EXPIRATION OF DRUGS IN PUBLIC HOSPITAL PHARMACIES OF SEKHUKHUNE DISTRICT, LIMPOPO PROVINCE, SOUTH AFRICA.

by

Kgabo Ambros Mashishi

Mini-dissertation submitted in partial fulfillment of the requirements for the degree of

Master of Public Health

In the

FACULTY OF HEALTH SCIENCES

School of Public Health

at the

UNIVERSITY OF LIMPOPO

Supervisor: Prof. Y.M DAMBISYA

2015

DECLARATION

I, Mashishi Kgabo Ambros, declare that the mini-dissertation '**EXPIRATION OF DRUGS IN PUBLIC HOSPITAL PHARMACIES OF SEKHUKHUNE DISTRICT, LIMPOPO PROVINCE, SOUTH AFRICA'** hereby submitted to the University of Limpopo, for the degree of Master of Public Health, has not previously been submitted by me for a degree at this university or any other university, that it is my work in design and in execution, and that all the material contained herein has been duly acknowledged.

Mashishi, K.A (Mr) 15 Jan 2015

DEDICATION

I dedicate my mini-dissertation work to my family and friends whose words of encouragement gave me power and believe that in the academic world, nothing is impossible. I also give special thanks to my friend Barker who showed me the importance of furthering my studies.

ACKNOWLEDGEMENTS

I would like to acknowledge the effort made by all participants with their valuable views which made this study a success. I thank the Limpopo Province Department of Health and Hospitals chief executive officers (CEOs) for giving me access to the facilities for data collection. Finally I would like to appreciate the effort made by the supervisor in motivating and showing me that the study is of supreme importance and leading me towards a point of success.

ABSTRACT

Background

Drugs expiration in public hospital pharmacies is a concern to health professionals as the Department of Health spends a lot of money to buy drugs. The number of drugs which expire in public hospital pharmacies can give an indication of how the drugs are used, and consequently reflect on the disease prevalence for which the drugs are indicated for. Drugs cannot be used beyond expiry date. The purpose of this study was to determine the cause or causes, extent and costs of expired drugs in public hospital pharmacies of Sekhukhune District in Limpopo Province of South Africa.

Methods

Sekhukhune District has seven public hospital pharmacies. Data collection involved interviews conducted by the researcher from thirty-five participants with each hospital having five participants. All interviews were recorded by the use of a laptop voice recorder. Participants in each hospital involved a pharmacy manager, an additional pharmacist who had twelve months or more working experience within the facility under study, a clinical manager, a nurse who attends the hospital Drug and Therapeutics Committee and a medical practitioner who had twelve or more working experience within the facility under study.

Results and conclusion

In this study it was identified that, overstocking; prescribing tendencies by medical practitioners; delivery of short-dated drugs from the supplier; poor stock rotation and unreliably minimum and maximum order levels were cited as some of the reasons for stock expiration. The study found drugs expiration value to be above the set limit of 0.05% of the expenditure in a financial year. An expired stock value of R86 815 was found based on the data collected for 2010/2011 financial year.

DEFINITION OF TERMS

Expiry date - is a date specified by the manufacturer of a drug product that a drug should meet applicable standard of identity, purity, strength and quality at the time of use provided it is kept under storage conditions indicated by that manufacturer (Farrugia, 2005).

Snake anti-venom - is a drug used against the venom of snakes like forest cobra, black and green mamba (Standard Treatment Guidelines and Essential Drugs List for South Africa, 2006).

Scorpion anti-venom - is a drug used against the venom of scorpions (Standard Treatment Guidelines and Essential Drugs List for South Africa, 2006).

'Prevalence refers to the proportion of a population infected (or sick or immune) at a specified period in time' (McCartney et al, 2002).

Short-dated drug and surgical sundries - are pharmaceuticals with an expiry date of less than six months.

An order - refers to a list of pharmaceutical and surgical sundries requisition while ordering is a step by step method of estimating quantities of the required items.

Computer suggested order - is an order of pharmaceutical and surgical sundries generated automatically by a computer.

Informed consent - implies the provision of information to potential participants regarding the nature of the research procedure, scientific purpose and alternatives to the study participation (South African Good Clinical Practice Guidelines, 2006)

Qualitative study - refers to a research study using methods such as participant observations and face-to-face interviews which result in a narrative and descriptive account of a practice.

Pharmaceutical Distribution System (PDSX) - refers to the computer software used for stock control.

In this study the words expiration and expiry are used interchangeable

LIST OF ABBREVIATIONS

FEFO - First Expiry First Out.

FIFO - First In First Out.

JFMH - Jane Furse Memorial Hospital.

PDSX - Pharmaceutical Distribution System.

DTC - Drug and Therapeutics Committee.

TABLE OF CONTENTS **PAGE**

Chapter 1

1 INTRODUCTION

1.1 BACKROUND INFORMATION

Expiration of drugs in South African public hospital pharmacies is a concern to health professionals as the government Department of Health spends a lot of money to buy drugs. Expiration of drugs in public hospital pharmacies suggested that there are challenges about the medical supply chain and the use of certain medical products such as snake anti-venoms. Asamoah et al (2003) stated that 'the pharmaceutical supply chain is the means through which prescription medicines are delivered to patients'.

The number of drugs which expire in public hospital pharmacies can give an indication of how the drugs are used, and consequently reflect on the disease prevalence for which the drugs are indicated for. Antai and Mutshinda (2010) reported that the number of drugs returned and the time within which they are returned can provide an indication of the use status of a particular drug type and the status for the disease for which the drug is indicated for. Public hospitals in South Africa are classified into provincial, regional, and district hospitals. Public hospital pharmacies keep drugs according to their classification. In South Africa, the selection of drugs as per classification is of significant value to pharmacists to avoid wastage and expiration. When slow moving drugs like scorpion anti-venoms are ordered in large quantities, they may expire unused, resulting in wasted expenditure.

The Pharmaceutical Services Department in the Limpopo Province of South Africa uses 0.05% of the expenditure on drugs as a norm for drugs expiration in public

hospital pharmacies (Expired stock report, Jane Furse Hospital, October 2010). Drugs expiration should not exceed the 0.05% of the annual allocated budget. Jane Furse Memorial Hospital (JFMH) in the Sekhukhune District of Limpopo Province had an estimated R18 213 value of expired drugs for the 2009 / 2010 financial year starting from 1 April 2009 to 31 March 2010 against the expenditure value of R10 482 208.817. The percentage value of expired stock for financial year 2009 /2010 would be 0.17% (expired value divided by expenditure value) which is above the 0.05% norm by 0.12%. An amount of R 5 241 (0.05% of expenditure) would be the acceptable maximum value of drugs to expire for year 2009 / 2010.

Jane Furse Memorial Hospital alone had an estimated R109 956.84 value of expired stock for the years 2005 to 2009 which was due for disposal in the year 2010 (Expired stock report, Jane Furse Hospital, October 2010). Pharmacy managers have a great influence about how their pharmacies should perform to keep the expired stock value below 0.05% of expenditure. Van Vactor (2011) stated that managers must be proactive regarding planning and develop the necessary coping and recovery skills to maintain the continuity and availability of supply.

In public hospital pharmacies, expiration of drugs before they are dispensed to patients appears to be a common problem which may result from various factors such as ineffective hospital Drug and Therapeutics Committee meetings, lack of the use of first expiry first out (FEFO) and first in first out (FIFO) principles, massive orders of rarely used medical products, motivational drugs for specific patients, which may expire due to patients relocating, lack of supervision by pharmacist when placing pharmaceutical orders, lack of stock rotation among hospital pharmacies, lack of computer system usage, and propensity to prescribe certain drugs by prescribers. Thron et al (2007) reported that issuing and replenishment strategies

are crucial and FIFO approach is advisable within a frame work of products having a limited lifetime span. Expiration of drugs is a problem to a system that is already constrained with lack of access to drugs. Drugs expiration often relates to supply chain inefficiencies that result in higher costs or lower patients service levels. Public hospital pharmacies are centers of activities, pharmacists and pharmacist assistants as well as other involved healthcare professionals like nurses must fully understand pharmaceutical inventory management to minimize expiration of drugs. This study aims to investigate the cause(s), extent and costs of drugs expiration and drugs that are prone to expire in different public hospital pharmacies.

1.2 PROBLEM STATEMENT

Expiration of drugs in public hospital pharmacies of the Sekhukhune District in the Limpopo Province could cost the department of health money and lower the quality of service. Expired drugs cannot be used beyond expiry date, primarily because the ingredients could change their chemical stability, leading to potential harm to patients, of which the manufacturer cannot be held accountable. Generally, several drugs are short-dated, meaning that they need to be purchased and used within a short period of time. It is therefore important for the department of health to purchase only drugs are necessary or that are commonly used per hospital, in order to reduce drugs expiration. In South Africa, most hospitals experience drug shortages, and only to find that the drugs that are on stock are not commonly used, which further leads to them expiring before they can be dispensed. Studies looking at factors influencing expiration of drugs in public hospital pharmacies are limited or not yet published, especially in rural hospitals in Limpopo Province, South Africa.

1.3 RESEARCH QUESTIONS

- ✓ What are the main contributing factors to drugs expiration in public hospital pharmacies of Sekhukhune District in the Limpopo Province of South Africa?
- ✓ How much did drugs expiration in public hospital pharmacies of Sekhukhune District cost the Provincial Health Department in the financial year 2010/2011?

1.4 STUDY AIM

The aim of the study was to explore the factors leading to expiration of drugs in public hospital pharmacies of the Sekhukhune District.

1.5 OBJECTIVES OF THE STUDY

The objectives of the study were:

- ✓ To determine the costs and extent of expired drugs in public hospital pharmacies of the Sekhukhune District.
- ✓ To explore factors contributing to drug expiration in public hospital pharmacies of the Sekhukhune District.

Chapter 2

2 LITERATURE REVIEW

2.1 DRUGS EXPIRATION AND CONSUMER PERCEPTION OF EXPIRY DATE

Drugs expiration is a problem which commonly affects South African public hospital pharmacies. According to Farrugia (2005), expiry date is defined as an assurance that a drug product should meet applicable standards of identity, strength, quality and purity at the time of use. Farrugia (2005) further indicated that the definition is only applicable under storage conditions specified by the manufacturer on the labeling and packaging. Nakyanzi et al. (2010) maintained that the medicinal supply chain process needs to be managed to avoid wastage, pilferage, misuse, and expiry in developing countries where budgets are tight. According to Thron et al. (2007) higher inventory add to the average age of the product and that lead to more expired products. Tumwine et al. (2010) reported that expired drugs stock is a waste of resources, which cannot be afforded in a resource-constrained nation. Poor quantification practices and donors ordering large quantities of drugs without the departmental inputs contributed to large quantities of expired drugs in Uganda (Tumwine et al., 2010). Patients usually perceive the expiration date as an important indicator of the drug's quality, short-dated drug products lessen patients' interest which indicates that demand is related to the remainder of shelf life (Hug et al., 2005). Antai and Mutshinda (2010) supported the view that pharmaceutical chains continuously have to move drug products back and forth between pharmacies and manufacturers because of the expiry dates attached to the delivered drugs. Antai and Mutshinda (2010) further indicated that expiration of drugs randomly occur in pharmaceutical inventory.

2.2 CONTROL AND MANAGEMENT OF MEDICALS SUPPLY

Mustaffa and Potter (2009) reported that awareness of the supply chain management within hospitals is low and managers are not properly equipped to control the supply of medication. Due to the severity of using expired or ineffective drugs, it is critical that pharmaceutical outlets get the reverse logistics right from the start and the most common causes of returns in pharmaceutical outlets are expired drugs and recalls (Kumar et al., 2009). Since most clinical decisions involve products management and medical supplies, supply chain activities have an important role in effective and efficient service delivery in hospitals (Bendavid et al., 2010). Bhakoo and Chan (2011) indicated that pharmaceutical products have long development cycles and this presents a challenge for supply chain managers in hospitals who have to manage their internal relationships with medical practitioners while simultaneously managing their external relationships with pharmaceutical manufacturers, wholesalers and distributors. Huq et al. (2004) maintained that organization may experience a partial loss of revenues when their inventory gets close to expiration date and customers become less likely to purchase products with short expiry date. Vries and Huijsman (2011) stated that in healthcare sector, the basic rationale of a supply chain management approach is founded in the belief that intensive co-ordination and integration between pharmaceuticals, medical devices and patient flow might lead to a better health supply chain performances.

2.3 MANAGEMENT OF DRUGS INVENTORY

Thron et al (2007) indicated that owing to the age of products held in inventory, product issuing and replenishment strategies are completely crucial and need to be considered more comprehensively. The unique nature of the supply chain for

pharmaceuticals makes managing complex information for supply chain effectiveness challenging, and lack of proper information mechanisms may lead to poor inventory control methods (Asamoah et al., 2011). According to the study conducted by Thron et al. (2007), the frequency and place of expiration control such as storage, distribution center or retailer-shelf determine the timelines of expiry or product flow information. Burt et al (2003) maintained that in order to develop ideas of how to reduce waste throughout supply chain cycle, one has to know and understand where that waste has been generated. Burt et al (2003) further indicated that any warehouse accumulates salvageable or waste material from breakage, deterioration and errors in record keeping regardless of how properly the warehouse is managed. In a book written by Magad and Amos (1995), it was stated that 'some materials are more susceptible to spoilage than others; material handling systems were designed to consider the shelf-life of stored items'.

2.4 PRODUCTS ISSUES AND DEMANDS

According to Thron et al. (2007), it should be fairly obvious that a FIFO approach is most advisable within a frame-work of products that have a short life span. Dobler and David (1996) agreed that reduction of outdated products costs could be realized by developing systems to detect slow moving and in-active materials. Hugos (2006) indicated that 'the aim of inventory management is to reduce costs of inventory as much as possible while still maintaining the service levels that the customers require'. Dobler and Burt (1996) maintained that deterioration, damage and pilferage of products are controllable to a great extent by managers.

CHAPTER 3

3. METHODOLOGY

3.1 STUDY SITE

The study was conducted in all public hospital pharmacies of the Sekhukhune District in the Limpopo Province, South Africa. The district has seven public hospitals, namely St. Ritas, Jane Furse, Matlala, Groblersdal, Philadelphia, Mecklenburg and Dilokong hospitals. St. Ritas and Philadelphia are regional hospitals of the district, while the remaining five are classified as district hospitals. Classification of hospitals is based on the level of care these hospitals provide with regional hospitals allowed to have more drugs than district hospitals.

3.2 STUDY APPROACH

Qualitative study approach was used to conduct the study. The researcher used a non-experimental research design that is exploratory and descriptive. The researcher conducted in-depth face-to-face interviews with key stakeholders in all public hospitals of the Sekhukhune District.

3.3 POPULATION

The study was conducted in all hospitals of the Sekhukhune District. In this study participants are hospital health professionals who are involved in the use of drugs. A total of 35 health professionals participated in the study. Five participants, namely a nurse, two pharmacists and two doctors from each of the selected seven district hospitals participated in the study.

3.4 SAMPLING

The total sample size used was 35 health professionals, i.e. five participants, namely a nurse, two pharmacists and two doctors from each of the selected seven district hospitals participated in the study. For each hospital selected, the following health professionals were interviewed: a clinical manager, pharmacy manager, an additional pharmacist who had twelve months or more working experience within the facility under study, a nurse who was a member of Drug and Therapeutics Committee and an outpatient medical practitioner who had twelve months or more working experience within the facility under study. The researcher conducted in-depth face to face interviews with all thirty five participants and the sample size was reached when data saturation was reached. In this study data saturation was reached when no new information was obtained from the participants.

3.5 DATA COLLECTION

The study was conducted over a period of three months from June to August 2013. The researcher conducted in-depth face-to-face interviews with all selected health professionals. All interview sessions were recorded by the use of a laptop computer voice recorder. A total of thirty-five health professionals were interviewed, five interviewees in each of the seven hospitals. A pilot study was conducted at Lebowakgomo Hospital of the Capricorn District. Arrangements were made to conduct interviews with the participants through the office of the chief executive officers (CEOs) of the hospitals based on their convenient times. The office was arranged such that there was no interference from noise such as people coming in and out of the office, telephones were off the hook and a “DO NOT DISTURB” sign was posted on the door where the interviews were conducted. Questions during an interview were not only limited to the ones mentioned on the interview guide, some questions asked were influenced by the responses of the participants during the

interview. Questions were asked based on the role and involvement of the participants. Each interview session took less than 40 minutes per interviewee. Collection of data was supplemented by monthly reports from all public hospital pharmacies where interviews were conducted. Monthly reports for all district public hospital pharmacies for the financial year 2010/2011 were collected from the Sekhukhune District pharmaceutical office. Data were collected over a period of seven weeks. Interview guide is included in appendix 3.

3.6 DATA ANALYSIS

The interviewees' recorded answers were transcribed and translated verbatim, and analyzed by the use of content and thematic analysis. The researcher listened to each tape separately to get the exact response of each participant. Themes were analyzed by an independent coder. The reasons for expiration given by pharmacists were compared to those given by doctors and nurses. Baseline information on budget, i.e. expenditure, and wasteful expenditure was established.

3.7 DATA MANAGEMENT

Participants' voice records were kept in possession of the researcher in a password controlled laptop and on discs which were kept in the researcher's locked cabinet. Copies of pharmacy monthly reports and researcher notes were also locked in researcher's cabinet. The researcher used one independent coder, who was informed of the importance of confidentiality in keeping information safe and not share with anyone.

3.8 TRUSTWORTHINESS OF THE RESEARCH

3.8.1 Credibility

In this study the researcher ensured credibility by allowing participants enough time to raise their opinions about drugs expiration in their facilities. This was achieved by creating a conducive environment which allows the participants to do most of the talking than the researcher during interview sessions.

3.8.2 Dependability

The researcher subjected raw data and the data analysis process to an external reviewer and established an audit trail to allow others to judge the dependability of the study findings. The researcher used the same method of collecting data from participants through interviews.

3.8.3 Conformability

In an effort to ensure a degree of neutrality or extent to which the study findings are shaped by the participants and not the researcher bias or interest, the researcher gave detailed methodological descriptions to enable the reader to determine to what extent the data is acceptable.

3.8.4 Transferability

Since the findings of a qualitative research are specific to a small number of a particular environment, it is difficult for the researcher to demonstrate that the findings and conclusion of this research is applicable to other situations and populations.

3.9 ETHICAL CONSIDERATIONS

Ethical approval was obtained from the University of Limpopo Medunsa Research Ethics Committee (MREC). The views of all interviewees were handled as a

confidential matter. A signed copy of the informed consent form was given to each interviewee. Permission to conduct the study was obtained from the Department of Health and Social Development, Limpopo Province and from the Chief Executive Officers of participating hospitals.

3.9.1 Rights of participants

In an effort to protect the rights of the participants in this study, the following key ways were adhered to: non-maleficence, human dignity, confidentiality and justice.

3.9.2 Non-maleficence

In this study no participant was reportedly harmed or experienced any form of harassment either physically or verbally during the course of the study. All participants freely expressed their views about drugs expiration in their facilities and they were all aware that is a voluntary exercise.

3.9.3 Human dignity

The researcher went through the informed consent form with the participants before the start of each interview session. Each participant was given a copy of the informed concern form and a chance to either agree to participate in the study or not.

3.9.4 Confidentiality

The names of the participants were not used in this study to protect their identity. The recorded voices of the participants were stored in a computer and discs which only the researcher has access to.

3.9.5 Justice

All participants in the study were treated fairly and equally with high level of respect by the researcher. The researcher clearly mentioned that participation in the study is voluntary and there are no financial gains for participating in the study.

Chapter 4

4. RESEARCH FINDINGS

4.1 MONTHLY REPORTS

Sekhukhune district hospital pharmacies were allocated R77 551 629.96 for pharmaceutical and surgical sundries for financial year 2010/2011. Each hospital was allocated an annual pharmaceutical and surgical budget for 2010/2011 as shown in Table 4.1.

Table 4.1: Allocated annual budgets for hospitals

Hospital Name	**Pharmaceutical Budget**	**Surgical Sundries Budget**	**Total Annual Budget**
Jane Furse	R 10 843 597.30	R 2 710 899.32	R 13 554 496.62
St. Ritas	R 13 439 965.96	R 3 3 59 991.49	R 16 799 957.45
Matlala	R 6 193 496.18	R 1 548 373.04	R 7 741 870.22
Grobblersdal	R 4 135 446.2	R 1 033 861.57	R 5 169 307.85
Philadelphia	R 14 035 606.16	R 3 508 901.54	R 17 544 507.69
Dilokong	R 8 818 861.36	R 2 204 715.34	R 11 023 576.69
Mecklenburg	R 4 574 330.75	R 1 143 582.69	R 5 717 913.43

Annual expenditures and annual expiration values for hospital pharmaceuticals and surgical sundries are used to calculate the percentage of expired stock in Table 4.2 below:

Table 4.2: Annual expenditure compared to expired stock

Hospital Name	Annual Expenditure	Total Annual Expiration	% of Expired
Jane Furse	R14 720 325.906	R12 971	0.09%
St. Ritas	R15 991 475.96	R43 122	0.27%
Matlala	R6 332 229.552	R2 681	0.04%
Grobblersdal	R24 471 018.217	R3 383	0.01%
Philadelphia	R31 535 972.960	R10 877	0.03%
Dilokong	R15 681 321.742	R5512	0.04%
Mecklenburg	R5 894 294.919	R8 269	0.14%

Table 4.2 shows that a total amount of expired stock for pharmaceutical and surgical sundries is R86 815 for financial year 2010/2011 in public hospital pharmacies of Sekhukhune district. Reports of short-dated drugs from hospital pharmacies indicate a number of drugs which commonly expire before dispense to patients. The following categories of drugs were most likely to expire in all seven hospitals of the district:

Table 4.3: Drugs which commonly expire before dispense to patients.

1. Small volume and large parenteral	2. Liquids internal and external; sprays and semi-solids	3. Tablets	4. Ear, nose and eye drops; fridge items; family planning and diagnostics	5. Surgical sundries
Adrenalin injection	Albendazole suspension	Allopurinol tablets	Acetic acid ear drops	Bag rebreathing antistatic
Aminophylline injection	Benzoin co. tincture	Carbilev 25/250 tablets	Atropine eye drops	Cannula substenon
Benzathine benzyl penicillin injection	Benzyl benzoate emulsion	Chloroquine tablets	Dexamethasone eye drops	anaesthesia
Biperiden injection	Chlorhexidine obstetric cream	Chlorpromazine tablets	Flouresceine strips	Electrocardiogram neonatal
Bupivacaine injection without dextrose	Ergocalciferol oral drops	Codein phosphate tablets	Insulin actrapid	Endotracheal tubes
Calcium chloride injection	Ethylchloride spray	Griseofulvin tablets	Insulin protaphane	Flanges
Dextrose 10%	Gambex shampoo	Imipramine tablets	Microval	
Digoxin injection	Gllycerine Suppositories	Lithium carbonate tablets	Ovral	
		Promethazine tablets	Oxybuprocaine eye drops	
		Quinine sulphate tablets		

Dopamine injection Flumazenil injection Labetalol injection Maintelyte and dextrose 5% Mannitol injection 20% Methylprednisolone injection Neostigmine injection Potassium chloride injection Propofol injection Quinine injection Sodium bicarbonate injection Streptomycin injection	Ipratropium bromide spray miconazole cream Nalidixic acid suspension Nystatin ointment Phenytoin suspension Promethazine syrup Selsun Shampoo Sodium phosphate enema	Rifampicin isoniazid (RH 60/30) Spironolactone 100mg tablets Thiamine tablets Thyroxin tablets	Spider antevenom Snake antivenom Test strip blood glucose Triphasil tablets	Mucous extractors

Suxamethonium injection				

4.2 INTERVIEWS

4.2.1 Participants characteristics

Thirty five health professionals from all seven public hospitals of the Sekhukhune District participated in the study. Out of fourteen pharmacists who participated in the study, seven were pharmacy managers and the other seven additional pharmacists had more than twelve months or more working experience within the facility under study. All seven nursing sisters were part of Drugs and Therapeutics Committee and seven outpatients medical officers had twelve months or more working experience within the facility under study. Seven clinical managers are chairpersons of Drug and Therapeutics committees.

4.2.2 Stock control

Pharmacists are mainly tasked to control all pharmaceutical and surgical sundries All public hospital pharmacies of the Sekhukhune district have a computer system called Pharmaceutical Distribution System (PDSX) for stock control which includes ordering, receiving, stock distribution, stock-taking, checking of expired stock, checking of short-dated items and other management procedures like stock movements reports.

4.2.3 Stock orders

A pharmacist indicated that pharmaceutical orders to the supplier are done by ”*going to the shelves, check item by item, no minimum or maximum order levels used, experience to estimate quantities is used”*. An order is processed by capturing the estimated quantities on the computer. Computer suggested orders are rarely used because computer minimum and maximum order levels are unreliable as they may

not reflect the current situation or the stock is unbalanced which may result in overstocking. In an effort to minimize overstocking and expiration, pharmacists mentioned that once the order gets processed and printed, a different person, usually *"a pharmacist verifies ordered quantities*" before an order is sent to the supplier. According to pharmacists, the stock is packed by the use of first expiry first out (FEFO) or first in first out (FIFO) principles.

4.2.4 Stock distribution

Distribution of stock from the pharmaceutical and surgical stores to the outlets is mainly done by capturing ordered quantities on the computer first. One of the pharmacists mentioned that the "*stock is picked by the use of a computer generated picking list from the computer though emergency issuing is done by writing the issued stock in the book and later issue from the computer*", which some of the pharmacists described as a method which has the potential to influence drugs expiration if not properly practiced. Out of fourteen pharmacists who participated in the study from seven public hospitals of the district, only one pharmacist mentioned to have received a formal training on the use of PDSX. This indicates that new pharmacy staff members learn the PDSX depending on the availability of a knowledgeable person.

4.2. 5 District stock rotation

A list of short-dated drugs is circulated throughout the district during a district pharmacy managers' meeting to reduce the quantity of drug's expiration and to establish which medicines expired or are about to expire. The meeting is usually held once a month. Another pharmacist said that "*short-dated drugs are received from the provincial pharmaceutical depot and may not be returned because they fear stock-*

outs". Some pharmacists, medical practitioners and nurses who participated in the study said that their hospitals have a Drug and Therapeutics Committee which is expected to meet once per month. The committee has on their agenda items like pharmaceutical stock availability, short-dated drugs but most committees inconsistently meet due to poor attendance by the committee members which negatively affect distribution of information about short-dated drugs. One of the medical practitioners mentioned that *"sometimes what they agree on in the Drug and Therapeutics Committee is not what they do in practice, especially the tendency to prescribe certain drugs over others".*

4.2.6 Ward stock rotation

A nursing sister said that "*ward visits are inconsistently done and this affects stock rotation between wards and pharmacy"*. Most pharmacists and medical practitioners reported that the stock expires because of overstocking; lack of ordered quantities verification before they are sent to the supplier; lack of pharmacist supervision of new pharmacy staff members who are learning; inconsistent hospitals Drug and Therapeutics Committee meetings; lack of standard treatment guidelines based on the individual hospital needs which is in line with the South African Medicines Formulary; the supply of short-dated drugs from the provincial pharmaceutical depot; prescribing tendencies where prescribers prefer certain drugs than others; drugs which were ordered by request from visiting specialised medical practitioners or medical practitioners who left the facility.

4.2.7 Common practices

All participants shared the opinion that a functional Drug and Therapeutics Committee should have an influence in the reduction of drugs expiration. A

pharmacist further reported that "*emergency drugs like adrenaline and atropine are likely to expire because they must keep them even if they expire because it is compulsory to have them inside emergency trolleys"*. Expired stock is disposed through an approval by the hospital Board of Survey, Provincial Pharmaceutical Committee and the Head of Department of Health. Reasons for drugs expiration and future measures to reduce drugs expiration are required when approval to dispose stock is requested. All expired stock should be priced before disposal begins.

4.3 CONTRASTING OPINIONS

4.3.1 Stock orders

Most pharmacists indicated that sometimes drugs expiration is influenced by requests to order drugs by visiting specialised medical practitioners and medical practitioners on short term contracts. A pharmacist further mentioned that *"it is good to have a standard treatment guideline for different hospitals which will help which drugs to order",*

4.3.2 Prescribing

Medical practitioners showed that in many situations, they prescribe according to their preferred choice of drugs, which leads to certain drugs being underutilised. A list of short-dated drugs is distributed by pharmacists to members of the hospital Drug and Therapeutics Committee and the clinical manager is expected to report back to the prescribing medical practitioners about the short-dated drugs list. Prescribing medical officers indicated that they usually don't receive a list of short-dated drugs which could consequently have an impact in reducing drugs expiration.

Chapter 5

5.1 DISCUSSION

The Limpopo Province's pharmaceutical services department uses a norm of 0.05% (when expired value is divided by expenditure multiplied by hundred) as maximum allowance for drugs expiration in public hospital pharmacies. According to Ritchie et al .(2000), it is inevitable that waste will occur given the operation of hospitals, the nature and purpose of pharmaceutical supplies, however it is important to establish an acceptable level of pharmaceutical waste, to ensure that it does not rise and if possible to limit it.

The total pharmaceutical expenditure for Sekhukhune district pharmacies during the financial year 2010/2011 was R114 626 639.256 (sum of expenditures from table 2). The total expired stock value for the same financial year was R86 815 (sum of expired stock from table 4.2). The total value of expired stock and annual expenditure gives 0.08% (annual expired stock value divided by annual expenditure multiply by hundred) value of expired stock for the financial year 2010/2011. The 0.08% indicates that the district is above the limit of 0.05% by 0.03%. As shown in Table 4.1, district pharmacies were allocated a total budget of R77 551 629.96 for pharmaceutical and surgical sundries and spent R114 626 639.256 by the end of financial year 2010/2011. Excess expenditure may be due to ordering of pharmaceutical items which were not budgeted for or overstocking which consequently lead to stock expiration.

In a study conducted by Kangis and Van der Geer (1996), it was indicated that demographic changes caused by the ageing population and increased demands and expectations are expanding health care budgets to uncontrollable levels. Chandra et

al (2011) agree that hospitals spending are out of control and all hospital processes need to be streamlined into the most cost effective method while allowing the highest patient care level possible. Out of an annual expenditure of R114 626 639.256, the district should have had a maximum of R57 313, 32 (0.05% of annual expenditure) value of expired stock. Pharmacists believe that price errors during capturing of stock could have an influence on the value of expenditure. Groblersdal hospital had an annual expenditure of R24 471 018.217 while it was allocated an annual budget of R 4 135 446.2 (Table 1).

Emergency drugs like adrenaline, spider antivenom, snake antivenom and flumazenil injections were common to expire because facilities are expected to keep them. Drugs mainly used in rare medical conditions like quinine tablets and quinine injections for malaria within the Sekhukhune District were found to reach expiration date on the shelf because they are regarded as slow movers and these suggests that very small quantities should be kept and closely monitored for rotation. Few surgical sundries reach their expiration date on the shelves mainly due to their long expiry date (e.g. mucous extractors, bag rebreathing antistatic, flanges).

All public hospital pharmacies of the district have computer software called PDSX for management of stock which includes reports on drugs expiration and short-dated drugs. One out of fourteen interviewed pharmacists reported to have received a formal training about the use of the computer software used for stock management. Pharmaceutical orders are commonly checked by pharmacists before they are sent to the suppliers to eliminate errors in ordered quantities and overstocking. Breen and Crawford (2005) found that it would be good business sense to have an electronic ordering system with the objectives of time saving for orders; easy access to order history and less manual intervention once system set up properly. The stock is

packed and issued according to FEFO or FIFO methods. Issues to the outlets are mainly done by the use of a computer generated picking list. Stock rotation is maximised by doing ward visits to aid in reduction of expired drugs. Richie et al (2000) found that pharmacy staff members do medical stock audits in hospital units to maintain agreed stock levels as well as rotation of stock between hospital units to avoid wastage.

Pharmacists, clinical managers and nurses are members of the hospital DTC where a number of issues like drugs availability, expiration and short-dated drugs are discussed. The DTC is expected to meet once per month. In the DTC, a pharmacist is the secretary and clinical manager is the chairperson. A list of short-dated drugs discussed in the DTC should be made available to medical officers for prescribing. Medical officers reported that they do not receive a list of short-dated drugs through the DTC which consequently should have a positive influence in reduction of expired drugs and costs. In a study conducted by Bjorkman et al. (2007) in Sweden, it was indicated that there is a need for DTC in every country with the aim of contributing to reliable safe and cost-effective drug use. Holden and Wilson (1996) found that 'the quality of prescribing is an aggregation of its effectiveness, safety, appropriateness and cost'.

Pharmacists highlighted that the use of a standard treatment guideline based on the level of hospital (e.g. district, referral, tertiary levels) may aid in reducing drugs expiration because each hospital will order items based on the guideline. Holden and Wilson (1996) emphasised that prescribers need to think rationally about therapeutics and consider carefully drugs they will include in their formularies as well as being mindful that formularies require continuing attention if they have to be effective.

One participant stated that *"when pharmacy staff rotate and there is lack of communication and hand over between rotating staff that could lead to inconsistency in ordering resulting in overstocking or under stocking"*. It is very important to use minimum and maximum stock order levels which are frequently reviewed and clearly displayed on shelves. A pharmacist indicated that *"it becomes a challenge if people who are ordering are not available".* Communication between Drug and Therapeutics committee, prescribing medical officers and pharmacists was indicated as one of the best method which can reduce drugs expiration because medical officers will know what's available to prescribe.

In all Sekhukhune district hospitals, expired stock is removed from the shelves, priced and quarantined until approval is granted for collection and disposal by head of Department of Health. In a study conducted by Ritchie et al (2000), it was suggested that materials to be disposed should be segregated according to their types for later safe disposal.

5.2 LIMITATIONS OF THE STUDY

Time and financial constraints limited the study to one district. The findings of this research cannot be generalized to other districts because the study was conducted in only one district of the Limpopo Province.

5.3 SIGNIFICANCE OF THE STUDY

Drugs expiration in public hospital pharmacies costs the department of health money and negatively affects the quality of service. It was important to check the extent to which drugs expire as well as costs and factors related to such expiration.

5.4 CONCLUSION

In the financial year 2010/2011, public hospital pharmacies of Sekhukhune district had exceeded the 0.05% of expired stock value. An amount of R86 815 value of expired stock was found for the financial year under review, being 0.08% which is the total expired stock value over total expenditure. Emergency and slow moving drugs were common to expire in all facilities. Few surgical sundries expire mainly because of their long expiration date. Lack of order verification by pharmacists, overstocking, poor methods of stock issues, lack of education about the system used for stock management, inconsistent DTC meetings, preference for certain drugs by prescribers were cited as some of the reasons for drugs expiration.

5.5 RECOMMENDATIONS

Based on the findings for the present study, it is recommended that the following steps in an attempt to reduce drugs expiration be taken:

1. Review of minimum and maximum order levels both on the PDSX and the shelves and should be done at least twice per annum. Review of order levels will aid in rotating slow moving drugs and discontinuing orders of drugs which are completely not moving.
2. Orientate and educate staff members about the PDSX used for stock management. Staff members should be able to print short-dated drugs report to enable them to take preventative action for drugs expiration.
3. Orders to the suppliers need to be checked by an experienced person to avoid overstocking.
4. The use only computer printed picking lists to issue stock helps to pick stock by the principle of first expiry first out or first in first out.

5. Regular ward visits to check overstocking should be encouraged to improve stock rotation between wards and pharmacy.
6. Strengthen the hospital Drug and Therapeutics Committee by encouraging members of the committee to attend and the pharmacist to give a list of short-dated drugs to the members.
7. The short-dated drug list should be made available to the prescribing medical practitioners.
8. Minimise special orders requested by medical practitioners were alternative drugs are available.

Appendix 1

REFERENCES

Antai, I. and Mutshinda C.M. 2010. Health status assessement using reverse supply chain data. *Management Research Review*. 33 (2) : 111-122.

Asamoah, D., Abor, P., and Opare, M. 2011. An examination of pharmaceutical supply chain for artemisinin-based combination therapies in Ghana. *Management Research Review*. 34 (7) : 790-809.

Bendavid, L., Boeck, H., and Phillipe, R. 2010. Redesigning the replenishment process of medical supplies in hospitals with radio-frequency identification technology.*Business Process Management Journal.* 16 (6) : 991-1013.

Bhakoo, V., and Chan, C. 2011. Collaborative implementation of e-business process within the health-care supply cahin: the Monash Pharmacy Project. *Supply Chain Management: An International Journal*. 16 (3) : 184-193.

Bjorkman, I.K., Schmidt, I.K., Holstrom, I., and Bernsten, C.B. 2007. Developing the role of the drug and therapeutics committees: perceptions of chairs. *International Journal of Health Care Quality Assurance*. 20(2) : 161-178.

Breen, L., and Crawford, H. 2005. Improving the pharmaceutical supply chain. Assessing the reality of e-quality through e-commerce application in hospital pharmacy. *International Journal of Quality and Reliability Management*. 22 (6) : 572-590.

Burt, D.N., Dobler, D.W., and Starling, S.L. 2003. *World Class Supply Management: The Key to Supply Chain Management*, 7th ed., McGraw-Hill, Singapore.

Chandra, C., Kumar, S., and Ghildayal, N.S. 2011. Hospital cost structure in the USA: what's behind the costs? A business case. *International Journal of Health Care Quality Assurance*. 24 (4) : 314-328.

Dobler, D.W, and Burt, D.N. 1996. *Purchasing and Supply Chain Management*, 6th ed., McGraw-Hil Higher Education.

Expired stock report. October 2010. Jane Furse Hospital. Sekhukhune District. South Arica.

Farrugia, C.A. 2005. Controlled temperature storage of medicinals: good practice measures in the community pharmacy. *Journal of the Malta College of Pharmacy Practice*. Issue 10 : 30-33.

Holden, J.,and Wilson, R. 1996. The quality of prescribing in general practice. *International Journal of Health Care Quality Assurance*. 9 (5) : 17-23.

Hugo, M. 2006. *Essentials of Supply Chain Management*, 2nd ed., John Wiley and Sons, New Jersey.

Huq, F., Asnani, S., Jones, V., and Cutright, K. 2005. Modelling the influence of multiple expiration dates on revenue generation in the supply chain. *International Journal of Physical Distribution and Logistics Management*. 35 (3) : 152-160.

Kangis, P., and van der Geer, L. 1996. Pharmaco-economic information and its effect on prescriptions. *Journal of Management in Medicine*. 10(5) : 66-74.

Kumar, S., Dieveney, E., and Dieveney, A. 2009. Reverse logistic process control measures for the pharmaceutical industry supply chain. *International Journal of Productivity*. 58 (2) : 188-204.

Magad, E.L., and Amos, J.M. 1995. *Total Material Management: Achieving Maximum Profits Through Material/Logistics Operations*, 2nd ed., Chapman & Hall, New York.

Mustaffa, N.H., and Potter, A. 2009. Healthcare supply chain management in Malaysia: a case study. *Supply Chain Management: An International Journal*. 14 (3) : 234-243.

Nakyanzi, J.K., Kitutu, F.E., Oria, H., and Kamba, P.F. 2010. Expiry of medicines in supply outlets in Uganda. *Bull World Health Organ*. 88 : 154-158.

Richie, L., Burnes, B., Whittle, P., and Hey, R. 2000. The benefits of reverse logistics: the case of the Manchester Royal Infirmary Pharmacy. *Supply Chain Management: An International Journal*. 5 (5) : 226- 233.

South African Good Clinical Practice Guidelines.2006.2nd ed. *Department of Health*, Republic of South Africa.

Standard Treatment Guidelines and Essential Drugs List for South Africa.2006. 2nd ed., *Department of Health*, Republic of South Africa.

Timbury, C.M., McCartney, A.C., Thakker, B., and Ward, K.N. 2009. *Notes on Medical Microbiology*, 2nd ed., Churchill Livinhstone, Elsevier.

Thron, T., Nagy, G., and Wassan, N. 2007. Evaluating alternative supply chain structures for perishable products. *The International Journal of logistics Management*. 18 (3) : 364-384.

Tumwine, Y., Kutyabami, P., Odoi, R., and Kalyango, N. 2010. Availabity and expiry of essential medicines and supplies during the ‘pull’ and ‘push’ drug acquisition

systems in a rural Ugandan Hospital. *Tropical Journal of Pharmaceutical Research*. 9 (6) : 557-564.

Van Vactor, J.D. 2011. Cognizant healthcare logistics management : ensuring resilience during crisis. *International Journal of Disaster Resilience in the Built Environment*. 2 (3) : 245-255.

Vries, J., and Huijsman, R. 2011. Supply chain management in health services: an overview. *Supply Chain Management: An international Journal.* 16 (3) : 159-165.

APPENDIX 2

INFORMED CONSENT FORM

1. I voluntarily participate in a research study titled ‘expiration of drugs in public hospital pharmacies of Sekhukhune District, Limpopo Province, South Africa’, conducted by Mr. K.A Mashishi, a master’s student of the University of Limpopo, Turfloop campus.

2. I am fully aware that the research interview is about collection of data on drugs expiration.

3. I am aware that the will be no financial gain for my participation in this study and I may withdraw my participation at any time without penalty or following legal processes.

4. I understand that my name will not be used during the interview and my confidentiality as a participant will remain secure.

5. I understand that the information I am providing in this research interview will be recorded on an audio tape and may be confidentially shared with the supervisor of Mr. K.A Mashishi and the examiner(s) for the purpose of this research only.

6. I understand that if I feel uncomfortable in any way during the interview session, I have the right to discontinue.

7. An interview will be conducted by the researcher (Mr. K.A Mashishi) for a period not exceeding 40 (forty) minutes.

8. I understand that the information I provide for this research interview will not affect my job in any way.

9. I understand that the contents of this research study has been reviewed and approved by the University of Limpopo Research Committee for studies involving human subjects.

10. To the best of my knowledge, I have read and understood the contents of this consent form and questions involving my participation are answered to my satisfaction.

11. I agree to participate in this research study and I have been given a signed copy of this consent form.

Name of Participant	Name of Researcher
…….....	……
Participant Signature	Researcher Signature
……	……...

Contact Details:

Researcher:.....

Participant:……

Date:……..

APPENDIX 3

INTERVIEW GUIDE

Name of Hospital……

Date…….

1. Explain how the stock is ordered in this pharmacy.

2. What happens with the order before it is sent to the supplier?

3. Explain how the stock is received.

4. Describe the method used to pack stock in your pharmacy.

5. How is the stock issued from the pharmacy to the outlets such as wards and clinics?

6. Explain how the bulk stock is controlled.

7. Explain how the new staff members get involved in the control of bulk stock.

8. What do you do with short-dated drugs?

9. How do you establish that the stock has expired?

10. What are the main issues of your drug and therapeutic committee?

11. What influence does the hospital drugs and therapeutics committee have on drugs expiration and how often does your committee meet?

12. Do you have pharmacy staff members who do ward rounds? If yes, what are their main focus areas?

13. In your opinion, why does the stock expire?

14. Could you mention which drugs commonly expire?

15. In your opinion, how much of the stock has expired for the financial year 2010/2011.

16. What do you do with expired stock?