An assessment of opportunities for implementing lean management in the healthcare supply chain of selected clinics in the East London area.

By

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DECLARATION

I, Fezekile Sydwell Beja, Student number 211195537 hereby declare that:-

- The treatise for Students qualification to be awarded is my own work and that it has not previously been submitted for assessment or completion of any postgraduate qualification to another University or for another qualification.
- The treatise is the result of my own work except where otherwise stated. The list of references used for this work is attached.

Fezekile Sydwell Beja

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Abstract

When the current South African government came into power two decades ago they inherited a fragmented health care system whose main focus was on the tertiary care level. The strategy of the current government was to re-focus the whole health care system and prioritize primary health care system. That included setting up district health care systems and building primary health care centres in the areas within the communities in order to make health care accessible to everybody.

Due to financial difficulties the majority of the people staying in these communities solely depend on these clinics as they cannot afford to buy health care services in the private sector. The study seeks to assess the current medication supply chain to these clinics with a view of coming up with recommendations that, when implemented, will ensure that the supply of medication by the clinics is able to meet the demands of their patients.

Lean management is a system that was started in the manufacturing sector and because of its success there it was later adopted by the service industry. Lean is a system that seeks to eliminate all forms of waste and improve the quality of the service rendered to the satisfaction of the customer/patient. Literature review and discussion of lean implementation is discussed extensively.

The findings of the study are presented, analyzed and discussed. In these findings it is noted that the system is functioning very well but there are challenges in these clinics that need to be addressed. Recommendations of how lean management can be implemented successfully to optimize the functioning of the current system are discussed.

Publication of this treatise

The permission received from the Department of Health to conduct this study came with contractual obligations that the researcher promised to honour. One of those requirement stated clearly that the findings of the study should not be published anywhere without the permission of the Department (see addendums A & C).

It is under that premise that the researcher wants to bring this to the attention of the relevant university departments, with the hope of ensuring that this contractual obligation is honoured.

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List of Abbreviations

SCM	Supply Chain Management
PHC	Primary Health Care
NDOH	National Department of Health
HIV	Human Immunodeficiency Virus
AIDS	Acquired Immunodeficiency Syndrome
TB	Tuberculosis
NSDA	Negotiated Service Delivery Agreement
DHS	District Health care System
MDG	Millennium Development Goals
MMR	Maternal Mortality Ratio
BoD	Burden of Disease
GDP	Growth Domestic Product

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An assessment of opportunities for implementing lean management in the healthcare supply chain of selected clinics in the East London area.

Chapter 1

1.1 Introduction

According to USAID (2010) the primary objective of a public health supply chain is to get the right health commodities, of the right quality, at the right time, in the right quantity, to the right place, and for the right cost and Kopczak (2003) clarifies it further by stating that supply chain management addresses the fundamental business problem of supplying a product to meet the demand. Whereas Schaay and Kruger (2011) clarify the fact that the objectives of any health system are to deliver accessible, equitable and good quality health services which are both responsive to community demands and based on the principle of inter-sectoral collaboration.

The pre- 1994 political landscape in South Africa led to the fragmentation of the health care system and the leaders of the new democratic government faced the mammoth task of addressing the imbalances of the past when they took power. These were inaccessible or unavailable PHC (Primary Health Care) services in mainly black populated areas such as the Eastern Cape.

In this democratic dispensation, access to basic health care is a right to every one living in this country as it is enshrined in section 27 of the South African Constitution (1996). Effective management of the entire medication supply chain, from the drug manufactures to the patient, plays a pivotal role in ensuring that this is achieved. Schaay and Kruger (2011) state that the PHC approach formed the basis of the transformation of the South African health system, at the advent of democracy in 1994. This system is seen as the strategy to revitalize the health system and successfully deliver on the key priorities outlined in the National Department of Health Strategic Plan (2010/11-2012/13).

The democratic government and the Ministry of Health have adopted a strategy of providing overall guidance on activities that contribute to improving levels of health in this country and it has generally been characterized by good policies, but without equivalent

emphasis on the implementation, monitoring, and assessment of these policies throughout the system. (Schaay and Kruger, 2011)

What is more concerning is the fact that South Africa is spending 8.7% of its GDP on health, and spending more on health than any other African country, but, despite that, statistics show us that the country has poor health indicators and outcomes, and still faces challenges with regards to the availability of financial and human resources, accessibility and delivery of health services to the people. (NSDA 2010-2014)

1.2 The Purpose of the Research

The purpose of the study is to improve the supply chain management in order to ensure medicines availability in the East London PHC centres, by investigating the role of managers or nurses-in-charge play in dealing with the supply chain demands of their PHC. This will be done by looking at the role, forecasting, ordering, inventory management, human resources and budgeting play in achieving supply chain management success in the primary health care sector. The results of the study will be used to provide guidelines to the district health care managers on how to address the shortcomings in their current health systems.

1.3 Motivation for undertaking the research

According to the NSDA 2010-2014 report the current state of health care in this country is under tremendous pressure as facing a quadruple Burden of Disease (BoD) consisting of HIV and AIDS and TB; High Maternal and Child Mortality; Non-Communicable Diseases, and Violence and Injuries. Breaking it down further, non-communicable diseases contributed 28% of the total burden of disease measured by disability-adjusted life years in 2004. Cardiovascular diseases, diabetes mellitus, respiratory diseases and cancers contributed 12% of the overall burden. South Africa has the highest burden of HIV with an estimated 5.7 million people or 11.6% of the population infected. While this is going on, the report goes on further to explain the fact that the public sector's inability to deliver health service that are accessible and of reliable high quality is due to the fact that the public health system has been under-funded for several years.

The report also highlights other several challenges that are currently plaguing the Department of Health in this country which include the fact that provinces have been

overspending on their budgets resulting in high accruals, non-availability of medicines and other critical items due to non-payment of suppliers. The second challenge lies with the inadequate production and deployment of human resources for health (HRH) professionals, which is associated with poor HRH planning, management and performance monitoring and evaluation (NSDA 2010-2014).

The end result of all these challenges is poor service delivery at our PHC, characterized by clinical staff shortages and medication shortages as well. South Africa faces high levels of poverty, unemployment and high illiteracy. This all translates to the fact that the majority of the population in this country depend solely on the public health sector and cannot afford to source these services in the private sector. When the system is plagued by the challenges mentioned above that means the majority of the people will be deprived a basic human right i.e. access to health care. This not only violates their basic constitutional right but it is also violates Ama-Alta declaration to which the country is a signatory. It is therefore imperative that this research be carried out to zoom in to the PHC sector with the intention of assessing the challenges as they are in their natural setting in order to come out with possible suggestions of ameliorating the situation, as this cannot be allowed to continue like this. Failure to get medicines at the local PHC centres will in the long run lead to a “chronically” ill society, and, when people are chronically ill, they are incapable of participating in working and building up our economy.

This is not the only country facing these challenges. Health care systems, on a global scale, have due to decreasing resources and increasing demand, been forced to find new approaches and concepts in order to improve quality but at the same time lower costs and increase value. But how can that be done? One possible intervention that has been implemented with great success in the manufacturing sector, is Lean management.

Lean as a principle has been introduced to streamline processes and to reduce costs or the ability to treat more patients with the same resources. Some studies argue that the increase in healthcare cost and inefficiencies are due to inadequate and tedious purchasing procedures and purchasing information systems (Aronsson, Abrahamsson and Spens, 2011).

Lean philosophy (Angelis, Conti, Cooper and Gill, 2011) is built on the principle that relentlessly pursues the solving of problems that affect the customer, generates a competitive advantage and solving these problems becomes the overall goal of the organization. Lean philosophy puts emphasis on customer satisfaction, high quality, and comprehensive employee training and empowerment. In other words, Lean is a system designed to be responsive to the needs of humans in business and deliver better outcomes for key stakeholders such as associates, suppliers, customers, investors and communities. This system is based on two key principles – “continuous improvement” (this includes the tools and methods used to improve productivity) and “respect for people”, (includes leadership behaviors and business practices that must be consistent with efforts to eliminate waste and create value for end-use customers. Lean practice has two main objectives, “eliminate waste” and “create value for end-use customers (Emiliani and Stec, 2005).

Lean management has been implemented successfully in the manufacturing sector but the service sector has been slow to adopt this management style that can actually benefit it including the health sector. In looking at the challenges that are affecting our health sector, the application of lean management practices can give one a clear understanding of where the main problems are, and more importantly what can be done about them if a turnaround strategy were to be implemented. This is because in Lean management the first step in assessing the challenge involves the identification of who the customer is and what the customer needs. Secondly, identification of the value streams in order to eliminate waste. This is achieved, by mapping every step, or individual action, involved in the process for specific services, and analyzing the flow in order to identify and eliminate waste. The identification of value adding processes provides an important foundation for eliminating waste. Value adding activities related to good medical quality, accessibility and patient satisfaction can be identified from the point the patient makes the first contact until the treatment is completed. Thirdly, is assessing the situation, one needs to see oneself through the eyes of the patient. This can be achieved by focusing on the patient and following him or her from the beginning to the end because the aim of the Lean principle is to see the creation of a smooth flow of products in value-adding processes (Kollberg and Brehmer, 2007).

The health sector like every other sector is faced with challenges of utilising the allocated scarce and diminishing resources it has effectively, and efficiently, to achieve the desired effect which is providing accessible health care services to the people.

The research on the application of Lean management in the health sector has been done mainly in the developed countries, and there are very few studies coming out of the developing countries and none from South Africa, which means the results from this study can give government and health policy makers locally, provincially and nationally a clear picture of what challenges they have at their PHC and more importantly what measures they can use or implement to change the status. In other words there are many stake holders that can benefit from this study, starting from the patients themselves who will benefit by getting better or improved health care services at the centres, the health personnel at the centres who will be empowered to deal with the day-day challenges with a new perspective and new approach. Lastly, the Department of Health who through the application of recommended Lean principles, can or should save lot of money through elimination of wasteful expenditure and improving the accessibility of good quality health care service to the people.

Having said all that, it then leads us to the formulation of the main research problem of the proposed study.

1.4 Research problem and sub-problems

What benefits can be gained from implementing Lean in in the healthcare Supply chain of selected clinics in the East London area?

1.4.1 Sub-problems

From the main problem, specific research sub-problems that are formulated include:

- Is the forecasting methods (FM) used by managers or nurses-in-charge in dealing with increased demands achieving/not achieving the supply chain management success?

— Is the methods used in the ordering process (OP) achieving/not achieving supply chain management success?

— Are the inventory management (IM) practices in current use achieving/not achieving supply chain management success?

— Is the available human resources (HR) achieving/not achieving supply chain management success?

— Are the budgeting (B) practices in use is achieving/not achieving supply chain management success?

1.5 Demarcation of the research – Scope/parameters

There are many areas that can be covered in this research but for it to be manageable and because of the very limited time frame, it is imperative that the study is conducted within delineated parameters, in other words topics or areas that are not mentioned in the study are by no means less important than the ones mentioned.

1.5.1 Organisation

The empirical component of the study was focussing only on the East London public clinics. They are the entry points of patients seeking medical assistance.

1.5.2 Geographic Demarcation

The study was only limited to East London which is under Buffalo City Municipality.

1.5.3 People to be surveyed

The people that were surveyed are those people that are involved in the supply chain management, either through ordering, storing, or dispensing medication to the general public, which will be either clinic managers or nurses-in-charge of the clinics.

1.5.4 Significance of the Study

The study was seeking to asses and evaluate the current status of the supply chain management to the East London clinics. The main objective of the study was to gather all the necessary information and learning points and forward it to the local health authorities, information that will assist them in identification of the strengths and weaknesses of the current system. It will also help them when they are designing the

intervention strategies of optimizing the delivery of health services to the people. A study like this has never been carried out in this region; it can therefore serve as a reference point for the future similar studies.

1.6 Research design

A qualitative approach was followed, because the nature of problems affecting the supply chain of medicines in the PHC was investigated. The main concern was to understand the problems as they are and hence therefore the approach was interpretivistic. This entails the investigation of the phenomenon (1) at a level of subjective experience by the participant rather than the observer of action and (2) by seeking explanations in the individual consciousness and frame of reference of the participant rather than the observer of action.

1.6.1 The sample

Judgmental sampling was used to select 21 PHC centres that are in the East London area. In each PHC centre the nursing sister in charge, the pharmacist, the manager and the district manager i.e. all the people that are involved in the supply chain management, were selected. Individual interviews were conducted with these respondents.

1.6. 2 Envisaged measuring instrument or data collection tools

An interview protocol was developed to guide probes in the following areas:

The forecasting methods (FM) of PHC managers or nurses-in-charge in dealing with increased demands in achieving/not achieving supply chain management success. How effective/ineffective are the forecasting methods currently in use in the clinic?

- If these methods are ineffective what do they think could be the reason/s for that?

The methods used in the ordering process (OP) is achieving/not achieving supply chain management success

- What are the employees' perceptions about the ordering process they use?

- If the method in current use is not effective, what could be the reason for that?
- How does the inaccurate ordering process manifest itself in the clinic?

The inventory management (IM) practices in current use are achieving/not achieving supply chain management success

- What are the employees' perceptions about the inventory management practice in use currently?
- If it is not effective, what could be the reason for that?
- How does ineffective inventory management practice present in the clinic?

The available human resources (HR) at the PHC are achieving/not achieving supply chain management success

- Does the employee think the available human resources are adequate to meet the supply chain demands?
- Does the employee think the available human resources are adequately trained in the supply chain management?

The budgeting (B) practices in use are achieving/not achieving supply chain management success

- What is the general level of employee satisfaction/ dissatisfaction with the current budgeting practices?
- If there are budgeting challenges how do they present in the clinics?

1.7 Research plan of action

The study conducted involved collecting raw data about the Research problem from clinic managers, nurses-in-charge or any other employee that is involved in forecasting, ordering, storing of medications in the East London public clinics. The data was analyzed

with the assistance of the University and the recommendations derived from the findings of the study will be forwarded to the health authorities in East London. According to the plan of action the study should be completed by the end of November 2013.

1.8 Outline of Chapters in this study

Chapter 1 – introduction to the research report and the general overview of the whole study

Chapter 2 – Literature review, whereby the researcher presents the literature that seeks to clarify and enlightens the research issue at hand.

Chapter 3 - Research Methodology. A detailed description of the research methodology used.

Chapter 4 – Interpretation of the data, justification of the data as evidence and validation of evidence as knowledge. Researcher will also state his solution to the issue at hand

Chapter 5 – Conclusion, summary of the study, limitations of the study and recommendations to the profession and indicating areas for future research.

1.9 Conclusion

A general overview of what the study was all about, its purpose, research problems and sub-problems that have been outlined including the research methodology that was used.

Chapter 2

2.0 Literature review

2.1.0 Supply Chain Management (SCM)

2.1.1 Introduction

The emergence of globalization has rendered the world “flat”, with people being free to move and trade wherever they wish. This globalization has also meant that the growing population has to be maintained on the limited available resources and it is therefore imperative for companies to look for cost effective ways of doing business while not compromising on the quality of their products or services. One of these ways is through managing the whole supply chain.

Schroeder, Goldstein and Rungtusanatham (2011) define SCM as the design and management of seamless, value-added processes across organizational boundaries to meet the real needs of the end customer. They further go on to state that other scholars and managers define it as the integration of three traditionally separate functions: operations, purchasing and logistics.

According to De Vries and Huijsman (2011), the origins of SCM is of a multidisciplinary nature and stems from different areas such as strategic management, marketing, and organizational behaviour, but despite the variety of perspectives, the elimination of waste and an emphasis on improving performance by coordinating supply chains are generally considered the core issues of supply chain management relationships.

2.1.2 What is the significance of SCM in an organization?

Supply chain (Asamoah, Abor and Opare, 2011) is a sequence of events intended to satisfy a customer and it includes procurement, manufacture, distribution and waste disposal, together with associated transportation, storage and information technology. Ford and Hughes (2007) describes SCM as a purchasing philosophy devoted to discovering tools and techniques that increase operational effectiveness and efficiency throughout product and service delivery channels. The emphasis here is first on customer

satisfaction and secondly it's about improving the functioning of the whole channel. In other words the concentration is not on the internal horizontal integration only but also on the vertical integration of the suppliers as well. Stadtler (2005) cited in Meijboom, Schmidt-Bakx and Westert (2011), puts it this way: "the task of integrating organizational units along a supply chain and coordinating materials, information, and financial flows in order to fulfill (ultimate) customer demands with the aim of improving competitiveness of the supply chain as a whole". Another important point that Meijboom, Schmidt-Bakx and Westert (2011) mention is the fact that in SCM it's not only the flow of products or services from the suppliers that matters but also the flow of product and services upstream i.e. from customers to the suppliers. Purchasing and logistics functions are vital for the effective and efficient performance of the SCM because these two functions co-ordinate and collaborate with the operations function within the organization to deliver products and services to customers while meeting cost, quality, delivery and flexibility objectives, Schroeder, Goldstein and Rungtusanatham (2011).

The benefits of the globalization is the fact that companies can operate wherever they choose in the world, in other words there is an ever increasing competitive pressure with respect to prices, delivery, quality, variety and innovation of products and services that the companies are facing these days. (Hamid and Sukati, 2010)

Hamid and Sukati (2010) state further that SCM is primarily concerned with managing relationships with suppliers and customers to provide the best customer value and also the ability of firms to achieve a good level of firm integration internally, and externally can produce supply chain orientation. Supply chain orientation provides an organization with that efficiency and flexibility in their production methods to handle any uncertainty they come across because a supply chain orientation is the recognition by a company that systematically, the strategic implications of the activities and processes involved in managing the various flows in the supply chain can give it a competitive edge over competitors (Hamid and Sukati, 2010).

Other writers {Stevens (1989) cited in Hamid and Sukati (2010), Asamoah, Abor and Opare (2011), Ford (2007) & Schroeder, Goldstein and Rungtusanatham (2011) } agree on the fact that supply chain integration should be inclusive of upstream and downstream

players, but more importantly is to note that the internal integration is the foundation of successful implementation. Successful internal integration, if implemented very well, can contribute to achieving cost reduction, eliminate stock outs, and improve lead time. Successful external integration is a must to achieve a strong competitive position. The focus on improving SCM was started by the manufacturing sector and the service industry is only starting now to follow and adopt these practices.

2.1.3 SCM in the Health care industry

According to Aronsson, Abrahamsson and Spens (2011) health care systems, on a global scale, have, due to decreasing resources and increasing demand, been forced to find new approaches and concepts in order to improve quality but at the same time lower costs and increase value. Chadha, Singh and Kalra (2012) state that two principal causes of excessive waiting times in hospitals can be directly attributed to poor design of health care services and inadequate capacity to meet scattered patient arrival patterns. This situation is exacerbated by rising population which places an additional burden on hospital resources.

Multiple studies, mentioned in an article by De Vries and Huijsman (2011), suggest that a significant portion of the costs associated with supply chains in the health care sector can be reduced by implementing effective supply chains. These authors are also of the view that in the service industry, the health care sector is far behind with respect to implementing supply chain management practices. This is also supported by Jarrett (2006) & Kumar, Ozdamar and Zhang (2008), who state that because of fears of being let down by the distributors and also fears of the liability incurred by a patient dying when critical supplies are not available, health workers tend to opt for stockpiling of the supplies. This fear or practice has hindered the health care industry's efforts of effective supply-chain management.

Guimara˜es, de Carvalho and Maia (2013) also share the same sentiments as Jarrett (2006), because they state that in the health sector it is common to find high levels of safety stocks in several points of healthcare units. This can be attributed to poorly implemented inventory management practices and personal judgment in determining

safety stock levels, a common problem of silo-structured organizations. They also go on to say that one of the difficulties of managing inventory in healthcare settings lies with the fact that these levels tend to reflect the desired inventory levels of the patient caregivers rather than the actual inventory levels needed in a centre and the inventory held in most cases is not data-based but rather experienced or politically based.

In a study done in Malaysia (Mustaffa and Potter, 2009) on the inventory management and replenishment/supply chain process which invariably affects the availability of medication to patients, and the latter invariable has impact on the quality of care received by a patient. The researchers commented on the fact that SCM is more complex in healthcare compared to other industries because of the impact or effect it has on people's medical conditions which normally requires an adequate and accurate medical supply according to the patient's needs.

Having said that though, it is a well-known fact that stock piling inventory is an expensive exercise because it will need more space for the inventory, security and insurance, secondly this massive stock is prone to stock theft. Kumar, Ozdamar and Zhang (2008) state that according to the Singapore Ministry of Health (1993), activities related to the purchase, distribution, and management of supplies account for about one third of the operating costs of healthcare facilities. This is a similar challenge that is faced by other governments as well, hence it is quite important for the authorities to look for best practices and cost effective measures when sourcing and managing their supplies in order to improve the quality of the services provided to their customers/patients.

A study that was carried out by Jahre, Dumoulin, Greenhalgh, Hudspeth, Limlim and Spindler (2012) on SCM of the local clinics in Uganda provided us with an in-depth understanding of the serious challenges that the PHC centres are facing. They found that the supply chain between the local clinics (or health centres), districts and distributors was characterized by inconsistent planning, forecasting, ordering, and inventory management and that the system in place was not using the appropriate tools. That therefore led to lack of coordination between information and goods flows, with the ordering process disintegrated from follow up of medical supply deliveries, in other words there was no information on what was ordered compared to what was received. In

addition to that the ordering process they were using was not based on appropriate stock levels or required demand, and that combined with long ordering lead times resulted in countless stock outs at the local clinics (Jahre, Dumoulin, Greenhalgh, Hudspeth, Limlim and Spindler, 2012).

Kumar, DeGroot and Choe (2008) provide a report about a study that was conducted in the USA looking specifically at the purchasing decisions of the hospitals with the view of isolating any inefficiency as the latter was affecting the patients. Once that was addressed more efficient product movement was implemented with immediate effect and that resulted in savings of $6.7 billion for the overall supply chain, as inventory management strategies became more automated. In other words besides improving the service delivery to the patient, implementing effective SCM can be a cost saving method for the department as well as it will eliminate all the unnecessary expenditures throughout the entire chain.

2.2 Lean practices in the Health care Industry

Lean is an improvement approach that consists in eliminating waste (steps that do not add value to the customer/patient, e.g. interruptions, delays, mistakes. . .) to improve the flow of patients… (*De Souza 2009)*

Lean system (Hines, Holweg and Rich, 2004) is a system that was started in the Toyota car manufacturing plant in Japan under Taiichi Ohno- it started with car engines in 50s, then car assemblies in 60s and supply chain in 70s. And it was not until the 80s that the manuals for the suppliers were available in English. The core of the lean production includes :- JIT(Just-In-Time) production system, Kanban pull method of production, respect for employees, high levels of employee problem-solving/automated, mistake proofing and waste elimination and the back bones of lean according to {Ho (2010) and Emiliani and Stec (2005)} include the 5S i.e. structurise, systematise, sanitise, standardize & self-discipline.

Lean philosophy is built on the principle that relentlessly pursues the solving of problems that affect the customer, generates a competitive advantage and solving these problems becomes the overall goal of the firm. Lean philosophy puts emphasis on customer

satisfaction, high quality, and comprehensive employee training and empowerment (Angelis and Fernandez, 2012).

Secondly Lean is a management system designed to be responsive to the needs of humans i.e. the customers, and it has the following key objectives, elimination of waste, value creation, minimizing process variability and pursuing continuous process improvement with employee involvement for end-use customers. {Emiliani and Stec (2005) & Angelis, Conti, Cooper and Gill (2011)}

In the health care industry (Aronsson, Abrahamsson and Spens, 2011) lean as a principle has been introduced to streamline processes and to reduce costs or the ability to treat more patients with the same resources. Womack and Jones (2003) cited in Kollberg and Brehmer (2007) state that the first step in implementing lean thinking in medical care should be to put the patient in the forefront and include time and comfort as key performance measures of the system. They also stress the fact that it should be the patient who should define what creates value in health care. Kollberg, Dahlgaard and Brehmer (2007) go on further to state that another important principle of lean thinking is to identify value streams in order to eliminate waste and that is achieved by mapping every step or individual action involved in the process for specific services, and analyzing the flow in order to identify and eliminate waste. The identification of value adding processes provides an important foundation for eliminating waste. Value adding activities related to good medical quality, accessibility and patient satisfaction, can be identified from the point the patient makes the first contact until the treatment is completed.

Womack and Jones (2003), cited in Kollberg, Dahlgaard and Brehmer (2007), explain the core service process in the healthcare as follows:

(1) Accessibility to health care services. (2) Interaction with the health care organisation.

(3) Patient participation.

In service industry as a whole, according to Bonaccorsi and Zammori (2011), there are ten major forms of wastes:-

— Defects i.e. Data entry errors; lost files; Lost or damages goods;

- Duplication i.e. Data re-entering; multiple signatures; unnecessary reporting; multiple queries;
- Incorrect Inventory- Stock out; Wasting time finding what was needed; unnecessary copies;
- Lack of customer's focus - Unfriendliness; Rudeness; Poor attention to the customer;
- Overproduction - Reports no one will ever read; processing paperwork before time;
- Unclear communication - Incorrect information; Lack of standard data format; unclear work flow;
- Motion/Transportation- Poor layout; Ineffective filing; Poor ergonomic;
- Underutilized Employees - Inadequate tools; Excessive bureaucracy; Limited authority;
- Variation - Lack of procedures; Lack of standard formats; Standard time not defined;
- Waiting/Delay- Waiting for approvals; Downtime; Waiting for supplies;

According to Kollberg, Dahlgaard and Brehmer (2007), there are other forms of wastes in the health care industry which are as follows:-

- Mistakes which require rectification.
- Production of items no one wants.
- Processing steps that are not actually needed.
- Movement of employees.
- Transport of goods without purpose.
- Groups of people in a downstream activity standing around waiting.
- Goods and services, which do not meet customer needs.

Other forms of waste in the health care sector include confusion; motion/conveyance; waiting; over processing; inventory; and overproduction (Guimara˜es, de Carvalho and Maia, 2013).

In other words lean, therefore, is primarily about improving quality so that non-value adding activity (i.e. waste), such as those mentioned above, which often increases delay,

require extra resources and ultimately attracts extra costs, should be eliminated (Burgess and Radnor, 2013).

Lean management is based on the following key principles (Burgess and Radnor 2013, Guimara˜es, de Carvalho and Maia 2013 & Bonaccorsi, Carmignani and Zammori 2011):

- Specify value from the customer's perspective
- Identify the value stream for each service provided and challenge all wasted steps by mapping all processes involved in creating a service. For example in the health care sector start from ordering medication and end when the patient receives it.
- Then after that make the service flow continuously and standardize processes around best practice, by minimizing queues and interruptions.
- Introduce "pull" between all steps where continuous flow is impossible by supplying only what is demanded by the customer.
- Manage towards perfection.

Toussaint and Gerard (2010) cited in Burgess and Radnor (2013) clarify the above by stating that, in the healthcare sector one should focus on the patients and design care around them. One also has to identify value for the patient and get rid of everything else (waste) that is non-value adding in the patient management.

Guimara˜es, de Carvalho and Maia (2013) mention success stories of lean implementation in Canadian health care sector where the introduction of "stockless initiatives" saw the introduction of the "unit of use" delivery method instead of bulk, the stockless replenishment change the delivery frequency from once a week to daily, reduced the number of suppliers from over 35 to one or two, almost eliminated the need of clinical staff involvement in daily materials-related tasks, simplified receiving procedures, reduced hospital storeroom size from 6,000 to 300sq. ft., storeroom inventory from six to eight weeks supply to one to three days' supply and full time equivalents managing materials from 31 to 13. Apparently this lean practice has been implemented with huge success in the European hospitals as well (Riley (2001), cited in Guimara˜es, de Carvalho and Maia 2013). One form of lean that has been implemented with success in the service industry is the Vendor Managed Inventory

(VMI) which is defined as “The practice of retailers making suppliers responsible for determining order size and timing, usually based on receipt of retail point of sale (POS) inventory data. The “pull” system in VMI programs is assured in the sense that it is the consumption in the point of use/patient care that triggers vendor’s deliveries in a perfect demand visibility basis. VMI has proven very effective and efficient by transferring an in-house activity to an existent supply chain partner resulting in less inventory costs, increased efficiency in replenishment and improving quality of care without having outsourcing costs; streamlining the material and information flow in a crescent seamless basis by introducing visibility to supply chain; and prevailing the pull trigger for replenishment leading by consumption (Guimara˜es, de Carvalho and Maia, 2013).

In VMI, the stress of worrying about ordering and replenishing inventory is taken out of the health care centre to be managed by supplier who is well experienced and able to do the job, in other words in this case/scenario the clinical staff in the health care centre will have ample time on their hands to do what exactly they are trained to do i.e. treat patients without having to take another time to do inventory assessment, management etc. The system works well when there is good communication software that links the health care centre to the supplier and the dispensing of the medication is done through the computer software.

Before lean can be implemented in the healthcare centre, there has to be a collaborative-based partnership with all the suppliers. Secondly, a research needs to be done in order to determine the capability of the health care supply chain systems currently in place to accurately identify, categorize, and predict all products (Kumar, DeGroot and Choe, 2008).

According to Grove, Meredith, MacIntyre, Angelis and Neailey (2010) lean is increasingly being applied to health services in the UK and overseas to improve the quality of patient care, improve safety, eliminate delays and reduce length of stay in hospitals while using no more resources.

2.3 South African Health care Sector

Schaay, Sanders and Kruger (2011) define the objectives of any health system as to deliver accessible, equitable and good quality health services which are both responsive to community demands and which should be based on the principle of inter-sectoral collaboration. They also state that in order for one to achieve these objectives a health system must perform a number of basic functions. These include ensuring appropriate stewardship; developing human resources for health; mobilizing and allocating adequate finances and other key resources; developing and maintaining a well-functioning health information system and ensuring equitable access to essential medical products, vaccines and technologies.

The South African Constitution (1996) is unambiguous when it comes into spelling out the rights of the citizens of this country as far as their bill of rights in health care issues is concerned, Chapter 2 of the constitution in section 27 provides as follows: every person has the right “to have access to health care services, including reproductive health care”. No person “may be refused emergency treatment”, it goes on further to state that the South African government should respect the right of access to health care services by not unfairly or unreasonably getting in the way of people accessing existing health care services, whether in the public or private sector. This law also forces the government to fulfil this right by creating the necessary conditions for people to access health care, by providing positive assistance, benefits and actual health care services (SA Constitution, 1996).

This was one of the reasons the South African Government came up with the South African National Health Bill in 2003. This bill was the vehicle the government used/uses to implement all the recommendations as per the requirement of the Constitution.

Chapter 3 of the National Health act, state the following:-

31. (3) *A district health council must- (a) promote co-operative governance; (b) ensure co-ordination of planning, budgeting, provisioning and monitoring of all health services that affect residents of the health district for which the council was established;*

32. (1) every metropolitan and district municipality must ensure that appropriate municipal health services are effectively and equitably provided in their respective areas.

Another important development to note that the government came up with in 2003 was the development of guidelines that would regulate the supply chain management to all the government institutions by the national treasury. In this Government Gazette it is stated clearly that in the establishment of supply chain management units: the accounting officer or accounting authority of an institution must establish a separate supply chain management unit within the office of that institution's chief financial officer, to implement the institution's supply chain management system. Secondly the accounting officer or accounting authority of an institution must ensure that officials implementing the institution's supply chain management system are trained and deployed in accordance with the requirements of the Framework for Minimum Training and Deployment issued by the National Treasury (National Treasury, 2003).

This indicates clearly that the legislative framework for implementation, promotion and ensuring that health care services are accessible to the people of this country is at the heart of the democratic government. This might be due to the fact that the previous political system that was in place did not pay much attention to the primary health care services. The government of this country is constitutionally bound to provide equitable, accessible and good quality health care services to all citizens of this country irrespective of where they live as this is enshrined in their Bill of Rights.

In South Africa (Patel, Norris, Gauld and Rades, 2009) there is a two-tier health care system that is operating: a well-resourced, private health care funded by medical insurance, catering for approximately 20 per cent of the population and it operates alongside the public sector that serves the remaining 80 per cent of the population. The public sector is run as a quasi-federal system with national, provincial and municipal Departments of Health (DoH). Services are free at primary care level with users paying part charges at secondary and tertiary levels calculated on income levels.

When the democratic government in this country came into power the health care industry was completely skewed and disintegrated because of the policies of the previous

government. The PHC approach formed the basis of the transformation of the South African health system at the advent of democracy in 1994. It was and is still seen as the strategy to revitalize the health system in this country. Restructuring of the public health sector post-1994 achieved substantial improvements in terms of access, rationalization of health management and more equitable health expenditure, Schaay, Sanders and Kruger (2011) & Harrison (2010).

The approach of the government to address the imbalances of the past was to come up with a different approach or system of the health care sector which was the establishment of a district-based system and this was one of the biggest post-1994 innovations, whose aim was to make health management more responsive to local conditions and distributing resources more equitably Harrison (2010).

The democratic government took a totally different approach in dealing with health care as compared to their predecessors. The latter were mainly concerned with “curative” care i.e. their main attention was with the big hospitals or tertiary care, whereas the new government came up with policies that concentrated more on “preventative” care hence the establishment of district health services (DHS): D*istrict level is the level at which co-ordination of community services takes place. It is the unit of management of the health system that is best able to drive the national health system. The district should be large enough to be economically efficient, but small enough to ensure community participation and accountability (*South African Health Review, 1995).

The current situation in the public health care sector, however doesn’t appear to be exactly what the government envisaged in their post 1994 plans according to the NDOH (National Department of Health) Annual Report (2011-2012).

As part of interventions to enhance the quality of care, the NDOH commissioned an independent comprehensive audit of public health facilities to assess their infrastructure, human resources and the quality of the services they provide. According to the report by the end of March 2012 a total of 3 780 of the 4 210 health facilities (i.e. 90%) had been audited. The audit revealed major challenges concerning the management of these

facilities, as well as the quality of services provided. As per the NDOH Annual report (2011-2012), they included the following:-

- Number of districts with functional district health councils (DHCs) were only six whereas the set target was 43.
- Number of functional facility committees established for PHC facilities (clinics and community health centres) was around 628 whereas the set target was actually 1964.

Schaay, Sanders and Kruger (2011), also paint a very gloomy picture about the state of Health Department in this country as they state that, despite the development of a national human resources strategy in 1999/2000 and the framework of a human resources plan in 2006, there remains a significant human resource crisis, especially at community and primary levels in the public health sector, with poor availability of health care personnel in disadvantaged areas further reducing access.

Issues of inadequate supply and uneven distribution are clearly illustrated in the decrease in the nurse-to-population ratio, from 149 public sector professional (or registered) nurses per 100,000 population in 1998 to 110 per 100,000 population in 2007; the increasing percentage of doctors working in the private sector (from about 40% in the 1980s to 79% in 2007) and the significant vacancy rate amongst health professionals (42.5% in 2010) in the public health sector. The low staff morale in the public health sector was also confirmed by Pillay (2009) who found that this country was facing an imminent crisis with the overwhelming majority of nurses planning to leave their current positions. Employment practices that nurses feel would improve retention include adequate remuneration, a safe environment with adequate resources, a work context that facilitates their professional practice, management support and a culture of participation and engagement and opportunities for career development.

Additionally, weaknesses in training, support, and supervision, and lack of managerial capacity and appropriate leadership to manage underperformance in the public sector have been raised as issues of concern. A growing number of studies point to deficiencies in stewardship, leadership, and management of different aspects of the health system –

as evidenced by the varying quality of care delivered within the public sector, inefficient management of health facilities, and an absence of managerial oversight and accountability for performance, Schaay, Sanders and Kruger (2011).

It is quite clear that the public health care sector in this country would actually benefit from any form of intervention that will attempt to change above picture, but what intervention can be used that has been proved to be successful elsewhere? Lean management might be one of the possibilities that one needs to look at.

According to Zak (2006), it might not be obvious to many people but the health care industry like any other industry needs lean principles as well. Why? In the past two decades there has been dramatic changes in the health industry as a whole and these changes mandate changes in health care service delivery in order to achieve both quality care and financial stability. Secondly people are getting older, the disease burden is increasing hence the number of patients is increasing which means the need for space and improved turnaround is becoming critical. At the same time the public health care sector is expected to do more with less, they are expected to serve more patients with fewer resources at low cost. Patients, community leaders, regulators on the other side are evaluating health care sectors demanding more accountability as never before. This is well supported by Graban (2009) who also agrees to the fact that many health care institutions are well underfunded and workers are working under extremely difficult conditions and many doctors and nurses go home frustrated every day because of recurring problems, others sometimes even leave their profession because of frustration. That is where lean practice comes in, it is a toolset, a management system and a philosophy that can change the way, the health centre is organized and managed. Lean is a methodology that allows the institution to improve the quality of care for patients by reducing errors and waiting times. In other words lean is about looking at “how we do our work” and figuring ways to improve how that work is done, it is about improving quality and productivity and also it’s about learning how to fix the problems permanently instead of hiding them away. It improves patient safety, quality of care the patient receives and improves patient satisfaction as well. It has been proven to be working in USA, UK and Canadian hospitals, Graban (2009).

Procurement of medicines in the public sector is through a state tender system. The provinces purchase their medicines directly from the suppliers. Distribution of medicines is undertaken by independent pharmaceutical wholesalers and exclusive pharmaceutical distributors. Also within the public sector drug distribution happens at two levels. First, it is between the manufacturer through their wholesaler/distributor and the provincial depot. Then the medicines move from the depot to the individual health care facilities, (Patel, Norris, Gauld and Rades 2009).

The following diagram is an illustration of medication procurement by the health centres in this country:-

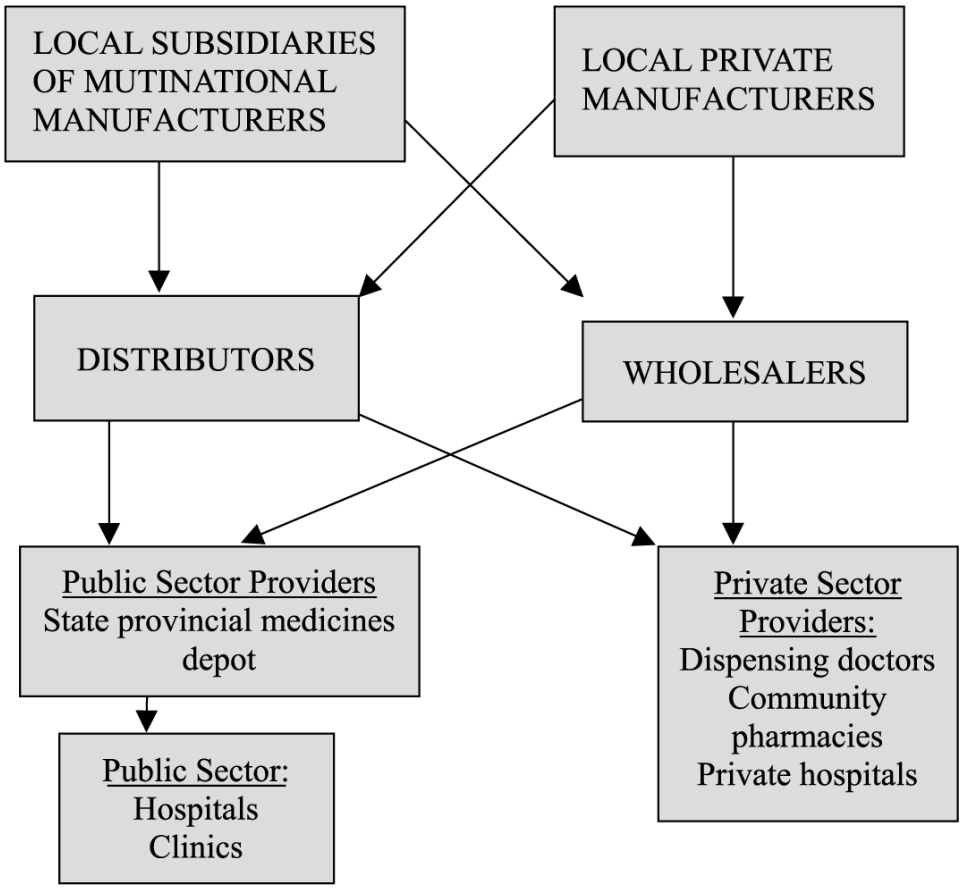
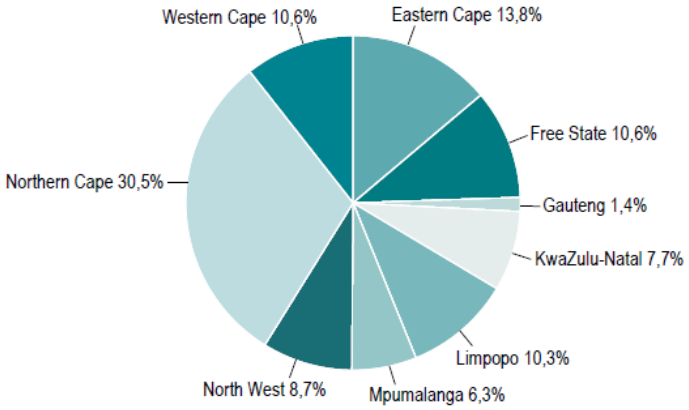


Table 1. Overview of medicines distribution in SA (Taken from Patel, Norris, Gauld and Rades 2009 Pg.3)

2.4 Eastern Cape

Our study is based in Eastern Cape which according to statistics South Africa (2011) is a province that by land distribution constitutes about 13, 8%.

Figure 2.1.Land distribution per Province in South Africa. Source: Stats SA 2011



Source: Stats SA, Geography Division

In this census report (2011) other important features (poverty indicators) of the Eastern Cape that were noted include the fact that although the province is the second largest in the country following the Northern Cape, it had the second lowest average annual income after the Limpopo Province. This province including Limpopo and Kwazulu-Natal were found to have the highest unemployment rates in South Africa. Lastly another important finding to note was the fact that the combination of piped water inside the dwelling and outside the yard is high in all provinces apart from Eastern Cape and Limpopo which have the lowest proportions. In short the findings of the census clearly showed us that the Eastern Cape province is one of the provinces that has high levels of poverty indicators which means the majority of people, when it comes to seeking medical care will not be in a position (financially) to buy these services in the private sector, they will solely depend on the government/public sector health care facilities.

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This is one of the reasons why this study was so vital in assessing whether the supply chain of the medical suppliers to our PHC facilities is at its best and whether it can be optimized through implementing lean strategies, which have been implemented with huge success elsewhere in the world as alluded to above.

2.5 East London

This study was based in East London which is part of the large Buffalo City Metro (i.e. East London, King Williams Town and Bisho), according to the Buffalo City Metro website (2013), this metro has a population of about 880 000 people and about a third of these dwell in the East London township (Mdantsane). The population demographics of this metro reflects the following:- More than 80% of the people in Buffalo City are African, about 10% are White, 6% are Coloured and just under 2% are Asian. East London is the second largest city in Eastern Cape after Port Elizabeth (Nelson Mandela Metro), the sixth largest city in South Africa and is bounded by two main rivers i.e. the Nahoon River in the north and the Buffalo River in the south. Historically the town itself used to be under the former white South African government and the township was under the black Ciskei government. The coming into being of the democratic South Africa meant that the health department had to inherit these different clinics with different resources. Currently East London has clinics in the rural areas, peri-urban areas and in the suburbs.

The Buffalo City metro is not one of the richest in this country because in this metro more than 70% of Buffalo City's population earns less than the household subsistence level (R1 500 a month). In other words the majority of people in this metro rely heavily on the government's public services including accessing the health care services. Also even the work opportunities are very limited as it has been shown that just over one in five people in Buffalo City are unemployed and looking for work. Only 15% of adults have full-time formal work, while 4% work full time informally, or part time. About 3% are self-employed. Buffalo City states that the main purpose of its department of Health Services is to provide a Primary Health Care and auxiliary health care service that is both preventative and curative through its 28 clinics and four mobile clinics which provide primary health care services to people, (Facts about Buffalo City, 2013).

As the metro is quite a vast area it was not possible to include all the clinics in this study as time is very limited, the sample of the clinics to be studied was only taken from the East London clinics. There is not much on literature reviews about studies similar to this one especially in the developing countries. Two that the researcher has come across are the studies that were done in Malaysia (Mustaffa and Potter 2009) and the one closer to home was done in Uganda by Jahre, Dumoulin, Greenhalgh, Hudspeth, Limlim and Spindler (2012). The main aim of the Ugandan study was to improve the availability of health services in the Ugandan PHC centres by identifying the main obstacles in the health care supply chain. Amongst other important findings of that study in Uganda, these were also noted:

- There were major deficiencies in the management of the supply chain with long erratic lead times and a bureaucratic ordering process involving many actors.
- The complexity in terms of distribution levels and points was quite high considering the lack of communication, controls, and transport, which posed particular problems for the flow of information, including ordering and feedback regarding stock shortages and deliveries.
- The supply chain was characterized by inconsistent planning, forecasting, ordering, and inventory management.
- Lack of coordination between information and goods flows, with the ordering process disintegrated from follow up of medical supply which meant the information is always lacking on what is delivered, as compared to what was ordered. Jahre, Dumoulin, Greenhalgh, Hudspeth, Limlim and Spindler (2012)

The Malaysian study (Mustaffa and Potter 2009) also found similar challenges in that country as far as inventory management was concerned, as a result many clinics were always placing urgent orders due to poor inventory control methods. Obviously each country has its own political and social challenges hence the findings of a study in other countries cannot be used to address the health challenges that face another country (instead these studies can be used as eye openers to what problems other countries are facing and how are they dealing with them) like this one of ours hence it is important that a study like this be carried out here in this country with the view of assessing the strengths

and weaknesses (if any) in our supply chain in order to come up with recommendations of optimizing the delivery of health care services to the people of our country. The fact of the matter is, globally, the resources are shrinking as the population is exploding. Secondly we are well aware that South Africa is a developing country which means it has limited financial resources, hence it is important that we always interrogate our processes and our system to make sure that they are exactly what they are supposed to be, including the health care services. We, as the citizens of this country need to come up with suggestions of ensuring that each and every cent that the government spends in the health care sector achieves the desired state that it was intended to do. It is a fact that we have to make more from less. This is confirmed by the Department of Health Strategic Plan (2010) where it is stated that the population growth between 2004-2009 appears to have outstripped the availability of health facilities because, the country's population per clinic is 13,718, which is inconsistent with the WHO norm of 10,000 people per clinic. Another important piece of information that transpired from this report is the fact that during 2009/10, there was a 12% stock out of the 45 Antiretroviral medicines (ARVs) on tender, measured in 9 provinces (405 items), and a 21.8% stock out of the 35 TB medicines on tender measured in 9 provinces (315 items) according to the report.

2.6 Conclusion

The South African constitution which is the guiding manual for all the lives of the people of this country mandates the Department of Health to make health care services accessible to all people of this country. Due to the fact there is scarcity or declining of resources and increasing number of the population it is imperative that the health sector looks for ways and means of utilizing the resources it has to the maximum to ensure that it provide the patients with high quality of health care. One of the ways this can be done is through the improvement of the supply chain which will ensure that patients get the medication they need in their local PHC. Lean thinking has been used with great success in USA, UK and Canada in improving the SCM in their health sector (Kumar, De Groot and Choe 2008). This study seek to find if our local SCM can be optimized through that lean management process.

Chapter 3

3.0 Research design

3.1 Introduction

The global village is getting smaller as people are moving all over the place and besides that the population is growing whilst the resources and getting smaller and smaller. This scenario forces the managers or the people in decision making levels to put in measures that ensure that waste is minimized at all cost and all the available resources are utilised effectively and efficiently. That is making more from less. This is the basic philosophy behind lean management.

Lean has been implemented with huge success in the manufacturing sector as mentioned in the previous chapters. This principle is being utilised now in the service sector as well, and this study's aim is to assess the supply chain of medication to the East London PHC centres with the view of assessing whether it can be optimised through lean implementation. In this chapter the researcher is going to present the research paradigm upon which the study is conducted and the reasons for that.

This study was looking at the way medication is ordered, delivered and utilised in the East London primary health care clinics. The whole purpose is to ensure that there is minimal or no waste at all of resources and that the best available possible methods are utilised to ensure that the end customer (the patient) is receiving the best medical care. If there is found to be a gap between the expected services and the current health care services, the study will come up with specific and relevant recommendations to the powers that be of what possible intervention methods can be implemented in order to rectify or close that gap. The steps to be taken in achieving this include going to all the selected study clinics in East London and collecting data.

This data was collected from the people who are at the fore-front of this process i.e. the nurses or clinic managers. The study has analysed the collected data and has come up with practical recommendations of where and how to improve the services these clinics

render to the patients. In short the end result of the study is to make a contribution that the health services rendered to the citizens of this country are on par with health services rendered anywhere in the world i.e. good, high quality standard.

Lastly the benefits of lean implementation in the service industry will lead to the elimination of the following waste and according Bonaccorsi, the following is the most common waste found in the service sector:

- Defects, data entry errors; lost files; Lost or damages goods;
- Duplication, data re-entering; multiple signatures; unnecessary reporting; multiple queries;
- Incorrect Inventory Stock out; wasting time finding what was needed; unnecessary copies;
- Unfriendliness; rudeness; poor attention to the customer;
- Overproduction reports no one will ever read; processing paperwork before time;
- Unclear communication, lack of standard data format; unclear work flow;
- Motion/Transportation poor layout; ineffective filing; poor ergonomic;
- Inadequate tools; excessive bureaucracy; Limited authority;
- Variation **l**ack of procedures; lack of standard formats; standard time not defined;
- Waiting/Delay waiting for approvals; downtime; waiting for supplies, (Bonaccorsi, Carmignani and Zammori, 2011).
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3.2 Researcher's, ontological and epistemological stand-point/position.

According to Saldana (2011) any researcher that is conducting a study to investigate some facet of social life, normally will initiate, plan, facilitate and oversee all the aspects of that particular project from start till finish to achieve the project's goals hence in many circles of the research he/she is considered to be the primary instrument. In the research field (Collis and Hussey, 2009) there are always two sides, positivists and interpretivists and their beliefs are as follows:-

- Ontological assumption is concerned with the nature of reality: - positivists believe social reality is objective and external to the researcher, therefore there is only one reality whereas interpretivists believe that social reality is subjective because it is socially constructed, therefore each person has his/her own sense of reality and there are multiple realities.
- Epistemological assumption: - this is concerned with what we accept as valid knowledge, in other words it examines the relationship between the researcher and that which is researched. In this regard positivists believe that only phenomena that are observable and measurable can be validly regarded as knowledge whereas interpretivists attempts to minimize the distance between the researcher and what is researched, in other words there is no absolute truth because it is contingent on context and multiple perspectives. (Collis & Hussey, 2009 and Saldana, 2011)

3.3 Overall research approach (qualitative/quantitative or mixed)

Generally speaking there are two approaches that the researchers would adopt when conducting a study, i.e. quantitative and qualitative study. Boeijie (2010:5) states that in quantitative study, there is a previously selected theory which is used to deduce hypotheses, then these hypotheses or propositions are tested by means of research. It is also stated that the building blocks of hypotheses and the relationships between them are called variables. Results are reached by working with numbers, and statistical criteria are

used to determine whether the results offer support for the hypothesis or not. Then subsequently the results or findings are fed back into the theory in an attempt to explain the results and reflect on the implication. In other words in quantitative study (Collis and Hussey, 2009:8) a deductive approach is employed which describes a study in which a conceptual framework and theoretical structure is developed which is then tested by empirical observation and then particular instances are deducted from those general inferences.

In qualitative study (Collis and Hussey, 2009:8) an inductive approach is employed because a theory is developed from the observations of empirical reality. In this type of study, literature including theory is used just to understand what is going on in the field and to discover theoretical perspectives, including proper concepts to look at the social phenomenon of interest, then data collection takes place normally through means of semi-structured measuring instruments that are tailored to the research subject and refined as the research progresses. During data analysis, the textual accounts or interviews or observations are searched for common themes and regularities and the findings will consist of descriptions of the field using various relevant, theoretical concepts necessary to interpret the participants' view of their social world and their behaviour (Boeijie, 2010:5).

In this current study the researcher will adopt an evaluation research which is a genre of qualitative research. Evaluation research according to Saldana (2011:17) systematically examines people, programs, organizations and/or policies to assess their quality, merit and effectiveness. This genre can employ both a combination of both qualitative and quantitative data collection and analysis if and when needed, secondly in this genre the researcher doesn't necessarily assume an objective stance but assesses the values at work in case- specific projects, offering practical recommendations for improvement.

3.4 Research methodology

Research methodology deals with the approach to the process of the research encompassing a body of methods and in this study which is qualitative in nature as mentioned above the researcher will adopt a case study approach as this study is trying

to explore a single phenomenon (i.e. SCM) in a natural setting and will be using the available raw data from the clinic files and also have interviews with people that are working in these clinics in order to obtain an in-depth knowledge of the issue at hand. Qualitative study is interpretive in nature hence this study will be dealing with people's perceptions and experiences, so the data that the study will collect is mainly what people say they believe, what they do, their feelings expressed and explained. This is so because in qualitative study it is understood that people at work will always make sense of whatever it is that they do and will therefore create their own reality because in qualitative study the research is not trying to prove or verify any truth as there are multiple truths and realities out there. What the study is trying to elicit from the people is what it is their true reality there where they are.

This study therefore is not about data generation, instead it will be about data collection and the unit of analysis for the study will be –the nursing sister/pharmacist/manager that is running the East London clinics, doing ordering, storing and dispensing of medication to the patients. The researcher is trying to understand "the supply chain management of medical supplies in the East London PHC with the view of assessing whether there are opportunities of implementing Lean management."

In this study the flow of the following four tracer dugs will be assessed

- Ridaq/HCTZ……..drug used for hypertension
- Glibenclamide……drug used for diabetes
- Rifafour……drug used for Tuberculosis (TB).
- Paracetamol……drug used for pain and fever

Buffalo City has about 28 clinics but four of those are in the King William's Town, an area that is outside of study and the other two "clinic/s" are mobile clinics and are also not included in the study. The approach of the study will include the site visits of all the selected study clinics, reviewing their records for the tracer drugs between the period, 01

January 2012 and 31 December 2012 (1year) this was also corroborated with the clinic staff interview which lasted for approximately 15 minutes per interview.

3.5 Limitations of the study

The time for the study was very limited hence the study was only based on the clinics that are in the East London area, which means the Buffalo City clinics that are in King William's town fell outside the study area hence they were be excluded in the study. Secondly the mobile clinics were not be included in the study as a qualitative study seeks to understand the situation in its natural environment (mobile clinics have no specific/identifiable natural environment).

3.6 Conclusion

Lean management is a new practice that has not been implemented well in the services sector (especially in the health care sector) although it has proven very successful, cost effective and effective in the manufacturing industry.

This qualitative study, which was conducted in the East London clinics with the intention of looking at the supply chain management of the medications in these clinics with a view of assessing whether the strategies and protocols recommended in lean management can have a place in optimizing the services rendered in these clinics.

Chapter 4

4.0 Data analysis and interpretation

4.1 Introduction

The process of collecting data as explained in detail in the previous chapter has been completed and the main purpose of this chapter is to interpret and analyse the collected data. This chapter will be focusing mainly on the sub-problems and subsequently the main problem of which the aim is to determine what the empirical study revealed in respect of supply chain management of medication to the East London municipality clinics.

Research results presented in this chapter are from the questionnaire sent out in this study which focused mainly on the following sub problem areas:-

- The forecasting methods used in the clinics
- The methods they use in the ordering process
- Their inventory management practices
- The availability human resources
- The current budgeting practices in use.

Research results of the current flow of medication are presented by looking at four current tracer drugs used in these clinics, they are:-

- Hydrochlorothiazide/ HCTZ
- Glibenclamide
- RIF/INH/PZA/ETH (Rifafour)
- Paracetamol

Frequency distribution was used for interpretation and analysis.

4.2 Response rate

East London has 28 clinics, including satellite and mobile clinics, the latter two i.e. satellite and mobile clinics were not included in the study. All in all the study was conducted on 22 clinics in and around East London. The nurse in charge in each clinic was given a questionnaire to fill. The response rate was 95, 45% as only one questionnaire was not completed.

4.3 Analysis and interpretation of the results

4.3.1 Socio-demographic factors of the surveyed people

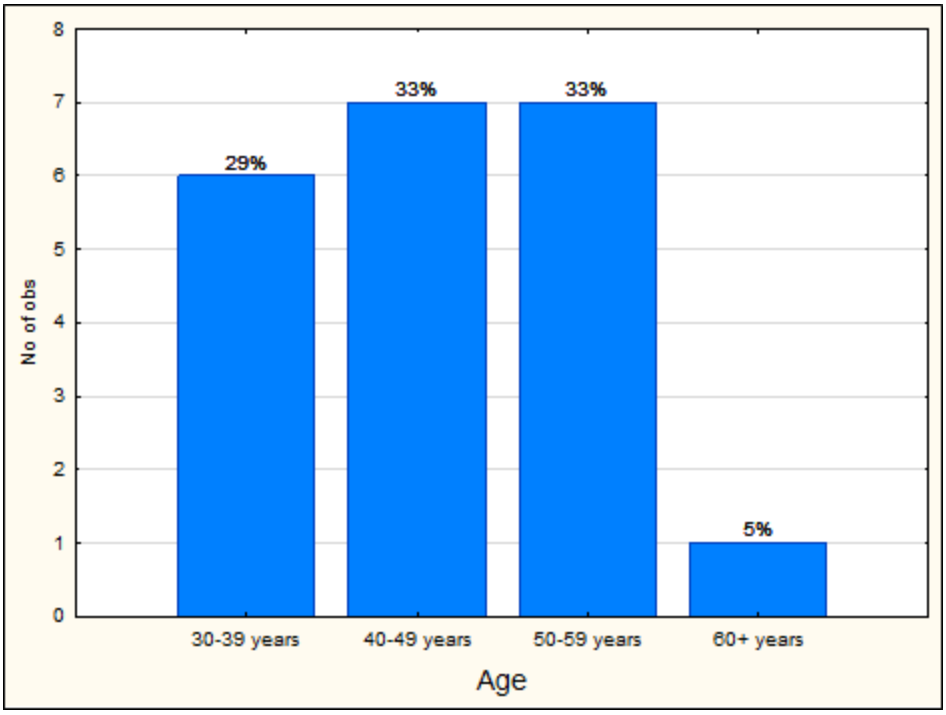
The following results of the study represents the socio-demographic data of the respondents. The gender distribution, age, qualifications, employment status and nationality are included.

4.3.1.1 Age and gender distribution

Figure 5.1 shows the age distribution of the people surveyed.

Frequency table: Age		
	Count	**Percent**
30-39 years	6	28,57
40-49 years	7	33,33
50-59 years	7	33,33
60+ years	1	4,76

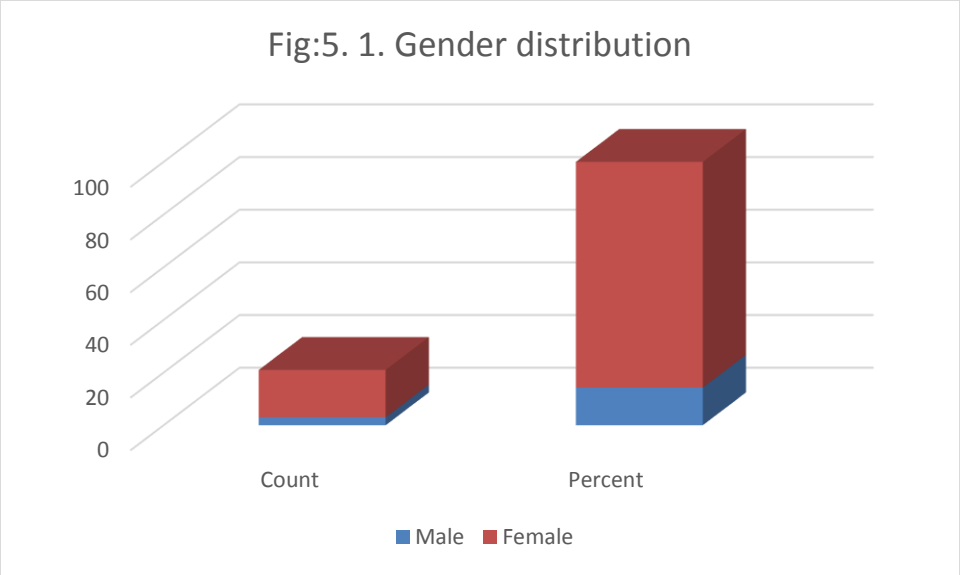
Table 1. Age distribution



The age distribution shows that about 66% of the personnel interviewed lie between the ages 40-59yrs. The obvious benefit of this is the fact that these centres are run by well matured people who are experienced.

Figure 5.1 shows that these local clinics are dominated by the female nursing personnel, as the latter constituted more than 85% of the interviewed personnel.

Frequency table: Gender		
	Count	**Percent**
Male	3	14,29
Female	18	85,71



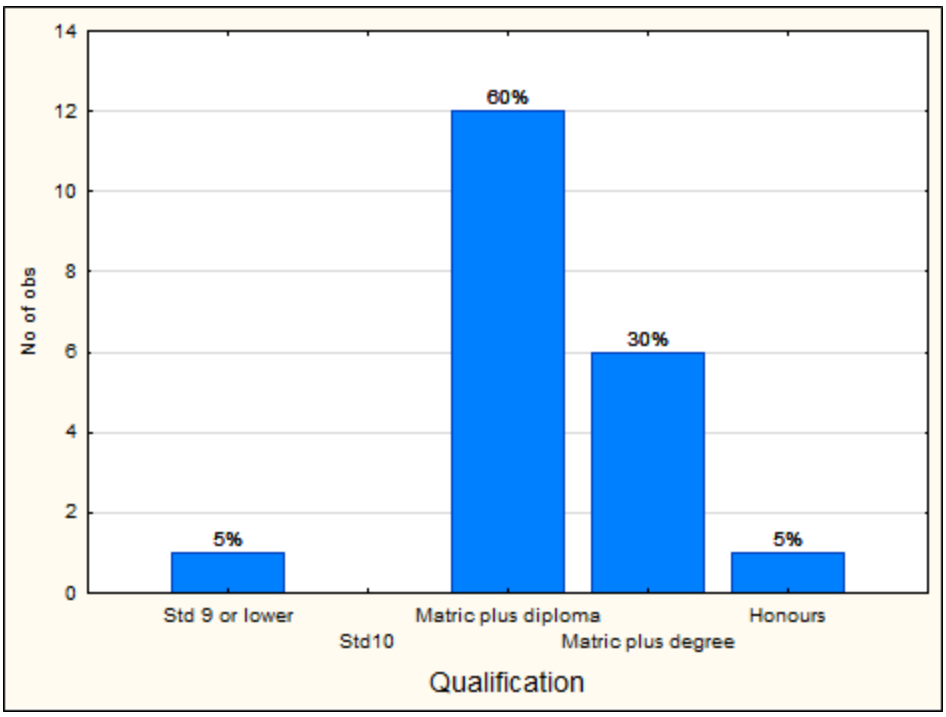
Traditionally the nursing profession used to be dominated by females, and based on the surveyed personnel this appears to be still the case in the East London municipality clinics.

4.3.1.2 Level of education

Table 5.2 below shows that more than 95% of the people have a matric and a tertiary qualification.

Frequency table: Qualifications		
	Count	**Percent**
Std 9 or lower	1	5,00
Matric plus diploma	12	60,00
Matric plus degree	6	30,00
Honours	1	5,00

Table 2. Level of education



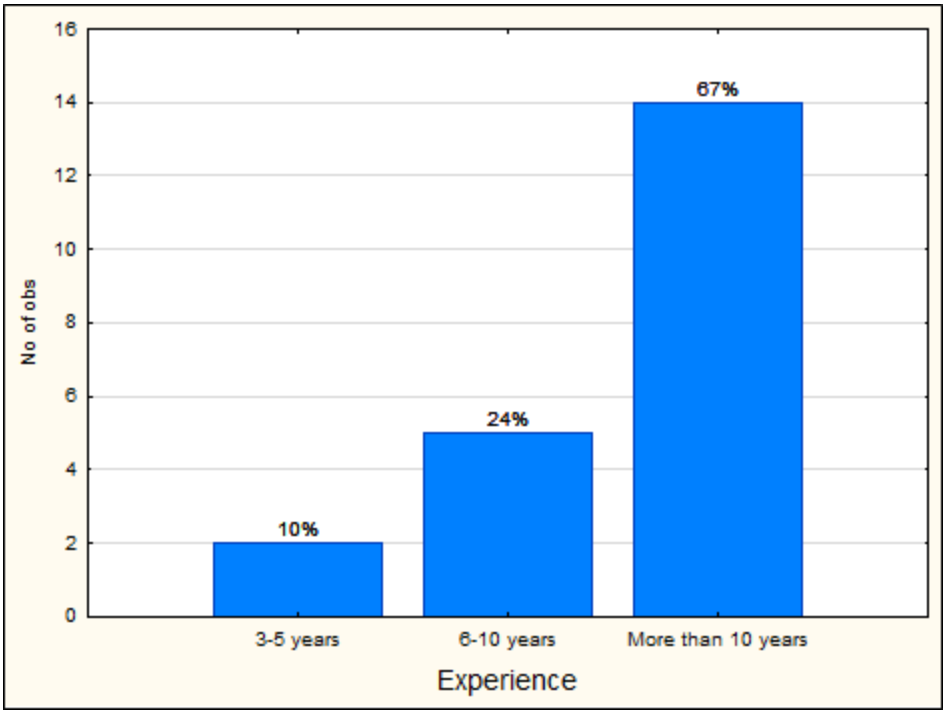
Due to the fact that all the people interviewed are trained professionals the above diagram shows that these primary health centres are managed by highly trained personnel.

4.3.1.3 Work experience

Table 5.3 below shows that about 67% of the people surveyed have more than 10 years' experience in their jobs.

Frequency table: Experience		
	Count	**Percent**
3-5 years	2	9,52
6-10 years	5	23,81
More than 10 years	14	66,67

Table 3. Work experience



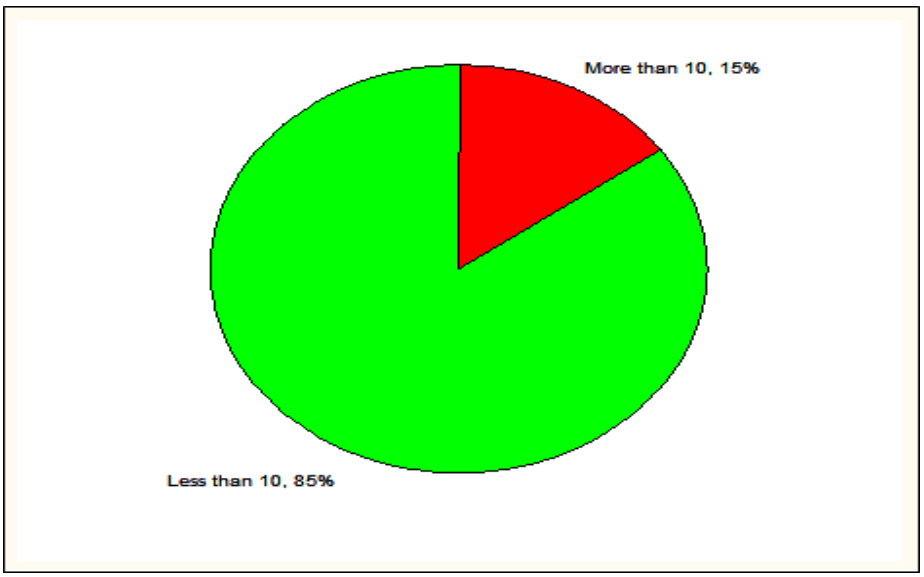
Taking the age, level of education and now experience and put all together one gets a clear picture that these clinics are in the hands of capable personnel.

4.3.1.4 Number of employed personnel in the centres

Table 5.4 below shows that the majority of the clinics are run by the staff of less than ten people.

Frequency table: Staff		
	Count	**Percent**
More than 10	3	15,00
Less than 10	17	85,00

Table 4. Number of employees per clinic



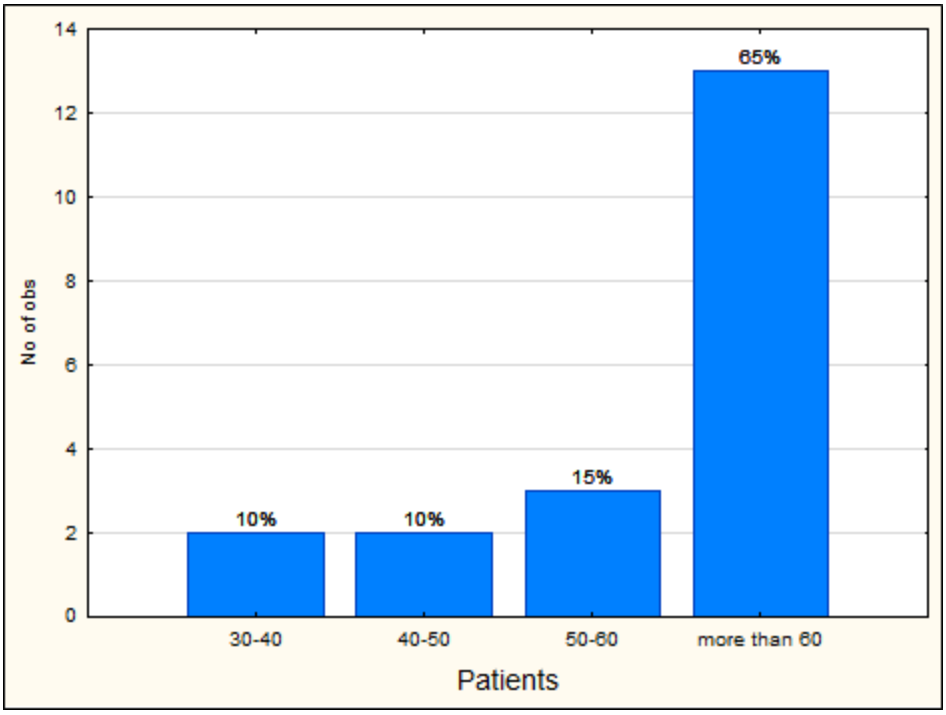
The survey shows that only 15% of these clinics have the staff make up of more than 10 personnel, including the general workers.

4.3.1.5 Number of patients seen in these clinics

Table 5.5 below shows that 65% of these clinics have an average number of patients per day of more than 60.

Frequency table: Patients		
	Count	**Percent**
30-40	2	10,00
40-50	2	10,00
50-60	3	15,00
more than 60	13	65,00

Table 5. Average number of patients seen per day



It is obviously clear that the majority of these clinics (65%) are very busy as they see all kinds of ailments from small babies to geriatric patients. Secondly they are located in the communities which makes them accessible to the people.

It was also noted on the collected data that all the employees in these clinics (nursing staff) are all South Africans and are fully employed by the department of health.

4.3.2 Research results of the qualitative survey

These clinics are managed by qualified nurses, which means the nurse will examine the patient, prescribe and dispense medication as well. The second part involves the drug supply management. Each clinic has a book supplied by the district office with the list of medication they are supposed to use, and they use a “ordering” book to place an order for stock replenishment, that book goes to the district pharmacist on 15th of every month. Then it is the district pharmacist who places an order at the provincial depot in Port Elizabeth on behalf of the clinics.

The clinic will then receive the medication it has ordered after two weeks. These medicines will be delivered to the clinics by the courier services that are contracted to the department of health. In the clinics the nurses use “bin” cards to record all the medication

usage. It is also the responsibility of the nursing sister to monitor her/his dispensary, i.e. receive stock from the courier services, issue medication to the patients, do stock takes, and stock replenishment.

Table 6. Research results from the interviews

Logistics processes and performance	**Results from interviews**
Forecasting	There are clear forecasting guidelines in place as supplied by the district office. All the interviewed nursing staff are well aware of them and are using them.
Ordering	Guidelines are in place, they order every 15th of the month. The problem faced by the clinics is that the ordering process is done by clinicians, who are not trained for this task. Secondly the ordering process is done manually and in most cases the nursing staff are not fully aware of their stock levels. There is a definite lack of capacity (human resources) to quantify needs and place appropriate orders. Due to the fact that a nurse has to dispense medication manually, it sometimes becomes a challenge for them at the end of the day to go back to the cards and count all the stock issued and balance it with what is on the shelves.
Inventory management	The clinics lack enough space to store their medication. 80% of respondents complained about lack of infrastructure, even those that have small dispensaries, these facilities lack appropriate ventilation, shelves and cupboards with locks. 90% of the respondents complained of the fact that they don't have trained pharmacy assistants in the clinics to help them. 95% complained of lack of computers and data capturers. Other complaint was for – "no time" to do proper stock counts as the clinics were busy almost every day.
Resources	90% of respondents complained of being short staffed, short of extra nurses, short of pharmacy assistants. Lack of computers, as the manual work was taking most of their time.

	14% of the respondents complained of having no telephone landlines, which makes communication with other clinics and hospitals impossible.
Supplier/Depot	80% of the respondents complained of getting wrong stocks, inadequate supplies or getting ordered stock with lot of discrepancies. Clinics complained of not having a direct access to the depot especially when they have stock discrepancies.
Stock outs	Due to lack of dispensary space most of the received stock is kept in boxes which makes it difficult to keep track of what is in/out of stock. Most of the clinics blame the depot for their stock outs as the depot supplies them with not what they have ordered.

4.3.2.1 *Research results of the tracer drugs*

The availability of the following tracer drugs in the clinics between January 2012 and December 2012 was assessed, and the results are as follows:

Glibenclamide: drug used in treating diabetes mellitus

HCTZ : Is used in treating hypertension

Paracetamol: Is used in treating pain and fever

Rifafour : Is used in treating tuberculosis (TB)

Research results:-

- 33% of the clinics never ran out of any of the four drugs in 2012
- 39% of the clinics were out of Glibenclamide for at least one month
- 5% of the clinics were out of HCTZ for 5 months, 14% of the clinics were of it for 2month and 24% were out of it for 1month
- 5% of the clinics were out of Paracetamol for at least 6month, another 5% was out of it for 5month, another 5% were out of it for 4month, 14% were out of it for 3month another 14% were out it for 2 months and 9% were out of it for 1 month
- Only 5% of the clinics were out of Rifafour for 2 months.

The above research results were compiled from the 2012 clinic records.

The policy guidelines which deals with drug management to these clinics is in place and there is an open communication channel between the clinics and the district office as the clinics have a direct access to the district pharmacist concerning the issue of drug management. The socio-demographic data above shows us that the clinics are run by well-trained clinicians, and that means now the issue of drug management and supply chain management doesn't exactly fall within their area of expertise. Below is the table that looks at the conceptual framework and supply chain concept:-

Table 7. Conceptual framework and supply chain results

Conceptual framework and supply chain concept	**Definition/measure**	**Research result**
Transaction		
Lead time	Time from order to delivery	Average time is 2weeks
Frequencies	How often orders and deliveries occur?	The clinics order monthly
Uncertainties	In lead time for ordering, receiving and accuracy of data on stock demand.	Large variations between what the clinics order and what they actually receive. Secondly working manually makes it difficult to track stock consumption.
Structure		
Distribution levels	Number of actors in information flow between the clinics and the district office.	3: patient, clinic then district.
	Number of storage levels in goods flow.	All the delivered stock goes directly to the clinic.
Distribution points	Number of clinics	A total of 22 clinics were studied
Management		
Management principles		

Management tools	Which guidelines are used for forecasting, ordering and inventory management?	Guidelines used by the clinics are prescribed by the district office. It is this office that provides the nurses with regular trainings on these issues.
	Which tools are used for forecasting, ordering and inventory management?	There is no electronic system in place. Tools used are bin cards, ordering books. Ordering books are taken to the district office every 15th of the month, drugs are received on the 30 or 31st of the month.
Organization	Efficacy of management structure and clear roles and responsibilities?	Lack of pharmacy assistants at the clinics affects the proper drug management at these clinics. Secondly lack of computers, to receive stock and monitor drug usage and give feed back to the district office or depot affects drug availability at the clinics.

4.4 Discussion

All the study clinics are run by enthusiastic and very dedicated staff, people who are very passionate about their work and it was quite amazing to see them use their resources to help patients in need. During the interviews what came out strongly is the fact that these clinicians are strongly committed to service they are offering to their patients, and would actually appreciate any form of intervention that would lessen the challenges they are facing.

In response to the forecasting method questionnaire, one response read as follows:-

*"*The forecasting method used is not achieving the supply chain management success because we are short staffed. As a sister one is expected to do forecasting, ordering, receiving of medication and one must

also consult patients. Due to that it is becomes difficult to achieve the requirements of the supply chain management."

Due to the fact that each patient that comes to the clinic has to be seen by these nurses it then becomes clear that as the volumes of patients increase (see charts above) the nurse will have little or no time to do the office work. This has to be said that it was the common complaint from most of the clinics surveyed.

This issue was also noted on the question about resources (human, technology), the following response was obtained from one respondent:-

"The available resources are not achieving supply chain success because of staff shortage, no working air conditioner, no computers, and no clerks. There are only two professional nurses and a clinic manager in this clinic to serve this entire population."

This response touched vital tools that have been mentioned by other respondents as well, lack of these resources have a negative impact on the working environment. The lack of computers for example has been mentioned by the majority of respondents because they state that working manually is time consuming and is taking them away from their job of examining and treating patients. They claim that most of the paper work they do can be done by the clerk if there was a computer system in place.

It is also the same claim the respondents mentioned with regards to ordering, receiving and storing medications, they claim that if they were to be provided with a person trained in this regard (they mentioned a pharmacy assistant) then they would be able to concentrate more on attending to their patients i.e. their area of speciality. This is how one respondent put it (the question posed was, in your opinion what could be done to address the issues you have highlighted above?):-

"employ a pharmacist or train one person per clinic to do assistant pharmacy course, and that person will be able to handle everything pertaining to medication well, because we as professional nurses are expected to do ordering, receiving of medication, seeing patients and dispense their medication and then do admin work as well and that is too much for one person to do that"

Based on the findings of the survey another main major challenge faced by these clinics can mainly be attributed to lack of computers/software, because as the district pharmacist is responsible for co-ordinating ordering and stocking these clinics, the lack of information flow from the clinic upstream is of major concern. Electronic use would make it possible for the district pharmacist to monitor the drug usage in all these clinics and that can also aid in cutting the lead time from two weeks to less than a week. Secondly that would also minimize stock outages in the clinics as the constant flow of information would assist in planning for the future variations by the district office. This information availability would also assist the district office to rotate medication from the centres where they are not frequently used to those centres that have the high demand for that particular drug. That will ensure that medication doesn't sit on the clinic shelves until it expires because it's not regularly used.

4.5 Recommendations

The district office should be commended for recruiting and staffing these primary health care centres with highly qualified and well experienced personnel. Secondly it is also encouraging and motivating for the district office to be receptive and highly compliant to a study like this and be keen and willing to participate fully with the research as they stated that the findings and recommendations might actually benefit them as the department and also benefit their patients.

Research results reveal that 33% of these clinics never ran out of medication in 2012, which means that there are things that these clinics are doing right. It would be recommended that the district office recognises these hard working people who most of them do their administration work after hours, i.e. going an extra mile for their jobs. These people need to be acknowledged, praised and motivated. Secondly a forum should be created where these clinicians can come together (all these clinics), share ideas, and learn from one another.

The majority of these clinics do not have proper dispensaries, their medications are stored in the make-shifts or temporary structures. There is an NGO that is led by pharmacists going around the clinics putting in burglar bars, locked cupboards. This must be highly recommended as the right step in the right direction, but it is not enough as some clinics don't have spaces/rooms to convert into proper dispensaries. The district office should source funding for the erection of proper dispensaries where they will be run by a person trained in this area.

The three clinics that are based in the squatter camps/townships are facing more challenges compared to other clinics – their telephone cables are stripped and stolen immediately they are erected, and according to one sister that has happened several times in her clinic and Telkom is now refusing to erect another set of cables. The end result is that these clinics have no telephone landlines and for the nurses to communicate with the district office or with other clinics they have to use their personal cell phones. The district office needs to review the situation in these clinics as a matter of urgency and make a provision available in the meantime while they are still searching for a lasting solution. Lack of telephones in these clinics is hindering them from doing their work. One of these clinics had a high rate of stock outs of all the tracer drugs in the studied 2012 period, although it is hard to attribute all that to a lack of telephones in that clinic but it might have been one of the contributing factors.

Lastly the district office has to create some form of communication between the clinics and the depot, because currently most of these clinics are sitting in their shelves with stock they didn't order. The reason they have not returned this stock back is because the procedure to be followed in doing that is very cumbersome and involves lot of paper work. This is one of the areas the district pharmacist might want to intervene as a matter of urgency and probably review this system.

4.6 Conclusion

About a quarter of the East London clinics did not run out of the tracer drugs in the period under study in 2012, this is something that is encouraging and the other clinics should be

allocated the resources that seem to be hindering their effective functioning. Lack of staff, especially the assistant pharmacist has been mentioned by the respondents as one of the major challenges they are facing at these clinics. This puts them in a difficult situation as they are forced to divide their time between examining and treating their patients and ordering and receiving medication. Secondly lack of computers makes it difficult to co-ordinate and monitor the drug supply chain. These challenges will make successful implementation of lean management in these clinics very challenging, but is possible if these current challenges can be addressed.

Chapter 5

5.0 Recommendations and Conclusion

5.1 Introduction

This chapter gives a brief overview of the chapters and concluding remarks, it also gives recommendations based on findings of the study. This chapter also deals with the study findings as far as addressing the research question posed in chapter one. As stated in chapter one the purpose of the study is to improve supply chain management in the East London clinics by looking at the challenges faced on a daily bases by the clinic managers/nurses. The sub questions of the study deals with: - forecasting method used, ordering process, stock management, and human resources and budgeting method used in these clinics. The chapter will deal with the findings of the empirical study as far as the study problem and sub-problems are concerned. The chapter will also give recommendations that these clinics need to follow in order to implement successful lean health care management.

5.2 Conclusions of the literature and empirical findings

The literature findings that deal with supply management challenges and how they can be addressed through lean management have been discussed extensively in chapter two. Secondly the results of the empirical study were presented in chapter four, therefore chapter five will give a summary of these findings and then provide practical recommendations that these clinics can adopt in implementing lean health care management in their systems.

5.3 Literature review findings

According to the literature the two main benefits of lean management include waste elimination and improvement of quality of service rendered. Elimination of waste sometimes goes with cutting costs which would have otherwise been wasted, in other words this benefits both parties that is the provider and the customer as the quality of the

service is improved. As explained in chapter two the most common forms of waste in the health care sector include the following:-

- Movement of employees.
- Transport of goods without purpose.
- Groups of people in a downstream activity standing around waiting.
- Goods and services, which do not meet customer needs, (Kollberg and Brehmer 2007).

Looking at the above forms of wastes, one can see that any form of intervention in the East London clinics (these clinics also have these forms of wastes) to deal with these can significantly improve the quality of services rendered.

5.4 Results of the Empirical study – demographic findings

The demographic assessment of the respondents included age, gender, qualifications and years of experience, the following is the summary of research:-

- The majority of the personnel running the East London clinics are females, a picture that is seen also nationally.
- The age range of the respondent lies between 30-59 yrs. (95%) with only 5% lying at a range of 60+.
- 95% of the respondents have matric plus diploma/honours degree
- More than 67% have more than 10yrs of experience and 24% have 6-10yrs experience
- 13 clinics see more than 60 patients per day

5.5 Research results from the interviews

- Forecasting: - all the respondents have been provided with training and guidelines of what to follow as far as forecasting stock usage in their clinics.
- Ordering process: - stock ordering is done by the nurses as all the clinics do not have in-house pharmacists or assistant pharmacists. This process is done manually (using cards and books).
    - Lead time i.e. time from order till delivery is two weeks

- Recourse for drug discrepancies received is tedious and involves multiple paper work

- Inventory management- almost all the clinics do not have adequate space to keep/store their medication.
    - All the clinics do not have proper locked cupboard for drug storage.
    - They lack proper shelves, lack proper ventilation.
    - Inventory management is also done manually.
- Resources: - more than 90% of the clinics complained of staff shortages, from data captures to nursing personnel and pharmacy assistants.
    - In addition to having no computers, 14 % of the clinics also complained of having no telephone landlines to communicate with the outside world.
- Depot/Supplier:- more than 80% of the clinics complained of getting incorrect stock from the depot, or sometimes getting stock with discrepancies. The fact that they don't have direct access to the supplier creates frustration at the clinics.
- Stock outs: - due to lack of space in the clinics, some of the received stock is kept in boxes hence it becomes difficult to keep track of what is in/out of stock. Secondly the clinics blames the supplier for giving them incorrect stock or inadequate stock, and the end result of that is stock out.

5.6 Research results of the tracer drugs

Four tracer drugs were used in this study and their availability (flow) in the clinics under study was examined for the period of January 2012 to December 2012. The drugs used were:-

- Glibenclamide:- a drug used in treating diabetes mellitus
- Rifafour :- a drug used in treating TB
- HCTZ :- a drug used in treating hypertension
- Paracetamol :- a drug used in treating pain and fever

Results:-

A third of the studied clinics never ran out the tracer drugs at all in the period under study, a feat that must be recommended.

Only one clinic ran out of TB drug for a period of two months in 2012. Considering that TB is a notifiable and a contagious disease, the clinics have to be recommended for ensuring that its treatment is always available.

Three tracer drugs that seemed to running out all the time at these clinics are – HCTZ, Glibenclamide and Paracetamol. 5% of the clinics were out of HCTZ for a period of 5 months and another 5% were out of Paracetamol for a period of 6 months.

5.7 Recommendations and Guidelines

It is worthwhile mentioning at this in point that in the first chapter the researcher stated that -The main objective of the study is to gather all the necessary information and learning points and forward it to the local health authorities, information that will assist them in identification of the strengths and weaknesses of the current system, it will also help them when they are designing the intervention strategies of optimizing the delivery of health services to the people.

5.7.1 Strengths of the current system

- Staff - the staff at the clinics are highly trained and they are well experienced
- The clinics are located with the communities, in other words they are accessible to people.
- There are clear guidelines and protocols in place for the staff to follow.
- The sub-district office is always accessible to provide guidance where necessary.
- The head/director of the sub-district is a clinician hence he is familiar with what is happening at the clinic level.

5.7.2 Weaknesses of the current system

- All the communication the clinics have with the sub-district and their suppliers are manual.
- Serious infrastructure problems as some clinics do not have “rooms” they use as dispensaries, hence medication is not properly stored up.
- Lack of a pharmacist-assistant at the clinics is putting the nurses there under lot of strain as they are expected to do drug forecasting, procurement and storage and dispensing. What makes the whole exercise tedious is the fact that it is all done manually.
- Shortage of nurses is also another issue that was raised continuously by the respondents. Considering that the majority of these clinics see huge volumes of patients daily, this complaint is something that needs to be attended to.
- There is no direct communication between the suppliers and the clinics –this makes things difficult especially when the clinic has received insufficient stock- an issue that can be addressed immediately, but because of the protocol it drags for a long time while the clinic is remaining with insufficient stock all that time.
- A clinic must place an order once a month, if that clinic experiences increase in patient load and runs out of medication, it has to “borrow” from other clinics- this system is not sustainable and is open to abuse as all these transactions are normally done telephonically and entered manually.
- Working manually makes it difficult for the sub-district to get continuous flow of information from the clinics, information that would otherwise assist in daily management of these clinics.
- Clinics that are in the squatter communities have no telephone landlines – this is another serious problem that needs urgent attention.

5.8 Introducing lean to the East London clinics

Amongst the intervention program that the sub-district office or the department of health can consider introducing in an effort to address the current challenges is Lean management. Lean management as explained in details in chapter two has been implemented successfully in the health care sector, and several studies have shown besides improving the service delivery to the patient, secondly implementing effective SCM can be a cost saving method for the government as well as it will eliminate all the unnecessary expenditures throughout the entire chain.

Since lean introduction needs to be done by trained personnel, the sub-district can outsource these services to these specialists who will them come in and be mentors to the clinic personnel.

The sub-district office can use the clinics that are well equipped with resources (computers) to introduce lean on a smaller scale/trial bases or as a pilot program. In this lean introduction, the most appropriate or ideal method to adopt would be- Vendor Managed Inventory (VMI).

In VMI program the clinics will make suppliers responsible for determining order size and timing, and this is usually based on receipt of retail point of sale (POS) inventory data. This means the process to follow, would be to install a software program in these “VMI pilot study” clinics and this software will be linked to depot/supplier. As explained in chapter two the “pull” system in VMI program is assured in the sense that it is the consumption in the point of use/patient care that triggers vendor’s deliveries in a perfect demand visibility basis. In other words without going into expenses of outsourcing these service, the clinics will be making the depot which is run by pharmacists to be responsible for replenishing their medication. In other words the stress that is currently experienced by the nurses of forecasting, ordering medication will be taken out of the clinics and the nurses will be left to do what they are trained to do, i.e. examine and treat patients.

Introduction of lean in this supply chain will transfer the in-house activities currently done by the nursing staff to an already existing supply chain partner. This will result in less inventory costs and will improve efficiency and quality of care.

This is a win-win situation for the patients and the clinics because this program will ensure that clinics never run out of stock and secondly the problem of receiving wrong stock or stock with discrepancies will be eliminated totally.

For the sub-district it will be a cost saving exercise because the “dead” stock in the clinics will be removed and the clinics will be well stocked without the sub-district having to hire assistant pharmacists for all these clinics. With the savings the sub-district will accrue through this program, it can with the assistance of other government departments look at upgrading the dispensaries in other clinics, installing software and training their staff as well.

Before lean is introduced in the East London clinics the staff will have to go for a full training on this program as lean is not a once-off course but an ongoing continuous program which seeks to eliminate all forms of waste in the work place and improve the quality services rendered.

For the clinics that do not have telephone landlines because of cable theft, the sub-district would be advised to consider introducing cell-phone technology. These days almost all the cell phones are linked to the mainstream form of communication i.e. internet. Hence people in the rural areas can do banking, e-mails and other forms of communication through cell phones. The nurses in these clinics should be trained and given cell phones to communicate with the outside world (the suppliers, the sub-district, ambulances etc.).

5.9 Limitations of the study

The study was conducted over a very limited space of time, because of that the impact or the effect the shortage of medication has on the patient i.e. from the patient’s point of view could not be covered. In other words there was not enough time to get the patients’ view of the subject under study.

It would be strongly recommended that a similar study should be conducted in another sub-district for comparative purposes.

It is recommended for the future studies to assess the financial aspect of this supply chain looking specifically at the estimated figures (monetary) that can be saved by the sub-district through implementation of lean management program.

5.10 Conclusion

It is a well-known secret that our health care facilities are being stretched to the limit, financial and otherwise, because of an increase in the burden of both communicable and non-communicable diseases. Internal and external migrations since the dawn of globalization also means that countries are facing continuous increase in the influx of people which obviously leads to an increase in demand of resources like health care services. This therefore means the government has to come up with practical solutions of doing more with less, i.e. the limited budget and resources they have should be utilised effectively and efficiently in servicing the people.

One of the sectors that is under severe strain is the health care sector and it is prudent that the government invests wisely in this sector because, the health care status of any nation has a direct impact on the economy of that country. As compared to the previous government that concentrated on tertiary health care, the approach that the new South African government adopted when it comes into health care was to invest in primary health care. The government wanted primary health services to be accessible to all the citizens of this country, so that people can access these services without travelling to faraway places. Also the constitution of this country states clearly that it is the right of every citizen to have access to health care services and it is the responsibility of the government to provide these services.

The study was done on the East London clinics, looking specifically at the medication supply chain with a view of optimizing it through the introduction of lean. The significance of ensuring that the supply chain is working optimally (that is all the patients receive medication) is because the majority of these patients are indigent and therefore cannot afford to buy these services elsewhere, these clinics are their only hopes.

The findings of the study as detailed in chapter four, uncovered a lot of unsung heroes and heroines in the form of nurses that are running these clinics. People that are working very hard and very passionate of what they do treating multitudes of patients some under very difficult conditions. On the other side the sub-district office that is running these

clinics is also open minded and willing to accept researchers to go into the field and come up with suggestions to improve their services, this must be recommended.

The challenges that have been unearthed on the study have been detailed in chapter four, they include:-

- Structural challenges – lack of space for clinic dispensaries
- Resources challenges - staff shortages, from nurse to assistant pharmacists. Lack of computers, lack of telephone landlines
- Communication challenges – between the clinics and the suppliers
- Skill/technical challenges - nurses working as both nurses and pharmacy assistants.

Through the implementation of Vendor Managed Inventory (VMI) in their supply chain it was shown that the benefits of introducing that program would be immense. As VMI would involve the clinics transferring the ordering and stocking of their clinics to the suppliers leaving the nurses with enough time to attend to their core duties of treating the patients. The patients also benefit through this program because the clinic will never run out of stock as is currently the situation in some of these clinics at the moment. The sub-district also benefits because through VMI because all the wastage is eliminated resulting in minimal inventory costs and improved efficiency.
The study also recommends that the sub-district office should acknowledge those nurses that have ran an extra mile to ensure that their clinics never run out of medications.

Motivation and support programs should be designed especially for those clinics that are operating under challenging situations and lastly the introduction of cell phones should be considered as a short term solution to those clinics that face daily cable theft of their telephones.

Addendum A

Letter from Department of Health in Bisho giving a go-ahead for the study

Eastern Cape Department of Health

Enquiries: Zonwabele Merile Tel No: 0406080830

Date: 29th August 2013 Fax No: 0436421409
e-mail address: Zonwabele.merile@impilo.ecprov.gov.za

Dear Dr F.S. Beja

Re: Supply chain management of medical supplies in the East London PHC with the view of assessing whether it can be optimized through Lean management

The Department of Health would like to inform you that your application for conducting a research on the above mentioned topic has been approved based on the following conditions:

1. During your study, you will follow the submitted protocol with ethical approval and can only deviate from it after having a written approval from the Department of Health in writing.
2. You are advised to ensure, observe and respect the rights and culture of your research participants and maintain confidentiality of their identities and shall remove or not collect any information which can be used to link the participants.
3. The Department of Health expects you to provide a progress on your study every 3 months (From date you received this letter) in writing.
4. At the end of your study, you will be expected to send a full written report with your findings and implementable recommendations to the Epidemiological Research & Surveillance Management. You may be invited to the department to come and present your research findings with your implementable recommendations.
5. Your results on the Eastern Cape will not be presented anywhere unless you have shared them with the Department of Health as indicated above.

Your compliance in this regard will be highly appreciated.

Addendum B

Form E completed in application for the ethical clearance from the university

Nelson Mandela Metropolitan University
for tomorrow

FORM E

ETHICS CLEARANCE FOR TREATISES/DISSERTATIONS/THESES

Please type or complete in black ink

FACULTY: Business School

SCHOOL/DEPARTMENT: NMMU - Business School

I, (surname and initials of supervisor) Prof. J-J Pietersе

the supervisor for (surname and initials of candidate) Beja F S

(student number) 211855337

a candidate for the degree of MBA

with a treatise/dissertation/thesis entitled (full title of treatise/dissertation/thesis):
Studying the Supply Chain Management of Medical Supplies in the East London Pilot with the View of assessing whether it can be optimized through Lean management

considered the following ethics criteria *(please tick the appropriate block)*:

	YES	NO
1. Is there any risk of harm, embarrassment of offence, however slight or temporary, to the participant, third parties or to the communities at large?		✓
2. Is the study based on a research population defined as 'vulnerable' in terms of age, physical characteristics and/or disease status?		✓
2.1 Are subjects/participants/respondents of your study:		
(a) Children under the age of 18?		✓
(b) NMMU staff?		✓
(c) NMMU students?		✓
(d) The elderly/persons over the age of 60?		✓
(e) A sample from an institution (e.g. hospital/school)?		✓
(f) Handicapped (e.g. mentally or physically)?		✓
(g) Socially/economically disadvantaged?		✓

3. Does the data that will be collected require consent of an institutional authority for this study? (An institutional authority refers to an organisation that is established by government to protect vulnerable people)		✓
3.1 Are you intending to access participant data from an existing, stored repository (e.g. school, institutional or university records)?		✓
4. Will the participant's privacy, anonymity and confidentiality be disclosed/revealed?		✓
4.1 Are you administering a questionnaire/survey that:		
(a) Collects sensitive/identifiable data from participants?		✓
(b) Does not guarantee the anonymity of the participant?		✓
(c) Does not guarantee the confidentiality of the participant and the data?		✓
(d) Will be distributed electronically (e.g. online via email/web link)?		✓

*Please note that if **ANY** of the questions above have been answered in the affirmative (**YES**), the student will need to complete the full ethics clearance form (REC-H application) and submit it with the relevant documentation to the Faculty Ethics Co-ordinator.*

and hereby certify that the student has given his/her research ethical consideration and full ethics approval is not required.

SUPERVISOR(S) — DATE: 29/5/2013

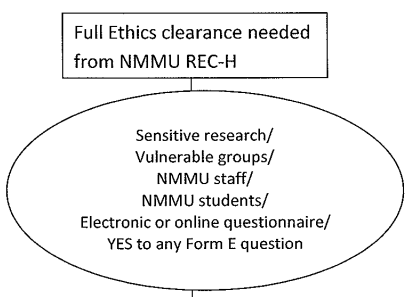
HEAD OF DEPARTMENT — DATE: 28/05/2013

STUDENT(S) — DATE: 28/05/2013

Please ensure that the research methodology section from the proposal is attached to this form.

Ethics clearance process

Please note that when a research proposal has been approved – it has NOT been given ethics clearance! Ethics clearance:



PRP/Supervisor complete form from intranet (RCD Research Ethics documents) and all parties to sign	Request form from Ms L van Rensburg lindie.vanrensburg@nmmu.ac.za Complete form and all parties to sign
Hard copies (form and additional docs, e.g. methodology, questionnaire, consent forms, etc.) to **Dr C Rootman as BES Ethics rep by 1st of a month**, if want to serve at REC-H meeting at month end. Therefore, begin process at least 3 months before planned data collection commencement date – it is not to say that ethical clearance will be given at the 1st REC-H meeting. E.g. students that want to conduct empirical research during end 2012 and possibly graduate April 2013 should at least submit the ethics clearance documents by 1 Aug – to serve at REC-H end Aug to (hopefully if all in order) receive clearance mid September...	Note: you as researcher take full responsibility of ethics relating to study (if all answers are NO, full clearance through REC-H not required; if any answers YES, follow full REC-H clearance process described on the left of this document)
Email all docs to **Dr C Rootman** (to communicate with FRTI and refer to REC-H) chantal.rootman@nmmu.ac.za	**Hard copy** of form E and research methodology to **Ms L van Rensburg** (MB, 10th floor)
REC-H committee to inform researcher(s) of ethics clearance, and when approved provide ethics clearance number	**Email** form to both **Ms L van Rensburg** (lindie.vanrensburg@nmmu.ac.za) and **Dr C Rootman** as BES Ethics rep (chantal.rootman@nmmu.ac.za)
Empirical investigation can then only commence with ethics clearance number displayed on all documentation (throughout data collection) and in final treatise/dissertation/thesis	Commence with empirical investigation Copy of Form E placed in treatise/dissertation/thesis

Addendum C

Letter from the sub-district authorizing the study

Province of the
EASTERN CAPE
HEALTH

Amathole District

Buffalo City Sub-district: **Enquiries: Mrs N.V.Nelani**

9 Vincent Road, Vincent, East London, 5200, Eastern Cape
Private Bag x 9015, Main Post Office, East London, 5200, Eastern Cape
Tel No. +27 (0)43 711 1100 Fax No. +27 (0)43 721 1972
Website www.ecdoh.gov.za

To:	Dr. Beja
From:	Buffalo City Sub-District Manager
Subject:	Agreement for research study to be conducted in Buffalo city Sub District
Date:	30/07/2013

Dear Researcher

Permission is herewith granted to you to conduct research in Buffalo City Sub District as requested. Kindly familiarize yourself with the conditions below before commencing with your study.

1. The researcher will conduct the study without compromising client`s confidentiality and the smooth running of the service.

2. The researcher will not provide/publish any reports/statements without prior discussion with and permission of the sub district.

3. A copy of a letter of approval by the ethics committee, Research proposal, Research tools will be submitted to the sub district office before commencing the study.

I accept the conditions as stated in the abbreviated version of Department of Health Agreement Clause for researchers.

Nzenzile Beja — 30/07/2013

Full Name & Surname — Signature — Date

Zanele Mantombona — 31/07/13

Witness Name & Surname — Signature — Date

Addendum D

Study questionnaire handed to all the clinics under study

I am studying towards my MBA (Masters in Business Administration) degree at the Nelson Mandela Metropolitan University Business School. I am conducting research on – ***An assessment of opportunities for implementing lean in the healthcare supply chain of selected clinics in the East London area.*** I believe that my study will make an important contribution to the improvement of customer service and will lead to better understanding of the current health care dynamics faced by these clinics. The study is done with a view of assessing whether the latest program (Lean management) advocated as one of the best programs in supply chain management would be beneficial to our local clinics.

You are part of our selected sample of respondents whose views we seek on the above-mentioned matter. We would therefore appreciate it if you could answer few questions. It should not take more than fifteen minutes of your time and we want to thank you in advance for your co-operation.

There are no correct or incorrect answers. Please answer the questions as accurately as possible. Please note also that your participation in this study is entirely voluntary and that you have the right to withdraw from the study at any stage.

Thank you very much.

Contact details: Dr Fez Beja – 082 6971157 or 043 -7224237 or email bejafez@gmail.com

To verify the authenticity of the study, please contact Prof JJ. Pieterse at 041-5043774 and jj.pieterse@nmmu.ac.za.

PLEASE COMPLETE THE FOLLOWING CLASSIFICATION QUESTIONS:

Indicate your Gender

Male	Female

Indicate your Age

20-29 years	30-39 years	40-49 years	50-59 years	60 plus

Indicate your Home Language

Afrikaans	English	isiXhosa	isiZulu	Specify other

Indicate your educational/ professional qualification

Std 9, equivalent or lower	Std 10 or equivalent	Matric plus diploma	Matric plus 1st degree	Honours degree or equivalent	Master's degree or MBA	Chartered Accountant	Doctoral Degree or equivalent

Indicate the whether you are employed by the department full time or part-time?

Full time	Part-time	other

Indicate your position in this clinic?

Qualified nurse	Pharmacist	Clinic manager	other

Indicate your nationality?

South African	Non-South African	other

Indicate the size of your staff in terms of people employed

More than 10 employees	Less than 10	other

Indicate the average number of patients you see per day in this clinic?

20-30	30-40	40-50	50-60	More than 60	Less than 20

Years of Experience in Role or Function

Less than 1 year	1-2 years	3-5 years	6-10 years	More than 10 years

1. The forecasting methods (FM) used in dealing with increased patient demands/numbers in this clinic is achieving/not achieving supply chain management success. Please motivate why you say so.

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2. The inventory (stock) management (IM) practices used in this clinic are achieving/not achieving supply chain management success. In your opinion why do you think so, please explain.

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3. The available resources (human, technology) (HR) at the clinic is achieving/not achieving supply chain management success. Why do you think so?

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4. The budgeting (B) practices used in this clinic is achieving/not achieving supply chain management success. What makes you say so?

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5. In your opinion, what could be done to address the issues you have highlighted in questions above?

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6. Is there anything you would like to add?

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Flow of the following four tracer dugs

7a). in the year 2012, has this clinic ever ran out of the following drugs? If so just tick the month/s.

2012 –Calendar												
Drug	**Jan**	**Feb**	**March**	**April**	**May**	**Jun**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**
HCTZ												
Glibenclamide												
RIF/INH/PZA/ETH (Rifafour)												
Paracetamol												

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THANK YOU VERY MUCH FOR YOUR PARTICIPATION!

Addendum E

Primary health care centres used in the study

Primary health care centre	Code
Alphendale	PHC1
Aspiranza	PHC2
Beacon bay	PHC3
Berlin	PHC4
Braelyn	PHC5
Cambridge	PHC6
Central	PHC7
Chris Hani	PHC8
*Collondale**	*PHC9…..Mobile clinic (not included)*
Drake Road	PHC10
Fort Grey	PHC11
Gompo A	PHC12
Gompo B	PHC13
Gompo C	PHC14
Gonubie	PHC15
Greenfields	PHC16
John Dube	PHC17
Moore street	PHC18
Pefferville	PHC19
Petros Jobane	PHC20
West bank	PHC21
Zanempilo	PHC22

References

Angelis, J., Conti, R., Cooper, C., and Gill, C., 2011. Building a high-commitment lean culture. *Journal of Manufacturing Technology Management*. [e-journal] 22 (5), pp. 569-586 {Accessed on 01/10/2012}

Angelis, J. and Fernandes, B., 2012. Innovative lean: work practices and product and process improvements. *International Journal of Lean Six Sigma* [e-journal] 3 (1) pp. 74-84 {Accessed on 27/02/2013}

Aronsson, H., Abrahamsson, M., and Spens, K., 2011. Developing lean and agile health care supply chains. *Supply Chain Management: An International Journal* [e-journal] (16) 3 pp. 176 – 183 [Accessed on 01/10/2012]

Asamoah, D. Abor, P. Opare, M., 2011. An examination of pharmaceutical supply chain for artemisinin-based combination therapies in Ghana. *Management Research Review* [e-journal] 34 (7) : pp. 790-809 {Accessed on 09/04/2013}

Boeijie, H. 2010. Analysis in qualitative research. Sage Publication, Ltd.

Bonaccorsi, A. Carmignani, G. Zammori, F., 2011. Service Value Stream Management (SVSM): Developing Lean Thinking in the Service Industry: *Journal of Service Science and Management*, [e-journal] 4, 428-439 {Accessed on 01/03/2013}

Burgess, N. and Radnor, Z., 2013. Evaluating Lean in healthcare: *International Journal of Health Care Quality Assurance*. [e-journal] 26(3) 2013 pp. 220-235 {Accessed on 23/03/2013}

Chadha, R. Singh, A. Kalra, J. 2012. Lean and queuing integration for the transformation of health care processes: A lean health care model. *Clinical Governance*: *An International Journal*. [e-journal] 17 (3) pp. 191-199 {Accessed 27/02/2013}

Collis, J. Hussey, R. 2009. Business Research. A practical guide for undergraduate & postgraduate students. Palgrave Macmillan

Constitution of the Republic of South Africa. *Act* No 108 of 1996 SS 27. Promulgated by Parliament on 18 December 1996. Available at: http://www.info.gov.za/documents/constitution/1996/a108-96pdf {accessed 24/01/2013}

De Souza, L.B., 2009. Trends and approaches in lean healthcare. *Leadership in Health Services*. [e-journal] 22 (2) pp. 121-139 {Accessed on 01/03/2013}

De Vries, J. Huijsman, R., 2011. Supply chain management in health services: An overview. *Supply Chain Management*: *An International Journal*. [e-journal] 16(3) 159–165. Guest editorial {Accessed on 01/10/2012}

Emiliani, M.L. and Stec, D.J., 2005. Leaders lost in transformation: *Leadership & Organization Development Journal* [e-journal] 26 (5) pp. 370-387 {Accessed on 26/02/2013}

Ford, E.W. Hughes, J.A., 2007. "A collaborative product commerce approach to value-based health plan purchasing", *Supply Chain Management*. *An International journal*. [e-journal] 12 (1) pp.32-41 {Accessed on 01/10/2012}

Graban, M. 2009: Lean Hospitals. City: Productivity Press.

Grove, A.L. Meredith, J.O. MacIntyre, M. Angelis, J. and Neailey, K., 2010. UK health visiting: challenges faced during lean implementation. *Leadership in Health Services*. [e-journal] 23 (3) pp. 204-218 {Accessed on 23/03/2013}

Guimara˜es, C.M., de Carvalho, J.C and Maia, A. 2013. Vendor managed inventory (VMI): Evidences from lean deployment in healthcare: *Strategic Outsourcing*: *An International Journal* [e-journal] 6 (1) 2013 pp. 8-24 {Accessed on 23/03/2013}

Hamid, A.B.A. Sukati, I., 2010. An analysis of the relationship between firm integration and supply chain orientation. *Asian Journal of Management Research Review Article* ISSN 2229 – 3795. [Online article] Available at: http://www.ipublishing.co.in/ajmrvol 1no1/EIJMRS1038.pdf

Harrison, D. 2011. An Overview of Health and Health care in South Africa 1994 – 2010*:* Priorities, Progress and Prospects for New Gains. Henry J. Kaiser Family Foundation. Muldersdrift, January 24-26. Available at: http://www.doh.gov.za/docs/reports/2010/overview 1994-2010.pdf.

Hines, J. P., Holweg, M. and Rich, N., 2004. Learning to evolve. A review of contemporary lean thinking. *International Journal of Operations & Production Management.* [e-journal] 24 (10) {Accessed 27/02/2013}

Ho, S.K.M., 2010. Integrated lean TQM model for sustainable development: *The TQM Journal* [e-journal] 22 (6) pp. 583-593 {Accessed on 27/02/2013}

Facts about Buffalo City. 2013. Available at: http://www.buffalocity.gov.za/visitors/facts.stm {accessed on 08/05/2013}

National Health Act No 61 of 2003. Available at: http://www.info.gov.za/view/downloadfile?id=68039 {accessed on 07/05/2013}

Jahre, M. Dumoulin, L. Greenhalgh, L.B. Hudspeth, C. Limlim, P. Spindler, A., 2012. Improving health in developing countries: reducing complexity of drug supply chains. *Journal of Humanitarian Logistics and Supply Chain Management*, [e-journal] 2 (1) pp. 54 – 84 {Accessed on 01/10/2012}

Jarrett. P.G., 2006. Leadership in Health Services: An analysis of international health care logistics. The benefits and implications of implementing just-in-time systems in the health care industry*. Leadership in Health Services*. [e-journal] 19 (1) pp. i-x {Accessed 23/03/2013}

Kollberg, B. Dahlgaard, J.J. Brehmer, P., 2007. Measuring lean initiatives in health care services: Issues and findings. *International Journal of Productivity and Performance Management.* [e-journal] 56 (1) pp. 7-24 {Accessed on 27/02/2013}

Kopczak, L.R. and Johnson, M.E., “The Supply Chain Management Effect”. *The MIT Sloan Management Review*. (Spring 2003) 27-34.Available at. http://sloanreview.mit.edu/article/the-supplychain-management-effect/

Kumar, A. Ozdamar, L. Zhang, C.N., 2008. Supply chain redesign in the healthcare industry of Singapore, *Supply Chain Management*. *An International Journal*, [e-journal] 13 (2) pp. 95 – 103 {Accessed on 01/10/2012}

Kumar, S. DeGroot, R.A. and Choe, D., 2008. Viewpoint Rx for smart hospital purchasing decisions: The impact of package design within US hospital supply chain. *International Journal of Physical Distribution & Logistics Management* [e-journal] 38 (8) pp. 601-615 {Accessed on 23/03/2013}

Meijboom, B. Schmidt-Bakx, S. Westert, G., 2011. "Supply chain management practices for improving patient-oriented care", *Supply Chain Management*. *An International Journal*, [e-journal] 16 (3) pp. 166 – 175 {Accessed on 01/10/2012}

Mustaffa, N.H. and Potter, A., 2009."Healthcare supply chain management in Malaysia: a case study", *Supply Chain Management*. *An International Journal*, [e-journal] 14(3) pp. 234 – 243. {Accessed on 01/10/2012}

National Department of Health (NDOH). Annual 2011-2012 Report. A Long and Healthy Life for All South Africans. http://www.doh.gov.za/docs/reports/annual/2012/Health_Annual_Report_2011-12.pdf {accessed 12/03/2013}

National Department of Health Strategic Plan 2010/11-2012/13. http://hs.ukzn.ac.za/libraries/postgraduate-administration_procedure/NDOH-strategic-plan_201011-201213_01_march_2010_1_1.sflb.ashx (accessed on 09/05/2013}

National Department of Health. 2010: A long and Health life for all South Africans. Negotiated Service Delivery Agreement (NSDA) 2010-2014. http://www.health-e.org.za/documents/3771ccea0610904ff03cde0f09f21039.pdf {accessed 12/02/2013}

Patel, R. Norris, P. Gauld, R. Rades, T., 2009. Drug quality in South Africa: Perceptions of key players involved in medicines distribution*: Health Care Quality Assurance*. [e-journal] 22 (5) : 2009 pp. 547-560 {Accessed on 09/04/2013}

Pillay, R., 2009. Retention strategies for professional nurses in South Africa. *Leadership in Health Services.* [e-journal] 22 (1): pp. 39-57 {Accessed on 09/04/2013}

Saldana, J. 2011.Fundamentals of qualitative research. Understanding qualitative research. Oxford University Press. Inc.

Schaay, N. Sanders, D. Kruger, V., 2011. Overview of Health Sector Reforms in South Africa 2010: DFID Human Development Resource Centre. [Online article] Available at: http://www.sarrahsouthafrica.org/LinkClick.aspx?fileticket=XB382S12kmw%3D&tabid=2067. **{**Accessed in 11/02/2013}

Schroeder, R.G. Goldstein, S.M. And Rungtusanatham, M.J., 2011. Operations Management: Contemporary Concepts and Cases. 5th Ed. Mc Graw Hill.

South African Health Review 1995. Available at: http://www.hst.org.za/sahr/chap17.htm(2 of 9). {Accessed 12/03/2013}

Supply Chain Management Framework. Available at: http://www.treasury.gov.za/legislation/pfma/regulation/gazette_25767.pdf {accessed 07/05/2013}

USAID | DELIVER PROJECT, Task Order 1. 2010. *Emerging Trends in Supply Chain Management: Outsourcing Public Health Logistics in Developing Countries*. Arlington, Va.: USAID | DELIVER PROJECT, Task Order 1. [e-journal] Available at. http://deliver.jsi.com/dlvr_Content/resources/allpubs/guidelines/EmerTrenSCM_Outs.pdf [Accessed on 03/08/2012]

Zak, H., 2006. Doing more with less: Lean Thinking and patient safety in health care. Joint Commission Resources Inc.