluent (Vial of 1.00 GRAM)	1,178	85,463.90	2.51%
18	3954	Rifam 300Mg Inh 150Mg Tabs (Tablet of 1.00 TABLET)	90,400	83,846.00	2.46%
19	2061	Sodium Chl 0.9% 1000 Ml (Vacoliter of 1000.00 Ml)	9,912	79,206.79	2.32%
20	0281	Vaccine Hepatitis B Paed. 10 Dose Vial (Multidose) (Vial of 10.00 Doses)	2,570	76,724.50	2.25%

Primary Health Care **3,407,306.01**

Paediatric

TOTAL ISSUE VALUE: (Excl. VAT & Service Fee) **10,538,843.44**

% of TOTAL ISSUE VALUE: **32.33%**

PURCHASES BY HOSPITALS

Top 20 Pharmaceutical Items

1	0137	Norethisterone Inj 200Mg/ml Long Acting (Vial of 200.00 Mgs)	52,700	251,582.86	9.67%
2	0136	Medroxyprogesterone Inj 150Mg/ml 1 Ml (Vial of 150.00 Mgs)	55,600	234,677.08	9.02%
3	0247	Perindopril Tabs 4Mg (Tablet of 4.00 Mgs)	348,936	203,254.81	7.81%
4	2549	Vaccine Hib-Dtp 10 Dose (Vial of 1.00 VIAL)	1,120	183,400.00	7.05%
5	2058	Ringers Lactate Sol. 1000 Ml (Vacoliter of 1000.00 Ml)	17,616	163,018.45	6.27%
6	2897	Rifam 120Mg Pza 300Mg Inh 60Mg Etha 200Mg Tab (Tablet of 1.00 TABLET)	296,000	157,176.00	6.04%
7	3154	Enalapril Tabs 10Mg (Tablet of 10.00 Mgs)	411,040	132,413.60	5.09%
8	2278, 0608, 0609	Hydrochlorothiazide Tabs 25 Mgs(Tablet of 25.00 Mgs)	1,516,006	132,405.57	5.09%
9	0324	Mist Expect Stim Adult 200Ml (Single Mls)	16,798,800	120,951.36	4.65%
10	2668	Nifedipine Tabs 30Mg (Tablet of 30.00 Mgs)	173,550	115,700.00	4.45%
11	0139	Levonorgestrel Oestradiol Tabs (Triphasil) (Packet of 28.00 Tablets)	52,500	115,335.00	4.43%
12	2716	Ciprofloxacin Tabs 500 Mg (Tablet of 500.00 Mgs)	19,450	98,319.75	3.78%
13	3954	Rifam 300Mg Inh 150Mg Tabs (Tablet of 1.00 TABLET)	103,000	95,532.50	3.67%
14	0210	Insulin Actraphane Hm 100Iu/ml 10Ml (Vial of 10.00 Mls)	3,265	92,964.35	3.57%
15	0566	Rifam 120Mg Pza 300Mg Inh 60Mg Etha 225Mg (Single Tablets)	127,700	88,368.40	3.40%
16	0093	Beclomethasone M.D.I. 100 McG 200 Dose (Unit of 200.00 DOSEs)	5,124	87,364.20	3.36%
17	3195	Paracetamol Tabs 500 Mg (Tablet of 500.00 milligrams)	1,893,190	87,190.21	3.35%
18	3320	Amoxycillin Caps 250 Mg (Capsule of 250.00 MGs)	574,020	83,041.56	3.19%
19	0122	Salbutamol M.D.I Complete 100 McG 300 Dose (Unit of 300.00 DOSEs)	11,700	81,689.40	3.14%
20	3953	Rifam 150Mg Inh 100Mg Tabs (Tablet of 1.00 TABLET)	116,200	77,415.62	2.98%

Primary Health Care **2,601,800.72**

Paediatric

TOTAL ISSUE VALUE: (Excl. VAT & Service Fee) **9,909,678.95**

% of TOTAL ISSUE VALUE: **26.26%**

PURCHASES BY HOSPITALS

Top 20 Pharmaceutical Items

1	2549	Vaccine Hib-Dtp 10 Dose (Vial of 1.00 VIAL)	1,863	305,066.25	11.78%
2	2278, 0608, 0609	Hydrochlorothiazide Tabs 25Mg (Tablet of 25.00 Mgs)	2,062,850	185,647.07	7.17%
3	0247	Perindopril Tabs 4Mg (Tablet of 4.00 Mgs)	303,240	177,703.30	6.86%
4	0137	Norethisterone Inj 200Mg/ml Long Acting (Vial of 200.00 Mgs)	35,592	173,589.28	6.70%
5	0136	Medroxyprogesterone Inj 150Mg/ml 1Ml (Vial of 150.00 Mgs)	39,200	170,583.10	6.59%
6	2897	Rifam 120Mg Pza 300Mg Inh 60Mg Etha 200Mg Tab (Tablet of 1.00 TABLET)	308,300	163,707.30	6.32%
7	0535, 3983	Carbamazepine Tabs 200Mg (Tablet of 200.00 Mgs)	583,600	152,282.35	5.88%
8	2716	Ciprofloxacin Tabs 500Mg (Tablet of 500.00 Mgs)	26,330	132,660.25	5.12%
9	2455, 2974, 0034	Erythromycin Tabs 250Mg 20 (Capsule of 250.00 Mgs)	418,540	127,275.41	4.92%
10	2058	Ringers Lactate Sol. (Vacoliter of 1000.00 Ml)	12,600	113,487.36	4.38%
11	0080	Ceftriaxone Inj 1G/vial + Diluent (Vial of 1.00 Gram)	1,557	112,960.35	4.36%
12	2668	Nifedipine Tabs 30Mg Slow Release (Tablet of 30.00 Mgs)	171,020	111,614.90	4.31%
13	3154	Enalapril Tabs 10Mg (Tablet of 10.00 Mgs)	330,960	106,616.40	4.12%
14	3320	Amoxycillin Caps 250Mg (Capsule of 250.00 Mgs)	663,900	96,044.20	3.71%
15	0210	Insulin Actraphane Hm 100Iu/ml 10Ml (Vial of 10.00 Mls)	3,183	90,629.56	3.50%
16	2220	Albumin Sol 20% 100Ml (Single Vials)	331	83,286.22	3.22%
17	2407	Reserpine Tabs 0.25Mg (Tablet of 0.25 Mgs)	203,840	71,967.75	2.78%
18	3954	Rifam 300Mg Inh 150Mg Tabs (Tablet of 1.00 TABLET)	77,300	71,695.75	2.77%
20	0139	Levonorgestrel Oestradiol Tabs 30/150 Ug (Packet of 28.00 Tablets)	31,800	70,926.00	2.74%
Primary Health Care				**2,589,099.58**	

Paediatric

TOTAL ISSUE VALUE: (Excl. VAT & Service Fee) **9,777,232.32**

% of TOTAL ISSUE VALUE: **26.48%**

- Methyldopa lies in the 27th place on this report for July.

PURCHASES BY HOSPITALS

Top 20 Pharmaceutical Items

1	2549	Vaccine Hib-Dtp 10 Dose (Vial of 1.00 VIAL)	2,210	361,887.50	12.79%
2	0136	Medroxyprogesterone Inj 150Mg/ml 1 Ml (Vial of 150.00 Mgs)	73,200	322,439.20	11.40%
3	0137	Norethisterone Inj 200Mg/ml 1 Ml (Vial of 200.00 Mgs)	44,500	217,035.40	7.67%
4	2897	Rifam 120Mg Pza 300Mg Inh 60Mg Etha 200Mg Tab (Tablet of 1.00 TABLET)	396,000	210,276.00	7.43%
5	0247	Perindopril Tabs 4Mg (Tablet of 4.00 Mgs)	339,080	207,034.30	7.32%
6	2278, 0608, 0609	Hydrochlorothiazide Tabs 25Mg (Tablet of 25.00 Mgs)	1,730,134	169,341.99	5.99%
7	2455, 2974, 0034	Erythromycin Tabs 250Mg (Capsule of 250.00 Mgs)	506,900	155,746.87	5.51%
8	0210	Insulin Actraphane Hm 100Iu/ml 10 Ml (Vial of 10.00 Mls)	3,993	113,692.69	4.02%
9	2668	Nifedipine Tabs 30Mg Slow Release (Tablet of 30.00 Mgs)	166,452	106,637.52	3.77%
10	2061	Sodium Chl 0.9% 1000 Ml (Vacoliter of 1000.00 Ml)	14,473	105,780.81	3.74%
11	3485	Sodium Chl 0.9% Inj 50 Ml (Bag of 50.00 MLs)	29,122	98,342.72	3.48%
12	3975, 0613, 3214	Ibuprofen Tabs 200Mg (Tablet of 200.00 Mgs)	1,734,475	97,484.66	3.45%
13	2716	Ciprofloxacin Tabs 500 Mg (Tablet of 500.00 Mgs)	18,820	94,626.96	3.34%
14	0139	Levonorgestrel Oestr (Packet of 28.00 Tablets	41,400	93,978.00	3.32%
15	0093	Beclomethasone M.D.I 100McG 200 Dose (Unit of 200.00 DOSEs)	5,310	90,535.50	3.20%
16	3320	Amoxycillin Caps 250 Mg (Capsule of 250.00 Mgs)	588,225	85,096.55	3.01%
17	2058	Ringers Lactate Sol. 1000 Ml (Vacoliter of 1000.00 Ml)	11,436	78,433.99	2.77%
18	3154	Enalapril Tabs 10Mg (Tablet of 10.00 Mgs)	278,040	75,144.30	2.66%
19	566	Rifam 120Mg Pza 300Mg Inh 60Mg Etha 225 Mg (Single Tablets)	106,400	73,628.80	2.60%
20	0004	Amoxycillin Susp 125Mg /5 Ml (Bottle of 100.00 Mls)	25,006	72,017.28	2.55%
Primary Health Care				**2,829,161.04**	

Paediatric

TOTAL ISSUE VALUE: (Excl. VAT & Service Fee) **10,012,763.87**

% of TOTAL ISSUE VALUE: **28.26%**

PURCHASES BY HOSPITALS

Top 20 Pharmaceutical Items

1	2549	Vaccine Hib-Dtp 10 Dose (Vial of 1.00 VIAL)	2,330	381,537.50	
2	0247	Perindopril Tabs 4Mg (Tablet of 4.00 Mgs)	444,360	271,853.10	
3	0210	Insulin Actraphane Hm 100Iu/ml 10 Ml (Vial of 10.00 Mls)	5,390	153,469.47	
4	2897	Rifam 120Mg Pza 300Mg Inh 60Mg Etha 200Mg Tab (Tablet of 1.00 TABLET)	286,200	151,972.20	
5	0080	Ceftriaxone Inj 1G/vial + Diluent (Vial of 1.00 Gram)	2,050	148,727.50	
6	3429	Amoxycillin Clavulan Inj 1000Mg/200Mg (Vial of 1.00 VIAL)	9,165	142,071.50	
7	0137	Norethisterone Inj 200Mg/ml Long Acting (Vial of 200.00 Mgs)	24,402	119,013.43	
8	2668	Nifedipine Tabs 30Mg Slow Release (Tablet of 30.00 Mgs)	185,168	118,381.58	
9	2058	Ringers Lactate Sol. 1000Ml (Vacoliter of 1000.00 Ml)	18,696	117,966.91	
10	3154	Enalapril Tabs 10Mg (Tablet of 10.00 Mgs)	451,920	115,473.12	
11	2716	Ciprofloxacin Tabs 500 Mg (Tablet of 500.00 Mgs)	22,140	111,319.92	
12	3954	Rifam 300Mg Inh 150Mg Tabs(Tablet of 1.00 TABLET)	115,840	108,850.96	
13	0324	Mist Expect Stim Adult (Single Mls)	12,701,800	91,452.96	
14	0566	Rifam 120Mg Pza 300Mg Inh 60Mg Etha 225Mg (Single Tablets)	122,400	84,700.80	
15	3953	Rifam 150Mg Inh 100Mg Tabs (Tablet of 1.00 TABLET)	121,600	80,985.60	
16	3320	Amoxycillin Caps 250 Mg (Capsule of 250.00 MGs)	541,500	78,337.00	
17	0281	Vaccine Hepatitis B Paed.10 Dose Vial (Vial of 10.00 Doses)	2,540	76,327.00	
18	0139	Levonorgestrel Oestradiol Tabs (Triphasil) (Packet of 28.00 Tablets)	31,400	71,278.00	
19	2455, 0034	Erythromycin Tabs 250 Mg (Capsule of 250.00 Mgs)	318,700	97,755.80	
20	3026	Carbamazepine Tabs 400 Mg (Tablet of 400.00 Mgs)	115,170	69,716.24	
Primary Health Care				**2,591,190.59**	

Paediatric

TOTAL ISSUE VALUE: (Excl. VAT & Service Fee) **9,483,539.61**

% of TOTAL ISSUE VALUE: **27.32%**

- Methyldopa (Stock No 2286) lies in the 24th place for September 2001
- Hydrochlorothiazide Tabs (Stock No 2278) lies in the 36th place

PURCHASES BY HOSPITALS

Top 20 Pharmaceutical Items

1	0247	Perindopril Tabs 4Mg (Tablet of 4.00 Mgs)	499,548	305,616.33	11.31%
4	2278, 0608, 0609	Hydrochlorothiazide Tabs 25 Mg (Tablet of 25.00 Mgs)	2,545,220	265,030.40	9.81%
2	2549	Vaccine Hib-Dtp 10 Dose (Vial of 1.00 VIAL)	1,618	264,947.50	9.81%
3	0137	Norethisterone Inj 200Mg/ml Long Acting (Vial of 200.00 Mgs)	48,000	234,113.60	8.67%
5	2716	Ciprofloxacin Tabs 500 Mg (Tablet of 500.00 Mgs)	35,700	179,499.60	6.64%
6	2058	Ringers Lactate Sol. 1000Ml (Vacoliter of 1000.00 Ml)	24,036	151,122.21	5.59%
11	3975, 0613, 3214	Ibuprofen Tabs 200Mg (Tablet of 200.00 Milligrams)	2,109,950	133,857.14	4.95%
10	2455, 2974, 0034	Erythromycin Tabs 250 Mg (Capsule of 250.00 Mgs)	411,400	122,097.09	4.52%
7	2897	Rifam 120Mg Pza 300Mg Inh 60Mg Etha 200Mg Tab (Tablet of 1.00 TABLET)	220,000	121,408.80	4.49%
8	0136	Medroxyprogesterone Inj 150Mg/ml 1Ml (Vial of 150.00 Mgs)	26,975	119,681.61	4.43%
9	0080	Ceftriaxone Inj 1G/vial + Diluent (Vial of 1.00 GRAM)	1,727	112,593.85	4.17%
12	0210	Insulin Actraphane Hm 100Iu/ml 10Ml (Vial of 10.00 Mls)	3,506	99,826.34	3.70%
13	0324	Mist Expect Stim Adult (Single Mls)	12,546,000	90,331.20	3.34%
14	2407	Reserpine Tabs 0.25Mg (Tablet of 0.25 Mgs)	293,188	89,108.21	3.30%
15	2668	Nifedipine Tabs 30Mg Slow Release (Tablet of 30.00 Mgs)	139,146	88,528.38	3.28%
16	3954	Rifam 300Mg Inh150Mg Tabs (tablet of 1.00 TABLET)	83,400	86,652.60	3.21%
17	3154	Enalapril Tabs 10Mg (Tablet of 10.00 Mgs)	304,640	82,569.40	3.06%
18	0139	Levonorgestrel Oestradiol Tabs (Triphasil) (Packet of 28.00 Tablets)	36,300	82,401.00	3.05%
19	0122	Salbutamol M.D.I. Complete 100McG 300 Dose (Unit of 300.00 DOSEs)	11,595	80,962.91	3.00%
20	2061	Sodium Chl 0.9% 1000 Ml (Vacoliter of 1000.00 Ml)	11,700	74,689.20	2.76%
				2,785,037.37	

Primary Health Care

Paediatric

TOTAL ISSUE VALUE: (Excl. VAT & Service Fee) **10,231,132.17**

% of TOTAL ISSUE VALUE: **27.22%**

PURCHASES BY HOSPITALS

Top 20 Pharmaceutical Items

1	2549	Vaccine Hib-Dtp 10 Dose (Vial of 1.00 VIAL)	1,895	310,306.25	3.04%
2	0247	Perindopril Tabs 4Mg (Tablet of 4.00 MGs)	482,888	295,423.98	2.90%
3	0137	Norethisterone Inj 200 Mg/ml Long Acting (Vial of 200.00 MGs)	48,000	234,105.60	2.30%
4	2278, 0608, 0609	Hydrochlorothiazide Tabs 25Mg (Tablet of 25.00 MGs)	1,900,032	198,668.57	1.95%
5	2374, 2286, 0636	Methyldopa Tabs 250Mg (Tablet of 250.00 MGs)	1,249,292	186,126.36	1.83%
6	2668	Nifedipine Tabs 30Mg Slow Release 28 (Tablet of 30.00 MGs)	246,904	156,787.63	1.54%
7	2897	Rifam 120Mg Pza 300Mg Inh 60Mg Etha 200 Mg (Tablet of 1.00 TABLET)	231,000	135,232.40	1.33%
8	2716	Ciprofloxacin Tabs 500 Mg 10 (Tablet of 500.00 MGs)	26,610	133,795.08	1.31%
9	3983	Carbamazepine Tabs 200 Mg) (Tablet of 200.00 MGs)	391,800	131,906.00	1.29%
10	0210	Insulin Actraphane Hm 100Iu/ml 10Ml (Vial of 10.00 Mls)	4,452	126,761.80	1.24%
11	0080	Ceftriaxone Inj 1G/vial + Diluent (Vial of 1.00 GRAM)	1,941	116,168.85	1.14%
12	3026	Carbamazepine Tabs 400Mg (Tablet of 400.00 MGs)	180,000	108,960.00	1.07%
13	0136	Medroxyprogesterone Inj 150Mg/ml 1Ml (Vial of 150.00 MGs)	23,250	103,774.59	1.02%
14	0093	Beclomethasone M.D.I 100 McG 200 Dose (Unit of 200.00 DOSEs)	5,005	102,162.07	1.00%
15	3954	Rifam 300Mg Inh 150Mg Tabs (Tablet of 1.00 TABLET)	94,200	97,873.80	0.96%
16	3154	Enalapril Tabs 10Mg 28 (Tablet of 10.00 MGs)	357,672	97,214.82	0.95%
17	2058	Ringers Lactate Sol. 1000 Ml (Vacoliter of 1000.00 Ml)	12,720	79,255.68	0.78%
18	0281	Vaccine Hepatitis B Paed.10 Dose Vial (Vial of 10.00 DOSEs)	2,460	78,498.60	0.77%
19	3320	Amoxycillin Caps 250Mg (Capsule of 250.00 MGs)	543,900	77,233.80	0.76%
20	2407	Reserpine Tabs 0.25Mg 28 (Tablet of 0.25 MGs)	230,076	69,926.67	0.69%
Primary Health Care				**2,840,182.55**	

Paediatric

TOTAL ISSUE VALUE: (Excl. VAT & Service Fee) **10,197,723.47**

% of TOTAL ISSUE VALUE: **27.85%**

PURCHASES BY HOSPITALS

Top 20 Pharmaceutical Items

1	0247	Perindopril Tabs 4Mg (Tablet of 4.00 Mgs)	550,844	336,998.49	11.66%
2	3967	Chlorpheniramine Tabs 4Mg 100 (Tablet of 4.00 Mgs) *	221,200	196,646.80	6.80%
3	2897	Rifam 120Mg Pza 300Mg Inh 60Mg Etha 200Mg Tab (Tablet of 1.00 TABLET)	313,500	196,439.10	6.80%
4	0137	Norethisterone Inj 200Mg/ml Long Acting (Vial of 200.00 Mgs)	39,300	191,673.96	6.63%
5	3270, 0038	Flucloxacillin Caps 250Mg (Capsule of 250.00 Mgs)	297,800	180,812.48	6.26%
6	2286, 0636, 2374	Methyldopa Tabs 250Mg (Tablet of 250.00 Mgs)	1,081,320	176,084.94	6.09%
7	0210	Insulin Actraphane Hm 100Iu/ml 10Ml (Vial of 10.00 Mls)	5,804	169,529.30	5.87%
8	2058	Ringers Lactate Sol. 1000 Ml (Vacoliter of 1000.00 Ml)	24,768	153,757.42	5.32%
9	2278, 0608, 0609	Hydrochlorothiazide Tabs 25Mg (Tablet of 25.00 Mgs)	1,392,062	142,796.08	4.94%
10	0093	Beclomethasone M.D.I. 100 McG 200 Dose (Unit of 200.00 DOSEs)	6,975	142,368.08	4.93%
11	2668	Nifedipine Tabs 30Mg Slow Release 28 (Tablet of 30.00 Mgs)	178,800	117,630.60	4.07%
12	2716	Ciprofloxacin Tabs 500 Mg 10 (Tablet of 500.00 Mgs)	22,330	112,275.24	3.88%
13	0139	Levonorgestrel Oestradiol Tabs (Triphasil) (Packet of 28.00 Tablets)	48,400	109,868.00	3.80%
14	3154	Enalapril Tabs 10Mg 28 (Tablet of 10.00 Mgs)	460,292	102,414.97	3.54%
15	0080	Ceftriaxone Inj 1G/vial + Diluent (Vial of 1.00 Gram)	1,709	102,283.90	3.54%
16	0136	Medroxyprogesterone Inj 150 Mg/ml 1 Ml (Vial of 150.00 Mgs)	22,225	99,039.31	3.43%
17	3429	Amoxycillin Clavulan Inj 1000Mg/200Mg (Vial of 1.00 VIAL)	4,310	95,062.42	3.29%
18	3983	Carbamazepine Tabs 200 Mg (Tablet of 200.00 Mgs)	271,980	91,566.60	3.17%
19	3954	Rifam 300Mg Inh 150Mg Tabs 20 (Tablet of 1.00 TABLET)	84,460	87,722.47	3.04%
20	2407	Reserpine Tabs 0.25Mg (Tablet of 0.25 Mgs)	280,420	85,227.65	2.95%
Primary Health Care				**2,890,197.81**	

Paediatric

TOTAL ISSUE VALUE: (Excl. VAT & Service Fee) **11,343,620.50**

% of TOTAL ISSUE VALUE: **25.48%**

* Product was out of stock. Many backorders to satisfy. Higher price because product had to be bought out.

PURCHASES BY HOSPITALS

Top 20 Pharmaceutical Items

1	2549	Vaccine Hib-Dtp 10 Dose (Vial of 1.00 VIAL)	1,605	262,818.75	10.88%
2	0247	Perindopril Tabs 4Mg (Tablet of 4.00 Mgs)	343,560	210,185.10	8.70%
3	0137	Norethisterone Inj 200Mg/ml Long Acting (Vial of 200.00 Mgs)	42,700	204,326.64	8.46%
4	2278, 0608	Hydrochlorothiazide Tabs 25Mg (Tablet of 25.00 Mgs)	1,744,020	180,727.20	7.48%
5	2668	Nifedipine Tabs 30Mg Slow Release (Tablet of 30.00 Mgs)	255,702	162,480.62	6.73%
6	2716	Ciprofloxacin Tabs 500 Mg (Tablet of 500.00 Mgs)	28,240	141,990.72	5.88%
7	2897	Rifam 120Mg Pza 300Mg Inh 60Mg Etha 200Mg Tab (Tablet of 1.00 TABLET)	218,500	136,912.10	5.67%
8	2058	Ringers Lactate Sol. 1000 Ml (Vacoliter of 1000.00 Ml)	20,316	125,999.84	5.22%
9	3026	Carbamazepine Tabs 400 Mg (Tablet of 400.00 Mgs)	183,810	111,266.32	4.61%
10	0036	Erythromycin Susp 125Mg/5 ml 100 Ml (Bottle of 100.00 Mls)	14,183	91,338.52	3.78%
11	0210	Insulin Actraphane Hm 100iu/ml 10 Ml (Vial of 10.00 Mls)	2,762	90,441.69	3.75%
12	0136	Medroxyprogesterone Inj 150Mg/ml 1 Ml (Vial of 150.00 Mgs)	19,175	85,355.39	3.53%
18	2455, 2974, 0034	Erythromycin Tabs 250 Mg 20 (Capsule of 250.00 Mgs)	256,800	78,616.30	3.26%
13	3485	Sodium Chl 0.9% Inj 50 Ml (Bag of 50.00 MLs)	25,140	77,179.80	3.20%
15	3270, 0038	Flucloxacillin Caps 250 Mg (Capsule of 250.00 Mgs)	113,200	74,491.48	3.08%
14	2061	Sodium Chl 0.9% 1000 Ml (Vacoliter of 1000.00 Ml)	11,880	73,871.02	3.06%
17	3154	Enalapril Tabs 10Mg (Tablet of 10.00 Mgs)	317,800	70,710.50	2.93%
19	0357	Mist Tussi Infans Mi xt 100 Ml(Bottle of 100.00 Mls)	40,500	67,635.00	2.80%
20	0093	Beclomethasone M.D.I . 100 McG 200 Dose (Unit of 200.00 DOSEs)	3,240	66,128.40	2.74%
Primary Health Care				**2,414,703.63**	

Paediatric

TOTAL ISSUE VALUE: (Excl. VAT & Service Fee) **8,986,847.88**

% of TOTAL ISSUE VALUE: **26.87%**

PURCHASES BY HOSPITALS

Top 20 Pharmaceutical Items

1	2286, 0636, 2374	Methyldopa Tabs 250Mg (Tablet of 250.00 Mgs)	3,782,960	533,996.08	14.51%
2	0247	Perindopril Tabs 4Mg (Tablet of 4.00 Mgs)	468,692	286,739.07	7.79%
3	2897	Rifam 120Mg Pza 300Mg Inh 60Mg Etha 200Mg Tab (Tablet of 1.00 TABLET)	419,500	262,855.56	7.14%
4	2716	Ciprofloxacin Tabs 500Mg (Tablet of 500.00 Mgs)	50,270	252,760.09	6.87%
5	2545	Vaccine Hib-Dtp Single Dose (Vial of 1.00 VIAL)	10,490	226,475.80	6.15%
6	0137	Norethisterone Inj 200 Mg/ml Long Acting (Vial of 200.00 Mgs)	45,000	218,996.81	5.95%
7	0136	Medroxyprogesterone Inj 150Mg/ml 1 Ml (Vial of 150.00 Mgs)	47,425	211,064.26	5.74%
8	2278, 0608, 0609	Hydrochlorothiazide Tabs 25Mg (Tablet of 25.00 Mgs)	1,812,802	190,296.52	5.17%
9	0210	Insulin Actraphane Hm 100Iu/ml 10 Ml (Vial of 10.00 Mls)	5,468	179,038.52	4.87%
10	3983, 0535	Carbamazepine Tabs 200Mg (Tablet of 200.00 Mgs)	476,380	150,804.60	4.10%
11	2668	Nifedipine Tabs 30Mg Slow Release (Tablet of 30.00 Mgs)	229,208	145,553.97	3.96%
12	2058	Ringers Lactate Sol. 1000 Ml (Vacoliter of 1000.00 Ml)	21,972	136,270.34	3.70%
13	3954	Rifam 300Mg Inh 150Mg Tabs (Tablet of 1.00 TABLET)	126,160	131,020.18	3.56%
14	3270, 0038	Flucloxacillin Caps 250 Mg 20 (Capsule of 250.00 Mgs)	204,480	123,400.85	3.35%
15	2455, 0034, 2974	Erythromycin Tabs 250 Mg 20 (Capsule of 250.00 Mgs)	401,020	121,796.74	3.31%
16	3429	Amoxycillin Clavulan Inj 1000Mg/200Mg (Vial of 1.00 VIAL)	7,395	116,693.10	3.17%
17	0080	Ceftriaxone Inj 1G/vial + Diluent (Vial of 1.00 Gram)	1,707	102,165.67	2.78%
18	0139	Levonorgestrel Oestradiol Tabs (Triphasil) (Packet of 28.00 Tablets)	43,600	98,972.00	2.69%
19	0093	Beclomethasone M.D.I. 100 McG 200 Dose (Unit of 200.00 DOSEs)	4,848	98,947.68	2.69%
20	0476	Miconazole Nitrate Gel 2% 30Gm (Tube of 30.00 Gms)	2,890	92,017.60	2.50%
				3,679,865.44	

Primary Health Care

Adult

Paediatric

TOTAL ISSUE VALUE: (Excl. VAT & Service Fee) [redacted]

% of TOTAL ISSUE VALUE: [redacted]

* Product was out of stock. Many backorders to satisfy. Higher price because product had to be bought out.