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SCHOOL OF COMMERCE

DEPARTMENT OF LOGISTICS AND SUPPLY CHAIN MANAGEMENT

FACTORS AFFECTING PHARMACEUTICAL SUPPLY CHAIN PERFORMANCE IN THE PUBLIC HEALTH SECTOR: THE CASE OF OROMIA REGIONAL HEALTH BUREAU

BY

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CERTIFICATION

The undersigned hereby certifies and recommends for acceptance by **Addis Ababa University, School of Commerce, Department of Logistics and Supply Chain Management** a dissertation titled: **"Factors Affecting Pharmaceutical Supply Chain Performance in the Public Health Sector: The Case of Oromia Regional Health Bureau"** in partial fulfillment of the requirements for obtaining the **Masters of Arts Degree in Logistics and Supply Chain Management**.

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DECLARATION

I, **Keno Feyisa Bona**, hereby declare that this dissertation is my own original work and that it has not been presented and will not be presented to any other University and/or Institution for a similar or any other Master's Degree Award.

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ABSTRACT

The study assessed and examined to what extent Supply Planning/Forecasting, Procurement, Warehouse/Inventory Management, and Distribution practices of Oromia Regional Health Bureau (ORHB) are affecting its pharmaceutical supply chain performance. In addition, the study identified which of these functions/practices is dominantly affecting the pharmaceutical supply chain performance of the bureau.

It was found that computed Cronbach Alpha for all variables were above 0.7 which makes the reliability test acceptable to continue the study. Correlation analysis result has shown that there is a strong correlation between supply planning and supply chain performance ($r=0.662$, $p=0.000$, $p<0.01$). Thus, the two variables are positively related. The analysis has also shown that there is strong correlation between procurement and supply chain performance ($r=0.749$, $p=0.000$, $p<0.01$) and warehouse/inventory management and supply chain performance ($r=0.707$, $p=0.000$, $p<0.01$). The variables are again positively related with supply chain performance. Finally, the analysis has shown positive relationship between distribution system and supply chain performance ($r=0.722$, $p=0.000$, $p<0.01$). With a p-value of 0.037, supply planning/forecasting was found to be the dominant factor affecting pharmaceutical supply chain performance of ORHB followed by procurement with p-value 0.034 and distribution with p-value 0.007 which are all below the cut-off point 0.05 to be considered as dominantly affecting.

In general, supply planning/forecasting, procurement, warehouse/inventory management and distribution practices and pharmaceutical supply chain performance of ORHB have a positive relationship. In addition, supply planning/forecasting was identified to be dominantly affecting pharmaceutical supply chain performance of the bureau; followed by procurement and distribution practices; while warehouse/inventory management is not. This is in line with (Management Science for Health (MSH) Report, 2012; Foster S. et. al (2006); Seiter A, 2010) that clearly stated that the root causes of stock outs at the health clinics may be due to problems in procurement, forecasting and requisitioning by the region or district, tardiness in ordering or poor forecasting by the clinics, or lack of transport at any stage in the system.

ABBREVATIONS

CSCMP	Council of Supply Chain Management Professionals
CMS	Central Medical Store
GHI	Global Health Initiatives
HC	Health Centers
HP	Health Posts
ICT	Information and Communication Technology
IOM	International Organization for Migration
JIT	Just- in -Time
MSH	Management Science for Health
MOH	Ministry of Health
OECD	Organization for Economic Cooperation and Development
ORHB	Oromia Regional Health Bureau
SCM	Supply Chain Management
TOC	Theory of Constraint
UN	United Nations
VMI	Vendor Managed Inventory

TABLE OF CONTENTS

Certification……i

Declaration……..…..ii

Acknowledgement……..…..iii

Abstract……..……..…iv

Abbreviations……..…….…….....v

Table of Contents.…….....vi

List of Tables……..…….....ix

CHAPTER ONE: INTRODUCTION……...……..…….....1

1.1. Background of the Study…….……...…….……..…...….1

1.2. Statement of the Problem……..……...……..….4

1.3. Research Questions……..……...…5

1.4. Objectives of the Study……...…….....…….……6

1.4.1. General Objective…….….6

1.4.2. General Objective……..6

1.5. Scope and Limitation of the Study……...…….……....…6

1.6. Significance of the Study……..…...……..…….…...7

1.7. Structure of the Paper……..……....…….…….....7

CHAPTER TWO: LITERATURE REVIEW……...…….…..…...……8

2.1 Supply Chain Management: An Overview……...…..……..……..8

2.2 Theoretical Review……...…..…….……..…..…9

2.2.1 Theory of Constraint on Supply Chain…….…….…..……...9

2.2.2 General Systems Theory on Supply Chain……...……..…..…10

2.3 Empirical Review……..…….…...…11

2.3.1 Structure of Health Products Supply Chain in Low-income Countries……..……..……..…11

2.3.2 Challenges in Public Sectors Medicine Supply Chain…..…….....13

2.3.3 Supply Planning/forecasting Process in Supply Chain …..…...…..15

2.3.4 Procurement Process in Supply Chain……..…….....16

2.3.5 Inventory and Warehouse Management in Supply Chain Process……...…….....……....17

2.3.6 Distribution System in Supply Chain…….…..……18

2.3.7 Supply Chain Performance……..……..…..…..……21

2.4 Supply Chain Efficiency…….……..21

2.5 Conceptual Framework……..……...…23

CHAPTER THREE: RESEARCH METHODOLOGY……...…….....24

3.1 Research Design……...……...…..24

3.2 Target Population……..……....25

3.3 Sampling Design……..……..……..…….25

3.3.1 Sampling Frame……..…….…….25

3.3.2 Sampling Techniques…….....……..…….26

3.3.3 Sample Size……..…….26

3.4 Data Collection Instrument…….…..…27

3.5 Data Analysis……..……..……....28

3.6 Reliability……..……28

3.7 Validity……..……29

CHAPTER FOUR: FINDINGS AND DISCUSSIONS ……..…..……30

4.1 Characteristics of the Respondents……...……...…….……..30

4.2 Analysis of the Findings of the Study…….…….33

4.2.1 Supply Planning……...…….……..……..….33

4.2.2 Procurement Practice……..……..34

4.2.3 Warehouse and Inventory Management…….……..……....35

4.2.4 Distribution System……...……...……..……..…37

4.2.5 Supply Chain Performance……..……..…38

4.3 Reliability Test……..…….……..40

4.4 Pearson's Correlation……..…….....…41

4.4.1 Correlation Matrix of Components of Supply Chain……..…..….42

4.5 Multiple Linear Regression Analysis……...……..…….….43

4.5.1 Multi Collinearity Test…….……..…44

4.5.2 Stepwise Multiple Regression Analysis: ANOVA…….…..45

4.5.3 Stepwise Multiple Regression Analysis: Results of Coefficients.…46

CHAPTER FIVE: SUMMARY, CONCLUSIN AND RECOMMENDATION.....48

5.1 Summary……...…....48

5.2 Conclusion……..……..……....….49

5.3 Recommendation…….……..50

5.4 Further Research Direction ……..51

REFERENCES…….……....52

APPENDIX A: RESEARCH QUESTIONNAIRE ……..57

LIST OF TABLES

TABLE:

I. Respondents' characteristics by gender, age, year of service and educational qualification……..……...32

II. Supply planning practice ORHB……..…..…..……33

III. Procurement practice in ORHB…….……..……..…..….35

IV. Warehouse and inventory management in ORHB……..…....36

V. Distribution of medical supplies in ORHB……..……...….37

VI. Supply chain performance in ORHB……....…..…..39

VII. Alpha coefficient of actual test based on 31 respondents……40

VIII. Correlation matrix of components of supply chain and supply chain performance……..…….…….……..…42

IX. Multi collinearity test of independent variables……..…….……44

X. Step wise multiple regression analysis: ANOVA…….……..….45

XI. Step wise multiple regression analysis: Results of model summary……..….45

XII. Step wise multiple regression analysis: Results of coefficient……..…..46

CHAPTER ONE
INTRODUCTION

Introduction

The main purpose of this study is to examine supply chain management (SCM) functions/practices affecting pharmaceutical supply chain performance in the public health sector with a focus on Oromia Regional Health Bureau (ORHB) pharmaceutical SCM. This chapter presents background of the study; statement of the problem; research questions; objectives of the study; scope and limitation of the study; significance of the study and structure of the paper.

1.1. Background of the Study

In the public sector, supply chain management (SCM) is concerned with the "co-ordination of all parties involved in delivering the combination of inputs, outputs or outcomes that will meet a specified public sector requirement." These parties include external suppliers, partner organizations, and internal corporate service units both inside and outside the organization (Ambe, 2006). One of the public sectors that governments give special attention to ensure its efficiency and effectiveness in its service delivery is public Health sector.

Well-functioning supply chains to deliver medicines, vaccines and other health products are critical for the provision of health services (Hart C, 2004; Management Science for Health (MSH) Report, 2012; Kraiselburd S et.al, 2013; Foster S et.al, 2006). Any good health system necessitates supply chain that can guarantee consistent availability of affordable, high quality medicines, vaccines and health products at all health service delivery points (Foster S, et.al, 2006; Dalberg Global Development Advisors, 2008; Seiter A,2010). Although some envision a supply chain to be a set of warehouses, trucks and carton boxes, a supply chain is in fact the ecosystem of organizations, people,

technology, activities, information, and resources that should come together to ensure the delivery of the product from the point where it is manufactured to the end-patient in a cost-effective way. Supply chains not only deliver medicines and health products to the population, they also return critical information regarding need, demand, and consumption to health system planners. Supply chains play a role in each of the categories identified for health system performance improvement: payment, organization, regulation, and behavioral aspects of the health system (Roberts MJ et.al, 2004).

Many middle- and lower-middle-income countries that are facing a significant demographic, epidemiological and economic transition are also realizing the value of investments in improving their healthcare supply chains making. Risks of poor product quality and counterfeiting are further reinforcing the demands to strengthen supply chains (International Organization for Migration(IOM), 2013). There is also an increasing skepticism around the conventional supply chain models used in developing countries and pressure to learn from the private commercial sector (Dalberg Global Development Advisors, 2013; Yadav P et.al, 2013).

Currently, ORHB manages 79 functional Hospitals, 1,375 functional Health centers (HCs), > 6,414 health posts (HPs). Since the bureau is service rendering government institution, its performance and end users/patients' satisfaction is heavily dependent on its pharmaceutical supply chain management performance. At regional level, the Pharmaceutical SCM department is structured under Clinical Service & Health Commodity Supply Directorate accommodating 5 Pharmacy Service Officers, 3 Pharmaceutical SCM Officers, 2 Procurement Officers, 2 Store Personnel (1 Officer, 1 Manager), and 1 Data Officer. Even though not fully filled at all zonal levels, the Pharmaceutical SCM structure of the bureau also allows a minimum of 2 Pharmaceutical SCM Officers at each zonal level; and even above that based on the size of the zone. Due to the nature of the sector and the bureau (i.e., public health sector using health commodities to deliver health services), its key SCM functions/practices are identified by

the bureau as Supply Planning/Forecasting, Procurement, Warehouse/Inventory Management, and Distribution. The below figure summarizes pharmaceutical SCM structure of ORHB at regional bureau level.

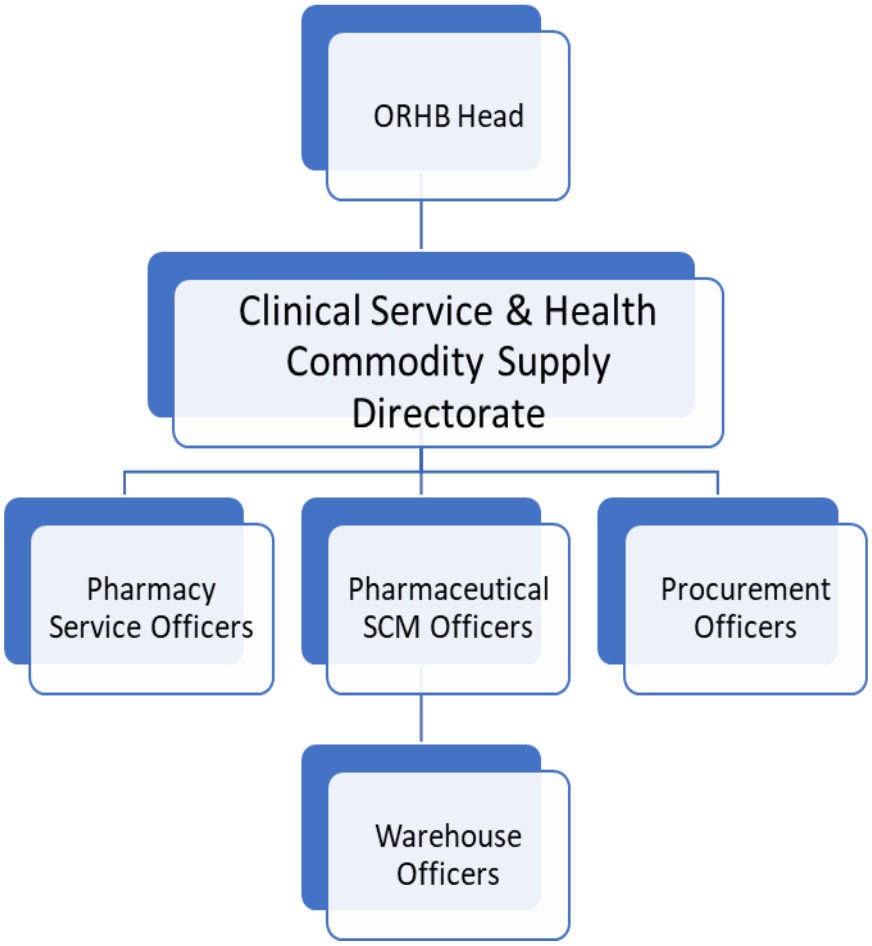


Figure 1. Organogram of ORHB SCM Structure at Regional Bureau Level

So, to what extent are Supply Planning/Forecasting, Procurement, Warehouse/Inventory Management, and Distribution practices of the bureau are affecting its pharmaceutical supply chain performance? And, which of these functions is significantly affecting the pharmaceutical supply chain performance of the bureau? This questions were addressed by this study.

1.2. Statement of the Problem

The need for fundamental reform of the supply chains for health products in developing countries is more necessary now than at any time in the past. Bold and concerted action is required to create a supply chain that is responsive to the needs of patients in a cost-effective manner. Supply chain management efficiency and effectiveness has profound implications on any organizations' ability to meet its customer's demands, its reputation, and its overall financial success (Ambe, 2006). In health sector, effective SCM can lead to efficient resource utilization and patients' satisfaction of the services offered (Yadav P, 2015).

Various authors have studied supply chain performance from different points of view. In his study (Paul et al., 2006) identifies purchasing planning, supplier collaboration, supplier base rationalization and nature of supplier relationships as major valuables predicting supply chain performance. The study by Davidrajuh (2005) on the other hand lay importance on distributing the processed goods, to customers. Their study proposed distribution channel planning model. Swink et al. (2007) asserted that there is a positive relationship between supply chain integration and organizational performance aimed at improving the procurement-supply chain practices for purposes of service delivery to the public in all public institutions.

Despite the fragmented approach and viewpoints to supply chain management and supply chain performance, researchers have noted several problems regarding supply chain activities (Sridharan et al., 2005). As it can be seen from the above stated statements, the researchers have come up with different conclusions and findings. This indicates that there is still gap on findings of different studies on the factors affecting supply chain performance. Moreover, many of the researches on the factors affecting supply chain performance have been conducted in developed countries and in business related areas and little studies have been done in developing countries like Ethiopia particularly in public health related supply chain performance. Based on preliminary document reviews,

face-to-face encounter with some relevant personnel, and some practical exposure to the situation, the researcher has also noticed that fundamental supply chain functions: supply planning, procurement processes, warehouse and inventory management and physical distribution of medical supplies to end users by ORHB is not well functioning and are observed to be affecting the pharmaceutical supply chain of ORHB though at different magnitude which was explained in detail in the data presentation and analysis chapter.

This study was therefore conducted and examined to what extent Supply Planning/Forecasting, Procurement, Warehouse/Inventory Management, and Distribution practices of the bureau are affecting its pharmaceutical supply chain performance; and, which of these functions is significantly affecting the pharmaceutical supply chain performance of the bureau.

1.3. Research Questions

The following research questions were developed and answered by the study:

- To what extent supply planning/forecasting practice in ORHB affects pharmaceutical supply chain of the bureau?
- To what extent procurement practice in ORHB affects the pharmaceutical supply chain performance of the bureau?
- To what extent warehouse and inventory management practice in ORHB affects the pharmaceutical supply chain performance of the bureau?
- To what extent distribution system practice in ORHB affects the pharmaceutical supply chain performance of the bureau?
- What is the most critical/fundamental factor currently affecting pharmaceutical supply chain performance of ORHB?

1.4. Objectives of the Study

1.4.1. General Objective

The General objective of the research is to investigate factors affecting pharmaceutical supply chain performance in the public health sector, the case of Oromia Regional Health Bureau (ORHB); the Pharmaceutical supply chain from Regional Office to three chains (to Chiro Town/Woreda of West Hararge Zone, Adama Twon/Woreda of East Showa Zone, and Dukem Town of Finfinne Surrounding Oromia Special Zone).

1.4.2. Specific Objectives

The specific objectives of the study are:

- To assess whether supply planning/forecasting practice of ORHB has an effect on pharmaceutical supply chain performance of the bureau.
- To assess whether procurement practice of ORHB has an effect on pharmaceutical supply chain performance of the bureau.
- To assess whether warehouse and inventory management practice of ORHB has an effect on pharmaceutical supply chain performance of the bureau.
- To assess whether distribution system practice of ORHB has an effect on pharmaceutical supply chain performance of the bureau.
- To identify the most critical/dominant factor affecting ORHB pharmaceutical supply chain performance of the bureau and to suggest recommendations thereof.

1.5. Scope and Limitations of the Study

Oromia Regional Health Bureau is currently undertaking its activities across Oromia Region with a total of 79 functional Hospitals, 1,375 Health Centers and 6,414 Health posts. However, due to shortage of time and budget, the research is only based on the data obtained from respondents involved in the pharmaceutical supply chains from regional health office to selected three chains (to Chiro Town/Woreda of West Hararge Zone, Adama Twon/Woreda of East Showa Zone, and Dukem Town of Finfinne Surrounding Oromia Special Zone). SCM is a broad concept that encompasses various

elements and variables. But again, the research is based on data collected on Supply Planning/Forecasting, Procurement, Warehouse/Inventory Management, and Distribution practices and how these practices affect supply chain performance of the bureau. Though supply chains in public health centers involve both pharmaceutical and non-pharmaceutical products, this study is limited to data collected from respondents involved in pharmaceutical supply chain only. Finally, the study might face limitations of relevant references on SCM in the public-sector context; as this sector is only recently that it is being gaining attention especially in developing world context.

1.6. Significance of the Study

The study will show Oromia regional health bureau to what extent Supply Planning/Forecasting, Procurement, Warehouse/Inventory Management, and Distribution practices of the bureau are affecting its pharmaceutical supply chain performance; and, which of these functions is significantly affecting the pharmaceutical supply chain performance of the bureau. The findings of the study will add to the body of knowledge on the topic and can be used as a source of reference for further studies to be conducted on pharmaceutical supply chain performance. The study also serves as partial fulfillment of the requirements for obtaining the Masters of Arts Degree in Logistics and Supply Chain Management.

1.7. Structure of the Paper

This study has five chapters. The first chapter dealt with the introduction and back ground of the study; statement of the problem; objectives of the study; scope and limitation of the study and significance of the study. The second chapter focused on the review of related literature. While third chapter dealt with research methodology, fourth chapter was meant for findings and discussions (presentation and analysis of data). Finally, summary, conclusion and recommendation were presented in the fifth chapter.

CHAPTER TWO

LITERATRE REVIEW

Introduction

The purpose of this chapter is to review the work that other scholars and researchers have done concerning supply chain management in general and pharmaceutical supply chain management system in public health sectors in developing countries in particular. Theoretical and empirical reviews are done leading to a conceptual framework which is proposed to guide the study. The chapter begins with a review of the theories that underpin the concept of supply chain management. The chapter then presents an empirical review of both the factors affecting supply chain generally and specifically in health institutions. The research gap is identified and conceptual framework adopted is discussed.

2.1. Supply Chain Management: An Over View

Supply chain management (SCM) is a term used in business literature to refer to the control of materials, information, and finances as they move in a process from supplier to manufacturer to wholesaler to retailer to consumer. According to the Council of Supply Chain Management Professionals (CSCMP, 2007), "Supply chain management encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. It also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third party service providers, and customers."

Supply chain management (SCM) represents a significant change in the way that organizations view themselves and has witnessed values created through the integration and coordination of supply, demand and relationships in order to satisfy customers in an effective and profitable manner both in the private and public sectors. The concept has seen interest among organizations (Burges & Singh, 2006) including the public sector

(Hendricks & Singhal, 2003; Gansler et al., 2004; OCG, 2005; 2006; Ambe, 2006; Matthee, 2006; Essig & Dorobek, 2006; Migiro & Ambe, 2008; Ambe, 2009). Supply chain management is applied by companies across the globe due to its demonstrated results such as delivery time reduction, improved financial performance, greater customer satisfaction, building trust among suppliers, and others. According to Ronnqvist and Weintraub (2008), companies resort to supply chain practices to improve their performance. Recently, public sectors have become increasingly interested in how Supply chain and their stakeholders impact on the organizational strategy (Walker and Wendy, 2006).

2.2. Theoretical Review

2.2.1. Theory of Constraints on Supply Chain

By far the most popular approach to supply chain management is Goldratt's Theory of Constraint (TOC) (Triestch, 2005). The theory of constraints is a management paradigm that views any manageable system as being limited in achieving more of its goals by a very small number of constraints and as such TOC uses a focusing process to identifying the constraints and restructure it to realize more thorough put through the system (Ibid). This is in line with the views of an earlier propagator of the theory of constraint, Mewes (1963), who identified bottlenecks as underlying inefficiencies of most processes. The theory of constraints is based on the premise that the goal achievement by a goal oriented system is limited by at least one constraint (Triestsch, 2005; Cox, Jeff, Goldratt & Eliyahu, 1986). Only by increasing flow through the constraint(s) can overall output be increased and the objectives of the system realized (Goldratts, 2004).

Assuming the goal of the system has been articulated and its measurement defined, the steps include identifying the systems constraint, deciding how to exploit the constraint, subordinate everything else to align the whole system and make changes (Goldratt, 2004). Constraints according to (Noreen, smith &Mackey, 1995) can be external or internal to the system and include such phenomenon as constraints of equipment, policy

and regulation, lack of skilled people. The theory of constraint has been used in the supply chain management to provide solution towards greater availability and flow of inventory by identifying constraints such as, and offering management techniques to reduce replenishment time, lead time, and late deliveries (Herman, 2000). Any improvements in such areas will improve availability of products and services to customer.

2.2.2. General Systems Theory on Supply Chain

The general systems theory was developed initially by Von Bertalanffy (1969) in the field of biology and extended by Weinberg (1975), Miller (1978) and Yourdon (1989) into paradigms of management (Rudolf, 2011). Bertalanffy (1969), a biologist who through his work on general body systems found that given the interaction between a system's components, a system was often more than just the mere sum of its components; it involves the interaction between components, differently, within the larger system. Miller (1978) argued that in most cases, real world systems are open systems which interact with, and are often influenced by, the external environment.

Another important concept of a system is the definable boundary that separates a system from its environment and allows inputs to and outputs out of the system (Rudolf, 2011). The general systems theory according to Rudolf (2011) identifies four general systems principles. These principles are; "The more specialized or complex a system is, the less adaptable it is to its environment", "The larger the system, the more the resources are required to support the system", "Systems often contain other systems, and are in themselves components of larger systems" and "Systems grow proportionally to resources allocated to the system."

Supply chains are considered systems of providing flow of good, product or services to consumers (Chopra & Meindl 2004). The contribution of the general systems to supply chain can be seen from this view point that the supply chain is a system with inputs and

expected outputs, to inform management of supply chain. Handfiled & Nicholas (1999) explains that, within the context of the general systems theory, the supply chain includes the management of information systems, sourcing and procurement systems, logistics systems, order and customer service systems and integration of these activities through improved relations between these systems can be used to gain competitive advantage. The general systems theory provides opportunity to distinguish subsystems and variables that operate within a supply chain leading to a better understanding of the dynamics within the supply for better study and improvements.

2.3. Empirical Review

2.3.1. Structure of Health Product Supply Chains in Low-Income Countries

Most governments in low-income countries, especially in sub-Saharan Africa, choose a distribution model where the government procures drugs and distributes them to health clinics using a publicly run Central Medical Store (CMS) and a government-owned transport fleet. There is considerable heterogeneity in the governance structure of Central Medical Stores (CMS) in different countries (Govindaraj R & Herbst CH, 2010). In some countries, the CMS is a government department or a part of the ministry of health. This provides limited flexibility for the CMS to hire people with supply chain experience systems in the public sector; they also often lack the authority to remove incompetent workers. In many countries, the CMS now has an autonomous or semi-autonomous status (Yadav P et.al, 2011). Autonomous or semi-autonomous status provides CMS greater flexibility in recruiting staff, creating performance based pay structures, and better financial management and agility in contracting with suppliers.

The procurement of pharmaceuticals and health products is carried out by the CMS in some cases and by a department within the ministry of health in other cases. It is typically a complex process which can take up to two years to complete (Seiter A, 2010; Arney L et.al, 2014; Dickens T, 2011). Public sector entities responsible for the procurement of medicines and health products have to manage the pressures of strict public scrutiny that

comes with the use of public monies (Arney L et.al, 2014). With limited technical capacity to manage this they are highly risk averse and use well-established but inefficient and archaic procurement methods. The procurement is typically carried out once a year or once every two years for some specific products with longer lead times from suppliers (Yadav P, 2015).

Once medicines arrive in the country, the most common structure for distribution involves warehousing and storage at the CMS. Depending upon the geography, administrative structure and the number of health facilities in a country, products are first distributed from the CMS to regional or district level stores. Some countries such as Kenya have designed a distribution structure that involves direct distribution from the CMS to the health facilities. In most cases the distribution from the CMS to the regional or district stores is carried out by a transport fleet that is owned and operated by the CMS (Yadav P, 2015).

In most countries, instead of a supply chain design based on technical or operational considerations, the structure of the supply chain is mapped directly to the administrative structure of the health system. It is argued that this creates convenience of administration and governance. CMS's mandate is to distribute to the regional level or district level. The distribution from the district or regional level to the health facilities is the responsibility of the district or region. In many instances, health facilities themselves travel to the district/region to obtain stock, as scheduled transport and delivery from the district/region to the health clinics is either non-existent or unreliable(Ibid).

A key design question that arises pertains to who (locus of decision) decides how much stock of each product to ship to a clinic and based on what information (information sets for decision). In a push system, the CMS or the regional or district store determines the quantities of medicines that are to be sent to a health facility, based on allocation rules that take catchment population, disease incidence and other such factors into account. In

a pull system, each health facility requisitions the quantity of product it needs based on its past consumption, stock status and other factors. The value of a pull system comes from its use of local information about consumption and demand, which may not reach the CMS or higher levels. A push system is designed to work in instances where ordering and stock management capabilities at the lowest level of the distribution system are extremely weak (Yadav P, Tata H & Babaley M, 2011). The choice of a push or a pull system at a given level in the supply chain depends largely on the capacity to conduct stock planning and forecasting at that level of the supply chain as well as the flow of local information to higher levels (Yadav P, 2015).

2.3.2. Challenges in Public Sector Medicine Supply Chains

Several factors contribute to poor availability of medicines and health products at health clinics in government-run systems. The failure to use a systematic diagnostic of why supply chains are underperforming leads to ad-hoc projects that address only the surface symptoms of the underlying structural causes. The main categories of causal factors that lead to supply chain underperformance are summarized and presented in the below figure (Ibid).

Challenging Factors	What these factors means	How these factors affect Pharmaceutical SCM Performance
i. Diffuse Accountability	A situation where each actor can attribute the underperformance of the supply chain to other actors in the system. (Yadav P,2015)	Creates lack of an accountability structure; which in turn leads to inability to track flows through the supply chain.
ii. Uncertainties in Financing	A condition where the timing of procurement funds disbursement is uncertain and highly variable, leading to delayed start of the procurement cycle (Natarajan K & Swami Natan J, 2012)	Any delays in procurement initiation creates a cycle of uncertainty in the system and results in system-wide stock outs.
iii. Unnecessary Levels of Complexity	The structure of the supply chain in most low-income countries is mapped to the administrative structure of the country, resulting in multiple tiers of stock holding and stock allocation decision making in supply chain (Yadav P, 2015).	Apart from creating poor accountability, multiple tiers in the supply chain, coupled with weak and less frequent information and communication between the tiers, contribute to a phenomenon called "the bullwhip effect".
iv. Long Re-supply Intervals	As most procurement departments procure only once a year and do not have much flexibility in the contracting mechanisms used, they end up using rather imprecise forecasts in their procurement planning. (Yadav P, 2015).	This results in either product stock outs or product overstock leading to expiration/wastage.
v. Lack of Interest in Funding Operation Costs	Finding resources to finance the operating costs (e.g., fuel expenses, vehicle maintenance, and per diems of drivers) of running the supply chain is a constant tug of war in most countries. (Yadav P, 2015).	This tendency percolates throughout the system and resource allocations from the center, province, and district, all tend to neglect adequate coverage of operating expense.
vi. Lack of Supply Planning Data	Currently, in most countries, there are no processes by which information about consumption is systematically captured (Sarley D et.al, 2009).	In the absence of periodic stock and consumption information, supply chain planning is conducted based on estimates drawn from outdated assumptions.
vii. Mismatch between System & Skill design	Systems with weak capacity of clinic staff to order and requisition perhaps require the locus of decision making about the order quantity to shift to a level with greater planning capacity (Vian T, 2003).	Poor understanding of the difference between the loci of decision making about order quantity vs. the information sets used for deciding order quantity is the root cause of faulty system design.
viii. Lack of Incentives for Public Supply Chain Staffs	This phenomenon is particularly pronounced for those involved in supply chain aspects because the ability to measure their output is extremely limited. (Yadav P, 2015).	Unlike their counterparts in service delivery who focus on treating patients, the supply chain staff does not have a single, clear, measurable goal.

Figure 2. Challenges in Public Sector Medicine Supply Chains

2.3.3. Supply Planning/Forecasting Practices in the Pharmaceutical Supply Chain

Per UN Commission on Life-Saving Commodities for Women and Children (2013), the quantification of commodities relies on access to good data, knowledgeable personnel, and the coordination of key stakeholders. Without these three key components, quantification exercises often lead to inadequate forecasts of commodity needs, resulting in an under- or oversupply of life-saving commodities.

Quantification answers the question: "How much will be procured and when will it be delivered?" Considering the expected demand for commodities, unit costs, existing stocks, stock already on order, expiries, freight, logistics and other costs, lead times, and buffer stocks. Using this information, the total commodity requirements and costs are calculated and compared with the available financial resources to determine the final quantities to procure. Forecasting answers the question: "How much is needed, in quantities and cost, to meet the health demand of the population?" The final output of quantification, supply planning details the quantities required to fill the supply pipeline, costs, lead times, and arrival dates of shipments to ensure optimal procurement and delivery schedules (Ibid).

Forecasting functions best when there is a high level of coordination among supply chain personnel, program staff, commodity coordinating committees, and other relevant stakeholders. Lower levels of adherence make it more difficult to gain accurate estimates of need and impact the accuracy of the overall forecast (Ibid). Once the forecast is finalized, the supply plan is developed from it.

The supply plan is the link between forecasting and procurement in that it defines what products will be procured, how much it will cost, how much to procure, and how long it will take. Supply planning is best carried out by logistics staff with knowledge of the entire supply chain as they must be able to factor in the capabilities and limitations of each supply chain function (Ibid).

2.3.4. Procurement Practices in the Supply Chain

Procurement as defined by Hoekman, Ptrois & Mavroids (1997) is the whole process of acquiring property or services. Public procurement, a division of procurement, entails any procurement which is financed by public funds. “Public funds” means monetary resources appropriated to procuring entities through the budgetary process, as well as extra budgetary funds, including aid, grants and credits, put at the disposal of procuring entities by foreign donors, and revenues of procuring entities (PPDA, 2005).

The Organization for Economic Cooperation and Development (OECD) acknowledges that government worldwide act as providers of essential services for socio-economic development through public procurement such as health, education, agricultural support and infrastructure, especially in developing country where major vulnerable populations exist. Arrowsmith (1998) in agreement, notes that procurement has been utilized as an important tool for achieving social economic goals.

Thai (2001) defines the goals of a procurement system as being divided into two: 1; procurement goals, to include quality, timeliness, cost and integrity and: 2; non-procurement goals to include economic, social and green procurement goals. Both these goals must be achieved to create value to citizenly of any nation. Aketch (2009) identifies two different ways in which procurement is actualized. 1: project specific procurement; is procurement of goods, works, and services sought for a particular initiative, and 2: general procurement; which relate to general consumable required by a procuring entity to perform its goals. In this context, procurement of subsidized fertilizer is project specific procurement. OECD (2009) defines the overriding goal of any state public procurement system is to deliver efficiency and value for money in use of public funds whilst adhering to regulation and policy. In this regard, Ogola (2008) & Otieno (2004) estimate the cost of inefficiency of public procurement in Kenya at ksh 30 billion out of poor planning and irregular procurement activities in public institutions leading to misappropriation of resources.

The ability of a government meeting its development objectives, according to word Bank (2004), is hinged on the efficiency in project specific procurement management. Most governments' development agenda is implemented in public projects such as infrastructure, health and education. The successful implementation, and hence achievement of project objectives is predicted by, among other things, the public procurement process: planning, supplier selection and contract management, that is transparent, open and accountable to ensure funds are absorbed into the project as outlined (Thai, 2001). The subsidy program is a project aimed at stimulating agricultural production in the country (Duflo, Esther, Michael & Jonathan, 2008).

2.3.5. Inventory and Warehouse Management in Pharmaceutical Supply Chain

i. Inventory Management

Frazelle (2002) indicated that the logistics of inventory management includes practices of forecasting, order quantity engineering, service level optimization, replenishment planning, and inventory deployment. The study by Sahay and Ramneesh (2003) found that some of the major reasons for holding inventories by Indian organizations include: improving customer service; hedging against price changes and contingencies; achieving production, purchase and transportation economies; protecting against demand and lead time uncertainties; and balancing supply and demand. On the contrary, Womack and Jones (1996) argued that in lean supply chain thinking, inventory is regarded as one of the seven "wastes "and, therefore, it is considered as something to be reduced as much as possible. Similarly, the study by Dimitrios (2008) suggested that too much inventory consumes physical space, creates a financial burden, and increases the possibility of damage, spoilage and loss.

ii. Warehouse Management

Warehouse management includes all planning and control procedures to operate the warehouse (Slack, 2001 as cited in Faber, 2013). Similarly, Frazelle (2002) indicate that the logistics of warehousing includes receiving, put away, storage, order picking and

shipping. The objective of warehouse management is to efficiently and effectively coordinate all warehouse processes and activities (Harmon, 1993; Tompkins, 2003 as cited in Faber, 2013). Generally, Faber (2013) concluded that warehouses that operate in more turbulent markets are likely to have to continually modify their products and services in order to satisfy customers' changing preferences. Receiving, transferring, handling, storage, packing, and expediting operations at the warehouse directly affect the effectiveness of a company as a whole as well as its quality and logistic service level (Rafele, 2004 as cited in Anna, Alberto and Carlo, 2011). In this sense, a proper warehouse management practice has become critical to gain competitive advantage through better customer service and shorter lead times (De Koster, 1998 as cited in Anna, Alberto and Carlo, 2011).

A study was conducted by Rogers and colleagues (1996) to check whether the use of information technology affects performance of warehouses or not. They conducted a survey including both public and dedicated warehouses. Their findings suggest that the use of information technology is related to several positive outcomes, such as improvement of quality, cycle times might be reduced as well as an increase in productivity.

2.3.6. Distribution Practices in the Pharmaceutical Supply Chain

Keskinocak & Tayur (2001) in an analysis of supply chains identifies distribution as a core subsystem within the entire supply chain that defines whether the supply chain objectives will be achieved. Distribution is an element of the marketing mix; others include product, pricing and promotion that are defined as making products or services available for use by consumers using direct or indirect means (Kotler, Keller & Burton 2009). Kotler *et al.* (2002) further asserts that distribution takes place by means of channels, which can be classified according to the number of intermediaries between source (producer) and consumer. A level zero channel has no intermediary. Burton (2008) identifies three types of distribution in various channels: intensive distribution,

where products are stocked widely in many outlets, selective distribution where producers rely on few intermediaries and exclusive distribution where producer relies on very few or one intermediary.

Chopra, Sunil & Meindl (2001) explains that while customer service consists of many components, response time, product availability and variety, and customer experience are most directly influenced by the structure and capability of the distribution design in a supply chain. Mbugua (2008) in a study on distribution of petroleum products in Nairobi established that outlet location and number of outlets is vital to ensuring product availability and customer response. Customized packaging is also another key element of the distribution system that has been found to enhance variety and customer experience in studies by Dibb & Smoking (2001) and Mulinge (2006).

Meindl (2010) defines Distribution as being "the steps taken to move and store a product from the supplier/manufacturing stage to a customer/end-user stage within the supply chain". He comments on how distribution occurs between every set of stages in the supply chain and how raw materials are moved from suppliers to manufacturers, whilst finished goods are moved from manufacturing to the end customer. Distribution is considered to be a key factor/driver of overall profitability of a company because not only does it affect supply chain costs but it also affects the end customer directly (Meindl, 2010, p86). Whilst Meindl describes distribution within the supply chain as the movement of the product from one point to another, Christopher M (2003) discusses how the role of distribution has moved away from the conventional view of distribution as being "solely concerned with transport and warehousing". He suggests that the key to successful distribution today is the model of demand management.

Demand management is regarded as "the process of anticipating and fulfilling orders against defined customer service goals". To optimize the process of demand management, it is essential that a firm has a well-integrated ICT (Information

Communication Technology) system in place, as information is vital to its success. Information from the marketplace, from customers regarding usage/consumption, production schedules and inventory statuses are all accounted for (Christopher, 2003, p27). Although this can be overcome by successful forecasting accuracy, Christopher M (2003) explains that "while forecasting accuracy is always to be sought", it is in fact very rarely achieved. Instead the aim should be for a firm to reduce its dependency on forecasting, by improved information demand and also by implementing systems that enable quick response or agility towards demand (Christopher, 2003, p27).

The task of implementing an effective distribution system in a modern firm/organization is often linked with reducing operational costs. As customers drive down prices and increase service requirements, there is tremendous pressure on all parts of the business to "Do more with less" (Zylstra, 2006, p34). If a company can clearly identify the specific sources of total distribution costs, they may benefit by making it easier to identify potential ‘trade-offs’. "A trade-off occurs where an increased cost in one area is more than matched by a cost reduction in another area" (Christopher, 1990, p8).

For example, if a distribution system has 5 regional depots with high warehousing and stockholding costs is compared with a system of 2/3 depots, the savings on haulage and reduction of stock-outs could possibly outweigh the extra costs involved in the 5-depot system. For benefits of such trade-offs to be achieved, it is necessary for managers to think in terms of total systems rather than of narrow functional areas. Whilst total distribution cost can primarily be the focus for firms, it is also important for a firm to develop a framework that allows them to achieve such operational excellence, in terms adapting a distribution network that is suited to their strategic goals. Christopher (2003) explains how today’s customer is increasingly seeking added value and how logistics management can provide that value is to do with the ‘Three R’s’: Reliability, Responsiveness, Relationships (Christopher, 2003, p28-30).

2.3.7. Supply Chain Performance

Supply chain performance can be looked at as the extent by which supply chain's activities effectively and efficiently ensure realization of organization goals and objectives**.** Simchi-Levi & Kaminsky (2003) define Supply chain performance as the operational excellence to deliver leading customer experience. The performance of a supply chain is influenced by both internal and external factors of the organization. SCM measures can be classified broadly into two categories: qualitative measures such as customer satisfaction and product quality; and quantitative measures such as order-to-order lead time, response time, flexibility; resource utilization and delivery performance.

Per Leong, Tan & Wisner (2005, p.441), performance measurement systems for supply chain must effectively link the supply chain trading partners to achieve breakthrough performance in satisfying the end users. This implies, for instance, in health care institutions, SCM should be very responsive to the ever-changing needs, expectations and aspirations of the patients as the end users for it to realize effective performance measures. Leong et al (2005) asserts that the focus of the system should be on value creation for end customers. The authors argue that the traditional measures of performance (cost, revenue and profitability) are no longer sufficient in gauging effective performance. They identified four critical areas that determine supply chain performance in any organizations, health care institutions not exceptional. These included: quality of care, operational efficiency, financial performance and adaptation to the environment.

2.4. Supply Chain Efficiency

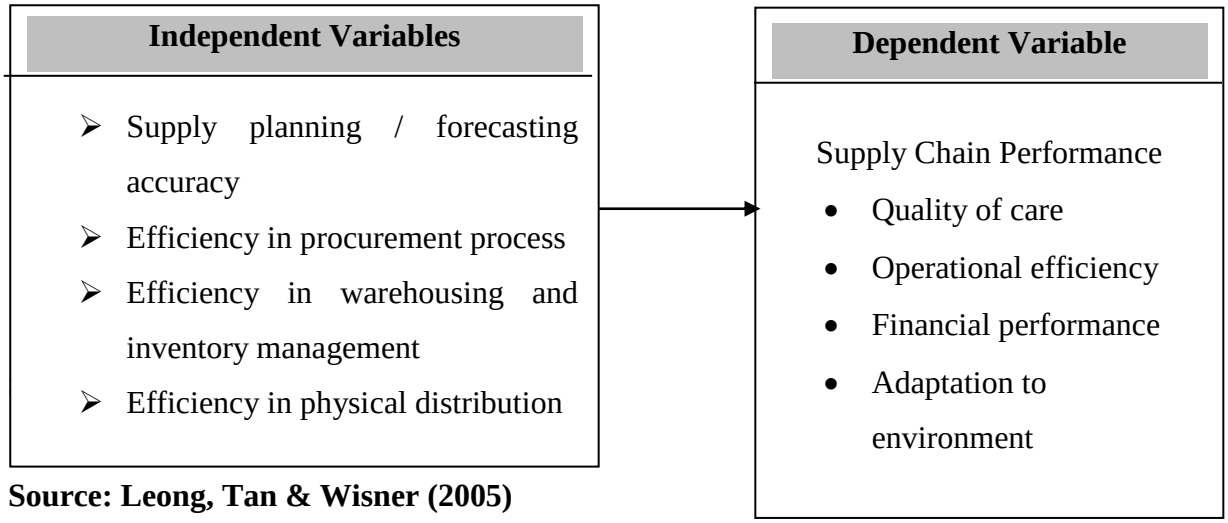
Gunasekaren, Patel & Tirtiro (2001), defined supply chain efficiencies as the level to which organizations involved in delivering value to customers create customer satisfaction by delivering the right product offering at the right time at the right place. Ralph (2000) stated that to achieve the supply chain validity of outcome (effectiveness); delivering the right product offering on time, to the right groups and at the right place (Gunasekaren, Patel & Tirtiro 2000), all barriers to free flow of products from the

supplier to user must be removed. Ineffective supply chains are loosely integrated with poor management of existing interdependencies (Hertz 2001).

Despite the fragmented approach and viewpoints to supply chain management and supply chain performance, researchers have noted several problems regarding supply chain activities (Sridharan et al., 2005). It's observed that either the system or subcomponent of the supply chain is malfunctioned or poorly designed (Spen & Bersk 2002). Mentzer et al. (2001) and Fawcet et al. (2005) findings are consistent with Sridharan et al. (2005) that supply chain performance is inhibited by barriers within or with the chain. These barriers per Fawcett et al (2008) range from poor supply chain planning and design, misaligned supply chain processes and structures, supply chain partner culture differences, trust and ethics, information technology deficiency. These problems are at both the enterprise level and supply chain level and hence need to be tackled to improve performance of the supply chain.

Reviewed supply chain scientific literature provides plausible solutions to supply chain barriers. Some of the plausible solution noted in literature according to Mentzer et al. (2001) Fawcett et al. (2008) & Sridharan (2005), include information transparency, collaborative planning, supply chain design and alignment, individual activities management and human factor control. In a commercial setting, these leads to increased revenues, inventory turnover, decreased order time, responsiveness, decreased time to market, reduced distribution costs- supply chain performance. The chartered institute of purchasing and supply (CIPS 2012) identifies key subcomponents of the supply chain that are key predictors of supply chain performance. These include; procurement, operations, logistics and distribution, the integration of which determine to a great extent the effectiveness of a supply chain. Similarly, Croom et al. (2000) and Wisner & Tan (2000) agree that all-encompassing philosophy of SCM embraces each of the stated subcomponents to produce overall supply chain performance.

2.5. Conceptual Framework



Source: Leong, Tan & Wisner (2005)

The above conceptual framework shows the relationship between the supply chain functions: Supply planning/forecasting, procurement, warehouse/inventory management, and physical distribution and the dependent variable - supply chain performance. And, the whole study was framed and guided by this framework.

CHAPTER THREE

RESEARCH METHODOLOGY

Introduction

This chapter described the methodology that was used by the researcher to carry out the research study. It presented the research design, the study location and target population, the sample size and selection method, data collection and analysis procedures.

3.1. Research Design

De Vos and Fouche (1998) defined a research design as the blue print or detailed plan of how a research study is to be conducted. This is of crucial importance because it determines the success or failure of the research, it guides with the logical arrangements for the collection and analysis of data so that conclusions may be drawn. In this study, the researcher employed descriptive research design approach. Kothari (2007) defines descriptive research studies as those which are concerned with describing characteristics of an individual or of a group; which was appropriate for this study.

The study is purely based on quantitative research method. Creswell (2003) defined quantitative approach as "one in which the investigator primarily uses post-positivist claims for developing knowledge (i.e., cause and effect thinking, reduction to specific variables and hypotheses and questions, use of measurement and observation, and the test to theories), employs strategies of inquiry such as experiments and surveys, and collects data on predetermined instruments that yield statistical data". A survey research design and standard instruments were used to measure the research variables namely supply forecasting/planning, procurement, warehousing and physical distribution and supply chain performance.

Regarding the time dimension, this research study was cross-sectional where information was obtained from a single group of respondents at a single point in time. A broad section

of the bureau's employees will be asked a series of questions via a survey instrument. A survey approach best suites this study as it involves individuals as the unit of analysis. The major advantage of survey is that it provides extensive information on larger respondent groups in a cost-effective manner (Bryman and Bell, 2009; Zikmund, 1997).

A survey was administered to a selected sample from the bigger and specific population of the bureau identified by the researcher. A survey is used to collect original data for describing a population too large to observe directly (Mouton, 1996). A survey obtains information from a sample by means of self-report, that is, people respond to a series of questions posed by the investigator (Polit and Hungler, 1993). The dependent variable is supply chain performance while the independent variables are four components of supply chain management systems.

3.2. Target Population

Burns and Grove (2001) define population as all the elements (individuals, objects and events) that meet the sample criteria for inclusion in a study. The population of this study include all employees of ORHB involving in pharmaceutical supply chain management activities at all structural levels (region, zone, woredas and health facilities) on a permanent basis. In order to capture a balanced report, the research concentrated on Pharmaceuticals SCM Officers/Managers, Pharmacy Service Officers, Procurement Officers, and Store/Warehouse Officers assuming that the respondents have thorough knowledge and are directly involved in the pharmaceutical supply chain of the bureau.

3.3. Sample Design

3.3.1. Sampling Frame

A sampling frame consists of a list of all items from which the sample is drawn (Kothari 2007). The sampling frame for this study was all pharmaceuticals supply chain employees in all of the chains from Regional Health Bureau to the 20 zonal health bureau

structures (i.e., 20 chains) undertaking Pharmaceuticals SCM activities, Pharmacy Service activities, Procurement activities, and Storage/Warehouse management activities.

3.3.2. Sampling Technique

Kothari (2007) defines sampling design/technique as a definite plan for obtaining a sample from the sampling frame. In this study, the researcher used non-probability sampling technique to select representatives for the study. On the first place, the researcher used purposive sampling to select the number of pharmaceutical supply chains to be considered for the study. In purposive sampling method, cross-section of samples selected by the researcher conforms to some criteria (J. Adams H. et.al, 2007). Here, the researcher selected 3 chains from Regional Health Bureau to selected 3 zones (to Chiro Town/Woreda of West Hararge Zone, Adama Twon/Woreda of East Showa Zone, and Dukem Town of Finfinne Surrounding Oromia Special Zone) although total population includes Pharmaceutical SCM employees of the bureau across the Oromia Region. Once the numbers of supply chains have been defined - which is 3 chains in this study case, the researcher decided whether the survey is to be conducted among all members of the population or only a subset of the population. Then, taking in to consideration the reliability issue, the researcher decided to conduct census as the data derived through census are highly reliable. Because they are large and complete, censuses are precise and detailed. Censuses give data in great detail for small details especially local areas.

3.3.3. Sample Size

Sample size represents the number of items selected from the population (Kothari, 2007). According to Mason and Marchal (2002) a good sample size depends on three key factors namely; the level of confidence desired, the margin of error and the variability of the population. Denscombe (2003) confirmed the same by stating that the adequacy of a sample depends on several factors connected with the research as weighed by the researcher in the process of reaching decision on sample size. To this end, 3 chains were purposively selected out of 20 chains; and, all pharmaceutical SCM employees in the 3

chains were included in the study to conduct census taking in to consideration the accuracy and reliability of the data. Accordingly, questionnaires were distributed to all pharmaceutical supply chain employees from regional health bureau to the selected 3 zones/chains (to Chiro Town/Woreda of West Hararge Zone, Adama Twon/Woreda of East Showa Zone, and Dukem Town of Finfinne Surrounding Oromia Special Zone). These 3 zones were purposively selected from 3 different contexts of zonal set up, i.e., 1 from hot-spot emergency prone zone with high health supply consumption and longer distance from the regional bureau, 1 from an average health supply consumption and moderate distance zone from the regional bureau, and 1 from urban set up zone and near to the regional bureau respectively.

3.4. Data Collection Instruments

Questionnaires are developed to gather relevant, accurate, sufficient, and reliable information pertaining to pharmaceutical supply chain performance, supply planning/forecasting, procurement, warehousing and inventory management, distribution and information sharing. A structured questionnaire was considered to be the most appropriate data collection instrument for survey research (Askia, 1999). Hence, structured questionnaire which consists of closed-ended questions with a 4-points Likert scale was used. A 5-points scale is found to be more reliable and valid than shorter or longer scales (Krosnick & Fabrigar, 1997). However, Dawis, (1987); Garland (1991); and Hughes, (1969) suggested that the decision largely rested on the preference of the researcher and there can be no single best method in scale construction. Hence, in this study, due to nature of the identified variables related to pharmaceutical SCM practices, a four-point rating scale was found to be sufficient and used in measuring responses of employees asking the respondents to give their opinions by ticking option 1 for “Strongly Disagree”, 2 for Disagree, 3 for Agree and 4 for “Strongly Agree.

The questionnaire was divided into three sections, Section I, II and III. Section I of the questionnaire consisted of four questions seeking general information about the

demographic characteristics of respondent which included the age, the gender, the level of education, and the number of years they have worked in ORHB. Section II of the questionnaire consisted of 20 statements related to the effect of the four components of supply chain management (supply planning/forecasting, procurement, warehousing and inventory management and physical distribution) on supply chain performance. Finally, section III consisted of 7 statements related to the current supply chain performance of ORHB.

3.5. Data Analysis

"Data analysis consists of examining, categorizing, tabulating, or otherwise recombining the evidence to address the initial propositions of a study" (Yin, 1994). There are several key features of analysis that can be identified for data analysis. The quantitative data collected through the questionnaire was analyzed through descriptive methods. Tables were used to summarize and give a clear view of the distribution of the responses given by the respondents to each question in the questionnaire. SPSS version 16.0 was also used to help in the computing of the quantitative data.

A bivariate correlation method (Karl-Pearson's correlation coefficient) was computed to see associations between five variables of pharmaceutical supply chain management system and supply chain performance. Besides, a multiple regression analysis was used to measure the relative importance of the major variables of supply chain management system in estimating supply chain performance. In addition, a confidence level of 95% with p-value < 0.05 is significant for all analysis results.

3.6. Reliability

Per Shanghverzy (2003), reliability refers to the consistency of measurement and is frequently assessed using the test–retest reliability method. Reliability is increased by including many similar items on a measure, by testing a diverse sample of individuals and by using uniform testing procedures. Reliability is also concerned with the question

of whether the results of a study are repeatable. The term is commonly used in relation to the question of whether the measures that are devised for concepts in business are consistent. One factor that might affect the reliability of the study is the respondents‟ lack of knowledge. It is further suggested that if a respondent at the moment is tired or stressed, or have attitudes toward the questionnaire it can impact negatively on the reliability of the study (Eriksson & Wiedersheim-Paul, 2001). Moreover, reliability is particularly an issue in connection with quantitative research. The quantitative study is likely to be concerned with the question of whether a measure is stable or not. In order to check reliability of the results, the study used Cronbach's alpha methodology, which is based on internal consistency. Cronbach's alpha measures the average of measurable items and its correlation. Overall scales of reliability of the present situation and the desirable situation was tested by Cronbach's alpha, which was found to be above the acceptable level of 0.70 (Hair et al., 1998).

The Cronbach's Alpha coefficient of actual test based on 31 respondents are 0.903 for supply planning/forecasting, 0.739 for procurement, 0.818 for warehouse/inventory management, 0.785 for distribution, and 0.867 for supply chain performance respectively; which are all above the acceptable level of 0.70.

3.7. Validity

Validity refers to the degree to which a study accurately reflects or assesses the specific concept that the researcher is attempting to measure. It is the degree to which results obtained from the analysis of data actually represent the phenomenon under study. To enhance the instrument's validity, the researcher sought expert opinion by consulting the study's supervisor in respect to content validity. After the final confirmation, a pilot test was conducted by distributing the questionnaire among 10 respondents from different colleagues of the researcher experienced on the pharmaceutical supply chain, which ensured that the questionnaire is appropriate and the aspects to be investigated are generally understandable.

CHAPTER FOUR

FINDINGS AND DISCUSSIONS

Introduction

This chapter covers the analysis and discussion of two major parts. Part one involves the descriptive analysis of the demographic characteristics of sample population involved in the study. Hence, the respondents are discussed in terms of gender and age, years of service and educational level.

Part two deals with the analysis of the findings of the study in light of the theoretical background stated in chapter II. This part involves descriptive report of the responses provided by the respondents; statistical analysis of the major variables (four components of supply chain management system) using Pearson's Correlation, multiple regressions and the reliability test for the actual study. A total of 35 questionnaires were distributed out of which 31 completed questionnaires were returned. This represented a response rate of 88.57%, which is valid and used for analysis. The collected data were analyzed using SPSS (version 16) statistical software.

As it is mentioned above, the study used correlation analysis, specifically Pearson's correlation to measure the degree of association between different variables under consideration. Regression Analysis was also used to test the influence of the independent variables on dependent variable.

4.1. Characteristics of the Respondents

Based on the responses obtained, as shown in table I, the characteristics of the respondents were examined in terms of gender, age, years of service and educational level.

Table I, Item A and B, reveal gender and age distribution of the sample population of respondents, respectively. Respondents who account for 77.4 % were male respondents. Female representation in this study was 22.6%. Therefore, majority of the respondents were male. As regards to age, it can easily be understood that the workforce population is largely dominated by the age group 31-40 comprising 61.3 %. However, the least group respondents were 51 years old and above which only covers 12.9 % of the sample population. On the other hand, 8 respondents (25.8%) were in the range of 21-30 years old.

Respondents, as employees of Oromia Health Bueau, have been working there for a diversified number of years. As indicated in Table I, Item C, respondents who had length of service 5 years and above category made up the majority which comprised 22 (71 % of the entire sample), followed by 7 (22.6%) of respondents who served 3-5 years in the bureau. However, only 2 respondents accounting for 6.5 % had 1-3 years of experience in the bureau. It would, therefore, be possible to generalize that such a relatively longer year of services might have helped the respondents to possess rich experience and better understanding about the various issues related to Pharmaceutical Supply Chain Management System of Oromia Health Bureau.

Table I: Respondents' characteristics by gender, age, year of service and educational level

Item	Frequency(n)	Percentage (%)
A. Gender		
a. Male	24	77.4
b. Female	7	22.6
Total	31	100.00
B. Age		
a. 21-30	8	25.8
b. 31-40	19	61.3
c. 41-50	4	12.9
d. 51 and above	-	-
Total	31	100.00
C. Years of service		
a. Less than a year	-	-
b. 1-3 years	2	6.5
c. 3-5years	7	22.6
d. More than 5 years	22	71.0
Total	31	100.00
D. Educational level		
a. 10+1	-	-
b. 10+2	-	-
c. 10+3	1	3.2
d. Diploma/Level IV	11	35.5
e. BA/BSC	18	58.1
f. MA/MSC	1	3.2
Total	31	100.00

(Source: Research Data, 2018)

It was also the matter of concern for this study to examine the educational distribution of the respondents. As it has been recorded in Table I, Item D, 18 respondents (58.1%) had first degrees which dominate the population sample, 11 respondents (35.5%) had level IV/ Diploma and 1 respondent (3.2%) had 10+3 education. Only 1 respondent (3.2 %) had master degree.

4.2. Analysis of the findings of the study

4.2.1. Supply Planning

Respondents were asked to give their opinion on what they thought the current supply planning practice of ORHB looks like. The four point Likert scale was used by the researcher to acquire direct response from the respondents and the mean score and standard deviation is presented in the **table II** below.

Table II: Supply planning Practice in ORHB

Supply Planning Practice *Source: (UN Commission on Life-Saving Commodities' Report, 2012)*	N	Mean	Std. Deviation
ORHB has a well-established supply planning/ forecasting tools and techniques	31	2.23	.762
Supply planning/forecasting of pharmaceutical commodities is based on adequate and accessible data	31	2.16	.898
Supply planning/forecasting practice in ORHB is accurate in predicting the quantity needs of medical supplies	31	1.87	.718
There is strong coordination between supply planning and technical staff	31	2.06	.854
Supply planning/forecasting is done by expertise sharing information from all pharmaceutical supply chain actors	31	2.19	.910
Valid N (list wise)	31		

(Source: Research Data, 2018)

As it can be seen from the above table the mean score for all the variables stated under Supply planning practice are less than cut-off point of 2.50. ORHB has moderately established supply planning and forecasting technique (2.23) but majority of the respondents believed that ORHB supply planning/forecasting practice in ORHB is inaccurate in predicting the quantity needs of medical supplies (1.87).

Supply planning in ORHB is also not based on adequate and accessible data. This is in line with (Sarley D et.al, 2009) who suggests that in most countries there are no processes by which information about consumption is systematically captured. Often information on stock outs is collected through ad hoc surveys. Such surveys fulfill an important objective for evaluation, but do not provide the continuous information feedback that is required for supply chain planning (Yadav P, 2015). In the absence of periodic stock and consumption information, supply chain planning is conducted based on estimates drawn from outdated assumptions (Sarley D et.al, 2009).

4.2.2. Procurement Practice

Table III discusses the extent of procurement management practice in ORHB and how it influences the efficiency of pharmaceutical supply chain of the bureau.

As it can be seen from the table, again all the variables outlined in procurement activities are less than the cut-off point for 4-point Likert-scale measurement. It is moderately practiced that ORHB has transparent tendering process; free from conflict of interest and ensures best value for money (2.45). It is least practiced that ORHB regularly measures and analyze suppliers' performance (2.00). In general, procurement practice in ORHB is believed to be less efficient.

Table III: Procurement Practice in ORHB

Procurement Practice *Source: (UN Commission on Life-Saving Commodities' Report, 2012)*	N	Mean	Std. Deviation
Medical supplies are procured based on proper procurement plan	31	2.42	.720
Delivery of medical supplies is predictable and lead time for delivery is short and quality is ensured	31	2.06	.680
Procurement practice in ORHB is less bureaucratic flexible	31	2.19	.792
Tendering process in procurement of pharmaceutical supplies is transparent; is free from conflict of interest and ensures best value for money.	31	2.45	.888
Supplier performance is measured and analyzed	31	2.00	.931
Valid N (list wise)	31		

(Source: Research Data, 2018)

4.2.3. Warehouse and Inventory Management

Warehouse and Inventory management practices were also assessed. The table presented below shows the results of the questionnaire on Warehouse and inventory management practices in ORHB. As it can be seen from the table, from all of the inventory management activities, correct identification of all pharmaceutical supplies in stock (2.65); ORHB has established proper inventory management mechanisms like FIFO and LIFO (2.71); medicines are arranged in proper places (2.52); ORHB has qualified staff to manage warehouse and inventory (2.71) are found to be well practiced ORHB. However, ensuring the lowest inventory driven cost; supporting warehouse and inventory management by appropriate WMS software and timely disposal of obsolete and expired medical supplies are found to be practiced to the lesser extent with mean values of 1.81, 1.74 and 1.68 respectively.

Table IV: Warehouse and Inventory Management Practice in ORHB

Warehouse and Inventory Management practice *Source: (UN Commission on Life-Saving Commodities' Report, 2012)*	N	Mean	Std. Deviation
ORHB has established correct identification of all pharmaceutical medical supplies in the stock using stock control cards, bin card, etc.	31	2.65	.709
ORHB has established proper inventory management mechanisms like FIFO or LIFO	31	2.71	.783
Medicines are arranged in proper places and are systematically arranged on shelves and other storage facilities per recommended guidelines	31	2.52	.811
ORHB inventory management practice ensures lowest inventory driven cost	31	1.81	.749
ORHB has a well-established replenishment planning and inventory deployment	31	2.10	.831
ORHB has established practice of Storage space optimization	31	2.06	.854
ORHB has established Warehouse Management System software for stock control	31	1.74	.682
ORHB has effective policies for timely disposal of obsolete and expired medical supplies	31	1.68	.748
ORHB has qualified staff to manage ware house and inventory	31	2.71	.739
ORHB provides capacity building training for warehouse staff	31	2.16	.779
Valid N (list wise)	31		

(Source: Research Data, 2018)

In general, Warehouse and inventory management activities are practiced moderately by ORHB, because it has ensured the correct identification of medical supplies in the stock, ORHB has established proper inventory management mechanisms like FIFO and LIFO; medicines are arranged in proper places; ORHB has qualified staff to manage warehouse and inventory.

4.2.4. Distribution System

Table V below reveals the respondents' opinion of what distribution system of ORHB looks like in distributing medical supplies to various destinations under the regional health bureau.

Table V: Distribution of Pharmaceuticals/Medical Supplies in ORHB

Distribution System *Source: (UN Commission on Life-Saving Commodities' Report, 2012)*	N	Mean	Std. Deviation
The transportation infrastructure of ORHB is adequate and reliable	31	2.10	.790
ORHB has adequate fund to support distribution costs	31	2.10	.790
Transporting medical supplies to health centers and health posts is timely and efficient	31	1.97	.706
ORHB has a well-established distribution plan and strategies	31	2.45	.624
There is strong collaborative decision making on the types and quantities of medical supplies to deliver to health facilities	31	2.45	.768
Valid N (list wise)	31		

(Source: Research Data, 2018)

As it can be understood from the above table, the ORHB moderately established distribution plan and strategies, and moderately established collaborative decision making

on the quantities of medical supplies to deliver to health facilities with mean score of 2.45, respectively. However, transporting medical supplies to health centers and health posts is not timely and is found to be less efficient with a mean score of 1.97.

4.2.5. Supply Chain Performance

Supply chain performance can be looked at as the extent by which supply chain's activities effectively and efficiently ensure realization of organization goals and objectives**.** Simchi-Levi & Kaminsky (2003) defined Supply chain performance as the operational excellence to deliver leading customer experience. Gunasekaren, Patel & Tirtiro (2001), also defined supply chain efficiencies as the level to which organizations involved in delivering value to customers create customer satisfaction by delivering the right product offering at the right time at the right place.

Braganza (2002) and power (2005) also noted that supply chain design; the level of effective integration of several functions at different organization levels is what achieves results. To this end, the respondents were asked to give their opinion on 4-point Likert scale measurement whether the current pharmaceutical supply chain performance of ORHB is effective and efficient or not.

As it can be seen from **table VI,** all of the variables designed to measure supply chain performance were rated low: overall efficiency in supply planning/forecasting (2.45), procurement (2.39), and warehouse and inventory management (2.32), distribution (1.94), cooperation and integration among supply chain members (2.35), ICT infrastructure (1.68) and efficiency and transparency in flow of information among pharmaceutical supply chain members (2.2.3). Above all, distribution system of medical supplies and also supporting pharmaceutical supply chain by IT infrastructure are practiced to a very low extent in ORHB.

Table VI: Supply chain Performance in ORHB

Supply chain Performance *Source: (UN Commission on Life-Saving Commodities' Report, 2012)*	N	Mean	Std. Deviation
ORHB has a well-established supply planning/ forecasting techniques in determining the type and quantity of medical supplies to be delivered to end users in an efficient manner	31	2.45	.568
ORHB has well developed procurement procedure for the procurement and delivery of medical supplies to end users in a timely and cost efficient manner	31	2.39	.615
ORHB has an efficient warehouse and inventory management system capable of receiving, thorough put and delivery of medical supplies to end users in a timely, cost efficient manner and reduced stock out	31	2.32	.599
ORHB has adequate, efficient and reliable transport facility to distribute medical supplies to end users in a timely and cost effective manner	31	1.94	.854
ORHB has ensured a strong cooperation and integration among supply chain members involved in pharmaceutical supply chain	31	2.35	.915
ORHB has well developed ICT infrastructure that supports pharmaceutical Supply Chain activities	31	1.68	.702
ORHB has ensured efficient and transparent information flow among pharmaceutical supply chain members	31	2.23	.920
Valid N (list wise)	31		

(Source: Research Data, 2018)

4.3. Reliability Test

In order to check reliability of the results, the study used Cronbach's alpha methodology, which is measure of internal consistency. Cronbach's alpha measures the average of measurable items and its correlation. Overall scales' reliability was tested by Cronbach's alpha, which should be above the acceptable level of 0.70 (Hair et al., 1998).

Table VII Alpha coefficient of actual test based on 31 respondents

Variables	Number of Items	Cronbach's alpha
Dependent Variable		
Supply chain performance	7	0.867
Independent variables		
Supply planning/forecasting	5	0.903
Procurement	5	0.739
Warehouse and Inventory Management	10	0.818
Distribution	5	0.785

(Source: Research Data, 2018)

According to George and Mallery Cronbach's (1951) Alpha reliability coefficient normally ranges between 0 and 1. The closer Cronbach's alpha coefficient is to 1.0, the greater the internal consistency of the items in the scale. The writers provide the following rule of thumb:' ≥.9=excellent; ≥.8good; ≥.7 acceptable≥.6 questionable; ≥.5 poor; and≤.5 unacceptable.

Reliability tests were undertaken and the Cronbach's Alpha values obtained for each independent variable are presented in **table VII** above**.** When we look at **Table VII,** the highest Cronbach's Alpha for independent variables vary from Supply planning/forecasting (.903) to procurement (.739). All computed Cronbach's Alpha values are >.7 and are acceptable.

4.4. Pearson's Correlation

The researcher used Pearson's correlation to analyze the strength of relationships between independent variables (components of supply chain management) and dependent variable (Supply chain performance) to find out the value of coefficient "r". The "r" value range between -1.0 and 1.0 ($-1 \leq r \leq 1$). The "r" value equal to 0 indicates that there is no relationship between dependent and independent variables. Positive "r" value shows positive relationship and negative "r" value shows negative relationship between the two variables. The strength of relation between dependent and independent variable is shown in the table below:

"r" value	**Strength of relationship**
0.80-1.00	Very strong
0.60-0.80	Strong
0.40-0.60	Moderate strong relationship
0.20-0.40	Weak relationship
0.00-0.20	Very weak relationship

(Source: Miller 1991)

4.4.1. Correlation Analysis of components of Supply chain and Supply Chain Performance

Table VIII Correlation matrix of components of Supply chain and Supply chain performance

		Supply chain performance	Supply planning	Procurement	Warehouse and inventory management	Distribution
Supply chain performance	Pearson Correlation	1	.662**	.749**	.707**	.722**
	Sig. (2-tailed)		.000	.000	.000	.000
	N	31	31	31	31	31
Supply planning	Pearson Correlation	.662**	1	.484**	.839**	.359*
	Sig. (2-tailed)	.000		.006	.000	.047
	N	31	31	31	31	31
Procurement	Pearson Correlation	.749**	.484**	1	.661**	.657**
	Sig. (2-tailed)	.000	.006		.000	.000
	N	31	31	31	31	31
Warehouse and inventory management	Pearson Correlation	.707**	.839**	.661**	1	.506**
	Sig. (2-tailed)	.000	.000	.000		.004
	N	31	31	31	31	31
Distribution	Pearson Correlation	.722**	.359*	.657**	.506**	1
	Sig. (2-tailed)	.000	.047	.000	.004	
	N	31	31	31	31	31

**. Correlation is significant at the 0.01 level (2-tailed).

A. Coefficient of Supply Planning/Forecasting and Supply Chain Performance

Table VIII portrays that there is strong correlation between supply planning and supply chain performance ($r=0.662$, $p=0.000$, $p<0.01$). The two variables are positively related. Accordingly, it is convincing to support the claim that supply planning/forecasting practice of the ORHB significantly affects supply chain performance of the bureau.

B. Coefficient of Procurement and Supply Chain Performance

The table VIII shows that there is strong correlation between procurement and supply chain performance ($r=0.749$, $p=0.000$, $p<0.01$). The two variables are positively related. From this, it can be understood that effective and efficient procurement management/practice improves or maintain better supply chain performance and its absence would significantly lead to poor supply chain performance.

C. Coefficient of Warehouse/Inventory Management and Supply chain performance

The table VIII also shows that there is strong correlation between warehouse and inventory management and supply chain performance ($r=0.707$, $p=0.000$, $p<0.01$). From this, it can be understood that effective warehouse and inventory management improves or maintain better supply chain performance and its absence significantly affects supply chain performance.

D. Coefficient of Distribution System and Supply Chain Performance

As it can be seen from **table VIII,** there is strong correlation between distribution system and supply chain performance ($r=0.722$, $p=0.000$, $p<0.01$). This implies that effective and efficient distribution system leads to effective supply chain performance.

4.5. Multiple Linear Regression Analysis

Regression is the determination of a statistical relationship between two or more variables (Kothari 2004). This regression analysis is conducted to know by how much the independent variable explains the dependent variable. The researcher tested the

hypotheses of the research using regression analyses as this technique was considered most appropriate and more conservative compared to covariance based modeling approaches, due to the complexity of the model and the available data points, and the great robustness of this technique (Dubey et al., 2015). The regression was conducted between components of supply chain management (independent variables) and supply chain performance (dependent variable). The results of the regression analysis are presented as follows.

4.5.1. Multi Collinearity Test

Multi collinearity test of independent variables was conducted to check whether the assumptions for regression analysis are met or not. According to Mendard, (1995), tolerance should be more than 0.2 and VIF (Variance Inflation Factor) should be less than 10 (Myers, 1990).

Table IX Multi Collinearity Test of independent variables

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	Supply planning	.286	3.494
	Procurement	.417	2.397
	Warehouse/inventory management	.208	4.809
	Distribution	.557	1.795

Source: Research Data (2018)

The result in **table-IX** above shows that the collinearity between independent variables has no serious problem since the value of tolerance for all independent variables is greater than 0.1 and all VIF is less than ten (VIF<10). Therefore, the assumption for regression analysis are met.

4.5.2. Stepwise Multiple Regression Analysis: ANOVA

Table X: Stepwise Multiple Regression Analysis: ANOVA

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.173	4	1.793	20.469	.000[a]
	Residual	2.278	26	.088		
	Total	9.451	30			

a. Predictors: (Constant), Distribution, Supply planning, Procurement, Warehouse and inventory management

b. Dependent Variable: Supply chain performance

(Source: Research Data, 2018)

As it can be seen from table **X** above**,** the significant value (p-value) is 0.000 which is less than 0.05. Furthermore, **Table XI** below shows the model summary of the regression analysis and it reveals that there is a significant overall contribution of the four components of supply chain system on supply chain performance.

Table XI: Stepwise Multiple Regression Analysis: Results of Model Summary

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.871[a]	.759	.722	.29599

a. Predictors: (Constant), Distribution, Supply planning, Procurement, Warehouse and inventory management

(Source: Research Data, 2018)

As it can be seen from the table above, the R^2 value is 0.759. This indicates that 75.9% of the independent variables (four components of supply chain management system) contributed to overall pharmaceutical supply chain performance in the bureau. In other words, 75.9% of the total variance of the pharmaceutical supply chain in the health bureau is explained by the four components of the supply chain system.

4.5.3. Stepwise Multiple Regression Analysis: Results of Coefficient

Table XII: Stepwise Multiple Regression Analysis: Results of Coefficient

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.023	.291		.080	.937
	Supply planning	.315	.143	.396	2.200	.037
	Procurement	.331	.148	.333	2.237	.034
	Warehouse and inventory management	-.045	.250	-.038	-.182	.857
	Distribution	.394	.134	.380	2.944	.007

a. Dependent Variable: Supply chain performance

(Source: Research Data, 2018)

Table above shows that Beta coefficient for Supply planning is 0.396 (β=0.396), Procurement is 0.333 (β=0.333), Warehouse and Inventory management -0.038 (β=-0.038), Distribution-0.380 (β=-0.380). As it can be seen from the table, all independent variables have linear relationship with dependent variable (supply chain performance). The standardized coefficient Beta value shows the sequence of contribution of individual independent variables on supply chain performance. This demonstrates that supply

planning is dominant component of pharmaceutical supply chain that influences supply chain performance in the bureau followed by distribution of medical supplies. Warehouse and inventory management is statistically insignificant and found to be not affecting supply chain function of ORHB because the p-value is 0.857 which is not less than 0.05. The prediction equation is supply chain performance =0.396 (supply planning) + 0.333 (Procurement) -0.038 (Warehouse and inventory management) +0.380(distribution) + 0.023 (Constant). From **table XII**, it can be understood that estimated regression coefficients are: $\beta 0=0.023$; $\beta 1=0.315$, $\beta 2=0.331$, $\beta 3= -0.045$, $\beta 4=-0.394$.

CHAPTER FIVE
SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1. Summary of Major Findings

Descriptive statistics was used to analyze the demographic characteristics of the respondents and responses provided by the respondents on the main questions using mean and standard deviation. Accordingly, respondents who account for 77.4 % were male respondents. Female representation in this study was 22.6%. With regards to age, the workforce population is largely dominated by the age group 31-40 comprising 61.3%. Respondents who had length of service 5 years and above category made up the majority which comprised 22 (71 % of the entire sample); which implies that such a relatively longer year of services might have helped the respondents to possess rich experience and better understanding about the various issues related to Pharmaceutical Supply Chain Management System of Oromia Health Bureau. Finally, 18 respondents (58.1%) had first degrees which dominate the population sample.

Cronbach's Alpha was used to test the reliability of the actual test; and it was found that computed Cronbach Alpha for all variables were above 0.7 which makes the reliability test acceptable. Moreover, Pearson's Correlation was used to determine the relationship between the four functions of supply chain management (supply planning, procurement, Warehouse and Inventory Management and distribution system) and pharmaceutical supply chain performance. The result has shown that there is a significant relationship between four of the supply chain system components and pharmaceutical supply chain performance (p-value=0.000).

Correlation analysis result has shown that there is strong correlation between supply planning and supply chain performance ($r=0.662$, $p=0.000$, $p<0.01$). The two variables are positively related. The analysis also shows that there is strong correlation between

procurement and supply chain performance (r=0.749, p=0.000, p<0.01) and warehouse and inventory management and supply chain performance (r=0.707, p=0.000, p<0.01). The variables are positively related with supply chain performance. Finally, the analysis has shown positive relationship between distribution system and supply chain performance (r=0.722, p=0.000, p<0.01).

Furthermore, multiple regression analysis was used to identify the dominant component of supply chain that is currently affecting pharmaceutical supply chain performance of ORHB. The p-value for supply planning/forecasting was 0.037 which is less than 0.05. Similarly, the p-value for procurement was 0.034 which is again less than 0.05. However, the p-value for warehouse and inventory management was 0.857 which is greater than 0.05. Finally, the p-value for distribution system was 0.007 which is less than 0.05. These results show that supply planning/forecasting is a dominant component that is enormously affecting pharmaceutical supply chain (β=0.396) followed by distribution system (β=0.380) and procurement 0.333. However, warehouse and inventory management is found to be not causing serious problem to the pharmaceutical supply chain performance of the health bureau.

5.2. Conclusion

The study has achieved its objective and has shown that there is a significant relationship between the four functions of supply chain management (supply planning, procurement, Warehouse and Inventory Management and distribution system) and pharmaceutical supply chain performance.

Therefore, in general, it can be concluded that out of the four components of pharmaceutical supply chain management functions in ORHB, supply planning/forecasting, procurement and distribution system practice are significantly affecting pharmaceutical supply chain management of the bureau whereas warehouse and inventory management is not. This is in line with (Management Science for Health

(MSH) Report, 2012; Foster S. et. al (2006); Seiter A, 2010) that clearly stated that the root causes of stock outs at the health clinics may be due to problems in procurement, forecasting and requisitioning by the region or district, tardiness in ordering or poor forecasting by the clinics, or lack of transport at any stage in the system.

Thus, it can also be concluded that the findings of study would help the Regional Health Bureau to develop appropriate pharmaceutical supply chain system to address the needs of end patients by making special focus on the dominant components that are enormously affecting the pharmaceutical supply chain performance of the bureau: supply planning/forecasting primarily, and distribution system management and procurement practices respectively.

5.3. Recommendations

The need for fundamental reform of the supply chains for health products in developing countries is more necessary now than at any time in the past. Bold and concerted action is required to create a supply chain that is responsive to the needs of patients in a cost-effective manner. Thus, the regional health bureau must develop appropriate pharmaceutical supply chain system which is efficient, effective and responsive to the needs of end users/ patients. Based on the result in chapter four, it was found that supply planning is dominant component of pharmaceutical supply chain system that is significantly affecting pharmaceutical supply chain performance of ORHB. Therefore, the regional health bureau is advised to emphasize more on this factor and should be able to create efficient and responsive pharmaceutical supply chain. It is critical to know the rate at which products are being consumed at each clinic/health facility in order to create supply processes that can guarantee the highest level of service and minimize stock outs.

Based on the result, the second component that has influence on ORHB pharmaceutical supply chain was distribution system. Therefore, in order to create efficient and effective pharmaceutical supply chain, the bureau should be able to design proper distribution

system capable of addressing needs of end user/patients. It is critical for the bureau to exactly know to who (locus of decision) decides how much stock of each product to ship to Health centers and clinics and based on what information (information sets for decision).

Furthermore, the study in chapter four multiple regression analysis shows that pharmaceutical supply chain performance of ORHB is also affected by procurement practice of the bureau (β=0.333) on the third place. Given the long procurement cycles, any delays in procurement initiation create a cycle of uncertainty in the system and result in system-wide stock outs. Thus, ORHB is advised to create procurement practice that is responsive and has shorter lead-time for the delivery of medical supplies to various destinations under the region.

5.4. Further Research Directions

This study was only to examine the four factors affecting pharmaceutical supply chain management: supply planning, procurement, warehouse and inventory management and distribution. However, there are also other components that can influence pharmaceutical supply chain performance. Thus, this study provides suggestion for future researchers to investigate other factors that can influence or affect pharmaceutical supply chain.

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APPENDIX A

RESEARCH QUESTIONNAIRE

Dear Sir/Madam,

Thank you in advance for becoming my respondent in this research.

I am **MA student** of **Addis Ababa University, School of Commerce**, and I kindly request your assistance in providing me with the necessary responses towards my research on "**Factors Affecting Supply Chain Performance in Public Health Sector: The Case of Oromia Regional Health Bureau."** The questionnaire consists of three sections: Demographic characteristics, questions related to supply chain performance and four components of supply chain management system (supply planning/forecasting, procurement process, warehouse and inventory management, and distribution system that influence pharmaceutical supply chain.

I will like to assure you that this study is purely for academic purposes and all the answers you provide here will be treated with the highest level of confidentiality. I; therefore, covet your objectivity and clarity to make this study successfully conducted for its intended purpose.

Yours faithfully,

Keno Feyisa Bona

Section A: Demographic Characteristics

This section is aimed to obtain information related to your background. (Please tick (√) the box which is applicable.

1. Gender	Male	
	Female	
2. Age	21-30	
	31-40	
	41-50	
	51 and above	
3. Educational level	10+1	
	10+2	
	10+3	
	Level IV/Diploma	
	BA/BSC	
	MA/MSC	
4. Year of service	Less than 1 year	
	1-3 years	
	3-5 years	
	Above 5 years	

Section B: Four components of supply chain management system and their influence on Pharmaceutical supply chain performance of ORHB

This section contains 20 statements related to the influence of four components of supply chain management on pharmaceutical supply chain performance of ORHB. (Please tick (√) the box which you think is appropriate. The four point Likert Scale (1-4) shows different states of agreement in which: **1: Strongly Disagree (SDA); 2: Disagree (DA); 3: Agree (A); 4: Strongly Agree (SA)**

S/N Statements

	(1) Supply Planning/Forecasting	1	2	3	4
1	ORHB has a well-established supply planning/ forecasting tools and techniques				
2	Supply planning/forecasting of pharmaceutical commodities is based on adequate and accessible data				
3	Supply planning/forecasting practice in ORHB is accurate in predicting the quantity needs of medical supplies				
4	There is strong coordination between supply planning and technical staff				
5	Supply planning/forecasting is done by expertise sharing information from all pharmaceutical supply chain actors				
	(2) Procurement Process	1	2	3	4
1	Medical supplies are procured based on proper procurement plan				
2	Delivery of medical supplies is predictable and lead time for delivery is short and quality is ensured				
3	Procurement practice in ORHB is less bureaucratic flexible				
4	Tendering process in procurement of pharmaceutical supplies is transparent; is free from conflict of interest and ensures best value for money.				
5	Supplier performance is measured and analyzed frequently				

	(3) Warehousing and Inventory Management	1	2	3	4
1	ORHB has established correct identification of all pharmaceutical medical supplies in the stock using stock control cards, bin card, etc.				
2	ORHB has established proper inventory management mechanisms like FIFO or LIFO				
3	Medicines are arranged in proper places and are systematically arranged on shelves and other storage facilities per recommended guidelines				
4	ORHB inventory management practice ensures lowest inventory driven cost				
5	ORHB has a well-established replenishment planning and inventory deployment				
6	ORHB has established practice of Storage space optimization				
7	ORHB has established Warehouse Management System software for stock control				
8	ORHB has effective policies for timely disposal of obsolete and expired medical supplies				
9	ORHB has qualified staff to manage ware house and inventory				
10	ORHB provides capacity building training for warehouse staff				
	(4) Distribution	1	2	3	4
1	The transportation infrastructure of ORHB is adequate and reliable				
2	ORHB has adequate fund to support distribution costs				
3	Transporting medical supplies to health centers and health posts is timely and efficient				
4	ORHB has a well-established distribution plan and strategies				
5	There is strong collaborative decision making on the types and quantities of medical supplies to deliver to health facilities				

Section C: Supply Chain Performance

This section contains 7 statements related to supply chain performance. (Please tick (√) the box which you think is appropriate. The four point Likert Scale (1-4) shows different states of agreement in which:

1: Strongly Disagree (SDA); 2: Disagree (DA); 3: Agree (A); 4: Strongly Agree (SA)

S/N	Statements	1	2	3	4
1	ORHB has a well-established supply planning/ forecasting techniques in determining the type and quantity of medical supplies to be delivered to end users in an efficient manner				
2	ORHB has well developed procurement procedure for the procurement and delivery of medical supplies to end users in a timely and cost efficient manner				
3	ORHB has an efficient warehouse and inventory management system capable of receiving, thorough put and delivery of medical supplies to end users in a timely, cost efficient manner and reduced stock out				
4	ORHB has adequate, efficient and reliable transport facility to distribute medical supplies to end users in a timely and cost effective manner				
5	ORHB has ensured a strong cooperation and integration among supply chain members involved in pharmaceutical supply chain				
6	ORHB has well developed ICT infrastructure that supports pharmaceutical Supply Chain activities				
7	ORHB has ensured efficient and transparent information flow among pharmaceutical supply chain members				

Please provide any factor you think will affect the SCM functioning of ORHB.

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**********THANK YOU FOR YOUR COOPERATION**********