FACTORS AFFECTING THE PROCESS OF SUPPLYING CORE MEDICINES AT LEHURUTSHE HOSPITAL PHARMACY

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DECLARATION

I, Johnson Mwebaze Nabyoma, declare that this mini dissertation is my own original work, the information-gathering and analysis was done by me, for which I am responsible for the discussion and conclusions reached in this study. Any work that is not of my own has been indicated and duly acknowledged.

I further declare that the information contained in this report has not been submitted before to any academic institution.

The report I submit emanates from research that was conducted at Lehurutshe hospital between 2017 and 2018. The field of study is pharmaceutical supply chain management as a mini dissertation in partial fulfilment of the degree Master in Business Administration.

I give consent to the North-West University to use my work for the purpose of research.

Johnson Mwebaze Nabyoma

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ABBREVIATIONS AND ACRONYMS

EML	Essential Medicines List
HIV	Human Immune Virus
MSH	Management Solutions for Health
NDoH	National Department of Health
NDP	National Drug Policy
NHI	National Health Insurance
PSCM	Pharmaceutical Supply Chain Management
PMPU	Provincial Medicines Procurement Unit
PTC	Pharmacy and Therapeutic Committee
SKU	Stock Keeping Unit
TB	Tuberculosis
WHO	World Health Organisation

ABSTRACT

Introduction: A search of literature and the World Health Organisation (WHO) reports have shown the unavailability of essential medicines in public hospitals all over the world. However, the factors contributing to this unavailability cannot be generalised but rather traced to a specific setting for remedial action to be of any success.

Objectives: The study sought to establish the trends in availability of essential medicines at Lehurutshe hospital pharmacy and thence establish supply chain management find other factors that affect the availability of essential medicines at the facility.

Method: The study was a mixed method study with both qualitative and quantitative components. Questionnaires were distributed to respondents to capture the factors affecting availability of essential medicines and a data tool was used to establish trends in the availability of essential medicines at the facility over a period of five years. Analysis of data was through descriptive statistics and thematic analysis.

Results: The results show that the most direct factors that contributing to the unavailability of essential medicines are lack of an accurate pharmaceutical supply chain management system, inaccurate data, lack of equipment and software to support the implementation of a good pharmaceutical supply chain management system.

Conclusion and **recommendations:** Based on the results, it is evident that pharmaceutical supply chain management at the facility operates below standards required and that a number of factors have contributed to stock out of essential medicines. To overcome this, it is suggested that a complete overhaul of the pharmaceutical supply chain management system needs to be implemented.

CHAPTER 1

1.1 INTRODUCTION

Shortage of medicines has become a worldwide problem occurring across the supply chain and has become a public health problem directly affecting patients. Medicine shortage, according to World Health Organisation (WHO), is a drug supply issue requiring immediate change. Not even a single class of medicine is an exception and such unavailability affects complex cases such as chemotherapy, anaesthetics, diabetes, asthma to the simplest medication such as aspirin and yet they are important components of the healthcare system (Wirtz *et al.*, 2017:1-3)

Post 1994, South Africa inherited a nation with a high level of inequality in the provision of health care amongst the four races (Anon, 2013:85; Collins, 2018; Harris *et al.*, 2011:105; Magadzire *et al.*, 2014:205; Meyer *et al.*, 2017). Unavailability of medicines remains one of the main problems among others that still affect the nation, despite many interventions to improve the situation. Availability of core medicines is meant to be at 95% and above yet this is hardly achieved (Cameron *et al.*, 2009:245)

This research investigated the availability of essential medicines at Lehurutshe hospital pharmacy located in the North West province, South Africa.

Population access to essential medicines is paramount to the principle of universal health. Essential medicines are only able to save lives only if they are available to the population (Quick *et al.*, 2005:115). Efforts to improve availability of essential medicines through stimulating efficiency and enhancing the pharmaceutical supply chain enable a health system to avail these essential medicines to the population in the right quantities, right time and in the right place (Tumwine *et al.*, 2010:1597-1598).

Shortage of medicines is a worldwide problem occurring across the supply chain and has become a public health problem directly affecting patients. Medicine shortage,

according to Heiskanen *et al.* (2015:232-233), is a drug supply challenge requiring immediate change. Not even a single class of medicine is an exception and this unavailability affects complex cases such as chemotherapy, anaesthetics, diabetes, asthma to the simplest medication such as aspirin (Prinja *et al.*, 2015:5-11)

Many citizens of South Africa measure health service delivery and performance through an estimation of the availability of essential medicines in their facilities.

This research was undertaken due to the recent problem of unavailability of essential medicines in public healthcare facilities across South Africa (Coovadia *et al.*, 2009:281). This study aimed at identifying the historical data on essential medicines outage in the past five years and then establishing reasons contributing to this problem.

WHO defines essential medicines as “those prescriptions that satisfy the priority health care needs of the population, selected with due regard to public health relevance, evidence on efficacy and safety, and comparative cost-effectiveness’’ (Organization, 2015:52).

1.2 BACKGROUND AND RATIONALE FOR THE STUDY

Availability of essential medicines is part and parcel of the components of quality health care service provision because availability of medicines is one of the six priorities for the national Department of Health (Patel, 2018:202-206).

Research conducted by the National Department of Health (NDoH) in 2012 sheds light on the unavailability of essential medicines countrywide based on the Health Systems Trust Report of 2012b (Swanson *et al.*, 2015; van Staa *et al.*, 2016:3636). In response to this, the NDoH introduced the essential medicines list (EML) which was to address this problem. However, the shortages and widespread unavailability have persisted till today. This has been attributed to a number of problems which include poor governance, absence of accountability, lack of skills in the PSCM the various health facilities (Barbazza & Tello, 2014:2-3).

Ensuring essential medicines availability is part of managing demand and supply in the PSCM philosophy and, because of this government, implemented a tool comprised of legislative policies and guidelines to improve access to medicines in public health care facilities all over the country.

Improving medicine supply management has been identified as one of the key indicators for improved quality healthcare provision (Meyer *et al.*, 2017:751; Moons *et al.*, 2018:207).

The South African government is moving towards the National Health Insurance (NHI), and emphasis is on affordable medical care for all that requires that core pharmaceutical items be available at all times at the required level to achieve this goal (Meyer *et al.*, 2017:207).

Management science for health (MSH) in a study conducted in the Free State in 2009 cited a number of reasons why availability is a problem: an unreliable, incoherent information management system, dysfunctional and unrealistic organisational structure (Zuma, 2013:31).

There are a number of problems associated with the shortage of essential medicines which include the risk associated with patient care in the hospitals as they are essential components of patient care, essential medicines should be administered timeously, especially in patients where there are significant clinical outcomes if the essential medicine is not available, the diversion of valuable time for pharmacists to attend to other issues into managing essential medicine shortages, and leading to reduced efforts in minimising the cost of healthcare (Bogaert *et al.*, 2015:3-8).

It is against this disturbing background that this study sought to establish the extent of the problem and the various contributing factors to the suboptimal availability of essential medicines at Lehurutshe district hospital pharmacy.

1.3 PROBLEM STATEMENT

There are significant supply chain factors acting as bottle necks in the availability of essential medicine at Lehurutshe district hospital.

1.4 RESEARCH QUESTION

1.4.1 Research question one

What is the historical percentage stock out of essential medicines at Lehurutshe hospital pharmacy in the past five years?

1.4.2 Research question two

What are the pharmaceutical supply chain factors contributing to the irregular availability of essential medicines at Lehurutshe hospital pharmacy?

1.4.3 Research question three

What other shortcomings could be contributing to the irregular availability of core medicines at Lehurutshe hospital pharmacy?

1.4.4 Research question four

What could the pharmacy management do to ensure availability of essential pharmaceutical items at Lehurutshe hospital?

1.5 AIM OF THE STUDY

The significant aim of the study is to establish PSCM, managerial and other PSCM related reasons for the irregular availability of essential medicines at Lehurutshe hospital pharmacy and then make recommendations to help improve availability of the essential items.

1.6 OBJECTIVES OF THE STUDY

The study set the following objectives in order to:

- Establish a trend in the unavailability of essential medicines at Lehurutshe hospital pharmacy over the past 60 months

- Identify supply chain related factors contributing to the irregular availability of core medicines
- Identify managerial and other factors related to PSCM that could be negatively impacting on essential medicine availability.
- Recommend ways to improve supply and availability of core medicines in the hospital

1.7 SIGNIFICANCE OF THE STUDY

The research examined PSCM in the public sector with specific focus on Lehurutshe hospital, identifying the trend and various reasons for stock outs.

The World Health Organisation conducted a study in which availability of essential medicines in low to middle income countries was seen to range between 29.4 and 54.4 % (Cameron *et al.* (2009:241-246). South Africa is not an exception, therefore the need to examine the state of the problem at Lehurutshe hospital. This study contributes to the knowledge already available on the problem relating to inventories of essential medicines in the public sector.

1.8 SUMMARY

This chapter outlined the problem informing this study and the research question, aim and objectives of this study. The next chapter focuses on the recent and relevant literature available regarding the availability of essential medicines in the public sector.

CHAPTER 2
LITERATURE REVIEW

2.1 INTRODUCTION

This section presents and interrogates the views of various authors examining the problem of availability of core medicines in public hospital pharmacies and the reasons for this occurrence. The chapter commences with a brief insight into the supply chain process followed when supplying pharmaceuticals and ultimately dwells in detail on the problem of availability of essential medicines across the world.

2.2 ESSENTIAL MEDICINES

Starting in the 1970s, low to middle income countries embarked on a programme for essential medicines in a quest to foster accessibility, quality, availability and affordability and coherent use of essential medicines. This was aimed at balancing conflicting policies and encourage worldwide commitment to a common goal. (Bruno *et al.*, 2015:112)

In 1997 WHO launched the world's first essential medicines list and to keep it up to date, it is revised the list every two years

Essential medicines can be defined as those used to treat the most common conditions that are encountered in a given population. They should be available in healthcare facilities at all times in sufficient amounts and in the respective dosage forms as per the population sub groups. The latest WHO essential medicines list was published in 2015 (Organization, 2015:108). The South African essential medicines list was developed in 2015 indicating which category and list of drugs are deemed essential (Balasubramaniam *et al.*, 2011:363-366; Organization, 2015:109).

2.2.1 Selection of essential medicines

The selection of essential medicines in every country follows a two-step process;

- First the product has to go under review of its efficacy, safety and quality withholding any comparison with other agents before it is registered for use.
- Secondly the product is then compared with other medicines within the same therapeutic class and here comparisons in inter product safety, efficacy and costs are done.

Once a national essential medicines list is established, it is used as guide the procurement and supply of such medicines in the public health sector of a country, act as a guide for reimbursement schemes, donations, and local manufacture of medicines and also help in defining the scope of training for healthcare workers.

2.2.2 Importance of an essential medicines list

A wealth of evidence has proven that EMLs once rigorously developed, introduced to the stakeholder and consequently supported by all stakeholders can lead to improved availability of medicines, appropriate prescribing and better outcomes for all.

Secondly, since low to middle income countries have low budgets for the pharmaceuticals, there is a notion that the EML is to their economic benefit since the EML products are quite pricey when compared to treatments prior to the advancement of the EML by WHO though in the end it is argued that they lower costs through economies of scale (Rathish *et al.*, 2017; Zuma, 2013).

This study assesses the physical access to essential medicines at Lehurutshe hospital.

2.3 AVAILABILITY OF ESSSENTIAL MEDICINES

The WHO emphasises that essential medicines should be made available to the population at all times when needed in an efficiently run healthcare system (Wirtz *et al.*, 2017:5).

Access to medicines is a basic human right and yet unavailability of these medicines continues to be a world challenge (Rathish *et al.*, 2017:7). Millions of people all over the world die or become disabled after suffering from conditions with proven pharmaceutical care.

The reason for developing such a list is to ensure continuous availability of the listed medicines. Supply of essential medicines in any health system is a high priority. This is not the case in low to middle income countries where this is still a problem. Availability refers to the physical access to the medicines listed, and is defined as "having medicines available continuously and accessible at public or private outlets within an hour's walk from the various residences of the population" (Dugani *et al.*, 2018:1209-1210).

It is estimated that a third of the world's population does not have full access to essential medicines (Balasubramaniam *et al.*, 2011:367). Essential medicines stock out is defined as the lack of medicines that the patients are meant to use and shortage is referred to as a situation where the inventory levels are less than what is required by the population being served (Hogerzeil *et al.*, 2013:684).

The factors constraining essential medicines availability are not common to all countries but are unique to a particular country and such should be investigated to ensure that interventions are directed towards the causal factors other than general mitigations. The inescapable point is that these factors overlap (Masters *et al.*, 2014:7).

Essential medicines unavailability has detrimental effects on the health of the population in various ways in that the patients tend to have adverse outcomes, less patients are willing to visit facilities which are known to experience stock outages as they perceive that they would not get the pharmaceutical care that they deserve to get. Patient satisfaction about the healthcare they are to receive and satisfaction with the service rendered is directly linked to the availability of medicines (Masters *et al.*, 2014:1). The dependence on essential medicine provision by the state in the rural settings is considered to be high. Search of literature has shown that

Availability of medicines in Brazil public healthcare system is of serious concern. In Africa there is poor availability of essential drugs which prevents implementation of simple intervention when managing the most common ailments in the population, leading to uncalled for distress among the population (Harding *et al.*, 2014:299).

In Kenya, Mwathi and Ben (2014:440) identified that there was stock out of common essential medicines in the selected public hospitals that they investigated around the Nakuru county. The Malawian public hospitals also experienced a host of drug shortages before the change in organisational set up in 2011 (Khuluza *et al.*, 2016:146)

The National Drug Policy (NDP) implemented in 1996 was to ensure equitable access to essential medicines through various channels such as resolving issues relating to supply chain (Pharasi & Miot, 2012:178-182). Magadzire *et al.* (2014:3) conducted a study in southern Africa where it was noted that approximately 20 percent of patients visiting public institutions in the region were unable to receive their supplies due to stock outage.

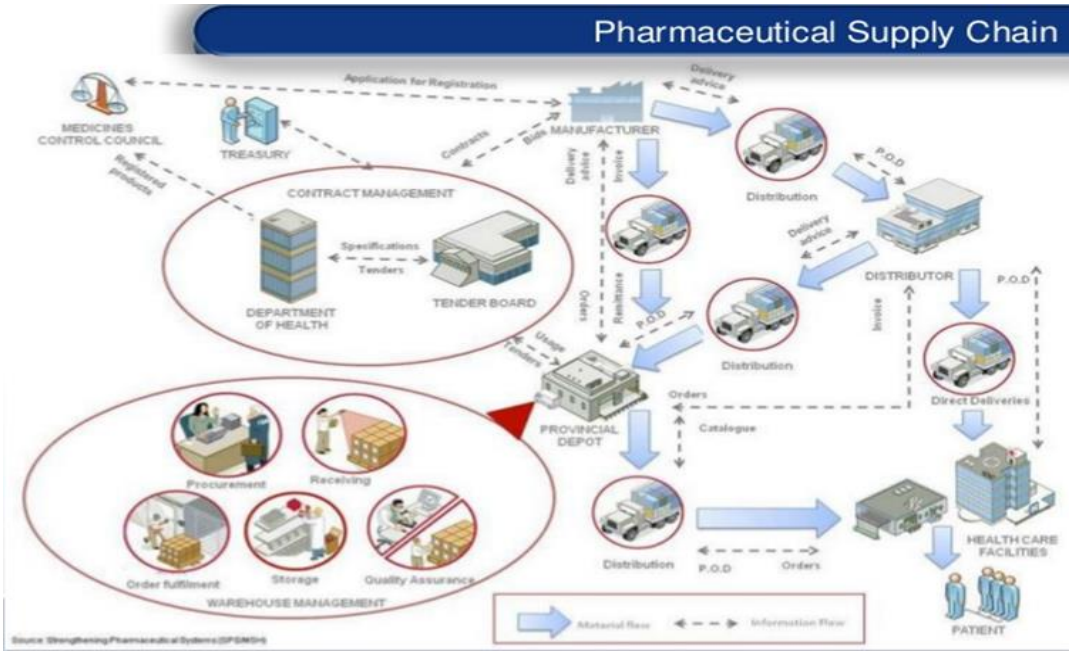
South Africa's healthcare system is characterised by a burden of multitudes of diseases which has increased demand for essential medicines in the public healthcare system, catering for approximately 70% of the South African population. Insufficient essential medicines or their complete absence has been identified as one of the major barriers to access to essential medicines in South Africa (Magadzire *et al.*, 2014:1-2).

The South African healthcare system is comprised of the public and private sector as seen in other low to middle income countries. The public health sector is funded and administered by the government and caters for about 71% of the population (Chopra *et al.*, 2009:1024). The South African constitution states that all citizens are entitled to access to proper healthcare. Studies conducted around South Africa have revealed that the country also faces issues of unavailability of essential medicines

despite its economic stature on the African continent. The factors identified in the studies include logistical inefficiencies in the essential medicines supply chain system, ineffective public transport network which delays delivery of medicines to facilities, the search for economic opportunities between the various provinces especially by immigrants making it difficult to forecast demand (Organization, 2015:994-995).

2.4 THE PHARAMACEUTICAL SUPPLY CHAIN PROCESS

The pharmaceutical supply chain process involves the procurement, shipping, storage and lastly issuing to various clients and dispensing to both in and out patients (Croxton *et al.*, 2001:30). The figure below illustrates the process followed in the pharmaceutical supply chain process that should be followed to ensure acceptable availability of core medicines. It is, however, a growing concern with the dwindling of the percentage availability of core medicines in public hospital pharmacies.



Adopted from (Croxton *et al.*, 2001:56)

Figure 1: Pharmaceutical supply chain process

It is against this background that it is imperative to identify and establish the factors leading to this trend of stock outs at Lehurutshe hospital and find solutions to overcome this massive problem.

Medicines shortages are complex global issues with adverse outcomes for the patients and severe constraints for the health care professionals. No single causative factor has been identified but a multitude of reasons, among them the highly complex medicine supply chain where efficiency relies on each individual input. The supply chain entangles raw material suppliers, wholesales, intermediaries and manufacturers among others. Any disruption in the supply chain process brings about medicine shortages (SALAAM:252-255). The medicines that are considered out of stock are not dependent on the individual EML adopted by a region. The EML span from antimicrobials to complex chemotherapeutic agents among others (Chaar, 2014:161-163; Walker *et al.*, 2017:3-6).

In Australia, a study conducted by Chaar (2014:163) revealed the unimaginable that medicine shortages had crept into the healthcare system of the country with the potential to cause serious harm. The study also indicated that the shortages made it hard for prescribers to make rational decisions especially where alternatives are either unavailable or nonexistent.

The United States is no exception, with a long-standing problem relating to medicine shortages for approximately a decade. In 2011 the American Society of Health System Pharmacists' web reported a shortage of 114 prescription medicines. In this case the shortages were identified as concentrated in the following areas: oncology, cardiovascular, central nervous system, anti-infective and pain management (Bogaert *et al.* (2015:1-3); t Hoen (2002:40-49) which shows a similarity in the category of medicines reported out of stock in Australia by (Chaar, 2014:163). Some of the contributing factors identified in the United States include increase in essential medicines demand globally, reduction in the generic medicines research and production and continuous upgrade to manufacturing plants instigated by changes in regulatory standards.

A study undertaken in Fiji (Walker *et al.*, 2017:10-15) involving a total of 48 stakeholders who undertook in an interview identified that international instances of medicine shortage all over the world are imminent and the World Health Organization has proposed global solutions streamlined into the specific needs of the organization.

In Africa, most of the countries are classified as low to middle income countries of which South Africa is one. In South Africa, the trend seems to be the same in the public sector, though studies have shown an improved availability in the private sector. Unavailability of medicines in public institutions which are the most affordable alternative for many people in the country subverts the global health initiative to increase the level of access to essential medicines (Ushie *et al.*, 2016b:3). In developed countries such as America, there is state of art logistics management system in hospitals which mitigates many problems relating to stock outage even though it also takes away time for patient care since is the management system is performed by medical staff (Volland *et al.*, 2017:82-85). In Africa, it seems to be a continental problem that health care facilities run short of supplies impacting on the provision of healthcare thus impacting on patient satisfaction all together. In a study conducted in two states in Nigeria, unavailability of essential medicines impacts on healthcare, mostly in the impoverished areas where patients cannot afford to buy medication from private facilities thereby eroding all the trust patients have in the public health care system (Ushie *et al.*, 2016a:1-3).

A study conducted on specific targets to be achieved by 2010 in malaria control strategy in accordance with international standards, the key factor in failure to achieve the set targets was the unavailability of artemisinin combination therapy in some healthcare facilities (Kassam *et al.*, 2015:255-260). Another study in Uganda by Kusemererwa *et al.* (2016:10) identified that many public institutions were out of stock due to the lack of equity in allocation of funding which led to some hospitals having stock while others were out of stock.

Similarly a study conducted in Tanzania identified that much as malaria is still one of the major health problem accounting for many deaths, mostly in children under five

years of age, an appreciable number of children brought to the healthcare facilities with fever are never tested or treated for malaria despite this being a national goals due to out of stock of medicines (Adinan *et al.*, 2015:5-6).

This problem has not skipped South Africa where stock outs have been noted in a number of studies. The Gauteng Department of Health, in a quest to improve health care services through reducing queues and waiting time, instructed health care facilities to give patients three months' worth of supply, especially those on chronic treatment and one of the contributing factor to the failures to this initiative, with a compliance of 26.7% to circular 23 of 2009 from 37.5 in 2010 was stock out of medicines (Mashile *et al.*, 2015:321). In another study conducted in Umgungundlovu, KwaZulu Natal, to confirm sufficiency of pharmaceutical services to support provision of antiretroviral therapy in primary health care clinics, it was observed that one of the major problems was functional stock out of pharmaceutical supply (Crowley & Stellenberg, 2015:85). On the same note, a study conducted at Dr. George Mukhari academic hospital to assess patient satisfaction as a measure of quality of service provided by health care professionals showed that one of the reasons for patient dissatisfaction despite the welcoming staff was stock outs (Bezuidenhout, 2015:220).

In the Western Cape Province, a study was conducted to assess the reason for outage of life saving medicines by Munedzimwe (2018:3) in which the causes of stock outs were explored. The study identified that the following as the main reasons for the stock outs: delays in awarding of pharmaceutical tenders, absence of tenders that actually appear on the essential medicines list (EML), inability of suppliers to honour contractual agreements.

The impact of medicine stock outs are enormous and some were pointed out in a study undertaken in Cote d'Ivoire where the effect of medicines stock outs on the death and retention in care of human immune virus (HIV) patient on combination antiretroviral therapy was assessed and the finding were that; the stock outs was witnessed by almost 11% of the cohort on treatment, discontinuation of treatment doubling the risk of interruption of pharmaceutical care or death much as the stock outs had not affected the first line regimen (Pasquet *et al.*, 2010:134-136).

Bediako *et al.* (2006:12) conducted a study in the North West province in 9 facilities in Taung district health institutions in which it was noted that more than half of patients were not satisfied with the availability of medicines and other pharmaceuticals in the district. Some of the proposed remedies that have been proposed include, increasing transparency and communication within the relevant stake holders, a group of internationally identified products should be generated and the United Nations co-opting the structure to deal with the shortage, all staff involved in essential medicines procurement and management should be encouraged to shift towards an active procurement process assuring the continuous supply of quality medicines, removal of unnecessary variability in regulatory practices between countries, and the development of evidence-based mitigation practices (Zuma & Modiba, 2017:5).

In the South African perspective, timeous tender awarding and supplier performance management could be pivotal in improving availability of medicines in public hospitals (Matimela *et al.*, 2016:50).

2.5 THE HOSPITAL PHARMACY OPERATING ENVIRONMENT

In a hospital pharmacy, there are numerous demands that the pharmacy must serve such as the wards and clinics. The main pharmacy is an exit point for pharmaceutical and surgical supplies to all the clients including all the inpatient and outpatients wards. This implies that carrying the responsibility of provision and accountability for all medicines in the hospital by ensuring their availability at all times.

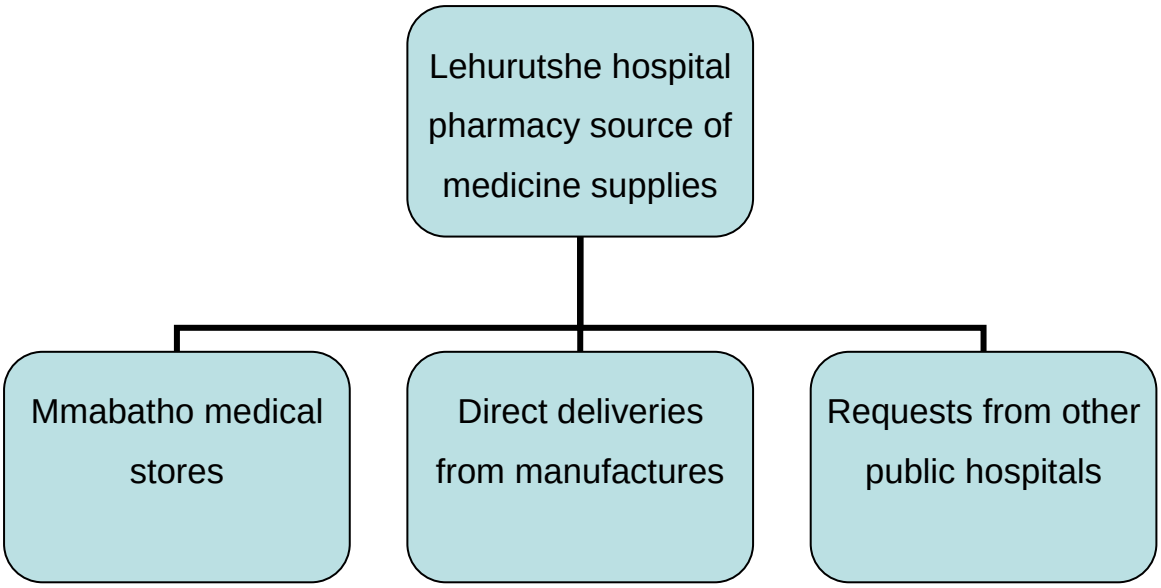


Figure 2: Source of medical supplies for Lehurutshe hospital pharmacy

The PSCM in the public sector becomes complicated when supplies have to come from a number of suppliers other than just medical stores. There is lack of control to verify if the essential medicines are indeed used by the patients or someone else when supplied in the wards or clinics. This is because of the dire lack of electronic systems in these outlets that would track down essential medicines use.

2.6 FACTORS CONTRIBUTING TO THE UNAVAILABILITY AND STOCK OUT OF ESSENTIAL MEDICINES

Most of the identified challenges in the supply of essential medicines can be classified as either internal or external. The external factors include delivery reliability, technology development, timely delivery, goodwill, flexibility in quantities ordered, supplier problems such as strikes. The internal issues were identified as poor inventory management, operation inadequacy, poor planning, lack of skilled workers, poor information flow, poor visibility on stock, inadequate strategies to manage stock, inadequate processes (Jaberidoost *et al.*, 2013:3). In another study by (Harding *et al.*, 2014:265) where the availability of essential medicines for managing HIV related pain, it was noted that the main reason for unavailability of

essential drugs was the lack of defined minimum stock levels for the various essential drugs.

Mwathi and Ben (2014:442) suggested that stock outs in the public hospitals in Kenya's Nakuru County were due to poor distribution practices, inconsistency in funding, poor selection of drugs and irrational use of essential medicines. The supply chain problems that contribute to the insufficient supply of essential medicines are:

- Errors in ordering of essential medicines
- Delays or changes in procurement strategies
- Logistical issues regarding transportation of medicines
- Erratic changes in demand for essential medicines
- The unavailability of structures necessary for appropriate quantification of essential medicines
- Ignoring the role of the private sector in ensuring availability of essential medicines
- Human resource problems in the public service system
- Unexpected changes or fluctuations.
- Unavailability of efficient and effective supply chain management team
- Absence of a national reporting system for stock outages particularly in low to middle income countries (Chukwuani *et al.*, 2006:93; Organization, 2000; Zuma & Modiba, 2017).

Literature attributes the unavailability of essential medicines in South Africa to the adoption of a supply chain management system in the absence of suitable technology and human capital to support, resulting in unaccountability and inconsistencies across systems.

2.7 EFFECTS OF UNAVAILABILITY OF ESSENTIAL MEDICINES

Literature reviewed suggests a number of detrimental effects that are caused by unavailability or insufficient supply of essential medicines. Literature in high income countries concentrated on medicines used to treat complicated illnesses such as cancer and anti-infective, mainly antibiotics. The low to middle income countries looked at medicines for treatment of the common disease burdens in such a resource setting spanning from HIV/AIDS to TB and malaria (Orubu *et al.*, 2017:235). This is enough evidence for one to suggest that medicine being out of stock is not a challenge limited to low to middle income countries but countries all over the world irrespective of economic classification (McLaughlin *et al.*, 2017:83-84). In the low to middle income countries, the most affected are medicines used for treatment or management of chronic illnesses, and where lifelong treatment is warranted (Awad *et al.*, 2016:53). Recently, the world has seen an increase in disease burden, which translates into an increase in essential medicines use contributing to the shortage of essential medicines (Matimela *et al.*, 2016:34).

It is therefore in every healthcare system's interest to improve the availability of these medicines to prevent the negative effects of stock out of essential medicines.

The problems encountered when out of stocks of essential medicines are experienced in a healthcare system are vast, both for the patients meant to use the medicines and the health system itself. Unavailability of essential medicines can lead to loss of trust in the public healthcare system by the citizens it is meant to serve (Matimela *et al.* (2016:45); (Meyer *et al.*, 2017:23; Munedzimwe, 2018) and yet a large proportion of the population in the low to middle income countries depend on state provided healthcare. There could be an increase in the cost of healthcare when there are shortages of essential drugs because of the extra hours needed to handle and sort out medicines shortages by staff (Balkhi *et al.*, 2013:17). One other factors that may increase the cost of healthcare is the need for replacement products when stock outs are experienced, which in most cases cost more than the primary choice (Griffith *et al.*, 2012:684).

Another problem is with third party funders who would have to reimburse since there are always identified medicines that are pre-selected for the treatment of selected illnesses. Such a scenario poses a problem to the service providers and the patient as there is increase in costs.

Since government has an established essential medicines list, stock out of these requires buying medicines that may not be listed. This is not always possible in the public sector due to the number of pre-authorisation protocols that have to take place before a healthcare facility can order such an agent, leaving the patient without treatment and sometimes worsening the patient's condition.

Once a patient does not have their medicine issued on the day of consultation, it is normal practice in the public sector that the patient is given a date on which to return and check if the prescription medicine is in stock, making the patient either miss work, or make multiple trips to the facility thus increasing the cost of such treatment for the patient (Bateman, 2015; Cameron *et al.*, 2009). The patient may also lose time and income that would be helpful for the family and generate revenue for the country.

Sudden interruption in treatment with antibiotics may lead to resistance thus necessitating a switch to alternative regimens which could be very expensive (Griffith *et al.*, 2012). Research done in sub Saharan Africa has shown that stock outs of essential medicines can lead to adverse effects such as resistance to antiretroviral treatment, and failure of treatment as a result of unavailability of essential medicines. Such adverse events have led to patients dying as result of errors emanating from switching regimens, especially when a healthcare professional is not conversant with the available alternative choices (Chaar, 2014).

When essential medicines are out of stock and patients are given alternatives, there is a risk of the patient reacting negatively to the alternative as opposed to if such a stock out was avoided (Awad *et al.*, 2016:7). Some of the essential medicines do not have any identifiable alternative such as in oncology. Such a situation leaves the patient with no treatment at all, leading to worsening of the patients' conditions (Cameron *et al.*, 2009).

Some of the main problems encountered are interruptions of patient treatment that may lead to resistance to medication, leading to switch to more expensive regimes such as in the treatment of tuberculosis (TB) and human immune deficiency virus (HIV) (Kafile, 2013:40).

The other detrimental effect of stock outs is that public confidence in public sector health facilities is eroded (Anon, 2013:43; Magadzire *et al.*, 2014:5)

2.8 PROPOSED METHODS TO ENSURE UNITERRUPTED AVAILABILITY OF ESSENTIAL MEDICINES IN THE PUBLIC SECTOR

A needs-based annual estimate of medicines would be appropriate for ensuring availability of essential medicines (Rathish *et al.*, 2017:7). Overhauling the pharmaceutical supply chain management system in the public hospital sector would enhance availability of essential medicines through the following:

- Using a digital business network to connect and collaborate with other sections in the healthcare system would allow for all units to work in sync, from requisition to delivery of medicines, it works like an electronic resource system for the entire supply chain so as to have real time visibility and coordination among all supply chain partners.

- Making a proper understanding of the true demand by looking close at what patients are consuming of the essential medicines using advanced demand sensing systems so as to better predict demand.

- Linking all demanders within the hospital pharmacy so as to have a live capture of all requisitions that could be coming in the next few weeks due to other problems such as transport.

- Developing capacity to quickly respond to changes in demand or supply of essential medicines such as delays in supply of essential medicines from medical stores or possibilities of industrial actions in the transport industry.

- Ensuring proper management of distribution so that all partners' schedules are tightly followed.
- Providing and efficient supply chain operating network so that there is high on shelf availability with low inventories.
- Providing facilities with more autonomy and accountability when procuring essential medicines.

  (Febreani & Chalidyanto, 2016; Masters *et al.*, 2014:8; Meyer *et al.*, 2017; Prinja *et al.*, 2015).

It is proposed that South Africa needs to overhaul the whole supply chain with special attention to nurturing operational competency and capacity of all stakeholders with the supply chain fraternity.

2.9 METHODS EMPLOYED IN RESEARCH ABOUT STOCK OUTS

The researcher reviewed literature and the methods that have been used before in the identification of factors that contribute to unavailability of essential medicines. There was no identifiable framework methodology that is standard to this type of research and thus evidence was context-bound if not all empirical.

The studies consulted used the mixed method to get answers to the identified research questions and this helped to increase the rigor of the research (Ballesteros *et al.*, 2014:1-6). Research into factors that contribute to essential medicines shortage also used the qualitative approach because there is room for in-depth interrogation of the phenomenon.

Some researchers employed across sectional surveys but the drawback has been the inability to identify trends occurring over a given time horizon which makes this study imperative and significantly relevant.

2.10 SUMMARY

This chapter elucidated the problem pertaining to unavailability of essential medicines under the global perspective, Africa and South Africa. The next chapter presents the methods employed in conducting this study.

CHAPTER 3
METHOD

3.1 INTRODUCTION

In this chapter, the study offers background to the method, the study design, the site where the study was conducted, the study population, selection of participants and the method used in collection of data. It also highlights how the data was analysed and presented.

3.2 BACKGROUND TO THE METHOD

The methodology used in this research emanates from literature survey. It is a scholarly process where a research idea is articulated into a research question Literature on the various methods that have been employed in collection of data on the subject in question were searched and the most appropriate methods chosen for this study. The rationale for the choice of the method used, reliability, ethical and validity considerations are presented in this section.

3.3 PHILOSOPHICAL ORIENTATION

The purpose of conducting this research was to establish the trend in availability of essential medicines at Lehurutshe hospital, establish factors contributing to the unavailability of medicines and finally to make recommendations on how availability of essential medicines could be improved. The research strategy was based on the research questions that were developed to answer an operational and implementation challenge in the sense of availability of essential medicines at Lehurutshe hospital pharmacy.

The choice to gather information relating to this research was guided by the following ontological and epistemological orientation of the theories.

- Ontological consideration

- Epistemological consideration

This study was based on the interpretivist epistemological philosophy which looks at social science differently from natural science (Bell *et al.*, 2018:161-205; Collins, 2018:214; Rosenberg, 2018:186).

3.4 RESEARCH PARADIGMS

Research can be either qualitative, quantitative or mixed methods. The research question is determined by the research gap, the purpose and strategy which in turn give rise to the research method. The difference in the qualitative and quantitative research is the research question, data collection, data collection instruments, the type of data collected. In qualitative research, a theory is generated which is flexible and interactive and appropriate in terms of clarifying difficult phenomenon. The protocols used unstructured or semi structured research methods for example interviews and questionnaires (Bell *et al.*, 2018:201-245)

To test a pre conceived theory, qualitative research uses measurements, or close ended structured questionnaires which restrict the researcher in asking further questions to acquire more information about the subject being studied. The drawback in this kind of research is that it there is no differentiation between people and institutions (Collins, 2018:200).

Taking into consideration the factors stated above, this study was designed as mixed method research to help cover for the drawbacks in social science research since both types of data were collected. The study was longitudinal in nature, the reason being that the study only looked at one variable which is the availability of the essential medicines in the hospital pharmacy by identifying factors associated with stock out of medicines in the hospital pharmacy. The mixed method approach investigated in detail the current standing and trends over the past 60 months in terms of the availability of essential medicines at the hospital pharmacy and the contributory factors to the unavailability of essential medicines in the facility.

The researcher ensured that there is logical flow of all the constituents of the study to capture information that may have not been contemplated in the research design. From literature review, the researcher developed research questions, sample, conceptual framework, data collection and analysis protocols.

With the guidance of the research questions developed, the qualitative method explored the availability of essential medicines at the hospital pharmacy over the past 60 months and the reasons thereof for the current standing at the hospital.

3.5 STUDY DESIGN

The study was longitudinal in nature, the reason being that the study examined only one variable which is the availability of the essential medicines in the hospital pharmacy. The study identified factors associated with stock out of medicines in the hospital.

The study design provides the basis on which data collection and analysis took place. For this study, the longitudinal method was chosen since the research was aimed at detecting the trends in the availability of essential medicines at the hospital pharmacy (Collins, 2018:215).

The use of open ended and closed ended questions relating to factors influencing the availability of essential medicines was chosen so as to allow for a thorough understanding of the sub set specific data (Bell *et al.*, 2018:160; Collins, 2018:220). The case approach to study was adopted to give an in-depth understanding of the situation of stock unavailability at the hospital pharmacy (Bell *et al.*, 2018:189).

The research was undertaken at a single site to establish and understand the trend in availability and reasons for unavailability of essential medicines therefore the longitudinal study at Lehurutshe hospital pharmacy.

The open and close ended questions regarding the factors that affect unavailability of essential medicines at Lehurutshe comprised of sections with questions relating to human resource factors, infrastructure, procedures and control, and other internal or external factors that affect essential medicines availability. This allowed for in-depth

interrogation of the various contributing factors identified in the literature (Bell *et al.*, 2018:231; Collins, 2018:221).

3.6 STUDY SITE

The study was Lehurutshe hospital pharmacy, a public hospital pharmacy linked to Lehurutshe district hospital.

3.7 STUDY POPULATION

This section discusses the study population from which information was derived as well as the way in which the participants were selected.

The study population or unit of analysis were the core standard items that are meant to be ordered and kept in the pharmacy at all times and these were grouped according to their percentage availability. Consequently, these were assessed and compared over the study period. The percentage availability is calculated every month for the core standard items meant to be stored in the hospital, whether it meets the acceptable level or not. These calculated percentages finally informed the ultimate analysis (Collins, 2018:180).

The study traced the reasons both internal and external that could have affected the percentage availability of core standard items. Such reasons were captured on a self-administered questionnaire and then tallied for the purposes of the final report.

3.8 STUDY PERIOD

The study period was January 2018 to November 2018 however retrospective dare will be collected for the past five years from 2018.

3.9 PILOT STUDY

A pilot study was conducted from the 1 of September 2017 to 21 September 2018 to test the appropriateness of the data collection instruments used in the research.

Input regarding the clarity of the questions asked was taken into consideration and all necessary adjustments were made to the instruments.

3.10 SAMPLE SELECTION

Sampling frame refers to all parts of the population where a representative sample is drawn. To establish a sample in this research, the purposive non-probability, convenience sampling method was used. This was to make sure that only participants with the capability to answer the research questions were included in the sample (Bell *et al.*, 2018:160).

3.10.1 Recruitment of participants

The sample in this research comprised all pharmacists and pharmacist assistants working at Lehurutshe hospital involved in stock management for the qualitative questionnaire (Appendix 1).

A tool was developed for collection of data relating to availability of essential medicines. Data was extracted from essential medicine availability reports for the last 60 months under the six categories and a percentage total availability for each month established (Appendix 2)

3.10.2 Informed consent

The pharmacists and pharmacist assistants who are involved in stock management were given a consent form (Appendix 3) to endorse their participation in the study.

3.10.3 Inclusion and exclusion criteria

Inclusion criteria

Only the availability reports within the study period were included in the study. The pharmacists and pharmacist assistants involved in stock management at the pharmacy at the time of study were included in the study.

Exclusion criteria

All essential medicine availability reports out of the study period were not included in the study and the pharmacists and pharmacist assistants who were not directly involved with stock management were not included in the study.

3.11 DATA COLLECTION INSTRUMENTS

A tool was developed to capture the trends in the percentage availability of the core items for the study period (see Appendix 2). This enabled the researcher to collate, comment and make fair recommendations.

The data collection tools were developed on the basis of information that was gathered during the literature review process on probable factors contributing to the unavailability of essential medicines in public hospitals. This data that was collected through a questionnaire administered to the pharmacist and pharmacist assistants who on a day to day basis work in stock management in the pharmacy, enquiring into the different reasons that affect availability of essential medicines in the facility (see Appendix 1). The researcher made use of a self-administered questionnaire and a data capturing tool to collect all the data pertaining to the study.

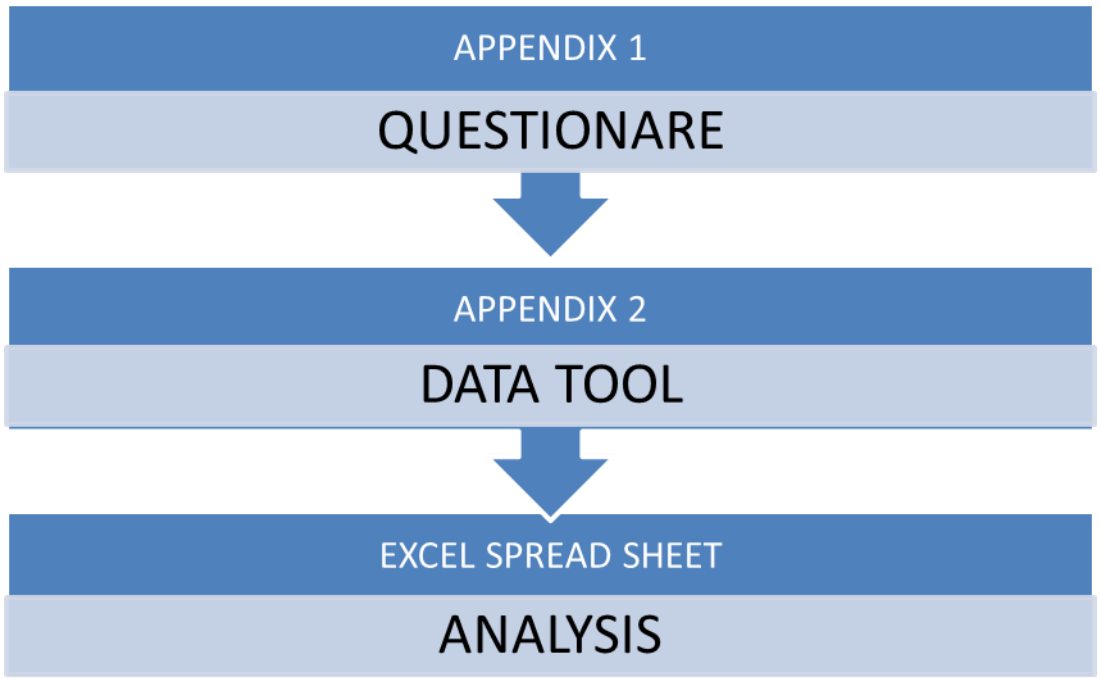


Figure 3: Process flow of obtaining data and analysis

3.11.1 Appendix 1

This tool was used to capture the various factors that could affect availability of essential medicines under the following sub sections; human resources, infrastructure, procedures and stock control or any other contributing factor that may not have been identified under the above categories.

3.11.2 Appendix 2

The tool was used to establish the absolute percentage availability of essential medicines for the period under the review and helped to establish trends in availability of essential medicines at Lehurutshe hospital pharmacy.

3.12 DATA COLLECTION

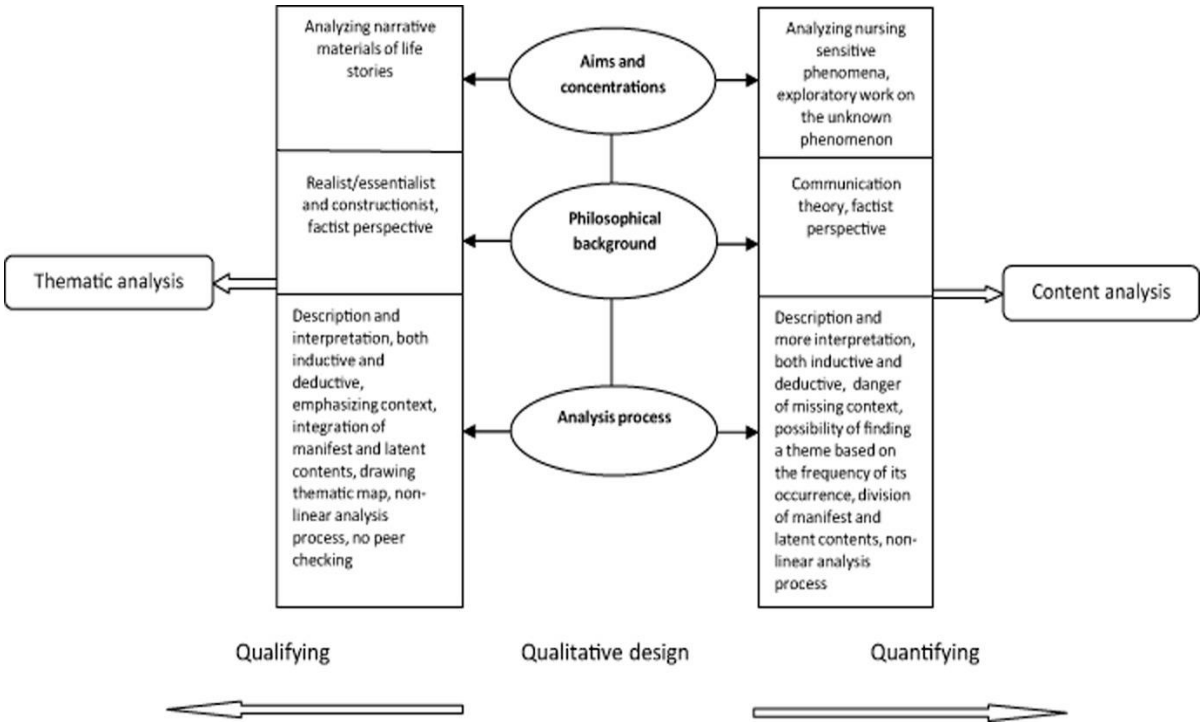
The researcher acted as a moderator during the process of answering the questionnaire. The interviewees gave written consent to the researcher before the questionnaire was administered. The researcher confirmed that the information given was solely for the purposes of research and this was treated as confidential, that the interviewee anonymity was upheld at all. The data was collected based on the subdivisions of the conceptual framework. The data was collected step by step to ensure reliability and validity of the research.

The researcher also consulted monthly reports relating to the availability of essential medicines at the pharmacy over the past five years from where a percentage availability was calculated and entered into the data collection tool under the six categories.

3.13 DATA ENTRY AND ANALYSIS

Analysis of data obtained by the researcher commenced immediately after data collection. The first step was to capture all data into an electronic data base. The data was then triangulated to ensure credibility and reliability of the data set (Carter *et al.*, 2014:546-547).

Thematic content analysis was used in the presentation of data since most of the data collected was textual in nature. This was the best method to apply because the data was mostly qualitative (Vaismoradi *et al.*, 2013:397-400). This allowed the researcher to attach meanings to the outcomes of the research. The codes generated were entered into the NVIVO software to enable adequate analysis.



Adopted from (Vaismoradi *et al.*, 2013:399)

Figure 4: Framework for data analysis

The data relating to the factors affecting availability of essential medicines were coded by the researcher and entered into an Excel spread sheet for analysis. The outstanding factors that coincided with the initial literature review were colour coded to ease analysis for each respondent under the different subsections of the questionnaire.

Data relating to the trends in availability of essential medicines was entered into an Excel spread sheet and analysed using the software SPSS. Data presentation, key findings, discussion of research findings and conclusion to this research are presented in a narrative format.

3.14 RELIABILITY AND VALIDITY

One of the major drawbacks in mixed method research is reliability and validity in relation to the consistency of results in comparison to the research questions and the collected data. One of the ways to deal with internal validity is to make use of a peer review so that the results obtained are confirmed and clarified during research. To make sure that other researchers can replicate current research, a step by step audit trail of the data collection, analysis and framework to decision making was made available In order to improve on the reliability of any research, a statement detailing the researchers' experience, bias and orientation should be presented to predict a manner in which the researcher might have interpreted the data (Bell *et al.*, 2018:205; Collins, 2018:165).

In this study, to ensure validity and reliability, the researcher states that the personal opinions relating to availability of essential medicines at public hospitals is below acceptable levels and that all the processes followed in the execution of this research have been accurately documented. The validity and reliability of the data collection tools was also tested through a pilot study conducted on the 10th October 2017.

3.15 ETHICAL CONSIDERATIONS

3.15.1 Permission and informed consent

Professional obligations of all researchers is measured by ethics, to facilitate a balance between the need for knowledge and the rights of the research participants.

Ethics are very important in research because actions are viewed as either morally right or wrong. The absence of a good ethical conduct during research leads to harm to participants, the denial of participants of informed consent constitutes invasion of one's privacy and deception (Bell *et al.*, 2018:300).

Much as this research was non-medical, it was conducted in a medical facility: Lehurutshe hospital therefore required approval from the hospital chief executive

officer and the pharmacy manager. The approval to proceed with research at Lehurutshe hospital pharmacy was granted on 31 of March 2017.

An application was sent to the university research and ethics committee for approval to conduct this research.

An informed consent form was filled and signed by the pharmacists and pharmacist assistants who took part in the study.

The personal details of all participants in this study and their individual responses were confidential at all times.

3.16 ANONYMITY

All the participants in the study are anonymous and no confidential information was taken from the participants.

3.17 CONFIDENTIALITY

All the data collected during the study was kept in a locker for confidentiality purposes. No one was allowed access to such data at any time and this data was only be used for research purpose.

3.18 CONCLUSION

There is a wealth of literature regarding unavailability of essential medicines in various hospitals around the world. However there is lack of knowledge of precise causes of this problem. This study is significant in the manner that it was to ascertain the trends in availability of essential medicines at Lehurutshe hospital and the factors that affect the availability of essential medicines.

3.19 QUALIFICATION OF RESULTS

The study was set to establish factors affecting the availability of essential medicines at Lehurutshe hospital pharmacy. It comprised a questionnaire to 9 pharmacy

personnel involved in stock management and stock availability reports for the past sixty months. The investigation into factors influencing the availability of essential medicines was with pharmacist and pharmacist assistants involved in stock management so as to capture the different perspectives around essential medicines availability at Lehurutshe hospital.

The findings in this research are views postulated by the participants and not the researcher. During the time of the study, the researcher was able to note that there was lack of resources relevant to essential medicines supply such as inadequate infrastructure, human resource and technology among others.

3.20 LIMITATIONS OF THE STUDY

This study was aimed at determining factors affecting the availability of essential medicines at Lehurutshe hospital pharmacy.

Limitations arise in respect of other areas where answers to the above question could have been sought to have a better understanding of the problem:

- The study did not take into consideration other facilities in the public sector around Lehurutshe that could have other reasons.
- The number of participants was too low for the results of this study to be statistically significant.
- The study did not explore other factors such as external factors beyond Lehurutshe hospital that might have contributed to the unavailability of essential medicines at the facility.

3.21 SUMMARY

This chapter presented the methods used in the research factor affecting the availability of essential medicines at Lehurutshe hospital pharmacy. The conceptual framework presented in Chapter three emanates from the synthesis of data done in

Chapter 2. The next chapter presents the findings and offers a contextual appraisal of the data.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 INTRODUCTION

This chapter presents perceptions of the research participants which involved pharmacists and pharmacist assistants working in stock management at Lehurutshe hospital pharmacy and retrospective data reports on the availability of essential medicines at this facility over the past sixty months.

The current challenge in the availability of essential medicines in South Africa is intertwined with supply system problems that rely on medical stores to supply essential medicines to all hospitals within the North West province and the frequent stock out of medicines at medical stores.

4.2 RESPONSE RATE ANALYSIS

Data presented was collected using two data collection tools, self-administered to respondents at Lehurutshe hospital pharmacy. This was in effort to establish factors affecting the availability of essential medicines at Lehurutshe hospital pharmacy. The questionnaires were handed out by the researcher to the participants upon signing a consent form.

All questionnaires issued were returned thus the response rate was 100%.

Table 1 : Response rate

Category	Number of respondents	Frequency	Response rate
Pharmacists	4	4	100%
Assistants	5	5	100%
Total	**9**	**9**	**100%**

If a response rate of 10% and above is achieved, the results are statistically acceptable (Besser *et al.*, 2010:1078). Bladon (2009:131) suggests a response rate of 75% and above, depending on the type of study conducted. The response rate of the study factors affecting the availability of essential medicines at Lehurutshe hospital pharmacy is appropriate for such statistical analysis.

4.3 DEMOGRAPHICS

4.3.1 Gender

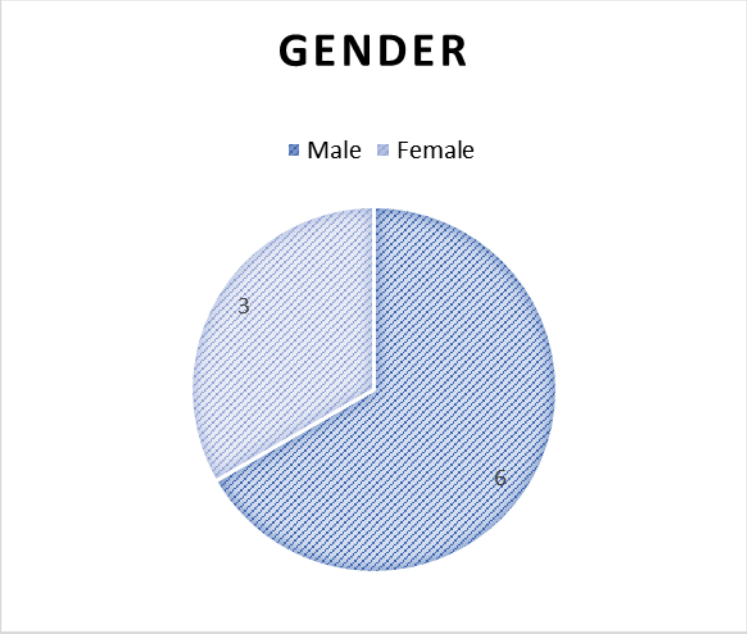


Figure 5: Gender distribution for participants

4.3.2 Average number of years of experience for pharmacist and pharmacist assistants in the pharmaceutical supply chain department

All the respondents indicated how many years' experience they had in PSCM and the table of results is presented below.

Table 2 : Number of years of experience in PSCM

Job experience	Frequency	%
Less than 1 year	0	
1- 2 years	2	22
3 – 5yrs	1	11
More than 5yrs	6	67
Total	9	100

Table 3 : Average number of years in service (n=9)

Category						**Total**	**Average**
Pharmacist	6	8	3	2	1	**20**	**4**
Assistants	8	21	6	6		**41**	**10.25**
Total						**61**	
Average						**6.7**	

On analysis of the data, the percentage of employees with two years expertise was 22%, three to five years' experience was 11% and more than five years' experience stood at 67%. It was also noted that the average number of years of experience in the hospital pharmacy environment for pharmacists was 4 years and 10.25 years for assistants. The low number of years of experience amongst pharmacists is attributed to the high turnover rate, a trend confirmed in the study by (Matloob *et al.*, 2018:899).

Questionnaires' internal consistency analysis

This part of the report presents validity and reliability results upon assessing the data collection tool (Appendix 2) using the tau-equivalent reliability test.

The tau- equivalent reliability test was used to measure the reliability of the tool that was used to identify factors that lead to the unavailability of essential medicines under the assumption that undimentionality is established. Below is a table representing the various sub-scales. The accepted range of values is 0-1 with a high value close to 1 indicating good internal consistency.

Table 4 : Internal consistance analysis

Subscale	**tau-equivalent (α)**	**# of Items**	**Mean**	**Standard Deviation**	**Reliability**
Pharmaceutical supply chain management (1)	0.812	19	1.99	0.81	Good
Human resource as influence of stock unavailability (2)	0.791	4	3.25	0.84	Acceptable
Technology as an influence of stock availability (3)	0.707	2	3.01	0.89	Acceptable
Infrastructure as an influence of stock availability (4)	0.837	1	3.84	0.87	Good
Total	**0.912**	**26**	**3.14**	**0.85**	Excellent

The values for *(α)* are all between 0.7 and 0.9 which implies that all respondents were consistent in the way the questions were answered. It could therefore be logically concluded that the empirical findings from the research are reliable and valid in assessing the factors affecting the availability of essential medicines at Lehurutshe hospital pharmacy.

4.3.3 Objective 1: Trends in the availability of essential medicines from 2013 to 2017

This section of this report provides the findings related to objective one which was to establish trends in the availability of essential medicines at Lehurutshe hospital pharmacy. The results are presented below.

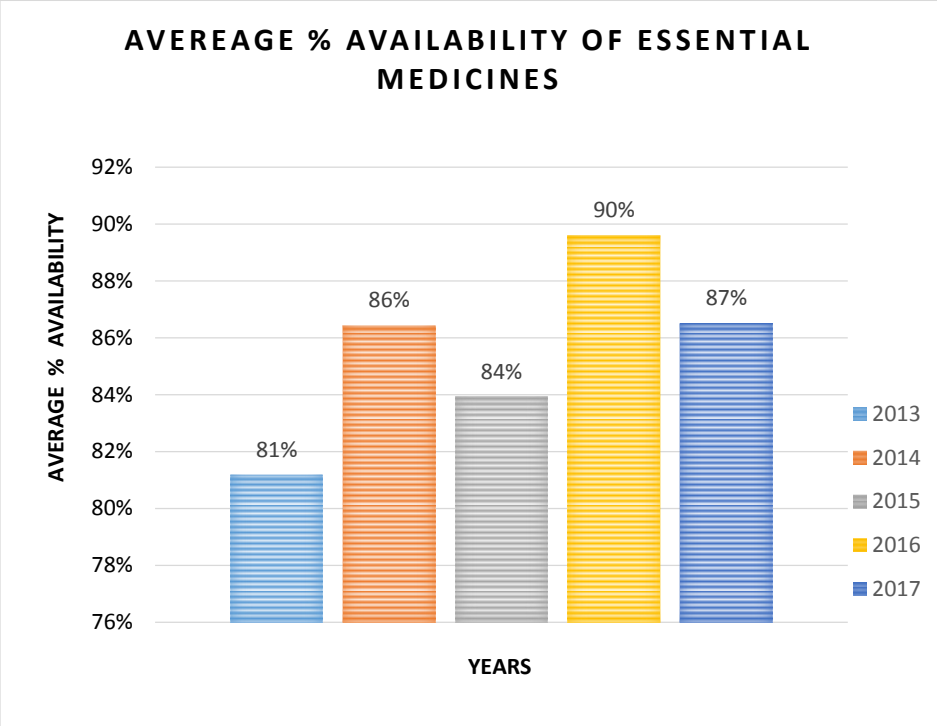


Figure 6: Twelve months average percentage availability for years 2013 to 2017

The average percentage availability for the twelve months for the years 2013 to 2017 ranges from 81% for 2013 which is the lowest and 90% for 2016 which is the highest average percentage availability for any year. The calculated average availability for the five years is at 86%. All the above are below the standard which is 95% according to NDoH (Macquart de Terline *et al.*, 2018:396).

The trends observed above are consistent with the findings of the study by (Cameron *et al.*, 2009) where the availability of essential medicines was also seen to be below the set standard.

4.3.4 Total days in a year when at least an item is out of stock

This section elaborates on the number of days when at least an item was reported to be out of stock. It was noted that 2016 had the highest number of days out of stock of 276 days of the 365 days in a year followed by 2014 with 129 days, 2013 with 2017 with 90 days and least being 2013 with 86 days as presented in the table below. The higher the number of days when an item was reported out of stock, the greater the number of patients who might go without supply.

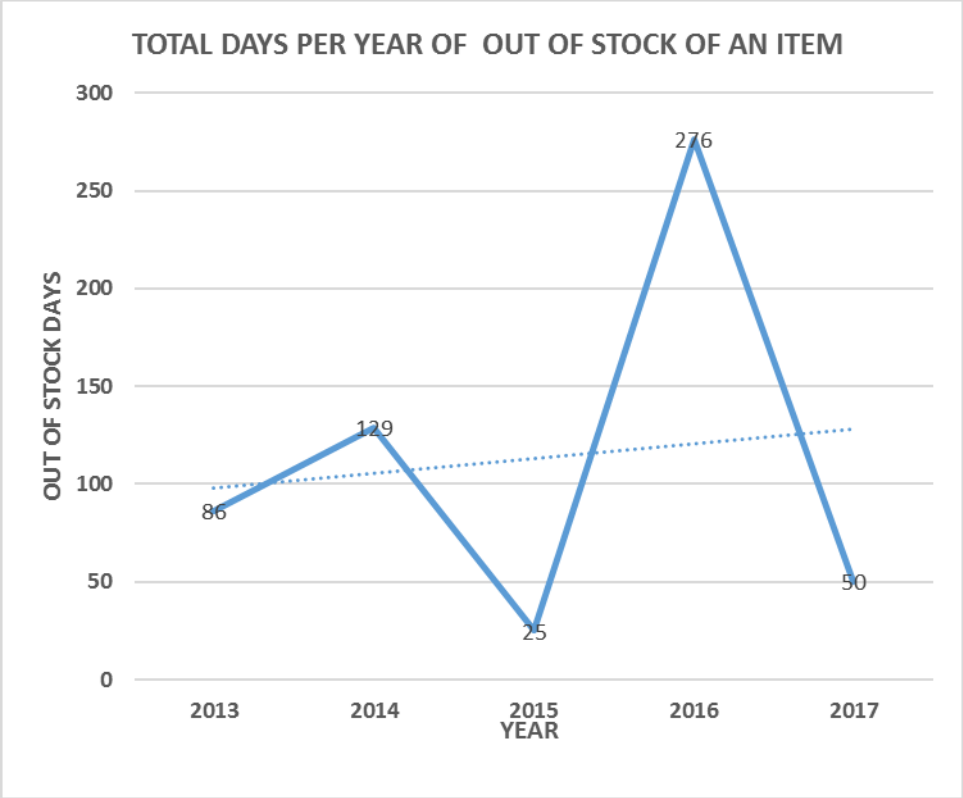


Figure 7: Total days per year when an item was reported out of stock

4.3.5 Objective 2: factors contributing to stock outs of essential medicines

4.3.5.1. Pharmaceutical supply chain management

Only 44% of the respondents had an understanding of the PSCM, PMPU. 22% were able to make follow up on orders placed for essential items for the facility. This poses a problem in terms of PSCM in that when those employees conversant with the

follow up process are not in the facility, orders have to wait which might increase lead time and thus contributing to out of stock medicines (Ahmadi *et al.*, 2018:461-491). Hugos (2018:95) further argues in his study that the lack of training and information flow contributes to the effect seen in this scenario.

On another note, SKU is important in the management of stock so that items are easily picked and availed to the patients from the stores. Hugos (2018:96) identified that 50% of the respondents were aware of the term SKU and its application in stock management in the pharmacy.

Another important aspect of stock management is accurate stock level determination using robust methods. Majority of the respondents (60%) were aware of the fact that stock levels are electronically managed using a dispensing and stock management software called *Rx Solution* however, Respondent 3 alluded to the fact that much as this software is in place, *"…the inventory levels are not accurate which poses a big problem when usingvalues as in the Rx solution program."*

Demand management is integral in PSCM since it helps in mitigating stock out of essential medicines. 50% of the respondents were aware of the demand determination process in the pharmacy but Respondent 1 reported that there was a problem with the demand projections because some of the issues made to demanders are not timeously recorded or never in the stock management system thus creating errors in the estimations made by the stock management software.

All the respondents indicated that they are not aware of the origin of the financial budget since it is handled by the provincial pharmaceutical therapeutic committee (PTC) and thus the respondents are not involved in the management of unavailability of essential medicines in the pharmacy.

Up to 88% of respondents said that stock issued to demanders is not managed well, and therefore this may lead to either over supply or under supply causing preventable stock out of essential medicines (Respondent 5).

To ensure that the inputs into the stock management program is up to date, information relating to stock management should be handled and stored in an

appropriate manner. 89% of the respondents were not happy with the way documents relating to stock management are handled in the facility citing the following:

> *"It is difficult to review documentation since they are often scattered all over the place''* (Respondent 2).
>
> *"It is always difficult for me to trace recalled items because documents are always misplaced''* (Respondent 3).
>
> *'' because of the poor handling of documents, we find items that reflect stock but in actual sense are out of stock and vice versa''* (Respondent 4).

It was clear from these responses that there were no strategies in place to improve PSCM as seen by the response from 89% of the respondents. Only 11% of respondents indicated that there are consequences for good PSCM such as performance bonuses. The other 89% of respondents were not aware of any performance bonuses mentioned relating to good PSCM.

4.3.5.2. Human capital factors

Only 11% of respondents were trained in PSCM, and the remaining 88% have never been trained either on duty or any other form of training regarding stock management.

It was noted that 78% of respondents alluded to inadequate staff at the facility as one of the most important contributors to stock outs of essential medicines. The unavailability of sufficient staff in the facility means staff hop between responsibilities in the different departments, making it difficult to concentrate on stock management:

> ''*Pharmacists are overwhelmed by the number of responsibilities they have to take care of in the facility making it difficult to ensure appropriate* PSCM'' (Respondent 1).

Despite the fact that one member of staff is trained in stock management, there has been no time to train others or even to practise what they have been trained as evident in the following vignette:

> *"I am well conversant of what I am supposed to do in terms of PSCM but multiple projects in the facility make it difficult to have sufficient time to concentrate on stock management"*(Respondent 6).

4.3.5.3. Information systems and technological challenges

All the staff members have been trained in the use of the stock management system *Rx Solution* however, majority is still logged by paperwork. Documents need to be generated and sent electronically to various stakeholders, but this is not always possible according to 89% of the respondents because of the

> *"Obsolete software which makes work very slow''* (Respondent 4).

> *"There is a lack of enough computers for everyone in the stock management department to be fully engaged in work, instead we keep on sharing computers''* (Respondent 2).

> *''The department does not replace multifunctional hardware''* (Respondent 1).

> *"The stock management software is a standalone program which makes it difficult to capture information from demanders"* (Respondent 9).

4.3.5.4. Infrastructure factors

The facility does has adequate infrastructure to cater for all the PSCM needs according to 50% of respondents while the other 50% indicated that there was lack of storage space therefore stock levels are usually modified to allow for space for storage.

> *"Sometime we cannot order all the quantity we need at once because of limited storage space for the medicines''* (Respondent 9).

4.3.5.5. Managerial factors

The respondents were not satisfied with the support they receive from management concerning PSCM. The main concern was the lack of appropriate communication between management and subordinates concerning therapeutic changes and changes to provincial EML that are anticipated or effected.

> "*This makes it difficult to have essential medicines affected immediately because there will be no such plan at the facility*" (Respondent 9).

4.3.5.6. Other factors influencing availability of essential medicines

The following are the other factors that were identified as affecting the availability of essential medicines at the facility:

- Poor managerial skill from the immediate supervisors
- Erratic ordering schedules from medical stores
- Uncontrolled orders from demanders
- Lack of enough storage area for the proposed quantity of medicines needed
- Poorly functioning stock management system
- Shortage of staff
- Lack of training on proper stock management

4.3.5.7. Factors beyond the control of the facility

- Political interference in the tender and procurement process at medical stores
- Labour demonstrations at the centralized depots
- Lack of raw materials for the manufacture of essential medicines
- Delayed response from suppliers once an order is placed
- Poor communication systems for example emails and faxes

- Lack of transport to deliver medicines to the facility

4.4 SUMMARY

This chapter presented date on the trend in average percentage availability of essential medicines in the facility for five years starting 2013 to 2017. It then provided the findings of the factors affecting availability of essential medicines. It is clear that unavailability of essential medicines in this facility is not solely caused by PSCM but a constellation of factors interplay to contribute to this problem such as staff shortages, infrastructure limitations, outdated and obsolete technology among others.

There was no mention of specific factors in the supply chain management process but the generic ones related to inaccurate data, unavailability of technology, shortage of staff, poor management, lack of skills in PSCM, lack of commitment form employees.

It logical to conclude that the main problems relating to essential medicines availability at Lehurutshe hospital pharmacy are inaccurate data, lack of training on PSCM and poor management.

CHAPTER 5

SUMMARY OF RESULTS, DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter offers a discussion on the summary of findings based on the study factors affecting the availability of essential medicines at Lehurutshe hospital pharmacy. The previous chapter presented the results of the study. This discussion on the findings in Chapter four extracts the core themes that emerged from the study.

Findings in the review of literature presented in Chapter two and the findings of this study confirm that the unavailability of essential medicines at Lehurutshe hospital pharmacy is largely a result of inaccurate data, lack of knowledge about PSCM, poor managerial skills, poor technology and hardware for implementation of a sound PSCM.

The findings of the literature reviewed in Chapter two and the findings of this study also confirm the causes of the stock outs culminating in the recommendation that since a number of factors were specifically identified, it is important for remedial actions for this particular facility.

This chapter discusses the findings of the research based on the objectives as presented in Chapter one as follows:

- Establish the trends in availability of essential medicines over the past five years from 2013 to 2017
- Establish PSCM factors contributing to stock outs of essential medicines
- Managerial and other factors that contribute to stock outs of essential medicines

- Make recommendations on how to improve the availability of essential medicines at the facility.

With reference to the literature, availability of essential medicines in health facilities is very pivotal in ensuring access to essential medicines by the citizens of the country, bearing in mind that approximately 70% of the South African population depends on public health care facilities for their healthcare and palliative needs.

5.2 SUMMARY OF RESULTS

5.2.1 Trends in the availability of essential medicines at Lehurutshe hospital pharmacy

It was established that for all the years under review, the percentage availability of medicines was below the accepted standard of 95% availability. The least average percentage availability was observed in the year 2013 at 81% and the highest average percentage availability was seen in 2016 at 90%. The average for all the years was at 86% which is still below the acceptable levels. This implies that Lehurutshe hospital has not had a percentage availability of essential medicine on or above the acceptable standard in the past five years.

It was also found that the average number of days that an item was out of stock for each respective year ranged from 25 to 276 days of the year. There was no direct correlation between the number of days an item was out of stock and the average percentage availability. For example, 2015 saw the least number of days when an item was reported out of stock but at the same time, the same year did not have the highest average percentage availability. This could be attributed to inaccurate data being captured for the period or items that were out of stock were not reported or that items were out of stock for a short period.

The same trend is seen in the year 2016 which had the highest average percentage availability but at the same time the highest number of days that an item was reported out of stock at 90% average percentage availability and 276 days of out of

stock for an item. This can be linked to the items that were out of stock being reported out of stock for a long period. When items that are out of stock are not made available, then the number of days an item is out of stock becomes very large. Respondent 2 indicated that there was a lot of labour unrest at the central medical stores at that time and that might have contributed to the high value of numbers in items that were out of stock. Due to the civil unrest, such out of stock items were not attended to so that the problem could be rectified as soon as possible but rather the medicines stayed out of stock for a long period.

Another concern was the products that were on the essential medicines list but were not readily available due to lack of pharmaceutical active ingredients to make them such as tuberculin for skin tests.

5.2.2 Factors contributing to stock outs of essential medicines

5.2.2.1. PSCM factors

PSCM refer to a package comprising principles that are used to move products and services from one place to another. The implementation and use of these strategies is entirely dependent on the organisation, based on stage of growth and how complex an organisation is in its operations. PSCM could be easily classified depending on the level at which an organisation stands, that is to say

The growth stage:	This stage is defined by activities such as making structures ready for implementation, preparing staff to implement all components of PSCM.
Maturity:	Here PSCM is part of the organisation and attention is only paid at improving and sustaining it.
Advanced:	Here the organisations look at different innovative ways to practice PSCM and maintaining that which worked well for the organisation.

From the above, one can confidently say that public facilities, including Lehurutshe hospital pharmacy, are at the growth stage.

From the results above it can be identified that about 44% of respondents were aware of what PSCM is, understood PSCM terminology such as SKU, demander data management, demand and forecasting, precise inventory management. It is quite difficult to implement something one does not really understand and that is one of the major problems facing the facility in terms of implementation of a good PSCM practice.

As seen in the literature reviewed in Chapter 2, stock outs of essential medicines is not a problem that is caused by just one set of factors but there are varied factors and therefore corrective measures should involve all stakeholders identified in a facility's PSCM system.

The facility's identified PSCM factors affecting the availability of essential medicines were submitted as:

- Poor data management practices
- Poor record practices relating to stock management
- Lack of understanding of the PSCM process
- Paucity in governance and accountability
- Lack of training regarding PSCM
- Poor demand and forecasting management
- Poor communication

5.2.2.2. Human capital

For an organisation to implement a good PSCM, staff must be involved because they can either foster or impede the successful implementation of a good PSCM. For example, for staff to be willing to use a given technology, they must be willing to

learn how it works. The culture within an organisation could be a determining factor in the implementation of a successful PSCM system.

Respondent 1 alluded to the fact that the software Rx Solution ® is managed by a donor who provides training on its use. This implies that most of the users of this software are only limited to the keyboard function other than the entre training for which the software is intended, which is PSCM.

It was also mentioned that the software does not belong to the South African government but the donor. This difference in ownership has invariably created a culture of resentment in the use of the said software, meaning that staff may not be willing to master its use thinking that another donor could come in with another software at any time which would still have to be learnt to ensure functionality.

The problem of staff willingness to learn was alluded to (Respondent 1), specifically that some of the staff members were not interested in learning anything related to PSCM. This creates a knowledge gap which needs to be filled at one point in time. This is also consistent with the finding that only 11% of the respondents were trained in PSCM. For one to use a technology adequately, there needs to be some form of training that enables one to apply the full functionality of a given software.

Staff shortage is one of the major hindrances to proper service delivery in the public sector (Combes *et al.*, 2018:6547). Approximately 80% of respondents said that the major problem with essential medicine availability is the absence of adequate staff to implement PSCM.

5.2.2.3. Information systems and technological changes

A good set of technology helps in the generation and management of information relating to PSCM so that this accurate data could be used to make sound decisions (Organization, 2015).

All the staff members in the facility have been trained in the use of the stock management system *Rx Solution* ® however, the training was just basic such that it did not allow for detailed stock management practices in the facility. The software is

not readily updated and the computers are not replaced or updated by the government which hinders the donor of the software from updating certain software due to the computers not meeting the software requirements.

It was also mentioned that the stock management system is a standalone software. Non-intergration creates a problem of not being able to relay information in time and also creates room for errors as information is transferred from one system to another, for example when ordering where multiple steps are involved in capturing of orders between systems. In this maze the wrong quantity is captured and such product under supplied or over supplied which generates out of stock or over supply respectively.

The fragmentation in technology seen in the public health care system is due to the reliance of government on donor software programs where such donors do not really communicate and implement these programs in unison but rather each of them pitches at their own time and implements programs that could even contradict the functionality of another system (Respondent 4). However, one needs to understand that technology is just a tool that can be used to effect good PSCM and not PSCM itself.

5.2.2.4. Infrastructure

The respondents were unanimous in the view that the infrastructure at the facility was not adequate for implementation of a proper PSCM. Respondent 4 alluded to the fact that there was not enough space to keep all the necessary supplies that the facility would have wanted to keep. This inadequacy led to adjustment of quantities ordered in order to accommodate the shortfall of storage space in the facility. Much as the space is not sufficient, there is also a challenge that part of the roof covering the store leaks which leads to stock damage and thus rendering it unavailable for use (Respondent 1).

It is very important for the facility to be able to store medicines based on the projected demand otherwise stock outs are guaranteed (Chaar, 2014).

5.2.2.5. Managerial and other factors

The concept of change management helps organisations to traverse from the current status quo to an envisaged future state (Harding *et al.*, 2014). The major challenge with implementation of PSCM is the inherent resistance to change by management. It is important that management is aware of the mission, vision and values of the organisation and disseminates such information to its subordinates.

These findings show that there was lack appetite from management in support of the implementation of an accurate PSCM. Once an organisation is able to successfully pair people and technology, then the chances of a successful and functional PSCM become very high.

Other factors that were mentioned included the problem with erratic processing of ordered items by the suppliers of essential medicines, the fact that facilities cannot project demand well and end up placing a multitude of emergency orders with render items to be out of stock and the absence of training of the PSCM stewards on the principles of PSCM.

5.2.3 Concluding remarks

In a nutshell, elucidation on the findings of this research show that the factors leading to unavailability of essential medicines at Lehurutshe hospital pharmacy are vast and span over a larger category of policies and processes, people and how they practice PSCM, infrastructure problems, communication inadequacy, lack of training in PSCM, lack of PSCM infrastructure such as computer and interconnected software programs and lack of support for implementation of a good and accurate PSCM system.

To solve the problem, there is need to overhaul the whole PSCM system in the facility to ensure adequate functionality by ensuring that all bottleneck identified in the system are well take care of by all stakeholders involved.

5.3 CONCLUSION AND RECOMMENDATIONS

A number of studies have been conducted to interrogate the factors contributing to stock out of essential medicines. It had been clarified that the factors are embedded in the PSCM system (Bateman, 2015). It has also been noted that the involvement of many stakeholders in the PSCM system also provides a challenge in ensuring an accurate PSCM system is implemented. Poor demand forecasting is one of the major problems haunting the successful implementation of demand planning techniques in facilities (Croxton *et al.*, 2001).

An interrogation of the different sections of this report point to the factors leading to unavailability of essential medicines at Lehurutshe hospital pharmacy being the lack of a coherent PSCM system at the facility, poor technology, the lack of resources to project essential medicine demand, lack of enough human capital.

5.3.1 Pharmaceutical supply chain management

In light of the finding in the facility, there is need to ensure that key performance indicators for PSCM become part and parcel of the good PSCM practice. This would help ensure smooth running of the day to day activities relating to PSCM.

The first step should be to determine the gap between the current status quo relating to PSCM at the facility and the “would be” so that a checklist is compiled to constantly monitor the progress in terms of accurate PSCM.

There should be defined responsibilities outlined for each of the staff involved in the PSCM at all levels within the facilities PSCM so as to ensure appropriate demand forecasting and management, and this will also help in quantifying demand for essential medicines by the different demanders.

An integrated PSCM system should be implemented where the facility can smoothly communicate with its current and potential suppliers, and all demanders so that errors can be eliminated that are generated when manual entries are being done at the various levels of the PSCM processed in the facility.

5.3.2 Human capital factors

It was noted from the results of the study that there was lack of training and that there was not enough staff to help in the smooth and accurate implementation and running of the PSCM system at the facility.

There is need for a PSCM skills audit at the facility so that training needs are identified and what kind of employees need to be added to the existing work force to enable for a fully functional and accurate PSCM system at the facility. If there are skilled, motivated and capable workforce within PSCM in the facility, momentum would be generated that could bring about change in the availability of essential medicines in the facility.

There is also need to inculcate a culture of performance management within the employees through establishment of key performance indicators which should be in line with the mission, vision and objectives of the hospital

5.3.3 Information system and technology challenges

Public healthcare facilities do not purchase or choose which type of technology and software to use in the facility. The NDoH should therefore implement a national information technology system for PSCM in all healthcare facilities to facilitate an accurate PSCM. This would enable NDoH to monitor and manage the integrated system as opposed to the current practice of relying on donor software which do not blend well with inter donor software based on the mission, vision and objectives of the department

The facility also needs an upgrade on all hardware used in PSCM so as to accommodate the updates and new software

5.3.4 Infrastructure

Implementation of a successful PSCM system requires that the infrastructure in question supports the cause, from the findings in this study, the respondents were

unanimously in support of the fact that the infrastructure was not adequate for the successful implementation of an accurate PSCM system.

One of the highlighted problems was space to cater for storage of essential medicines. There needs to be an upgrade on the infrastructure at the facility so that medicines demand forecast can be ordered and stored conveniently in the facility.

The facility is in dire need for renovation so that stock loss due to preventable damage especially due to rain is avoided and in turn would mitigate the problem of stock out of essential medicines at the facility.

5.3.5 Managerial and other factors

A successful PSCM system requires that there should be both collective and individual accountability, responsibilities and roles at all levels of management in a facility for the smooth running of an accurate PSCM system. It is therefore imperative that the management at the facility take responsibility for their relevant roles they are meant to play in the effective implementation and sustainability of an accurate PSCM system.

In the implementation of the proposed PSCM system, emphasis must be placed on the inclusion of key performance indicators for all actors in PSCM

Emphasis should be placed on ensuring that key performance indicators are in place to ensure that all the metrics that measure accountability from the top to bottom management is upheld in the PSCM ecosystem.

The pharmaceutical budget is managed at provincial level according to Respondent 1, it would be of advantage if the management of this budget is shifted to the hospital so that there is accountability for the money spent, and this would improve the availability of essential drugs in the facility. The province can maintain oversight but allow for managers at the facility to be held accountable.

In conclusion, the factors that affect the availability of essential medicines at Lehurutshe hospital pharmacy are divided into PSCM factors, and other factors. The most outstanding is the lack of an accurate PSCM system at the facility and lack of

staff to take care of PSCM. The current level of PSCM practice will not help in eradication of stock out of essential medicines. An overhaul to the whole PSCM system in the facility needs to be effected in order to avoid problems of stock outs of essential medicines

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APPENDICES

Appendix 1: DATA COLLECTION TOOL

This questionnaire is about factors that affect the availability of essential medicines at Lehurutshe hospital pharmacy. Please indicate under the following subheading if there any factors identifiable that affect the availability of medicines at the pharmacy.

Gender: Male……Female……..

Number of years of experience working in pharmaceutical stock management……

1. Pharmaceutical supply chain management

Do you have an understanding of what pharmaceutical supply chain management (PSCM) is?

.....

Are you aware of Provincial Medicine Procurement Unit (PMPU) and its role in the province?

.....

Are you able to follow up on orders placed with companies that supply the various products used by the facility? .....

Do you think allowing you access would help improve on the PSCM process in the facility?

.....

Are you aware of Stock Keeping Unit (SKU) and its relevance to stock management?

……

……

……

……

How are stock levels of medicines determined in the facility?

……

……

……

Do you have enough support to enable you implement an effective supply chain management system?

……

How is demand projection effected in the pharmacy?

……

……

……

……

How is the pharmaceutical and surgical supplies budget established?

……

……

……

How is the allocated budget managed?

……

……

Are in any way involved in the management of unavailability of supplies in the pharmacy? .....

If yes please indicate in what ways you are involved

……

……

……

How is stock issued to various demanders monitored to ensure proper use?

……

……

……

……

Are you satisfied with the current level of transparency regarding stock out of medicines? Give reasons.....

.....

.....

How is stock loss or damage managed in the facility?

……

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……

Are you satisfied with the level at which documentation regarding stock is handled in the facility? .....

In your own opinion, do you think documentation handling can affect stock availability? Give reasons in support of your view

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Are you aware of any strategies in place to improve on PSCM in the facility? Please explain

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Are there any consequences if PSCM is not managed well? Please explain

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2. Human resource

Have you had any training pertaining to pharmaceutical supply chain management?

……

Are you appreciated or rewarded in any way for effective PSCM practice in the facility?

……

If yes, what form of remuneration it?

……

Do you think the number of staff at the facility has an effect on availability of medicines? Please explain

……

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……

3. Technology

Does the facility have enough capacity, hardware and software programs to help in stock management? Please explain

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……

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……

How does the software used currently compare to an integrated system where all suppliers and demanders are linked?

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4. Infrastructure

Do you have enough capacity to store medicines in the facility?

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5. Other factors

What other factors do you consider as direct influencers of stock availability at the facility?

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Appendix 2: DATA CAPTURING TOOL

MONTH	2013						2014						2015						2016						2017					
	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
JAN																														
FEB																														
MAR																														
APR																														
MAY																														
JUN																														
JUL																														
AUG																														
SEP																														

OCT																													
NOV																													
DEC																													

Appendix 3: INFORMED CONSENT

CONSENT FORM FOR PRESCRIBERS

Statement concerning participation in a Research Project

Name of Study: **FACTORS AFFECTING PROCESS OF SUPPLY OF CORE MEDICINES AT LEHURUTSHE HOSPITAL PHARMAC**Y

I have read the information on the aims and objectives of the proposed study and was provided the opportunity to ask questions and given adequate time to rethink the issue. The aim and objectives of the study are sufficiently clear to me. I have not been pressurized to participate in any way.

I understand that participation in this Study is completely voluntary and that I may withdraw from it at any time and without supplying reasons.

I know that this Study has been approved by the Northwest university ethics committee and the Lehurutshe hospital management. I am fully aware that the results of this Study will be used for scientific purposes and may be published. I agree to this, provided my privacy is guaranteed.

I hereby give consent to participate in this Study.

....

Name of volunteer Signature of volunteer

Place…… Date

Statement by the Researcher

I provided verbal information regarding this Study

I agree to answer any future questions concerning the Study as best as I am able.

I will adhere to the approved protocol.

Name of Researcher Signature Date Place

Appendix 4: TURN IT IN REPORT

29885868:JM_NABYOMA_29885868_DISSERTATION_VERSIO.

ORIGINALITY REPORT

11%	9%	4%	3%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

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	www.aph.gov.au	

Appendix 4: IDENTITY DOCUMENT

NOTICE OF PERSONAL PARTICULARS

1. Any changes to the personal particulars in your ID Book must be communicated to all relevant parties.

NOTICE OF CHANGE OF ADDRESS

1. Keep the NOTICE OF CHANGE OF ADDRESS form in this pocket to report a change of address or a change in particular of your present address e.g. name of street and/or street number etc.
2. Hand in at or post to the nearest regional/district office of the DEPARTMENT OF HOME AFFAIRS

I.D. No. 831202 6283 185

NON S.A.CITIZEN

SURNAME
NABYOMA

FORENAMES
JOHNSON MWEBAZE

COUNTRY OF BIRTH
UGANDA

DATE OF BIRTH
1983-12-02

DATE ISSUED
2013-07-08

ISSUED BY AUTHORITY OF THE DIRECTOR-GENERAL HOME AFFAIRS

Appendix 4: CERTIFICATE OF LANGUAGE EDITING

Office: 0183892451

FACULTY OF EDUCATION **Cell: 0729116600**

Date: 3rd December, 2018

TO WHOM IT MAY CONCERN

CERTIFICATE OF EDITING

I, Muchativugwa Liberty Hove, confirm and certify that I have read and edited the entire mini-dissertation **FACTORS AFFECTING THE PROCESS OF SUPPLYING CORE MEDICINES AT LEHURUTSHE HOSPITAL PHARMACY** by **Johnson M NABYOMA, Orcid.org 0000-0003-3637-6053,** submitted in partial fulfilment of the requirements for the degree *Master of Business Administration* at the North-West University.

Johnson Nabyoma was supervised by **Dr Seboka Kopung** of the North-West University.

I hold a PhD in English Language and Literature in English and am qualified to edit such a thesis for cohesion and coherence. The views expressed herein, however, remain those of the researcher/s.

Yours sincerely

Dr M.L.Hove (PhD, MA, PGDE, PGCE, BA Honours – English)