A study on medicine expiry within the supply chain in Limpopo Province

by

Emelda Khataza Motlanthe

(Student number: 210438832)

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Faculty of Health Sciences

Department of Pharmacy

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Supervisor : Prof Gous

Co- Supervisor: Ms EA Helberg

DECLARATION

I, Emelda Khataza Motlanthe, hereby declare that the dissertation, hereby submitted to the University of Limpopo for the degree of MSc (Med) in Pharmacy has not previously been submitted by me for the degree at this or any other University, that it is my work in design and in execution, and that all material contained herein has been duly acknowledged.

_____. _____.

Initials and surname Date

DEDICATION

I dedicate this dissertation to

- my parents, Mr. Harry and Johanna Baloyi, and
- my lovely family, my husband Dr Masila Stephen Motlanthe, my little kids Betty, Thato, Tumelo and Tshegofatso.

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Nothing in life is ever successful without the corporate effort of many people who are willing to network and submit their experiences, talents, knowledge and common goal.

This work is purely mine with the help of countless individuals whose thoughts, ideas, lot of work and support have really opened my mind and made me to understand how much I need others in order to gain the exposure to the knowledge I have gained.

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TABLE OF CONTENTS

Contents

LIST OF ABBREVIATIONS

ARVs	-	Anti-retroviral drugs
COMED	-	Coordinating Body for Medical Supplies
DoH	-	Department of Health
DSM	-	Drug Supply Management
EDL	-	Essential Drug List
EDP	-	Essential Drug Program
EEL	-	Essential Equipment List
FEFO	-	First expiry first out
FIFO	-	First in first out
GPP	-	Good Pharmacy Practice
LP	-	Limpopo Province
MDS	-	Managing Drug Supply
MTBF	-	Medium Term Budget Framework
MTEF	-	Medium Term Expenditure Framework
MTFF	-	Medium Term Fiscal Framework
NDoH	-	National Department of Health
NDP	-	National Drug Policy
PDSX	-	Pharmaceutical Distribution System
PFMA	-	Public Finance Management Act
PHC	-	Primary Health Care
SA	-	South Africa
SANDP	-	South African National Drug Policy
SOP	-	Standard Operating Procedure
STG	-	Standard Treatment Guideline
WHO	-	World Health Organization

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

ANNEXURE

Annexure A: Limpopo Province 2007 Pharmaceutical Depot tender specification

Annexure B: Limpopo Province Guidelines on the disposal

Annexure C: 2008 Community Service Pharmacist‘s Depot presentation

SUMMARY

The Limpopo Province Pharmaceutical Services has been experiencing many challenges with regard to expiry of medicines. In the 2007/8 financial year, the budget for medicine and related items was exhausted by October 2007. The Pharmaceutical Services Directorate had to then motivate for more funds and at the same time had to seek approval for the disposing of lists of expired stock. This prompted the Directorate to investigate the management of expired stock within the province:

Discussions held at the various Pharmacy and Therapeutic Committees indicated that the following challenges are currently experienced within institutions in the province

- Overspending on allocated budgets by facilities,
- Increased amount of expired stock at facility levels,
- Information systems not being reliable,
- Lack of facility formularies,
- Lack of implementation of standard treatment guidelines by facilities and
- Lack of accountability by managers with regard to procurement of medicines.

The aim of this study was to identify reasons for medicines expiry in order to prevent loss of expenditure through efficient and effective management of medicines within healthcare facilities.

The objectives of the study were to:

- Record the value of medicines expired over the study period in the health care facilities,
- Determine the reasons for medicines to expire,
- Determine the financial loss due to the medicine expired,
- Determine if there is a need to train health care workers on the efficient and effective management of medicines,
- Identify other ways of preventing medicine expiry.

A retrospective, quantitative descriptive study was conducted during the period July 2007 till June 2008. Previous records of evaluations and statistics on expired medicines of the Limpopo Province were analysed. The stock management principles were analysed to investigate the main reasons for stock expiry within the supply chain.

The budget over the study period was calculated and compared to the total value of issues to various facilities. The loss of expenditure through expired stock was therefore recorded to determine the percentage loss of expenditure.

The average percentage of expired stock per month was used and compared with the allowed average percentage of expired stock in the province which is 0.05% (Annexure C)

- The total value of expired stock within the study period was R1 009 998.79, i.e. an average of 0.07 % per month.
- The reasons for expired medicine within the province were:
  - Poor drug selection within facilities,
  - Poor procurement practices,
  - Lack of internal control measures,
  - Frequent stock shortages from manufactures hence bulk stocking by managers,
  - Lack of training in drug supply management,
  - Lack or inadequate supervision and monitoring of drug management systems,
  - Centralised budget and lack of accountability for overspending by managers.
- The total value of overspending by facilities is at R149 962 821.53 on an annual basis.
- The possible ways of preventing medicine expiry include:
  - Improving inventory management,
  - Entrenching good procurement practices within facilities,
  - Instilling accountability for funds on officials responsible for procurement of medicines,

- Supervision and monitoring of drug supply management.
- Strengthening the enforcement and monitoring roles of the Pharmaceutical Depot Manager – Regulatory Affairs and Quality.

To conclude, expiry of medicines is a challenge within the Limpopo Province and the overall stock management principles need to be improved. The following aspect should be taken into consideration.

- Effective management will make a vital difference in all aspects of drug supply. It is especially true with respect to procurement and distribution of essential drugs.
- Wise drug selection underlines all other improvements in the supply chain management. The establishment institutional formulary is perhaps the most cost effective action that any health care system or health care provider can take to promote regular supply and rational use of medicines
- The strengthening of the therapeutic drug committees. Such committees must monitor progress within the province with regard to drug supply management.
- The responsibility of procuring should be given to those who are trained. The responsible person should adhere to the policies and procedures from the Department of Health for procurement.
- There should be a system in place that is aimed at ensuring that there is accountability of pharmacy managers at various facilities. This will bring about responsibility and better medicine supply management skills within the pharmaceutical directorate.
- The province should be able to cope up with a system which can be able to capture reliable information and maintains quality information. The system should be linked to a provincial office which will be able to monitor on a continuous basis the information from different facilities. The systems would be able to provide early warning signs such as possible expiry of medicines, overstocking, and unnecessary overspending of the budget, irrational drug usage, at any facility and be able to correct discrepancies on time.

CHAPTER 1

1.1 INTRODUCTION

1.1.1 Background and introduction

Limpopo, South Africa's northernmost province, borders onto Mozambique, Zimbabwe and Botswana, making it the ideal entrance to Africa. Named after the Limpopo River that flows along its northern border, the province is rich in wildlife, spectacular scenery and a wealth of historical and cultural treasures. Limpopo has a strong rural basis. Its growth strategy centres on addressing infrastructure backlogs, the alleviation of poverty and social development. The province is linked to the Maputo Development Corridor through the Phalaborwa spatial development initiatives, which is a network of rail and road corridors connecting to the major seaports, which will open up Limpopo for trade and investment. This is complemented by the presence of smaller airports in centres such as Phalaborwa and Musina, as well as the Gateway International Airport in Polokwane. The airport caters for about 38 000 passengers a year. The province covers 123 910 square kilometer with an estimated population of 5.4 million which translates into a population density of 44 people per square kilometer (South Africa Yearbook, 2009/10)

According to Limpopo Province Department of Health and Social Development, the population of Limpopo province accounts for 11.3% of South Africa's population of 47.9 million. (Department of Health, 2008). This makes it the fourth most populated province in the country. It is youthfully populated with 37% of the population being children aged fourteen years or younger while the economically active population (15-64 years) makes up 57.6%. Females outnumber the males with the former constituting 53% (Department of Health, 2008).

The management of stock and inventory is at the heart of the drug supply system; some people may even suggest that inventory management is drug

management. Without a healthy inventory management system, the drug supply system, as a whole will not be viable. Drug supply entails order, receive, store, issue, and then reorder a limited list of items. Poor inventory management in the public drug supply system leads to waste of already limited financial resources, shortages of essential drugs, and a decrease in the quality of patient care (Olson & Savelli, 1997:209)

Improving health care outcomes have already been linked to effective management of expired medicines by Ruhoy and Daughton volume 388:137-148 (2007). These authors have focused on obtaining comprehensive data on left over drugs and their disposal, as they believe that such data could help foster the optimization of prescribing and dispensing practices within the health care communities. This could further improve communication between health care workers and patients for better adherence to medication regimens (Ruhoy, Daughton, 2007).

The 2008, Limpopo Province Annual Performance Plan indicated some of the challenges that are encountered by the Pharmaceutical Services directorate which are as follows:

- There is a shortage of pharmacists,
- There is a high turn-over rate of pharmacists positions,
- Provincial Pharmaceutical Therapeutics Committee (PTC) fully functional. Institutional PTC functionality is at 90% and the provincial department's target is 100%
- Hospital pharmacies are experiencing problems in obtaining transport to deliver medicines to clinics.
- Stock availability at the depot is 92% (95% target), hospitals 93% (95% target) and clinics 90% (92% target).
- Most pharmacy support personnel and other health care professionals are not trained in line with pharmacy legislation (Department of Health, 2008)

According to the Department of Health, 1996, the following problems might have led to the expiry of medicines in the country at large (Department of Health, 1996)

- Irrational use of drugs,
- Losses through malpractice,
- Cost ineffective procurement and logistic practices.

The procurement of pharmaceutical stock has been outsourced to a private procurement, warehousing and distribution company since 1995. The main aim was to capacitate the departmental personnel in managing procurement, warehousing and distribution. The current contractor's term is coming to an end in January 2011 (Annexure A).

As a way of controlling and minimizing wastage, before the study can be conducted, the Pharmaceutical Services Directorate came up with the guidelines on management and safe disposal of expired stock (Annexure B), which was distributed to all the institutions, all institutions are required to adhere to these guidelines. Several meetings and presentations were held within the province with the pharmacy managers to create a greater awareness on the importance of good stock management. (Annexure C). The drafting of the stock disposal guidelines were done before this study.

The Pharmaceutical Services Directorate then decided that it is necessary to have an indicator that specifies the desired percentage of expired stock versus expenditure. Institutions are expected not to exceed this figure. This indicator was fixed at 0.05%, i.e. value of expired stock versus the total expenditure which originated from the Pharmaceutical Directorate Managers. (Annexure C)

During 2005, the Directorate of Limpopo Pharmaceutical Service handed in a motivation for the recruitment and retention of pharmacists to the General Manager: Provincial Health Service to ensure enough staff for this directorate in order to render quality pharmaceutical services. The emphasis of the written motivation was on the basis of:

- Ensuring the availability of medicines at all times,

- Training of health care service providers on stock management principles,
- Effective management of the pharmaceutical budget,
- Compliance of all health care service providers with applicable Acts, policies and procedures and appropriate standards (Annexure A)

1.1.2 Research question

What are the reasons for medicines to expire in the supply chain in Limpopo Province and how much money does the Province waste on expired medicines?

1.1.3 Aim of the study

The aim of the study is to identify reasons for medicines expiry in order to prevent loss of expenditure through efficient and effective management of medicines within healthcare facilities in the Limpopo province.

1.1.4 Objectives of the study

The objectives of the study are to:

- Record the value of medicines expired over the study period in the health care facilities, and determine financial loss due to medicine expired,
- Determine the reasons for medicines to expire,
- Determine if there is a need to train health care workers on the efficient and effective management of medicines,
- Identify other ways of preventing medicine expiry.

1.1.5 Motivation and significance of the study

According to a study conducted by The Nigerian Ministry of Health in 2002 on the “Baseline assessment of The Nigerian Pharmaceutical Sector”, seven percent of the baskets of key drugs on health facility shelves were expired (Nigerian Ministry of Health, 2002). It was also observed that there were large quantities of expired drugs in the stores due to either poor drug management or

inadequate drug disposal procedures. However, no expired drugs were found on the shelves in the private sector. This apparent compliance of the private sector should be viewed with caution as re-labeling, concealing of stocks of expired drugs in stores are some of the problems that the drug regulatory authority in Nigeria has to constantly grapple with. The Nigerian study recommended that in order to improve access there should be an improvement in drug management with adequate documentation through:

- Improving drug storage facilities and inventory management especially at the Primary Health Care (PHC) levels,
- Enhancing the efficiency of drug management through regular in-service training of drug managers,
- Entrenching good procurement practices into the drug management system,
- Sustaining supervision and monitoring of drug management especially at the PHC levels,
- Improving attendance to public health facilities through ensuring availability of essential medicines and mobilizing the community,
- Strengthening the enforcement and monitoring roles of the pharmacists' regulatory authority. (Nigerian Ministry of Health, 2002)

In a study conducted by Coma, *et al.,* (2007), the objectives were to monitor the amount of unused drugs and the cost to the public health system.

The main reasons of unused drugs were:

- Expiry of the medicine (28.2%),
- That the patients' condition had improved and there was no need for further therapy (24.9%),
- Patient had died (20.8%).

The authors confirmed the importance of analyzing why medicines were returned and its impact on the health expenditure. It also highlighted the inadequacies of the Spanish Health System in the areas of prescribing,

dispensing and usage of medicines. The recommendation was to establish strategies to reduce wastage of unused medicines (Coma *et al*.,2008).

During a baseline survey of pharmaceutical sector in Tanzania in 2002 it was found that there were no expired drugs in private facilities. However, in the public facilities 13% of key drugs expired (Tanzania Ministry of Health, 2002).

Currently no studies could be found that were conducted in South Africa with regard to expiry of medicines within a supply chain.

On an annual basis Limpopo Province always overspend the allocated pharmaceutical budget with approximately 10 to 20 %.(Department of Health, 2008). There is also a concern on the frequency, generally on a monthly basis, by which the institutions are requesting for the approval of disposal of expired and damaged stock. The value of expired stock in 2007/8 financial year which were to be disposed of on a monthly basis is averaging at R 409 410.74 which is about 1.29% of the total budget allocated. The main reasons for the expiry of drugs in the Limpopo Province are unknown. (Department of Health, 2008)

It is therefore important to conduct the study on medicine expiry within the supply chain in Limpopo Province.

CHAPTER 2

2.1 LITERATURE REVIEW

2.1.1 **Introduction**

This chapter will cover the National Drug Policy (NDP) and the Essential Drug Concept, the Drug Supply Management (DSM) framework and the financial legal, policy and procedural framework that governs DSM in the public sector. Finally, the challenge of expired medicines will be highlighted.

The problem of expired stock is not unique to South Africa and in a study done in Minnesota (United States of America) it was estimated that at least 250 million pounds of drug waste and drug-contaminated packaging are thrown away each year. Included in this estimate are expired or spoiled drugs (Gutierrez, 2009).

Anecdotal evidence suggests that poor storage conditions such as, excessive heat, moisture and lights, as well as poor needs estimation and stock control management, are amongst the principal causes of drug expiration in health facilities (Mohammed Ali, 2000). According to Keizer (2007) large buffer stock is amongst the factors that can cause high losses of stock due to expiry.

In a study conducted by Coma *et al.,* (2008), the objective was to monitor the amount of unused drugs and the cost to the public health care system. The main reasons cited why drugs were returned to the pharmacy were:

- Expiry dates of the medicines (28.2%),
- The patients' condition had improved and there was no need for further therapy (24.9%),
- Patient had died (20.8%).

The above mentioned literature but also the lack of literature emphasizes the importance of correct stock management to prevent expired stock.

2.1.2 The National Drug Policy and Essential Programme

Essential medicines are those that satisfy the priority health care needs of the population. They are selected with due regard to public health relevance, evidence on efficacy and safety, and comparative cost-effectiveness. Essential medicines are intended to be available within the context of functioning health systems at all times in adequate amounts, in the appropriate dosage forms, with assured quality and adequate information, and at a price the individual and the community can afford (WHO, 2002).

The South African government implemented the National Drug Policy (NDP) in 1996. The main goal of the NDP was to ensure an adequate and reliable supply of safe, cost effective drugs of acceptable quality to all the citizens of South Africa and the rational use of drugs by prescribers, dispensers and consumers. One of the economic objectives of the NDP was to lower the cost of drugs in both the private and the public sector whereas the national development objective was to improve the knowledge, efficiency and management skills of pharmaceutical personnel (Department of Health, 1996).

The overall goal of drug policies from other African countries is very similar to that of South Africa. For example in Tanzania (Tanzania National Drug Policy, 1991)

- The overall objective of the NDP is to make available to all
- Tanzanians at all times the essential pharmaceutical products which are of quality, proven effectiveness and acceptable safety at a price that the individual and the community can afford, when these are needed to prevent, cure or reduce illness and suffering.
- In addition to making pharmaceutical products available, the NDP aims at rationalizing the use of drugs through better information, prescription and compliance. Rational use of drugs includes the availability of alternative methods of treatment, when the use of pharmaceutical products is unnecessary.

- The NDP aims at developing and supporting the national pharmaceutical industries with a view to increase local production, thus encouraging self reliance.
- The National Drug Policy aims at using the potential of traditional medicines of acceptable safety side by side with allopathic medicines, when such treatment is acceptable to the individual (Tanzania National Drug Policy, 1991).

According to the NDP, Standard Operating Procedures (SOPs) will be developed with practical guidelines to cover all administrative procedures to manage and control effectively the storage and distribution of drugs and medical supplies, including methods to define minimum and maximum stock levels, guidelines on systematic stock rotation and handling of expired and obsolete stock. These SOPs will be used for training and supervision of staff and will be updated regularly (Department of Health, 1996).

Appropriate functional staffing structures for public sector depots and institutional stores will be defined to include the correct rank, occupational class and personnel establishment levels. Effective and standardized security systems will be developed and implemented in all public sector depots. The turn-over of drugs and medical supplies will be monitored with the aid of a systematic and practical information gathering process. This information will be used to determine the quantities to be procured (Department of Health, 1996).

2.1.3 The Drug Supply Management Framework

The Medicine Control Council (MCC) will review legislation and regulations in order to support the objectives of the NDP and liaise frequently with relevant departments and organizations active in the implementation of the policy, e.g. the NDP Consultative group, the South African Drug Action Program and governmental procurement and distribution agencies. The Medicines Control Council will play a prominent role in facilitating the harmonization of drug regulation and control in Southern Africa. This process will include: sharing of review decisions and exchange of evaluation reports without compromising

confidentiality; adoption of criteria for drug evaluation and for Good Manufacturing Practice (GMP); and promoting the use of the WHO Certification Scheme for the Quality of Pharmaceuticals moving in International Commerce (Department of Health, 1996).

Only drugs which are registered in South Africa may be imported, produced, stored, exported and sold. All companies which wish to register products for marketing in the country will be issued with licenses if all registration and Good Manufacturing Practice (GMP) requirements are met. All licenses will be reviewed periodically. The current drug registration procedure will be adapted to meet needs within the policy framework. Formal procedures for registration, based on quality, efficacy and safety will be upgraded through introduction or strengthening of (Department of Health, 1996):

- A five-year re-licensing system for drugs,
- Computerization of the evaluation system,
- An evaluation report exchange system with reputable regulatory bodies in other countries,
- Prioritization of registrations, based on need,
- Fast-track procedures for essential drugs,
- Norms and standards for registration of medical devices (Department of Health, 1996).

Special attention will be given to the needs of health providers in primary health care environments. This step may include rescheduling of certain drugs to improve patient access to appropriate treatment (Department of Health,1996).

Drugs are part of the link between the patient and health services. Consequently, their availability or absence will contribute to the positive or negative impact on health. Secondly, poor drug management, particularly in the public sector of developing countries is a critical issue, but major improvements are possible that can save money and improve access (Quick *et al*.,1997).

Looking at the fact that drugs are no longer the responsibility of the health worker alone, political, economical, financial and traditional considerations have

become so crucial in health care that it has become imperative to look at drugs and health care from these perspectives (Quick et al,. 1997).

Drugs should be managed appropriately to contribute to:

- Appropriate financial expenditure,
- Avoiding wastage,
- Increase access,
- Ensure that drugs are properly used (Quick et al,. 1997).

Proper drug management may also be a source of revenue, which can be used to cater for other health care needs and in particular for disadvantaged populations (WHO, 2004).

There are four basic functions in the Drug Supply Management Framework (Quick et al,. 1997).

- Selection
- Procurement
- Distribution
- Use

Selection

According to the South African Pharmacy Council medicines should be selected in the following manner (Good Pharmacy Practice, 2010)

- A Pharmacy and Therapeutic Committee responsible for the selection of pharmaceuticals for the facility and promotion of rational drug use.
- A code list or an Essential Drug List (EDL) and/or a formulary should be used as a basis for medicine therapy and promotion of rational drug use. The Pharmacy and Therapeutic Committee should be responsible for the formulary

- Pharmaceutical usage review programs must be developed to ensure maximum patient benefit and cost effectiveness (Good Pharmacy Practice, 2010)

The selection of drugs on the National Essential Drugs List will be based on the following criteria:

- Must meet the health needs of the majority of the population
- Sufficient proven scientific data must be available regarding the effectiveness of any such product
- Products should have a substantial safety and risk/benefit ratio
- The aim, as a general rule will be to include, as far as possible, only products containing single pharmacologically active ingredients.
- Combination products may, as an exception, be included
- Where patient compliance becomes an important factor or two pharmacologically active ingredients
- Are synergistically active in a product
- When two or more drugs are equivalent in the above respects, preference will be given to those which have:
    - The best cost advantage,
    - Best pharmacokinetic properties,
    - Has been the best researched,
    - The best patient compliance,
    - The most reliable local manufacturer (department of health, 1996).

Procurement

According to the NDP, (1996), all public sector institutions will procure essential drugs through the public sector tender system. In the long term this system will be extended to non-governmental organizations (NGOs) and the private sector. The system for issuing and administering the tenders will be computerized and standardized. A system for supplier performance monitoring will be established. Information from this system will be used in the adjudication of new drug supply contracts (Department of Health, 1996).

A computer system will be developed to record drug purchases by provincial authorities and other organizations, in order to improve the forecasting of annual needs. To facilitate this, all institutional purchases will be channeled through the depots, either for ex-stock deliveries or merely for recording purposes. Provincial administrations will be requested to adopt the use of standardized public sector Coordinating Body for Medical Supplies (COMED) or compatible systems. This includes the use of the National Codification System and the participation in national tenders for EDL and Essential Equipment List (EEL) items. National tender prices will be monitored and compared with international prices. Preference will be given to national manufacturers (Department of Health, 1996).

Notwithstanding this preference, procurement will aim at securing the lowest available prices for products of defined specifications (Department of Health, 1996).

COMED is responsible for the procurement of medicines for the national public health sector. All the public sector institutions procure essential drugs through the public sector tender system. The annual budget for the procurement of drugs is based on proper quantification of estimates based on the population served, the morbidity and related consumption data (Department of Health, 1996).

Although COMED is responsible for all activities including national procurement of medicines, there have been many outcries about stock shortages from most provinces, and poor supplier performance of those suppliers who were awarded tenders to supply essential medicines (Department of Health, 1996).

The government will thus reserve the right to consider procurement on the international market, which includes the options of parallel importation and purchasing on the international generic market. Drug procurement and distribution for the public sector will be limited to drugs on the national list of essential drugs, and to products registered for use in South Africa. A fast-track

registration procedure will be established for products which are procured solely for the public sector (Department of Health, 1996).

Distribution

The primary management goal 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 way. A good distribution system is a cost-effective system. A well-run distribution system should:

- Maintain a constant supply of drugs;
- Keep drugs in good condition;
- Minimize drug losses due to spoilage and expiry;
- Rationalize drug storage points
- Use available transport as efficiently as possible;
- Reduce theft and fraud;
- Provide information for forecasting drug needs. (Quick et al,. 1997).

Senior management should regularly monitor the cost and performance of the distribution system as important indicators of the health care system's operations. Major alterations in the system should be introduced only after careful evaluation and planning, taking into account available human and material resources (Quick et al,. 1997).

Use

The aim of the 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 rational use of drugs (Quick et al,. 1997).

Depending on the context, however many factors influence what is considered rational. For the purpose of the study rational use may include the following criteria:

- Correct drug
- Appropriate indication – that is, the reason to prescribe is based on sound medical considerations;
- Appropriate drug, considering efficacy, safety, suitability for the patient, and cost;
- Appropriate dosage, administration, and duration of treatment;
- Appropriate patient – that is, no contraindications exist, and the likelihood of adverse reactions is minimal;
- Correct dispensing, including appropriate information for patients about the prescribed medicines;
- Patient adherence to treatment (Quick et al., 1997).

To conform to the criteria, prescribers should follow a standard process of prescribing, which starts with a diagnosis to define the problem that requires intervention. Next, the therapeutic goal should be defined. The prescriber must decide which treatment is required, based on up-to-date drug and therapeutic information, to achieve the desired goal for individual patient. When the decision to treat the patient with drugs is made, the best drug for the patient is selected based on efficacy, safety, suitability, and cost (Quick et al., 1997).

Managers and policy-makers collect data about drug utilization for various reasons. These reasons can be grouped into three general categories (MSH in collaboration with WHO, 1997):

- To describe current patterns of drug use

- Measure consumption of particular drugs or therapeutic groups of drugs;
- Compare use by individual health facilities or prescribers;
- Decide whether drug use is clinically justified or cost effective;
- Learn about the influence of prescribing on pharmaceutical costs.

- To correct specific drug problem
  - Find out about the factors that cause specific problem practices;
  - Identify and correct problems in prescribing, dispensing, or patient use.
- To monitor drug use over time
  - Monitor quality of care within a health facility or geographic area;
  - Monitor the efficiency and cost effectiveness of prescribing (Quick *et al*., 1997).

2.1.4 The financial legal, policy and procedural framework of Drug Supply Management in SA

The Constitution of South Africa stipulates that government departments may only spend funds allocated and /or approved by the Public Finance Management Act 1999, as amended by Act 29 of 1999, (PFMA). Therefore the Department‘s expenditure may never be more than its approved income, as this constitutes unauthorised expenditure (South African Constitution, 1996).

The Department experienced over-spending in the 2006/2007 financial year, after two years of being within the budget. The Department was implementing measures such as strengthening of internal control and cash flow, improving financial quality control and monitoring and evaluation to prevent recurrence in the next financial year (Department of Health and Social Development, 2007).

The National Treasury will increasingly complement its role of assessing the quality and credibility of budget bids with an assessment of past performance of

departments and assess quantifiable outputs related to departmental programmes. It is important that departments familiarize themselves with the content of the Medium Term Expenditure Framework (MTEF) guideline in order to continue the drive towards improving non-financial information reported in budget documents, annual reports and other relevant publications.

The link between strategic planning, budgeting and spending plans is important in compiling a credible budget, as inadequate planning could lead to budgets which do not give effect to strategic priorities. In recognition of the different planning needs of policy departments, as opposed to service delivery departments, the National Treasury is developing further guidance on simplifying and improving planning and budgeting processes.

In order to measure the success of government programmes and to accelerate the implementation of these programmes, the National Treasury will continue to assess the efficacy of public spending, or whether value for money has been obtained on past spending.

The Medium Term Fiscal Framework (MTFF) contains a statement of fiscal policy objectives, which are the financial or monetary policies that will finally directly affect the study as a result of financial loss due to expiry of medicines. It also contains a set of integrated medium–term macroeconomic and fiscal targets and projections which assist in the projections of the usage of allocated funds to the Department (Department of Finance, 2007).

The second level of MTEF is the Medium Term Budget Framework (MTBF), where funds are allocated to programmes within government departments. The estimated funds for public spending is based on departmental spending, based on departmental spending plans and are aligned with the funds available through the MTEF. It is therefore imperative that spending within programmes remain within the allocated budget to prevent pressure on the MTEF. The PFMA acknowledges this by declaring this overspending as a financial misconduct (Department of Finance, 2007).

The PFMA clearly states that public institutions should avoid unauthorised, fruitless expenditure where expired stock will be taken as a wasteful expenditure by the Department. The PFMA gives responsibility to all officials as to how to manage their finances within their area of work and hence the accountability of all the losses through wasteful expenditure. Recently terms such as economy, efficiency, effective and performance have become meaningless in Public Service Finance dialogue. However the politicians and the media frequently reports on overspending, wasteful expenditure and the inability to spend allocated funds by the government. (News 24: 2010)

Section 45 of the PFMA, 1999 states the following responsibilities of other officials, which include pharmacists and the pharmacy managers, to

- Ensure that the system of financial management and internal control is established for that department, trading entity and it is carried out within the area of responsibility of that official.
- Be responsible for the effective, efficient, economical and transparent use of financial and other resources within that officials' area of responsibility.
- Take effective and appropriate steps to prevent, within that officials 's area of responsibility, any unauthorised expenditure and any under collection of revenue due
- Comply with the provisions of this act to the extent applicable to that official, including any delegations and instructions in terms of section 44,
- Be responsible for the management, including the safeguarding of the assets and the management of the liabilities within that official's area of responsibility (Department of Finance, 2005).

The accounting officer of an institution must exercise all reasonable care to prevent and detect unauthorized, irregular, fruitless and wasteful expenditure, and must for this purpose implement effective, efficient and transparent processes of financial and risk management. When an official of an institution discovers unauthorized, irregular or fruitless and wasteful expenditure, that

official must immediately report such expenditure to the accounting officer. In the case of a department, such expenditure must also be reported in the monthly report, as required by section 40(4)(b) of the Act. Irregular expenditure incurred by a department in contravention of tender procedures must also be brought to the notice of the relevant tender board or procurement authority, whichever applicable (Department of Finance, 2005).

The pharmaceutical budget is the second biggest budget or expenditure of the Department of Health after the personnel budget. The budget allocated for medicines alone is usually not enough to cover up for the financial year; hence there is usually a transfer of funds from one budget to the other. In the Limpopo province the budget is centralised at the provincial depot (Department of Health and Social Development, 2007).

2.1.5 Expiry of medicines

Few countries have adequate administrative provisions for writing-off pharmaceutical stock. In the public sector drugs are the property of the state, for which strict accounting procedures are necessary. If procedures exist at all, they tend to be complicated and time-consuming, and in practice the disposal of expired stock is difficult. This applies both to drugs that are procured through the normal channels and to donated drugs (WHO, 2001).

Administrative and regulatory procedures concerning safe disposal of pharmaceuticals which are in line with national drug and environment legislation, should be adopted and implemented in countries that receive drug donations (WHO, 2001).

Simplifying procedures in general would probably be the best solution. One approach would be to state that donated drugs are not entered into the government inventory or considered state property unless specifically accepted as such. In this case any drug that is not officially accepted can be destroyed without the need for governmental approval; however, correct disposal procedures must be followed. A further solution would be to establish special,

simplified, administrative procedures for writing-off unwanted donations (WHO, 2001).

According to the NDP, the disposal of expired and unwanted drugs should be done promptly, efficiently and safely. The policy states that the Department of Health (DoH) in cooperation with the private sector and in consultation with the pharmaceutical depots will ensure that an appropriate method is applied for the removal and disposal of expired, returned and damaged stock. There would be authorised inspectors who will carry out regular inspections to ensure that the disposal of unwanted stock is in accordance with prescribed guidelines (Department of Health, 1996).

The WHO has guidelines for safe disposal of unwanted pharmaceuticals in and after emergencies, which are available on their website (WHO, 2001).

The WHO guidelines stated that pharmaceuticals which should never be used and should always be considered as pharmaceutical waste, the list of which is stated below (WHO, 2001):

- All expired pharmaceuticals,
- All unsealed syrups,
- Opened eye drops,
- All cold chain items damaged and unexpired pharmaceuticals that should have been stored in a cold chain but were not (for example insulin, polypeptide hormones, gamma globulins and vaccines),
- All bulk or loose tablets and capsules. If unexpired these should only be used when the container is still sealed, properly labelled or still within the original unbroken blister packs,
- All unsealed tubes of creams, ointments, expired or unexpired (WHO, 2001).

Expiry of medicines within the supply chain, even after the implementation of the NDP, poses a serious challenge to all provinces.

Achieving financial sustainability in medicine supply is of utmost importance. Financial sustainability is achieved only when expenditures and financial resources balance and are sufficient to support a given level of demand. If demand for medicines exceeds the available resources the health system is left only with the following four options (Quick *et al*., 1997).

- To improve efficiency,
- To increase financial resources,
- To reduce demand for medicines,
- To accept decline in quality care.

When the components of financial sustainability are not in balance it simply defies economic reality to promise constant availability of high-quality essential drugs without improving efficiency, increasing financing or limiting demand (Quick *et al*.,1997).

To achieve financial sustainability, policy makers and essential medicines program managers must become familiar with economic concepts and methods related to cost containment, efficiency, cost effectiveness analysis, public expenditure decisions, the role of public and private sectors and the economics of regulation (Quick *et al*., 1997).

According to (Nakyanzi *et al*., 2010) factors that can contribute to medicine expiry are:

- Medicines procured with short shelf life,
- Medicines affected by abrupt cessation of use/treatment policy change,
- Expensive medicines (slow turnover),
- Medicines that treat rare diseases.

Poor coordination appears to be responsible for some expiry incidents. For example, expiry due to treatment policy change and duplicate procurement can be prevented by sound coordination between key stakeholders. Even though a medicine procurement and supply management task force was set up by Uganda's Ministry of Health to plan the phasing out of chloroquine and

sulfadoxine/pyrimethamine, the expiry of large stocks of the latter suggests a serious lapse in coordination. Countries undertaking similar ventures should involve their national medicine regulatory agencies at all stages of the transition process to guide local production and to curtail entry of phased-out medicines into the market well before implementation of the change (Nakyanzi et al, 2010)

Similarly, better coordination between government projects or vertical programmes and public medical stores can ameliorate the problem of overstocking associated with duplicate procurement, as well as harmonize medicine quantification with prescribing habits and preferences of consumers to ensure procurement matches turnover. This can be achieved with the involvement of prescribers in determining the scope and quantities of supplies, and the use of surveys of consumer tastes and preferences to determine suitable dosage forms for example. Medicines with slow and unpredictable turnover are generally prone to expiry (Nakyanzi *et al*.,2010)

2.1.6 Conclusion

Managing medicine supply or logistics of drug supply directly affects the quality of healthcare. If medicine supply is inconsistent, patients and staff will lose motivation due to stock shortages and inconsistent supplies of chronic medicines. Everyone will lose confidence in the system and therefore patient attendance to the healthcare will decrease.

A constant medicine supply promotes effective healthcare, inspires confidence in the system and contributes to job satisfaction among the staff.

Avoiding expired medicines as part of inventory management is actually at the heart of a medicines supply system. Every facility needs an effective inventory management system to deal with ordering supplies, receiving, storing stock, issuing, re-ordering and accounting for stock.

The methodology of the study is described in the next chapter.

CHAPTER 3

3.1 METHODOLOGY

3.1.1 INTRODUCTION

This chapter describes the methodology of the research study, the sampling method is provided, the setting is discussed and the chapter ends with the discussion of the ethics of the study.

The general aim of this research study was to identify reasons for medicines expiry in order to prevent loss of expenditure through efficient and effective management of medicines within healthcare facilities in the Limpopo province

The specific objectives of the study were to

- Record the value of medicines expired over the study period in the health care facilities
- Determine the reasons for medicines to expire
- Determine the financial loss due to the medicine expired
- Determine if there is a need to train health care workers on the efficient and effective management of medicines
- Identify other ways of preventing medicine expiry

3.1.2 The design of the study

3.1.2.1 Research design

A retrospective, quantitative, descriptive study approach was followed.

3.1.2.2 Study period

The study was conducted for the period July 2007 till June 2008

3.1.2.3 Setting and study site

The study was conducted in the Limpopo province. This province has five districts, one pharmaceutical depot and 42 hospitals.

The statistics from the hospitals at Limpopo Province indicated that there were 42 hospitals during the year 2007. This included Phalaborwa hospital, which was downgraded into a primary healthcare facility during 2007/2008 financial year. For the purposes of this study Phalaborwa 'hospital' was thus excluded as a hospital.

3.1.2.4 Sample

All 41 hospitals were included in this study.

3.1.3 Data Collection

3.1.3.1 Sources of data

The data for this study were retrieved from previous records of data collected by the pharmacy managers within the province. The following records were used

- The previous statistics of expired stock incorporated by the province as part of data collection at Limpopo province which included the following
  - Reports on the availability of Pharmacy and Therapeutic Committees and the functions of these committees at facility levels.
  - Reports of stock usage by facilities and average prescribed drugs per patient.
  - Reports of budget usage by facilities compared to the allocated budget.

- Evaluation reports on stock management principles by facilities showing reports on the following :
  - Medicine storage areas
  - Housekeeping
  - Ordering, issues and receiving
  - Stock usage

3.1.3.2 Data collection

Two data collection tools (Appendix A) were used and copies are available in the Appendices. The following data were collected

- Data of expired stock from facilities collected over a period of a year, from July 2007 to June 2008. The data was then tabulated using the Microsoft Excel program.
- Data on stock management principles was extracted from the existing evaluation tool from Limpopo Province (Appendix A)
- The researcher was involved in the consolidation of all data collected by pharmacy managers, analysis and interpretation thereof.

3.1.4 Data consolidation, analysis and interpretation

The value of expired stock per facility was calculated and compared to the actual allowed percentage of expired stock in the province.

A descriptive statistical analysis was performed to get the averages of percentages of the stock management principles.

The table with critical indicators was extracted from the spreadsheets and they are reflected further on in this document. The indicators were developed by Limpopo pharmaceutical services as a tool of monitoring performance within the hospital pharmacies.

3.1.5 Ethical approval

Permission to conduct the study was granted by the University of Limpopo's Medunsa Campus Research and Ethics Committee. The ethical number for the research is MREC/H/219/2008:PG

Permission for this research was also obtained from the Provincial Ethical Committee.

3.1.6 Conclusion

The above mentioned research methodology was used successfully in conducting this study. The findings are presented in the next chapter.

CHAPTER 4

4.1 RESULTS

4.1.1 INTRODUCTION

The chapter will cover the results for each objective of the study:

- Value of medicines expired over the study period in the health care facilities,
- Reasons for medicines to expire,
- Financial loss due to the medicine expired,
- Need to train health care workers on the efficient and effective management of medicines,
- Ways of preventing medicine expiry.

4.1.2 Demographic characteristics

Table 4.1: Demographic characteristics

District	Hospitals	Number of beds	Number of pharmacists	Number of community pharmacists	Number of intern pharmacists	Total
Sekhukhune district	Philadelphia	330	2	4	0	6
	St Ritas	402	7	1	2	10
	Dilokong	144	5	1	0	6
	Groblersdal	40	5	1	0	6
	Jane Furse	252	6	1	2	9
	Matlala	220	5	0	0	5
	Mecklenburg	74	3	0	1	4
	Total	1482	33	8	5	46
Vhembe	Donald Frazer	349	5	1	1	7
	Elim	325	4	1	0	5
	Hayani	24	0	0	0	0
	Louis Trichardt	52	2	1	0	3
	Malamulele	300	3	1	0	4
	Messina	65	2	1	0	3
	Siloam	220	4	2	0	6

District	Hospitals	Number of beds	Number of pharmacists	Number of community pharmacists	Number of intern pharmacists	Total
	Tshilidzini	430	3	1	0	4
	Total	1765	23	8	1	32
Waterberg	Ellisras	82	2	1	0	3
	FH Odendaal	201	1	1	0	2
	George Masebe	113	3	1	1	5
	Mokopane	210	3	3	3	9
	Thabazimbi	55	3	1	0	4
	Voortrekker	91	5	1	0	6
	Warmbaths	133	3	0	2	5
	Witpoort	59	1	1	0	2
	Total	944	21	9	6	36
Capricorn	Botlokwa	84	2	0	0	2
	Hellen Franz	119	0	2	0	2
	Lebowakgomo	220	5	3	4	12
	Seshego	139	3	1	2	6
	Thabamoopo	18	1	0	0	1
	W F Knobel	120	4	1	2	7

District	Hospitals	Number of beds	Number of pharmacists	Number of community pharmacists	Number of intern pharmacists	Total
	Zebediela	74	1	0	0	1
	Total	774	16	7	8	31
Mopani	Dr CN Phatudi	130	1	3	1	5
	Duiwelskloof	17	0	0	0	0
	Evuxakeni	0	1	0	0	1
	Kgapane	178	3	1	2	6
	Letaba	351	2	1	1	4
	Maphutha Malatji	117	2	2	1	5
	Nkhensani	318	3	1	0	4
	Sekororo	137	3	1	2	6
	Van Velden	68	2	1	1	4
	Total	1316	17	10	8	35
Complex (Tertiary hospitals)	Mankweng	482	10	0	8	18
	Polokwane	493	14	1	12	27
	Total	975	24	1	20	45
Grand Total		7236	134	43	48	225

4.1.3 Value of medicines expired over the study period in the health care facilities

The following table indicates the total value of expired medicines in the various hospitals within the Limpopo Province over the study period. The data on table 4.2 will be able to indicate the study year budget, patient day equivalent of each facility, the total value of expired stock and the amount overspent by each facility during the period of study. The data is collected per district to indicate how much each district has lost on expired medicines and on overspending.

4.1.4 Value of expired medicines per hospital

The value of financial loses of expired medicines per hospital due to expired stock and overspending is presented in Table 4.2.

Table 4.2: Value of expired medicine

Hospital Names	District	Study year budget allocated	Study Year budget allocated/PDE	Patient Days Equivalent (PDE)	AMOUNT OVERSPENDING	Total expired	Total Expired/ PDE	%(actual expired stock) vs. issues
Botlokwa	CAPRICORN DISTRICT	**R 1,398,898.57**	**R 65.52**	21351	R 4,376,402.41	R 23,754.62	R 1.11	0.41%
Helene Franz		**R 2,360,121.45**	**R 62.75**	37613	R 3,716,333.76	R 172,569.85	R 4.59	2.84%
Lebowakgomo		**R 4,391,802.66**	**R 61.57**	71326	R 6,754,457.69	R 3,333.29	R 0.05	0.03%
Seshego		**R 2,280,794.26**	**R 45.53**	50092	R 6,939,787.16	R 16,624.44	R 0.33	0.18%
Thabamopoo		**R 904,592.40**	**Unknown**	unknown	R 350,108.67	R 35,719.19	Unknown	2.85%
W.F. Knobel		**R 2,767,583.08**	**R 70.81**	39082	R 4,153,224.08	R 2,379.03	R 0.06	0.03%
Zebediela		**R 1,873,577.29**	**R 78.25**	23944	R 2,103,374.39	R 9,506.89	R 0.40	0.24%
	Capricorn Total	**R 15,977,369.71**	**R 65.64**	243407	R 28,393,688.16	R 263,887.31	R 1.08	
Dr C.N. Phatudi	Mopani district	**R 3,061,589.08**	**R 68.28**	44836	R 8,441,698.56	R 10,949.23	R 0.24	0.10%
Duiwelskloof		**R 415,840.82**	**Unknown**	Unknown	R 215,787.32	R 0.00	Unknown	0.00%
Evuxakeni		**R 437,341.18**	**Unknown**	Unknown	R 185,434.09	R 4,529.73	Unknown	0.73%
Kgapane		**R 3,622,261.66**	**R 73.34**	49388	R 6,941,715.56	R 26,518.95	R 0.54	0.25%
Letaba		**R 6,738,556.00**	**R 81.97**	82209	R 7,082,980.98	R 21,198.71	R 0.26	0.15%
Maphuta L Malatjie		**R 2,300,794.26**	**R 56.13**	40992	R 7,876,686.30	R 19,687.00	R 0.48	0.19%
Nkhensani		**R 5,279,080.62**	**R 77.01**	68549	R 9,052,505.51	R 58,133.07	R 0.85	0.41%
Sekororo		**R 2,683,546.41**	**R 70.86**	37869	R 1,156,204.11	R 2,833.28	R 0.07	0.07%

Hospital Names	District	Study year budget allocated	Study Year budget allocated/PDE	Patient Days Equivalent (PDE)	AMOUNT OVERSPENDING	Total expired	Total Expired/ PDE	%(actual expired stock) vs. issues
Van Velden		**R 1,977,736.27**	**R 116.57**	16966	R 3,321,024.70	R 7,548.93	R 0.44	0.14%
	Mopani Total	**R 26,516,746.30**	**R 77.80**	340811	R 44,274,037.13	R 151,398.90	R 0.44	
Dilokong	Sekhukhune district	**R 3,066,237.40**	**R 64.38**	47625	R 1,239,976.43	R 2,775.22	R 0.06	0.06%
Groblersdaal		**R 1,820,425.60**	**R 79.11**	23011	R 1,642,493.44	R 19,756.47	R 0.86	0.57%
Jane Furse		**R 4,417,613.05**	**R 76.23**	57949	R 2,535,351.16	R 7,841.73	R 0.14	0.11%
Matlala		**R 2,162,568.01**	**R 64.55**	33501	R 249,280.32	R 13,237.05	R 0.40	0.55%
Mecklenburg		**R 1,583,057.52**	**R 63.74**	24838	R 563,379.75	R 8,115.47	R 0.33	0.38%
Philadelphia		**R 6,991,760.04**	**R 96.26**	72637	R 2,216,783.09	R 53,611.01	R 0.74	0.58%
St Ritas		**R 6,204,044.48**	**R 85.84**	72277	R 3,126,861.07	R 17,089.66	R 0.24	0.18%
	Sekhukhune Total	**R 26,245,706.10**	**R 79.09**	331837	R 11,574,125.26	R 122,426.61	R 0.37	
Mankweng	Tertiary Complex	**R 11,188,156.84**	**R 81.51**	137255	R 9,353,822.86	R 110,718.89	R 0.81	0.54%
Pietersburg		**R 12,951,448.15**	**R 91.48**	141584	R 16,970,384.91	R 114,322.40	R 0.81	0.38%
	Tertiary Complex Total	**R 24,139,604.99**	**R 86.57**	278840	R 26,324,207.77	R 225,041.29	R 0.81	
Donald Fraser	Vhembe District	**R 5,931,068.14**	**R 73.41**	80789	R 3,155,950.38	R 9,573.32	R 0.12	0.11%
Elim		**R 6,947,092.23**	**R 66.18**	104979	R 4,382,987.08	R 100,632.05	R 0.96	0.89%
Hayani		**R 318,306.94**	**Unknown**	Unknown	R 89,777.06	R 330.45	Unknown	0.08%
Louis Trichardt		**R 1,461,650.84**	**R 71.63**	20406	R 2,340,968.94	R 1,427.00	R 0.07	0.04%
Malamulele		**R 4,370,885.23**	**R 79.27**	55141	R 3,716,213.56	R 3,331.88	R 0.06	0.04%
Messina		**R 1,952,415.18**	**R 86.12**	22672	R 1,866,828.82	R 3,386.22	R 0.15	0.09%
Siloam		**R 4,231,741.56**	**R 63.28**	66872	R 1,799,399.74	R 9,805.92	R 0.15	0.16%
Tshilidzini		**R 9,872,024.11**	**R 78.95**	125043	R 6,384,103.79	R 34,574.37	R 0.28	0.21%
	Vhembe Total	**R 35,085,184.23**	**R 73.72**	475902	R 23,736,229.37	R 163,061.21	R 0.34	
Ellisras	Waterberg District	**R 1,091,436.91**	**R 56.49**	19322	R 2,068,009.29	R 42,062.69	R 2.18	1.33%
F.H. Odendaal		**R 2,047,461.02**	**R 66.15**	30953	R 1,554,654.62	R 14,885.29	R 0.48	0.41%
George Masebe		**R 1,987,338.72**	**R 61.50**	32314	R 1,553,844.29	R 7,503.55	R 0.23	0.21%
Mokopane		**R 5,843,133.23**	**R 77.00**	75887	R 2,648,035.94	R 0.00	R 0.00	0.00%
Thabazimbi		**R 1,409,968.90**	**R 68.50**	20583	R 1,245,756.81	R 23,344.64	R 1.13	0.88%
Voortrekker		**R 1,833,760.79**	**R 65.02**	28202	R 2,295,129.54	R 2,804.65	R 0.10	0.07%
Warmbad		**R 3,073,645.92**	**R 77.13**	39850	R 5,233,945.54	R 5,046.06	R 0.13	0.06%

Hospital Names	District	Study year budget allocated	Study Year budget allocated/PDE	Patient Days Equivalent (PDE)	AMOUNT OVERSPENDING	Total expired	Total Expired/ PDE	%(actual expired stock) vs. issues
Witpoort		**R 961,651.02**	**R 59.92**	16049	R 703,651.23	R 8,293.10	R 0.52	0.50%
	Waterberg Total	**R 18,248,396.51**	**R 69.34**	263160	R 17,303,027.26	R 103,939.98	R 0.39	
	Grand Total	**R 146,213,007.84**	**R 75.60**	1933958	R 151,605,314.95	R 1,029,755.30	R 0.53	

4.1.5 Value of medicines expired over the study period in the healthcare facilities

The total value of expired stock within the province during the study period has been indicated as R1 029 755.30 of the total issues to facilities which accounts for the total amount of the allocated budget. The allowed percentage of expiry of medicines in Limpopo province has been set at 0.05%. The value of stock that expired could have been used for other projects like ensuring compliance with legislations and procurement of essential medicines if timely intervention were made. Disposing of expired medicines requires funds for the collection and transporting to the accredited disposal area and this is in addition to the value resulting from expired stock, leading to request of more funds to procure the usable stock, thereby compromising service delivery.

All the districts given had a higher percentage of expired stock compared to the accepted value of expired stock within the province.

Table 4.3: Capricorn District Hospitals

Hospitals	Acceptable Limit (%)	Value of expired stock (%)	% exceeding limit
Botlokwa	0.05%	0.41%	0.36%
Helene Franz	0.05%	2.84%	2.79%
Lebowakgomo	0.05%	0.03%	-0.02%
Mankweng	0.05%	0.54%	0.49%
Polokwane	0.05%	0.38%	0.33%
Seshego	0.05%	0.18%	0.13%
Thabamoopo	0.05%	2.85%	2.80%
WF Knobel	0.05%	0.03%	-0.02%
Zebediela	0.05%	0.24%	0.19%

Capricorn District

- Capricorn district had an average of 1.65% of expired stock.
  - ⇒ Thabamoopo had the highest value of expired medicines at 2.85% of expired stock with the standard deviation of 2.8% from the normal acceptable limit of 0.05%. It is a psychiatric hospital and its patient day equivalent is unknown due to longer period of stay per patient at the facility. During the study period it had one pharmacist. It was allocated with lowest budget in the district of R904 583. Even though it had the lowest budget allocated it overspend by R350 000 and had the highest value of expired medicine.

  - ⇒ Helena Franz hospital had the second highest value of expired stock within the district at 2.84% with the standard deviation of 2.79% from the normal acceptable limit. During the study period it had no experienced pharmacist and had two community pharmacists being responsible for all pharmaceutical duties within the facility. The number of beds were at 119 and patient day equivalent (PDE) at 37613 which was the third highest in the district. The expired stock can be due to the pharmacy not having a pharmacist responsible for medicines or budget allocated to the facility hence overstocking. The expired stock per PDE at Helena Franz hospital was the highest and three times above the provincial average at R4.59.
  - ⇒ The value of expired stock at Botlokwa hospital was at 0.41% with the standard deviation of 0.36% from the normal acceptable limit of 0.05%. It had two pharmacists and 84 numbers of beds. PDE at Botlokwa hospital was at 21351. Botlokwa accounts for R1.11 of expired stock per PDE for the allocated budget which is the third highest in the district.

⇒ The value of expired stock at Zebediela hospital was at 0.24% with the standard deviation of 0.19% from the normal acceptable limit. It had one pharmacist and 74 numbers of beds. PDE at Zebediela was 23944, hence it accounts to R0.40 expired stock per PDE.

⇒ Seshego hospital had expired stock at 0.18% with the standard deviation of 0.13% from the normal acceptable limit of 0.05%. There were three pharmacists and the total number of beds were139 with PDE at 50 092. Seshego hospital is the regional hospital at Capricorn district and was allocated a budget lower than other district hospitals whereas the hospital had the second highest value of PDE in the district. Seshego hospital had an expired stock per PDE of R0.33.

⇒ Lebowakgomo had expired stock at 0.03% with the standard deviation of 0.02% from the acceptable limit. It had five pharmacists during the study period. Lebowakgomo had the highest number of pharmacists in Capricorn district and the numbers of beds were at 220. PDE at Lebowakgomo was at 71 326 and it accounted for expired stock per PDE of R0.05.

⇒ Knobel hospital had value of expired stock at 0.03% with the standard deviation of -0.02%. The hospital had four pharmacists with a total number of 120 beds. The PDE was at 39 082 and it accounted for expired stock per PDE of R0.03.

⇒ The average expired stock per PDE for the district is R1.08.

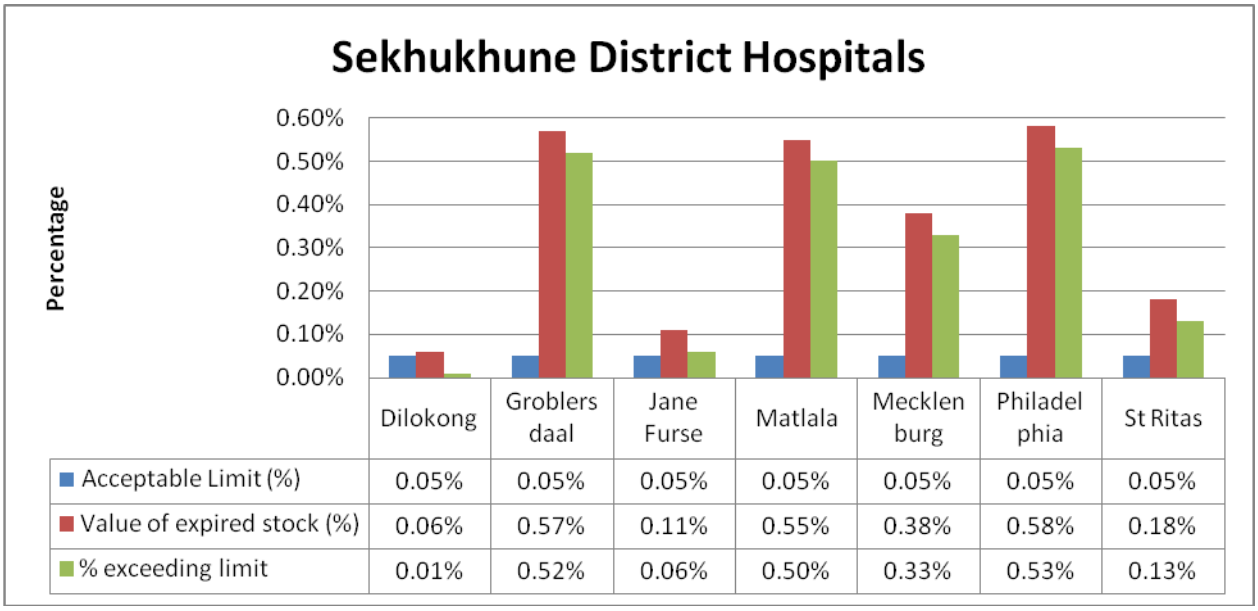


Figure 4.1: Sekhukhune District Hospitals

Sekhukhune district

- Sekhukhune district had an average of 0.46% of expired stock
  - ⇒ Philadelphia hospital had an expired stock at 0.58% with the standard deviation of 0.53% from the acceptable limit of 0.05%. It had 2 pharmacists, 330 number of beds and PDE was 72 637. This hospital was allocated with the fourth highest budget within the province and during the study period it was a new hospital taken from Mpumalanga Province. It accounts for R0.76 expired stock per PDE.
  - ⇒ Groblersdaal hospital had a value of expired stock at 0.57% with the standard deviation of 0.52% from the acceptable limit. During the study period it had five pharmacists and the number of beds was 40. The hospital had PDE of 23011. Groblersdaal was also a new hospital during the time of study from Mpumalanga Province. It accounts for R0.86 of expired stock per PDE for the budget allocated.
  - ⇒ Matlala hospital had an expired value of stock at 0.55% with the standard deviation of 0.5% form the acceptable limit of 0.05%. There were five pharmacists during the study period and the

number of beds was 220. The PDE of this hospital was at 33501 and it accounted for the expired stock per PDE of R0.40.

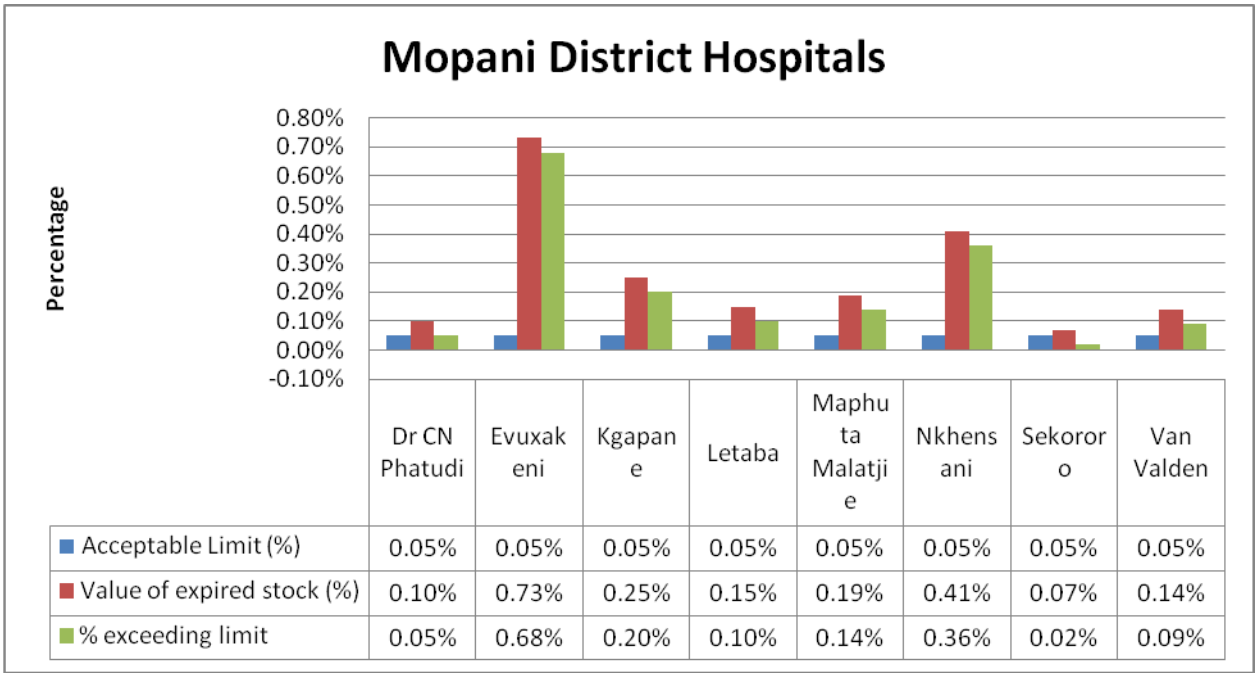
⇒ Mecklenberg had expired stock at 0.38% with the standard deviation of 0.33% from the normal acceptable limit of 0.05%. There were three pharmacists during the study period. The number of beds was at 74 and PDE was at 24838 and it accounted for expired stock per PDE of R0.33.

⇒ St Ritas hospital had a value of expired stock at 0.18% with the standard deviation of 0.13%.There were seven pharmacists during the study period. The number of beds was at 402 and PDE was at 72 277. The hospital accounted for the expired stock per PDE of R0.24.

⇒ Jane Furse hospital had a value of expired stock at 0.11% with the standard deviation of 0.06%. There were six pharmacists during the study period. The number of beds were 252 and PDE was at 57949. The hospital accounted for the expired stock per PDE of R0.14.

⇒ Dilokong hospital had a value of expired stock at 0.06% with the standard deviation of 0.01% from the acceptable limit of 0.05%. There were five pharmacists during the study period. The number of beds was 144 and PDE was at 47625.The hospital accounted for the expired stock per PDE of R0.06.

⇒ The average expired stock per PDE of Sekhukhune district was R0.37.



	Dr CN Phatudi	Evuxakeni	Kgapane	Letaba	Maphuta Malatjie	Nkhensani	Sekororo	Van Valden
Acceptable Limit (%)	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%
Value of expired stock (%)	0.10%	0.73%	0.25%	0.15%	0.19%	0.41%	0.07%	0.14%
% exceeding limit	0.05%	0.68%	0.20%	0.10%	0.14%	0.36%	0.02%	0.09%

Figure 4.2: Mopani District Hospitals

Mopani District

- Mopani district had an average of 0.57% of expired stock

  ⇒ Evuxakeni hospital had a value of expired stock at 0.73% with the standard deviation of 0.68% from acceptable limit of 0.05%. There was one pharmacist during the study period. The number of beds was not known and PDE was also not known. The hospital accounted for the expired stock per PDE of R0.06.

  ⇒ Nkhensani hospital had an expired value of stock at 0.41% with the standard deviation of 0.36% from acceptable limit. There were three pharmacists during the study period. The number of beds were 318, PDE was 68 549. It was allocated with the second highest budget within the district and its PDE was less than Maphutha Malatji's PDE. It accounted for the expired stock per PDE of R0.85.

  ⇒ Kgapane hospital had a value of expired stock at 0.25% with standard deviation of 0.20%. There were three pharmacists during the study period. The number of beds were 178 and the PDE was 49 386. It accounted for the expired stock per PDE of R0.54.

⇒ Maphutha Malatji had a value of expired stock at 0.19% with the standard deviation of 0.14%. There were two pharmacists during the study period. The number of beds were 117 and PDE was at 82 209. It accounted for the expired stock per PDE of R0.48.

⇒ Letaba hospital had the value of expired stock at 0.15% with the standard deviation of 0.10%. There were two pharmacists during the study period. The number of beds was 351 and PDE was at 40 992. It accounted for expired stock per PDE of R0.26. This is the regional hospital at the Mopani district.

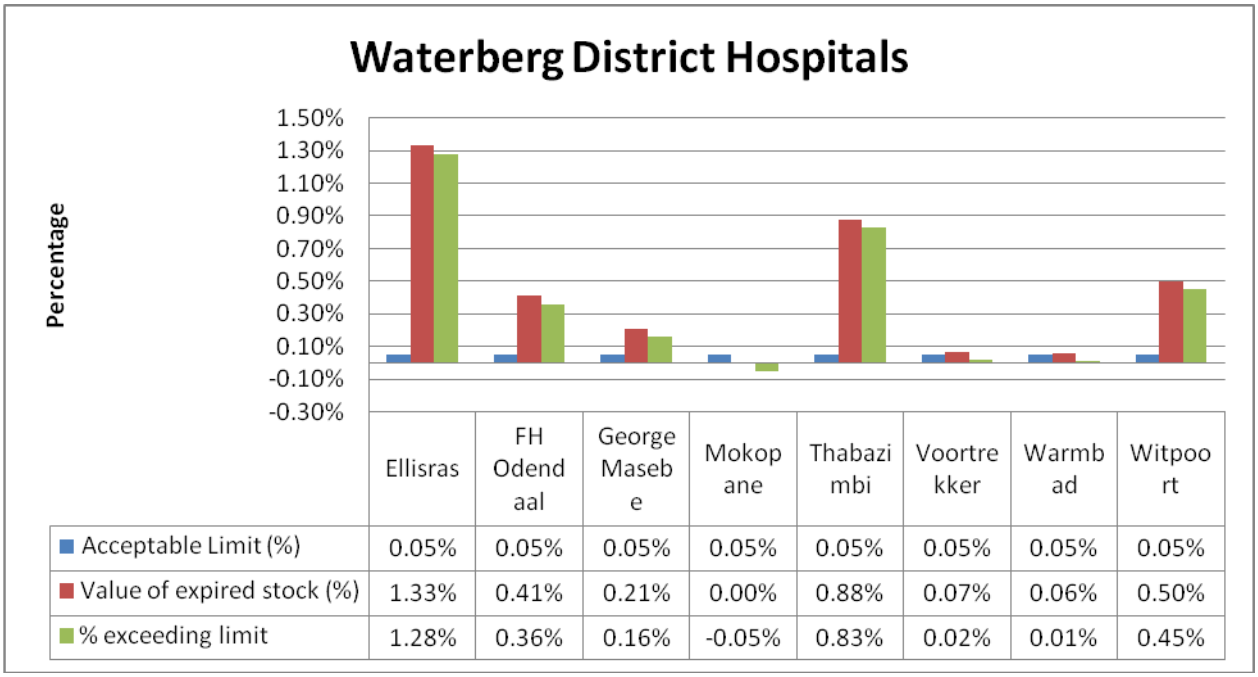
⇒ Van Velden hospital had the value of expired stock at 0.14% with the standard deviation of 0.09%. There were two pharmacists during the study period. The number of beds were 68 and the PDE was at 16 966. It accounted for the expired stock per PDE of R0.44.

⇒ C N Phatudi hospital had a value of expired stock at 0.1% with standard deviation of 0.05%. There was one pharmacist during the study period. The number of beds were 130 and the PDE was at 44 863. It accounted for the expired stock per PDE of R0.24.

⇒ Sekororo hospital had a value of expired stock at 0.07% with standard deviation of 0.02%. There were three pharmacists during the study period. The number of beds were 137 and the PDE was at 37 869. It accounted to the value of expired stock per PDE of R0.07.

⇒ Duiwelskloof hospital had zero stock expired and there was no pharmacist during the study period. The hospital pharmacy was managed by a registered nurse during the study period. The total number of beds were 17 and PDE unknown. This was a challenge to all other hospital pharmacies and the management of drug supply

⇒ The average expired stock per PDE of Mopani district is at R0.44 and the hospitals with highest expired stock per PDE were Kgapane hospital at R 0.54 and Van Velden hospital at R0.44.



	Ellisras	FH Odendaal	George Masebe	Mokopane	Thabazimbi	Voortrekker	Warmbad	Witpoort
Acceptable Limit (%)	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%
Value of expired stock (%)	1.33%	0.41%	0.21%	0.00%	0.88%	0.07%	0.06%	0.50%
% exceeding limit	1.28%	0.36%	0.16%	-0.05%	0.83%	0.02%	0.01%	0.45%

Figure 4.3: Waterberg District Hospitals

Waterberg district

- Waterberg district had an average of 0.56% of expired stock

  ⇒ Ellisras hospital had a value of expired stock at 1.33% with standard deviation of 1.28% from the normal acceptable limit of 0.05%.There were two pharmacists during the study period. The number of beds were 82 and PDE was at 19 322. The hospital accounted for expired stock per PDE of R2.18 which was the highest within the district.

  ⇒ Thabazimbi hospital had an expired stock value at 0.88% with the standard deviation of 0.83% from the acceptable limit of 0.05%.There were three pharmacists during the study period. The number of beds were 55 and PDE was 20 583. The hospital accounted for the expired stock per PDE for R1.13 which was the second highest within the waterberg district.

  ⇒ Witpoort hospital had the value of expired stock at 0.50% with standard deviation of 0.48% from the acceptable limit of 0.05%. There was one pharmacist during the study period. The number of beds were 59 and PDE was 16 049.

⇒ FH Odendaal hospital had a value of expired stock at 0.41% with the standard deviation of 0.36% from the acceptable limit. There was one pharmacist during the study period. The number of beds were 201 and PDE was 30 953. It accounted for the expired stock per PDE of R0.48.

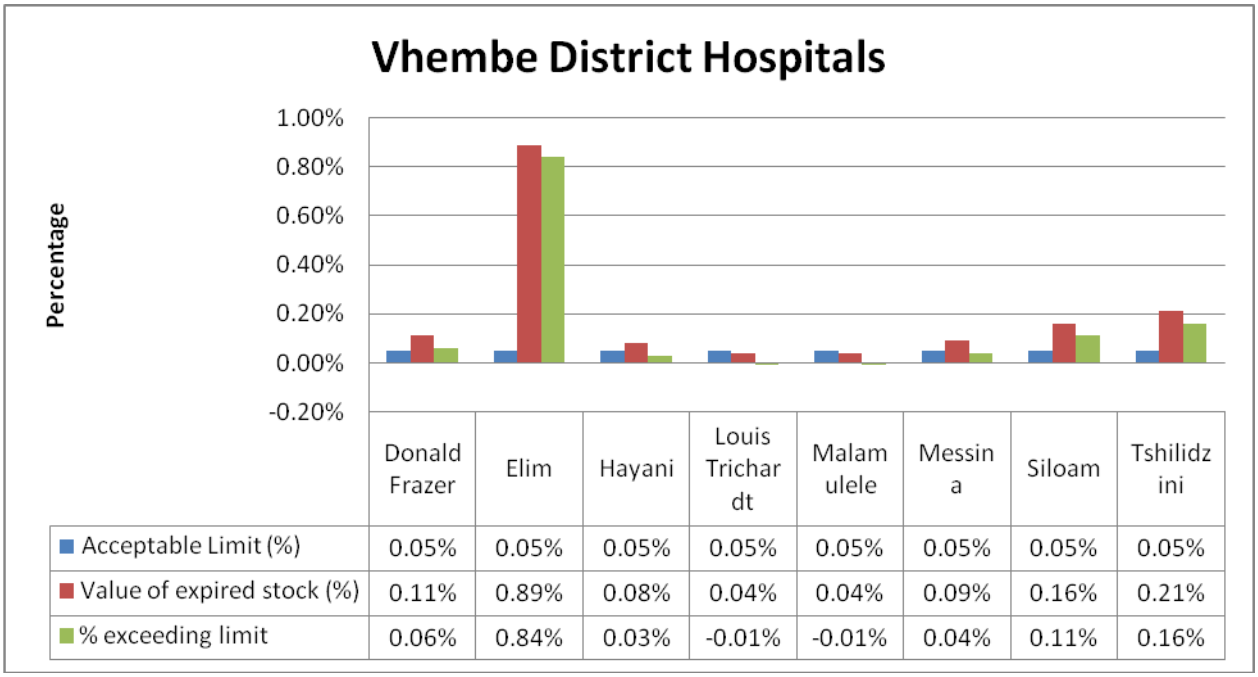
⇒ George Masebe hospital had a value of expired stock at 0.21% with the standard deviation of 0.16% from acceptable limit. There were three pharmacists during the study period. The number of beds were 113 and PDE was 32 314. It accounted for the value of expired stock per PDE of R0.23.

⇒ Voortrekker hospital had a value of expired stock at 0.07% with the standard deviation of 0.02% from the acceptable limit of 0.05%.There were five pharmacists during the study period. The number of beds were 91 number and PDE was 28 202. It accounted for the value of expired stock per PDE of R0.10.

⇒ Warmbad hospital had a value of expired stock at 0.06% with the standard deviation of 0.01% from the acceptable limit of 0.05%. There were three pharmacists during the study period. The number of beds were 133 and PDE was 39 850. It accounted for the value of expired stock per PDE of R0.52.

⇒ Mokopane hospital had zero stock expired during the study period with three pharmacists. The number of beds were 210 and PDE was 75 887.

⇒ The average expired stock per PDE of Waterberg district was at R0.39 and the hospitals above the average were Ellisras at R2.18, Thabazimbi hospital at R1.13 and Witpoort hospital at R0.52



	Donald Frazer	Elim	Hayani	Louis Trichardt	Malamulele	Messina	Siloam	Tshilidzini
Acceptable Limit (%)	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%
Value of expired stock (%)	0.11%	0.89%	0.08%	0.04%	0.04%	0.09%	0.16%	0.21%
% exceeding limit	0.06%	0.84%	0.03%	-0.01%	-0.01%	0.04%	0.11%	0.16%

Figure 4.4: Vhembe District Hospitals

Vhembe District

- Vhembe district had an average of 0.46% of expired stock

  ⇒ Elim hospital had a value of expired stock at 0.89% with the standard deviation of 0.84% from the acceptable limit of 0.05%. There were four pharmacists during the study period. The number of beds were 325 number and PDE was 104 979. It accounted for the expired stock per PDE of R0.96.

  ⇒ Tshilidzini hospital had a value of expired stock at 0.16% with the standard deviation of 0.16%. There three pharmacists during the study period. The number of beds were 430 and PDE 125 043. Tshilidzini was allocated the highest budget in the province following the two tertiary hospitals. It accounted for the expired stock per PDE of R0.28.

  ⇒ Siloam hospital had a value of expires stock at 0.16% with standard deviation of 0.11%. There were four pharmacists during the study period. The number of beds were 220 and PDE was 66 872. It accounted for the value of expired stock per PDE of R0.15.

  ⇒ Donald Frazer hospital had a value of expired stock at 0.11% with the standard deviation of 0.06%.There were five pharmacists

during the study period. The number of beds were 349 and PDE was 80 789. It accounted for the value of expired stock per PDE of R0.12.

⇒ Messina hospital had a value of expired stock at 0.09% with the standard deviation of 0.04%. There were two pharmacists during the study period. The number of beds was 65 and PDE was 22672. It accounted for the value of expired stock per PDE of R0.15.

⇒ Hayani hospital had a value of expired stock at 0.08% with the standard deviation of 0.03%.There was no pharmacist during the study period. The number of beds were 24 and PDE unknown

⇒ Malamulele hospital had a value of expired stock at 0.04% with three pharmacists during the study period. The number of beds were 300 and PDE was 55 144. It accounted for the value of expired stock per PDE R0.06.

⇒ Louistrichardt hospital had a value of expired stock at 0.04% with the standard deviation of 0.01% from the acceptable limit. There were two pharmacists during the study period. The Number of beds were 52 and PDE was 20 406. It accounted for the value of expired stock per PDE of R0.07.

⇒ The average expired stock per PDE of Vhembe district was at 0.34 which was the lowest in the province.

⇒ The hospital which was above the district average was Elim hospital with R0.96 of expired stock per PDE.

4.1.6 Reasons for medicines to expire in the 41 hospitals

From the Limpopo Province evaluation tool (Annexure D), the items reported on were relevant to the objectives of the study and were also in line with the strategic plan of the department.

There were seven indicators chosen in order to find out some reasons for medicine to expire within the province. These indicators were extracted from the evaluation

tool used by the Province to evaluate compliance of facilities with regard to pharmacy legislation.

The table has been broken down into districts in order to find out per district which facilities are complying and in particular which district is doing well in stock management for other districts to do benchmarking. The percentage compliance per facility is also indicated in order to show which facility is doing well in comparison to all other facilities.

Table 4.4: Reasons for medicines to expire in the 41 hospitals

Hospital	District	Minimum and Maximum Stock Levels Available	Orders from outlets are signed and dated by an authorized person	Does stock cards balance with physical stock on shelf	Expired Stock from Outlets returned as per policy	Written procedures are available for procurement and stock control	Facility has Hospital Formulary and PTC	Stock is packed according to FIFO and FEFO	% per facility
Seshego	Capricorn	C	C	NC	C	C	C	C	86%
WF KNCbel	Capricorn	C	NC	NC	C	C	NC	C	57%
Botlokwa	Capricorn	NC	C	NC	C	C	NC	C	57%
Thabamoopo	Capricorn	NC	NC	NC	C	C	C	C	57%
Zebediela	Capricorn	NC	C	NC	C	C	NC	NC	43%
Lebowakgomo	Capricorn	NC	NC	NC	C	NC	C	C	43%
Helena Franz	Capricorn	NC	NC	NC	C	NC	NC	C	29%
% C	**(n = 7)**	**28.57%**	**42.86%**	**0.00%**	**100.00%**	**71.43%**	**42.86%**	**85.71%**	
Nkhensani	Mopani	C	NC	NC	C	C	NC	C	57%
Letaba	Mopani	NC	C	NC	NC	C	NC	C	43%
Dr CN Phathudi	Mopani	C	C	NC	C	NC	NC	C	57%
Maphutha Malatjie	Mopani	C	C	C	C	C	NC	NC	71%

Hospital	District	Minimum and Maximum Stock Levels Available	Orders from outlets are signed and dated by an authorized person	Does stock cards balance with physical stock on shelf	Expired Stock from Outlets returned as per policy	Written procedures are available for procurement and stock control	Facility has Hospital Formulary and PTC	Stock is packed according to FIFO and FEFO	% per facility
Sekororo	Mopani	C	C	NC	C	C	NC	C	71%
Van Velden	Mopani	NC	C	NC	C	C	NC	C	57%
Kgapane	Mopani	C	C	NC	C	NC	C	C	71%
Evukaxeni	Mopani	C	C	NC	C	C	NC	NC	57%
Duiwelskloof	Mopani	C	NC	NC	NC	NC	NC	C	29%
% C	**(n = 9)**	**77.78%**	**77.78%**	**11.11%**	**77.78%**	**66.67%**	**11.11%**	**77.78%**	
Dilokong	Sekhukhune	C	C	NC	NC	NC	NC	C	43%
Mecklenburg	Sekhukhune	C	C	NC	C	C	NC	C	71%
Matlala	Sekhukhune	C	C	NC	NC	C	C	C	71%
Jane Furse	Sekhukhune	C	C	NC	NC	C	C	C	71%
ST Ritas	Sekhukhune	C	C	NC	C	NC	C	C	57%
Philadelphia	Sekhukhune	C	C	NC	NC	NC	C	C	14%
Groblersdaal	Sekhukhune	C	C	NC	NC	NC	C	C	57%
	(n=7)	**100.00%**	**100.00%**	**0.00%**	**28.57%**	**42.86%**	**71.43%**	**100.00%**	

Hospital	District	Minimum and Maximum Stock Levels Available	Orders from outlets are signed and dated by an authorized person	Does stock cards balance with physical stock on shelf	Expired Stock from Outlets returned as per policy	Written procedures are available for procurement and stock control	Facility has Hospital Formulary and PTC	Stock is packed according to FIFO and FEFO	% per facility
% C									
Elim	Vhembe	C	C	NC	C	C	NC	C	71%
Louis Trichardt	Vhembe	C	C	NC	C	C	NC	C	71%
Tshilidzini	Vhembe	NC	NC	NC	C	C	NC	C	43%
Donald Frazer	Vhembe	C	C	NC	C	C	NC	C	71%
Hayani	Vhembe	NC	C	NC	C	C	NC	NC	43%
Malamulele	Vhembe	NC	C	NC	C	C	NC	NC	43%
Messina	Vhembe	NC	C	NC	NC	C	NC	C	43%
Siloam	Vhembe	C	C	NC	C	C	NC	C	71%
% C	**(n=8)**	**50.00%**	**87.50%**	**0.00%**	**87.50%**	**100.00%**	**0.00%**	**75.00%**	
Mankweng	Tertiary Complex	C	NC	NC	C	C	NC	C	57%
Polokwane	Tertiary Complex	C	C	NC	C	C	NC	C	71%
% C	**(n=2)**	**100.00%**	**50.00%**	**0.00%**	**100.00%**	**100.00%**	**0.00%**	**100.00%**	

Hospital	District	Minimum and Maximum Stock Levels Available	Orders from outlets are signed and dated by an authorized person	Does stock cards balance with physical stock on shelf	Expired Stock from Outlets returned as per policy	Written procedures are available for procurement and stock control	Facility has Hospital Formulary and PTC	Stock is packed according to FIFO and FEFO	% per facility
Warmbath	Waterberg	C	C	C	C	C	C	C	100%
FH Odendaal	Waterberg	C	C	NC	C	C	C	C	86%
Thabazimbi	Waterberg	NC	C	NC	NC	C	NC	C	43%
George Masebe	Waterberg	C	C	NC	NC	C	NC	NC	43%
Mokopane	Waterberg	NC	NC	NC	NC	C	C	C	43%
Voortrekker	Waterberg	C	NC	NC	C	NC	NC	C	43%
Ellisras	Waterberg	C	NC	NC	C	C	NC	C	57%
Witpoort	Waterberg	C	C	NC	NC	C	C	C	71%
% C	**(n=8)**	**75.00%**	**62.50%**	**12.50%**	**50.00%**	**87.50%**	**50.00%**	**87.50%**	
% C (Grand Total)	**(n=41)**	**68.29% 28/41)**	**73.17% (30/41)**	**4.88% (2/41)**	**70.73% (29/41)**	**75.61% (31/41)**	**31.71% (13/41)**	**85.37% (35/41)**	

The results showed that the facilities had specific gaps in their inventory management which can lead to the deterioration and/or expiry of stock.

Capricorn

- ⇒ Seshego hospital complies with 6 indicators out of 7 chosen indicators accounting to 86% of compliance
- ⇒ The provincial average compliance of all facilities is at 58.54% roughly four out of seven indicators.

Sekhukhune

- ⇒ The district had three facilities with compliance above the provincial average namely, Mecklenburg hospital, Matlala hospital and Jane furse hospital.
- ⇒ The district also had the worst performing facility within the province with compliance of 14% or one out of seven indicators

Mopani

- ⇒ The district had three facilities performing above provincial average namely Sekororo hospital, Maphutha Malatji hospital and Van Velden hospital

Waterberg

- ⇒ The best performing hospital was found within the district which is Warmbaths hospital with compliance of 100%.
- ⇒ The other two facilities above provincial average were FH Odendaal hospital and Witpoort hospital

Vhembe

- ⇒ The district had four facilities with compliance above provincial average
- ⇒ The hospitals were Elim hospital, Louis Trichardts hospital , Donald Frazer hospital and Siloam hospital

4.1.6.1 Minimum and Maximum stock levels

Stock management is the essence of the drug supply system. Minimum and maximum stock levels, order quantities are based on sound forecast models

and also assist in accurate record keeping. Minimum and maximum stock levels assist in understanding inventory management.

Maximum stock (in units of issue) is equal to the average monthly consumption multiplied by the maximum stock factor. The art of inventory management is to ensure that the stock is replenished before the stock level falls below the safety stock level while not exceeding the maximum stock level. (Quick et al,. 1997)

Of the 41 facilities that were evaluated 32% (13/41), did not have maximum and minimum stock levels, a factor that can greatly contribute to overstocking which in turn may lead up to expiry of medicine as there is no guide on how much they need to keep or order. For a better stock management in a pharmacy, institutions should ensure that stock cards are implemented and maintained at all the times. If used correctly, this would enable the facility to track the usage patterns of all the products that are on the formulary list. Pharmacy managers have the responsibility of ensuring that all staff members know how to calculate the average monthly consumption and knowing the value would assist in the determination of minimum and maximum stock parameters. Without proper stock levels, institutions would not have a guide when placing an order to the provincial pharmaceutical depot, and these results in facilities overstocking especially in times when suppliers are failing to maintain the supply as estimated. Internal control measures need to be put in place to guide pharmacists on issues relating to stock management. Facilities that have maximum and minimum stock levels can provide technical assistance to those that are not meeting the requirements through teamwork, monthly or quarterly meetings discussions, information sharing or benchmarking.

4.1.6.2 Orders from outlets are signed by the authorized person

Internal controls are to be the integral part of any organization‘s financial business policies and procedures. Internal control consists of all the measures taken by the organization for the purpose of:

- Protecting its resources against waste , fraud ad inefficiency,
- Ensuring accuracy and reliability in accounting and operating data,
- Securing compliance with the policies of the organization,

- Evaluating the levels of performance in all units of the organization.

As an internal control measure, it works well when orders from institutions are regulated in a manner where the responsible personnel or his or her designate would authorize any order that goes to the supplier. This helps to prevent unnecessary ordering of slow moving products and other challenges that may be experienced as the authorizing personnel would have to be accountable and responsible for any financial deviation due to poor stock management. As financial resources are limited, having delegated personnel to authorize the orders is good for budgetary and stock control management .As change in formulary can also contribute to expiry of medicine, it is therefore necessary that a person that is responsible and accountable for authorization be a member of the Hospital Pharmacy and Therapeutic Committee meetings since it is the forum where most decisions on stock utilization and prescribing patters are taken, making it easier to execute and apply the deliberations. (Quick et al,. 1997)

Although it may be a challenge to implement, 29% (12/41) of the facilities are still experiencing challenges which need collaboration, mechanism of implementation and support in order to comply like all other facilities. Ward order lists were not part of the study and it would have been interesting to see if it had any effect on the non-compliance with the standards of ensuring all orders are signed before they are sent to the depot.

4.1.6.3 Stock on cards not balancing stock on shelves

Stock cards are used to record and monitor order, receipts and issues of stock. The information on the stock card can be divided into two categories , fixed information such as medicine name, strength or size, form and issue unit and variable information include quantity received or issued a given date, stock balance and reorder level. One of the key aspects of stock management is to be able to keep accurate records. It means at any time the physical stock of a product should match the quantity recorded on the stock card

One of the reason why institutions end up with large quantities of expired medicines is due to the mismatch of stock quantise on shelves to that reflected on the system. (Quick et at, .1997)

The unbalanced stock makes it difficult for the personnel who is placing the orders as the usage patterns are incorrect and thus the wrong estimation of quantities to be ordered. The fact that only 5% of the institutions had the stock on shelves balancing stock on cards, it is clear that improvement on this regard is a necessity as this also contributes to the expiry of medicines. Without proper stock card maintenance, orders for items that may seem not to be available can be placed leading to large amount of stock that may not be used before their shelf life. This is an indication of poor stock management. No stock cards to manage inventory, hence no consumption data available to calculate order quantities. Factors impacting on the consumption data are

- stock outs from the suppliers and hence the provincial depot
- seasonal changes
- formulary changes
- short shelf life of products issued by the depot
- insufficient storage space both at the depot and facilities

4.1.6.4 Expired stock from outlets returned as per policy

According to the good pharmacy practice it is adequate to record of expiry dates in all the outlets including wards and wherever the medicines is stored, including emergency cupboards .

In Limpopo Province, there is a policy for returning stock from facilities and the objective of the policy is to ensure that unusable pharmaceutical stocks are written-off and disposed of in the correct manner. In addition to the objective, purpose of the policy is to prevent expired stock from accumulating in institutions as well as to quantify the value of the stock that is essential in times of intervention. It is good to learn that 71% of the institutions are adhering to the guidelines and more emphasis should be placed on the remaining facilities.

4.1.6.5 Written procedures are available for procurement and stock control

It is clearly shown that procedures for procurement and stock control are not followed at 24% of the facilities, the effect of which contributes greatly to poor stock management. Procedures should be followed and all facilities need to be adhering to the standards in order to improve service delivery and complying with the relevant standards as set out by Medicine Control Council and the South African Pharmacy Council. Pharmaceutical services monitoring and evaluation team should be established to monitor and evaluate the services in outlets as well as ensuring quality assurance.

4.1.6.6 Hospital formulary and PTC

The effective management of formularies, clinical guideline and treatment protocols promotes rational use of drug therapy. A local formulary is a compilation of medicines approved for use within the hospital and should reflect the current judgment of clinicians and pharmacists on the basis of efficacy, safety and costs.

The minimum requirements for the formulary should be a written list of approved medicines classified according to therapeutic use.

The formulary can also contain the following:

- Information on method of use of the formulary,
- Local procedures governing prescribing medicines,
- Relevant policies and procedures controlling medicine distribution,
- Advice on selection of medicines for the formulary,
- Procedures for amending the formulary,
- Procedure on how to obtain non-formulary items.

In drug selection the pharmaceutical coding and formulary system should be used as the basis for medicine therapy and the promotion of rational use of medicine. This system includes a formulary of approved pharmaceutical substances and motivational procedures as well as a policy and procedures

The pharmacy and therapeutics committee should be responsible for the formulary.

In 68% of hospitals there were no updated hospital formularies. This can impact negatively on the prescribing of medicines within a hospital. The unavailability of the hospital formulary results in health professionals prescribing according to their own personal preference, which can impact negatively on stock management. If such a prescriber leave the facility, the specific items might not be prescribed anymore and can lead to expiry of such items. The main reason given by facilities for stock expiry is changing of prescribers and changing prescribing patterns. Hospitals should therefore have functional Pharmacy and Therapeutic Committees that will be responsible for medicines selection and appropriate use according to the guidelines. It works well if the establishment and functionality of the Pharmacy and Therapeutic Committee can be made one of the key result areas of the clinical manager and the Chief Executive Officer where pharmacy department is reporting.

4.1.6.7 FIFO/FEFO

Only 15% (6/41) of the facilities that were evaluated were found not be applying the FIFO/FEFO principles when issuing stock. Except in the case where stock control management is not computerized, the issuing of stock according to FIFO/FEFO should not be a problem as the batch that expires first is selected by default using the pharmaceuticals system at the province PDSX. According to the orders that are received at the depot, all facilities that took part in the research study are using the PDSX stock control system and it therefore suggests that reasons for non-adherence to FIFO/FEFO may be that the quantities on stock do not match quantities on the system.

4.1.7 Need to train healthcare workers on the efficient and effective management of medicines

The organization need to practice the management concepts which include planning , directing , organizing and controlling in order to achieve its goals .

The following table looking at the medicine supply management will be able to detect the management concepts including the stock usage analysis within the facilities, and the procurement practices used at facility levels. Eight indicators were chosen to determine need for training at Limpopo Province.

The medicine management indicator would be able to find out if facilities are having standard operating procedures and how medicine storage is handled at facility level.

It will also be able to find out if good inventory management practices are being maintained and internal control measures practiced.

Table 4.5: Facilities medicine supply management indicators

Hospital	District	Has the stores person been in-service trained on Drug Supply Management?	Are there records of cyclical stock count?	Are maximum stock level parameters set for 6 weeks?	Is there monthly list of short-dated products displayed	Are there no expired stocks on shelves	Are all invoices and credits reconciled with monthly Depot statements and signed.	Is the Expenditure vs. Budget record up to date	Stock on hand adjustments are filed and authorized with valid reasons	% per facility
Seshego	Capricorn	C	C	NC	NC	C			C	75%
WF Knobel	Capricorn	C	C	NC	C	C	C	C	NC	75%
Botlokwa	Capricorn	NC	NC	NC	C	C	C	NC	NC	38%
Thabamoopo	Capricorn	C	C	NC	NC	C	C	C	C	75%
Zebediela	Capricorn	NC	C	NC	C	C	C	C	NC	63%
Lebowakgomo	Capricorn	NC	C	C	NC	C	C	NC	NC	50%
Helena Franz	Capricorn	C	NC	NC	NC	C	C	NC	NC	38%
	Capricorn Total	**4**	**5**	**2**	**3**	**7**	**7**	**4**	**2**	75%
% C (n=7)		**57.14%**	**71.43%**	**14.29%**	**42.86%**	**100.00%**	**100.00%**	**57.14%**	**28.57%**	
Nkhensani	Mopani	C	NC	NC	NC	C	NC	C	NC	38%
Letaba	Mopani	C	C	NC	NC	C	C	C	NC	63%
Dr CN Phathudi	Mopani	NC	C	C	NC	C	NC	C	NC	50%
Maphutha Malatjie	Mopani	C	C	C	NC	C	C	NC	C	75%
Sekororo	Mopani	C	NC	NC	C	C	C	C	C	75%

Hospital	District	Has the stores person been in-service trained on Drug Supply Management?	Are there records of cyclical stock count?	Are maximum stock level parameters set for 6 weeks?	Is there monthly list of short-dated products displayed	Are there no expired stocks on shelves	Are all invoices and credits reconciled with monthly Depot statements and signed.	Is the Expenditure vs. Budget record up to date	Stock on hand adjustments are filed and authorized with valid reasons	% per facility
Van Velden	Mopani	C	NC	NC	NC	C	C	C	C	63%
Kgapane	Mopani	C	NC	NC	NC	C	NC	C	NC	38%
Evukaxeni	Mopani	C	NC	NC	NC	C	C	NC	NC	38%
Duiwelskloof	Mopani	NC	NC	NC	NC	C	C	C	NC	38%
	Mopani Total	**7**	**3**	**2**	**1**	**9**	**6**	**7**	**3**	38%
% C (n=9)		**77.78%**	**33.33%**	**22.22%**	**11.11%**	**100.00%**	**66.67%**	**77.78%**	**33.33%**	
Dilokong	Sekhukhune	NC	C	C	C	C	C	C	C	88%
Mecklenburg	Sekhukhune	C	NC	C	NC	C	C	C	NC	63%
Matlala	Sekhukhune	NC	C	C	C	C	NC	NC	NC	50%
Jane Furse	Sekhukhune	C	C	C	C	C	NC	NC	NC	63%
ST Ritas	Sekhukhune	NC	C	C	C	C	NC	NC	NC	50%
Philadelphia	Sekhukhune	NC	C	C	C	C	NC	NC	NC	50%
Groblersdaal	Sekhukhune	C	C	C	C	C	NC	NC	NC	63%
	Sekhukhune Total	**3**	**6**	**7**	**6**	**7**	**2**	**2**	**C**	

Hospital	District	Has the stores person been in-service trained on Drug Supply Management?	Are there records of cyclical stock count?	Are maximum stock level parameters set for 6 weeks?	Is there monthly list of short-dated products displayed	Are there no expired stocks on shelves	Are all invoices and credits reconciled with monthly Depot statements and signed.	Is the Expenditure vs. Budget record up to date	Stock on hand adjustments are filed and authorized with valid reasons	% per facility
% C (n=7)		**42.86%**	**85.71%**	**100.00%**	**85.71%**	**100.00%**	**28.57%**	**28.57%**	**14.29%**	
Elim	Vhembe	C	C	C	C	C	C	C	C	100%
Louis Trichardt	Vhembe	C	NC	NC	C	C	C	C	NC	63%
Tshilidzini	Vhembe	C	C	C	NC	C	C	NC	NC	63%
Donald Frazer	Vhembe	C	NC	C	C	C	C	C	C	88%
Hayani	Vhembe	C	NC	NC	C	C	C	NC	NC	50%
Malamulele	Vhembe	C	NC	NC	NC	NC	C	NC	C	38%
Messina	Vhembe	NC	NC	NC	NC	C	NC	NC	NC	13%
Siloam	Vhembe	C	C	C	NC	C	C	NC	C	75%
	Vhembe Total	**7**	**3**	**4**	**4**	**7**	**7**	**3**	**4**	
% C (n=8)		**87.50%**	**37.50%**	**50.00%**	**50.00%**	**87.50%**	**87.50%**	**37.50%**	**50.00%**	
Mankweng	Tertiary Complex	C	C	NC	NC	C	C	C	C	75%
Polokwane	Tertiary Complex	C	C	NC	NC	NC	C	C	C	63%
	Tertiary	**2**	**2**	**0**	**0**	**1**	**2**	**2**	**2**	

Hospital	District	Has the stores person been in-service trained on Drug Supply Management?	Are there records of cyclical stock count?	Are maximum stock level parameters set for 6 weeks?	Is there monthly list of short-dated products displayed	Are there no expired stocks on shelves	Are all invoices and credits reconciled with monthly Depot statements and signed.	Is the Expenditure vs. Budget record up to date	Stock on hand adjustments are filed and authorized with valid reasons	% per facility
	Complex Total									
% C (n=2)		**100.00%**	**100.00%**	**0.00%**	**0.00%**	**50.00%**	**100.00%**	**100.00%**	**100.00%**	
Warmbath	Waterberg	C	NC	C	NC	C	NC	NC	NC	38%
FH Odendaal	Waterberg	C	NC	C	NC	C	C	C	C	75%
Thabazimbi	Waterberg	NC	NC	NC	NC	C	C	NC	C	38%
George Masebe	Waterberg	C	NC	C	C	C	NC	C	NC	63%
Mokopane	Waterberg	C	NC	NC	NC	C	NC	NC	C	38%
Voortrekker	Waterberg	C	NC	NC	NC	C	C	C	C	63%
Ellisras	Waterberg	C	NC	NC	NC	C	C	C	NC	50%
Witpoort	Waterberg	C	NC	NC	NC	C	C	C	NC	50%
	Waterberg Total	**7**	**0**	**3**	**1**	**8**	**5**	**5**	**4**	
% C (n=8)		**87.50%**	**0.00%**	**37.50%**	**12.50%**	**100.00%**	**62.50%**	**62.50%**	**50.00%**	
% C Total (n=41)			**46.34%**	**41.46%**	**36.59%**	**95.12%**	**70.73%**	**56.10%**	**39.02%**	

Hospital	District	Has the stores person been in-service trained on Drug Supply Management?	Are there records of cyclical stock count?	Are maximum stock level parameters set for 6 weeks?	Is there monthly list of short-dated products displayed	Are there no expired stocks on shelves	Are all invoices and credits reconciled with monthly Depot statements and signed.	Is the Expenditure vs. Budget record up to date	Stock on hand adjustments are filed and authorized with valid reasons	% per facility
		73.17%								

Expired or poor quality drugs may have adverse or reduced effects on patients and should therefore be discarded. The above table indicates that there were two districts which complied on training of pharmacists on the drug supply management, which are Vhembe and Waterberg. The table indicates that all facilities lacked on drug supply management and hence training is vital on these aspects.

⇒ Mopani district showed to be poor in keeping lists of short dated stock items.

⇒ Waterberg district showed to be poor in keeping records of cyclical stock counts, and keeping lists of short dated stock items.

⇒ Capricorn district showed to be poor in not adhering to the set maximum stock levels of six weeks.

⇒ Vhembe district were less compliant on records of cyclical stock counts and usage of expenditure versus budget allocated.

4.1.8 Ways of preventing medicine expiry

There were seven indicators chosen in order to find out some ways of preventing expiry of medicines in the province. These indicators were extracted from the evaluation tool used by the Province to evaluate compliance.

The indicators were as follows:-

- Availability of standard operating procedures
- Invoices checked for correctness
- Segregation of duties on receiving stock
- Availability of signed good received vouchers
- Availability of order lists
- Segregation of duties on issued stock
- Availability of records in the pharmacy.

Table 4.6: Facilities procedures for ordering, issuing and receiving of medicines

Hospital	District	An in-house SOP is available for emergency orders from outlets	Invoices are checked for correctness (Quantity, Batch No. And Expiry. Date)	Stock received is captured onto system by another person	Goods received notes are signed by person that captured stock received	Does every outlet have its own order list	Issues are signed and checked by a second person	All records of orders and issues are filed in pharmacy	% per Facility
Seshego	Capricorn	NC	C	C	C	C	NC	C	71%
WF Knobel	Capricorn	C	C	C	NC	C	NC	NC	57%
Botlokwa	Capricorn	NC	C	NC	NC	C	NC	C	43%
Thabamoopo	Capricorn	NC	C	C	NC	C	NC	C	57%
Zebediela	Capricorn	C	NC	C	NC	C	NC	NC	43%
Lebowakgomo	Capricorn	NC	C	C	NC	C	NC	C	57%
Helena Franz	Capricorn	NC	C	C	NC	C	NC	NC	43%
	Capricorn Total	**2**	**6**	**6**	**1**	**7**	**0**	**4**	
% C	**7**	**28.57%**	**85.71%**	**85.71%**	**14.29%**	**100.00%**	**0.00%**	**57.14%**	
Nkhensani	Mopani	C	C	C	NC	C	NC	NC	57%
Letaba	Mopani	C	C	C	NC	C	C	C	86%
Dr CN Phathudi	Mopani	C	C	NC	NC	C	NC	C	57%
Maphutha Malatjie	Mopani	C	C	C	C	C	C	C	100%
Sekororo	Mopani	NC	C	C	C	NC	NC	NC	43%
Van Velden	Mopani	NC	C	C	C	C	NC	C	71%

Hospital	District	An in-house SOP is available for emergency orders from outlets	Invoices are checked for correctness (Quantity, Batch No. And Expiry. Date)	Stock received is captured onto system by another person	Goods received notes are signed by person that captured stock received	Does every outlet have its own order list	Issues are signed and checked by a second person	All records of orders and issues are filed in pharmacy	% per Facility
Kgapane	Mopani	NC	NC	C	NC	C	NC	NC	29%
Evukaxeni	Mopani	NC	C	C	C	C	NC	NC	57%
Duiwelskloof	Mopani	NC	C	C	C	NC	NC	C	57%
	Mopani Total	**4**	**8**	**8**	**5**	**7**	**2**	**5**	
% C	**9**	**44.44%**	**88.89%**	**88.89%**	**55.56%**	**77.78%**	**22.22%**	**55.56%**	
Dilokong	Sekhukhune	NC	C	C	C	C	C	C	86%
Mecklenburg	Sekhukhune	NC	C	C	C	C	C	C	86%
Matlala	Sekhukhune	NC	C	C	C	C	C	C	86%
Jane Furse	Sekhukhune	NC	C	C	C	C	C	C	86%
ST Ritas	Sekhukhune	NC	C	C	C	C	C	C	86%
Philadelphia	Sekhukhune	NC	C	C	C	C	C	C	86%
Groblersdaal	Sekhukhune	NC	NC	C	C	C	C	C	71%
	Sekhukhune Total	**0**	**6**	**7**	**7**	**7**	**7**	**7**	
% C	**7**	**0.00%**	**85.71%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	
Elim	Vhembe	C	C	C	NC	C	NC	C	71%
Louis Trichardt	Vhembe	C	C	C	NC	C	NC	C	71%

Hospital	District	An in-house SOP is available for emergency orders from outlets	Invoices are checked for correctness (Quantity, Batch No. And Expiry. Date)	Stock received is captured onto system by another person	Goods received notes are signed by person that captured stock received	Does every outlet have its own order list	Issues are signed and checked by a second person	All records of orders and issues are filed in pharmacy	% per Facility
Tshilidzini	Vhembe	NC	C	C	NC	C	C	NC	57%
Donald Frazer	Vhembe	C	C	C	NC	C	NC	C	71%
Hayani	Vhembe	C	C	NC	NC	C	NC	C	57%
Malamulele	Vhembe	NC	C	C	NC	C	NC	C	57%
Messina	Vhembe	NC	C	C	C	C	NC	NC	57%
Siloam	Vhembe	NC	C	C	C	C	C	C	86%
	Vhembe Total	**4**	**8**	**7**	**2**	**8**	**2**	**6**	
% C	**8**	**50.00%**	**100.00%**	**87.50%**	**25.00%**	**100.00%**	**25.00%**	**75.00%**	
Mankweng	Tertiary Complex	NC	C	C	C	C	NC	NC	57%
Polokwane	Tertiary Complex	C	C	C	C	C	C	C	100%
	Tertiary Complex Total	**1**	**2**	**2**	**2**	**2**	**1**	**1**	
% C	**2**	**50.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**50.00%**	**50.00%**	
Warmbath	Waterberg	NC	C	C	C	C	NC	C	71%
FH Odendaal	Waterberg	NC	C	C	NC	C	NC	C	57%
Thabazimbi	Waterberg	NC	C	NC	NC	C	NC	C	43%
George Masebe	Waterberg	NC	C	C	C	C	C	NC	71%

Hospital	District	An in-house SOP is available for emergency orders from outlets	Invoices are checked for correctness (Quantity, Batch No. And Expiry. Date)	Stock received is captured onto system by another person	Goods received notes are signed by person that captured stock received	Does every outlet have its own order list	Issues are signed and checked by a second person	All records of orders and issues are filed in pharmacy	% per Facility
Mokopane	Waterberg	NC	C	NC	NC	NC	NC	C	29%
Voortrekker	Waterberg	C	C	C	C	C	NC	C	86%
Ellisras	Waterberg	NC	C	C	NC	C	NC	NC	43%
Witpoort	Waterberg	NC	C	C	NC	C	NC	NC	43%
	Waterberg Total	**1**	**8**	**6**	**3**	**7**	**1**	**5**	
% C		**12.50%**	**100.00%**	**75.00%**	**37.50%**	**87.50%**	**12.50%**	**62.50%**	
	Grand Total	**12**	**38**	**36**	**20**	**38**	**13**	**28**	
% C	41	**29.27%**	**92.68%**	**87.80%**	**48.78%**	**92.68%**	**31.71%**	**68.29%**	

The management of the drug supply works best when supplies are available. Supplies are more likely to be available if ordered regularly. Supplies should be ordered based on their use (consumption). If you order supplies based on consumption, you will have the supplies you need when you need them. The above table indicates that the facilities did not comply on the segregation of duties in ordering and issuing of stock. The following results were tabulated:-

- ⇒ All districts combined had a compliance of 31.71% on the indicator which stated that all issues were signed and checked by the second person. The results indicated that there is no segregation of duties.
- ⇒ All districts combined had a compliance of 29.27% on the indicator which stated that an in-house standard operating procedure is available for emergency orders.
- ⇒ Capricorn district had zero compliance on the segregation of duties when coming to issues to other outlets.
- ⇒ Sekhukhune district had zero compliance on availability of a standard operating procedure on emergency orders from outlets.

4.1.9 CONCLUSION

Data collection is essential in every organization and it assist in the improvement of organization processes and management of information. However there can be benefits and possible limitations to the data collected. The data used for the facilities above is only information provided by the pharmacy managers for each and every facility and has not been directly observed by the researcher.

Observing each and every facility would be able to give detailed information and other factors involved. The danger in the data could be the observer biasness in this case it would be the pharmacy manager.

By using available information supplied by facilities is inexpensive and allows analysis of past trends data. But this data might not be fully accurate as it is supplied by the pharmacy managers for a particular institution.

CHAPTER 5

5.1 Summary and recommendations

5.1.1 Introduction

This chapter includes a summary where the objectives are weighed against the key findings, limitations of the study and the chapter concludes with a few recommendations which could be applied in the province to reduce the expiry of medicines in its healthcare facilities.

5.1.2 Objectives versus key findings

The first objective was to record the value of medicines expired over the study period in the health care facilities. The value of expired medicines was R1 009 998.79.

The second objective was to determine the reasons for medicines to expire. The reasons were identified and all the reasons were within the scope of Drug Supply Management principles, e.g.

- Poor selection within facilities which was determined by the lack of functional therapeutic drug committee which is the cornerstone of procurement and selection of drugs for the facility. The second point is that there are no hospital formularies at facility levels which can be adding to poor selection of drugs.
- Poor procurement practices due to lack of formularies at facility level. Only 31.7% of hospitals at Limpopo Province complied in having hospital formularies.
- Lack of internal control measures
- Frequent stock shortages from manufactures hence bulky stocking by pharmacy managers. The evaluations done for facilities indicated that the stock availability was lower than the average percentage of stock availability required for the Province. (refer to Appendix D, Annexure C)

- Lack of training in drug supply management. Even though the drug supply management principles above shows that compliance is at 61% this shows that about 39% of facilities does not comply on drug management principles at the Province. This is a concern as pharmacists should actually be the pioneers when coming to drug management.
- Lack of monitoring and evaluation of drug management systems within the province.
- Lack of accountability for overspending by managers which is indicate by the high percentage of overspending by facilities above the allocated budget by a margin of higher than 50%.

The third objective was to determine the value of financial loss due to the medicine expired, which the findings amounted to R1 029 755.30 during the study period. The findings indicated that the financial loss was not only due to the expiry of medicines but also due to overspending of funds and lack of management skills by personnel. The province had shortage of funds in the same financial year when the study was conducted and if the programme was well managed the money could have been used to purchase essential medicines and training more pharmacists' assistants on stock management as well as cutting the overspending

The fourth objective was to determine the need for training health workers on the efficient and effective management of medicines. The need was positively identified by using the evaluation tool reports specifically looking at the storage of stock within the pharmacies. It was important that training focus should be emphasized on the following topics:

- Stock usage analysis patterns,
- Procurement and the PFMA,
- Pharmaceutical standards on medicine storage management,
- SOP on receipt of stock,
- All aspects of good inventory management,
- Internal control measures in the pharmacy,
- Importance of Information management, analysis and record keeping.

The fifth objective was to identify ways of preventing medicine expiry using an evaluation tool looking at the distribution, procurement and usage of drugs within the province, which included

- Effective prescribing by authorized prescribers by implementing and maintaining the use of hospital formularies.
- Following standards treatment guidelines.
- Ensuring functional Pharmacy and Therapeutic Committees that will amongst its responsibilities conduct drug utilization reviews and develop the institutional formulary.
- Ensuring that all health care workers are suitably trained on stock control management.
- Ensuring continuous monitoring and evaluation by district pharmacists to ensure that facilities are reporting and adhering to identified pharmacy indicators for quality improvement initiatives.

5.1.3 Limitations

The limitations identified during the study were as follows:-

- There was no proper substantiation as to how the pharmaceutical service management came up with 0.05% as the maximum acceptable limit of expired stock.
- Unreliability of the data, as the data was collected by different managers based on that particular hospital.
- Lack of PDE from psychiatric hospitals due to unknown number of patient stay at the hospital.
- Hospitals with zero records of expired stock do not reflect the true picture of data collected.

5.1.4 Recommendations

The following general recommendations should be taken into consideration:-

- Effective management will make a vital difference in all aspects of drug supply. It's especially true with respect to procurement and distribution of essential drugs. The basic principles of efficient drug management principles have been known for several decades, it is just a matter of implementing them correctly at the facilities and ensuring that the policies are adhered to.
- Wise drug selection underlines all other improvements in the supply chain management. The establishment of institutional formulary is perhaps the most cost effective action that any health care system or health care provider can take to promote regular supply and rational use of medicines

The following recommendations arose from the study:-

- The strengthening of the therapeutic drug committees. Such committees must monitor progress within the province with regard to drug supply management.
- The responsibility of procuring should be given to those who are trained. The responsible person should adhere to the policies and procedures from the Department of Health for procurement.
- There should be a system in place that is aimed at ensuring that there is accountability of pharmacy managers at various facilities. This will bring about responsibility and better medicine supply management skills within the pharmaceutical directorate.
- The province should be able to come up with a system which can be able to capture reliable information and maintains quality information. The system should be linked to a provincial office which will be able to monitor on a continuous basis the information from different facilities. The systems would be able to provide early warning signs such as possible expiry of medicines, overstocking, and unnecessary overspending of the budget, irrational drug usage, at any facility and be able to correct discrepancies on time.

- Continuous training for health workers would be vital. The most probable courses to cover are the following
    - Managing drug supply which covers amongst all the topics necessary to provide effective management of drugs.
    - Role clarification of various pharmacists in the province.
    - Role of regulatory pharmacists at the province.
    - Supply chain management which would concentrate mostly on the importance of procuring what one requires and be able to estimate the supplies according to the demands.
- Budgeting method is vital and the tasks of allocating budget to the facilities should be the responsibility of a person with financial and accounting expertise. The overspending by facilities also indicates that the province would need someone to take charge of the whole process of supply chain management within the pharmaceutical service.
- A more detailed study on medicine expiry should be conducted to find out more qualitative reasons for stock expiry within Limpopo Province.

5.1.5 Conclusion

It can be concluded that a lot still needs to be done within the supply chain of medicines in Limpopo Province with respect to the prevention of the expiry of medicines. Expiry of medicines causes excessive spending on pharmaceuticals which leads to the wastage of financial resources.

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