
# ADDIS ABABA UNIVERSITY SCHOOL OF COMMERCE

## DEPARTMENT OF LOGISTICS AND SUPPLY CHAIN MANAGEMENT

## MEASURING SUPPLY CHAIN PERFORMANC OF PHARMACEUTICALS USING SUPPLY CHAIN OPERATION REFERENCE (SCOR) MODEL: THE CASE OF BLACK LION SPECIALIZED HOSPITAL

**BY**

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## DECLARATION

I the undersigned, hereby declare that the work which is presented in this thesis entitled *''measuring supply chain performance of pharmaceuticals using supply chain operation reference (scor) model: the case of black lion specialized hospital''* is the original work of my own effort and done under the guidance of Dr. Matiwos Ensermu (Phd), and that all the sources of materials used for the study have been duly acknowledged. I further confirm that the thesis has not been submitted either in part or in full to any other university for the purpose of earning any degree.

Declared by:

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Student Signature Date

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**LOGISTICS AND SUPPLY CHAIN MANAGEMENT**

**ENDORSEMENT**

This thesis has been submitted to Addis Ababa University School of Commerce Graduate Studies for examination with my approval as a university advisor.

Dr.Matiwos Ensermu (Phd) _____ _____

Advisor Signature Date

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## LIST OF ACRONYMS & ABBREVIATIONS

| | |
|---|---|
| BLSH | Black lion specialized hospital |
| EPSA | Ethiopian pharmaceutical supply agency |
| FMOH | federal ministry of health |
| IPLS | integrated pharmaceutical logistics system |
| KPI | key performance indicators |
| PSC | pharmaceutical supply chain |
| SCOR | Supply Chain Operations Reference |
| SCC | Supply chain council |
| SCM | Supply chain management |
| SCPM | Supply chain performance measurement |
| WHO | world health organization |

# ABSTRACT

Pharmaceutical supply chain (PSC) is the overall activities involved with the manufacturing of pharmaceuticals to delivery of products to the end user through supply chain management system. Supply chain performance measurement is key process in evaluating supply chain from this supply chain operation reference (SCOR) model is commonly used. Objective of the study is to assess the pharmaceutical supply chain performance of Black lion specialized hospital (BLSH) with SCOR analysis. Descriptive approach is used in the study. Purposive sampling technique is used to collect data. Structured questioners & observations were some of the tools used in the data collection process. General assessment of the supply chain activities of BLSH shows that there is an improvement in documentation and requisition formats and procedures are being followed. Results from SCOR analysis indicates the hospital supply chain is working well with respect to supply chain reliability but low in assessing and acting on customers complain and satisfaction. Moreover it reviles the hospital is dependable on few supplier ability to respond to demand variation and seasonality is not satisfactory. The study shows that cost associated to supply chain is not separated from other activities of the hospital and data's on transportation and handling cost are unpredictable.



**Key words**: pharmaceutical supply chain, SCOR, supply chain performance

# CHAPTER ONE: INTRODUCTION

## 1.1 Background of the study

Pharmaceutical supply chain (PSC) is the overall activities involved with the manufacturing of pharmaceuticals to delivery of products to the end user through supply chain management system. The activities include, sourcing of row material, manufacturing, transportation, storage and delivery to end user. Four main components of the supply chain includes: producers, purchasers, providers, and patients (Brian, 2011).

Health care supply chain is unique from other supply chain since it's a matter of life and death. It involves monitoring the acquisition of products and their path from origin to destination. On top of this managing health care supply chain creates significant expense for health care providers. Recent survey found that it's the second biggest expense that providers have. When prescription drugs, medical devices and other medical supplies fall in to optimized supply chain, health care providers see their cost lowered, their revenue enhanced and most importantly, their quality of care improved. To optimize the supply chain, providers need to address the biggest challenges they face in the supply chain of this valuable drugs and medical supplies (Detlef *et al*, 2011)

Hospitals are complex organizations providing a multiple of service to patients, physicians and staffs. The main logistics service includes pharmaceutical supply chain which involves selection, quantification, procurement, storage and dispensing of pharmaceuticals and medical supplies. Black lion specialized hospital, which was founded in 1972 is one of the largest serving hospital of the country which serves approximately 400,000 patients a year. The performance measurement system in the SC is important in the joint efforts of the stakeholders in the logistics system under the premise that generates added value to customers in the short, medium and long term, better-looking global local optima service (Sisay, 2017).

According to Ramdas *et al*.2003, improving the performance of the SC is a continuous process that requires an analytical system for measuring performance and a mechanism for the implementation of key performance evaluations (KPIs).

The Supply Chain Operations Reference (SCOR) model was developed by the Supply-Chain Council (SCC) to assist firms in increasing the effectiveness of their supply chains, to provide

a process-based approach to SCM. As a tool to address, improve, communicate and evaluate the performance of SC. The SCOR model provides a common process oriented language for communicating among supply-chain partners in decision areas of plan, source, make, and deliver. Recently, the details for the decision area of return have been added to the SCOR Version 5.0 model (Lockamy *et al*, 2004 and Richardo, 2013).

### 1.2 Statement of the problem

The pharmaceutical supply chain is complex and unique by itself since it operates with the availability of valuable and lifesaving pharmaceuticals and medical supplies. Moreover, it involves many organizations that play differing roles. In Supply chain performance measurement the main purpose is to get information for top management to decision making, evaluate the level of service provided and customer satisfaction. In 2004 Gunasekaran *et a*l introduced six metrics for measuring SCM capability and performance. Metrics are based on the following SCM processes: plan, source, make/assemble and delivery/customer (Gunasekaran *et al*, 2004).

In the health care industry there is no debate with the need for overnight shipping. Unexpected situations, disease outbreak or disasters might happen and hospitals have to deal with the situation no matter what the cost is. Forecasting demand based on previous year consumption might not give us exact figure of medications to procure in the presence of unexpected demand. This results in frequent shortage (stock out) of valuable pharmaceuticals to patients and inventory holding cost and expire for over stocked pharmaceuticals. Since black lion serves patients from all over the country, demand forecasting is difficult in considering different disease pattern and disease out breaks.

According to WHO report in 2004, one third of the world's population suffers with lack of access to essential pharmaceutical items, diagnostic facilities and health care system. This proportion greatly increases to fifty percent in the poorest part of Africa and Asia. Even though, the major causes for poor availability and hence accessibility of pharmaceutical items remains complex, major contributing factors includes unaffordable price of pharmaceutical items, irrational drug use, shortage of budget, unreliable supply and distribution system to make essential pharmaceutical items available for patients. (WHO, 2004)

The Ethiopian pharmaceutical supply agency (EPSA) is the only supplier that procure and distribute pharmaceuticals to all government hospitals and health institutions. Its capability to meet variable needs of all health institutions based on different disease pattern of different regions is in question. EPSA deliver pharmaceuticals mostly with cottas rather than actual demand forecasted (PFSA SOP, 2010).

Black lion Specialized hospital (BLSH) faces frequent shortage of valuable medications especially after midterm of the year and the problem gets worst when EPSA perform annual inventory of pharmaceuticals for more than a month. Moreover, Dependency on single supplier and unable to perform emergency order from other suppliers worsen stock out of these valuable drugs. Since stock outs at health facilities can result in treatment interruption that can quickly lead to drug resistance or missed opportunities for diagnosis, significant resource for procurement and distribution of essential drugs. Patients frequently complains on unavailability, most of the patients are with chronic disease with lifelong medical treatment, are from rural area and couldn't come back frequently or can't afford to buy it (Bunting, 2013).

The health system's cost saving goal to address other area of care is also another challenge in the hospitals supply chain of pharmaceuticals. Budget constrains limits procurement and availability of pharmaceuticals. One of the most important issues affecting the sustainability of healthcare service in Canada is medicine cost. They represent the third largest budget item for the Canadian health care system which is 32 billion in 2011 (Romero, 2013).

Despite high sales rate and being the 1$^{st}$ biggest revenue source for Black lion hospital, the pharmacy department is on debt of procured pharmaceuticals from EPSA because the sales obtained from pharmaceuticals is used to pay for duties of health professionals and other activities than paying to PSA (Black lion hospital directory).

Lack of Integration across care delivery system is another challenge the hospital is facing. Supply chain integration with revenue capture, quality and IT are important in terms of cost effective and efficient process. To solve these problems in public health facilities, EPSA introduced integrated pharmaceutical logistics system (IPLS) since 2010. IPLS is single pharmaceutical reporting and distribution system based on the overall mandate and scope of EPSA. It ensures the patient gets pharmaceuticals they need and fulfill the 6 rights of SCM.

The right product, in the right quantity, of the right quality, at the right place, at the right time, and for the right cost (PFSA SOP, 2010).

Data shortage is the other main challenge the hospital is facing. Actionable data is important for institution to see what they are missing. Data's on consumption pattern, available budget, stock level, treated disease pattern, patient complain feedback and level of satisfaction are key information for tope level decision making and all the parties involved in the supply chain. Application of IT system throughout the supply chain is important for cost saving and efficient process (Romero, 2013).

Physician's preference on the type of product they use or prescribe might not go well with available pharmaceuticals. They may not understand the associated cost of product with patient's affordability and availability in the hospital. Patients may need to buy branded medications at privet pharmacy at higher cost this intern make the service unaffordable, tedious and lower patient satisfaction (Romero, 2013).

Measuring supply chain performance is not as such simple as traditionally known sets of performance measurement that only focuses on financial measures. Supply chain activities like sourcing, producing, inventory and distribution and associated factors that affect supply chain performance and meet the maximum service level provided by the company. The pharmaceutical industry is not renowned for its supply chain management capabilities, unlike many other highly publicized industries that have profitably exploited their supply chains (Adane, 2017).

A study done by Amare S. on BLSH, IPLS implementation in the Hospital is encouraging only with respect to some measurements such as availability of logistics reporting and recording tools and stock keeping logistic formats, providing supervision and training, availability of drugs and some measurements of logistic system performance such as having an acceptable resupply period and less frequent emergency order trend. Even though the hospital showed good logistic and inventory system management practice and logistic system performance with respect to the above mentioned measurements, much gap is observed in some other logistic and inventory system management practice and logistic system performance measurements such as in proper utilization of the logistics recording and reporting tools, LMIS data quality, and perceived order fill rate. In addition, the study showed that certain gaps are observed in Stock status information & Storage condition

measurements that include, availability of expired items, gaps in storage conditions for ARV drugs store (Sisay, 2017).

Based on the above facts measuring the supply chain performance of BLSH is crucial to solve supply chain related issues and challenges that in turn impacts the success of health service delivery and patient satisfaction with cost saving and less wastage of pharmaceuticals in the hospital. More over the research will try to answer research questions related to the level of SC performance of the hospital, most important SC planning practice of the hospital and how the supply chain performing of the hospital is in terms of planning, sourcing, making, and delivery and return aspects of SCOR.

## 1.3 Research question

1) What does the pharmaceutical supply chain practice with in the Hospital looks like?
2) What is the level of pharmaceutical supply chain responsiveness of the hospital?
3) How is the level of pharmaceutical supply chain performance of the hospital in terms of supply chain reliability?
4) How flexible is the pharmaceutical supply chain of the hospital?
5) How is cost and asset management of pharmaceutical supply chain in the hospital

## 1.4 Objectives of the study

### 1.4.1 General objective

The general objective of the study is to measure the supply chain performance of pharmaceuticals in Ethiopia the case of black lion specialized hospital with SCOR model

### 1.4.2 Specific objectives

1. To measure pharmaceutical supply chin performance of the hospital in terms of SCOR categories of plan, source, make, deliver and return.
2. To measure the pharmaceutical supply chain reliability of the hospital
3. To measure the pharmaceutical supply chain responsiveness of the hospital
4. To measure the pharmaceutical supply chain flexibility of the hospital
5. To measure the pharmaceutical supply chain cost and asset management of the hospital

## 1.5 Significance of the study

In delivering health care service, ensuring availability of valuable drugs and medicals to each patient is important to avoid treatment interruption that can quickly lead to drug resistance or missed opportunities for diagnosis, wastage of significant resource for procurement and distribution of essential drugs (Bunting, 2013).

To avoid such consequences, the supply chain of a hospital must function properly. Hence, this study will help to examine the supply chain performance of the hospital in terms of SCOR. Moreover, it help to increase the understanding of the use of SCOR model in the evaluation of SC performance of hospitals in Ethiopia the case of Black lion specialized hospital and how other hospitals can improve and develop SCOR model in their context for better performance of their supply chain.

In addition, this study contribute in academics & training by providing important insights to learners and trainees on possible challenges of pharmaceutical supply chain, how SCOR model could be implemented in performance measurement and on what actions should be taken to enable proper functioning of PSC.

On top of this, since there are no enough studies in the area, this study is believed to provide a comprehensive starting point and will help as a source of information for future research that is aimed to go in-depth to the subject matter and also for any study that is aimed to assess the supply chain performance with SCOR model and to sort out any other PSC challenges that has not been identified in this study.

## 1.6 The scope of the study

The study is focused on measuring the pharmaceutical supply chain performance of BLSH with SCOR model. Because of the wider nature of hospital logistics the scope of the study is limited to pharmaceuticals and medicals supply only. The geographical scope of the research is Black lion specialized hospital and addresses the pharmaceutical supply chain Performance from SCOR model perspective.. Despite many parties involved in the supply chain of the hospital, it only included the view of staffs working on the hospital. The study does not include the view of its supplier (EPSA) and end customers (patients).

## 1.7 Limitations of the study

The encountered limitation from the study were lack of similar studies in Ethiopia to compare and contrast and make comparative conclusions. In addition it did not include the view of its supplier (EPSA) and can't discuss on supply chain performance of the hospital from EPSA perspective.

Other limitation were sample size determination where number of respondents with supply chain analysis knowledge can't be determined.

### 1.8 Definitions of terms

PSC: Pharmaceutical supply chain (PSC) is the overall activities involved with the manufacturing of pharmaceuticals to delivery of products to the end user through supply chain management system.

SCOR: The supply chain operation reference (SCOR) model is a framework which supports communication between supply chain partners and enhances the effectiveness of supply chain management, technology, and related supply chain improvement activities

IPLS: is single pharmaceutical reporting and distribution system based on the overall mandate and scope of PSA. It insures the patient gets pharmaceuticals they need and fulfill the 6 rights of SCM. The right product, in the right quantity, of the right quality, at the right place, at the right time, and for the right cost

### 1.9 Organization of the study

The study was organized in five chapters. Chapter one includes the introductory part of the study, the background of the study, and statement of the problem along with the research questions and objectives of the proposed study.

Chapter two deals with the review of the literature related to pharmaceutical supply chain and SCOR model.

Chapter three deals with detail account of research design and methodology that was employed in sampling and data collection.

The analysis of the study data, presentation of the results and corresponding discussions is presented under chapter four.

Chapter five concludes the thesis by providing brief conclusions and relevant suggestions on the basis of the findings of the study.

# CHAPTER TWO: REVIEW OF RELATED LITRATURE

## 2.1 Theoretical review

### 2.1.1 Health care supply chain

Health supply chains can be characterized by different modes of integration which are: Integration and co-ordination of processes, information flows, planning processes, integration of intra- and inter organizational processes, integration of market approach and market-development. Hospital supply chain is divided in to two areas which are, supply chain of pharmaceuticals and medical products, and supply chain of non-medical products that aids in providing service to the patient (Yongyi, 2014).

The hospital supply chain includes four areas. These are goods and services planning, procurement and contracting, materials management and working capital management. To set up an extra ordinary supply chain, hospitals need to establish an integrated governance system, employ dynamic processes, and automate their IT systems. Integration of the internal and external hospital supply chain may reduce the costs associated with supply chain almost half. It is believed that staffs in any hospital spend 10% of their time performing logistics tasks instead of taking care of patients (Nawshad *et.al*, 2016*).*

Hospital Supply Chain Management is a set of approaches to efficiently integrate suppliers or vendors, transport, hospital services (including outpatient, emergency, inpatient, laboratory, radiology, stores and purchase, food, laundry and medicines or equipment) to achieve Total Quality Management (TQM) in health care services by optimum utilization of resources SCM in hospitals involves the internal chain, including patient care unit, hospital storage, patient and the external chain, including vendors, manufacturers, and distributors. Healthcare SCM processes have three types of flows: physical product flow, information flow, and financial flow (Yongyi, 2014 and Kazemzadeh *et al*, 2014).

Healthcare supply chains are characterized by multiple stakeholders that work together in order to ensure the flow of products and services. Inside and outside hospital, medicine management requires a wide variety of human intensive processes which are poorly supported by technology. This results in an increased of workload and a higher possibility of errors. Moreover, healthcare

supply chains are high regulated and must respect a number of standards and procedures. In fact, national and international healthcare organizations and government have defined several standards for the distribution, storage, preparation and administration of medical products and materials. Finally, healthcare supply chains are vulnerable to terrorism and criminal facts. According to many observers, this industry experiences a strong possibility of being affected by the presence of counterfeited products. From the above-mentioned reasons, one can conclude that healthcare supply chains are indeed inherently complex (Romero, 2013).

### 2.1.2 pharmaceutical supply chain

Pharmaceutical supply chains are different because they usually have large and extended global pipelines requiring high levels of product availability with high uncertainty in supply and demand. In order to sustain and expand the successful interventions, these supply chains need to be made more robust and flexible through better management and increased investment of resources to achieve supply chain optimization (Ames, 2011 and Nilay, 2004).

The management of drug supply is organized around five basic functions of the Medicines Management cycle namely, selection, quantification, procurement, distribution, and use. At the center of this cycle is a core of management support systems, which include organization, financing and sustainability, information management, human resource and quality assurance management. The selection of pharmaceuticals is a basic function of the qualified hospital pharmacist who is charged with making decisions regarding products, quantities, product specifications, and sources of supply. Although the pharmacist has the authority to select a brand or source of supply, with economic considerations and quality (Ames, 2011 and Javid *et.al*, 2017).

In selecting a vendor, the hospital must consider price, terms, shipping times, dependability, quality of service, returned goods policy, and packaging. It's estimated that there are 3000-4000 drugs, registered in any country of which almost 70% are non-essential. National list of essential medicines should have 300-400 drugs. , selection of essential drugs is very important and is considered as a crucial step in ensuring access to essential drugs and in promoting rational drug use (Javid *et.al*, 2017)

Quantification is the process of estimating needs for quantities of specific health commodities during a specific period of time. Accurate quantification requires information from various sources including the consumption data, epidemiological (morbidity) data, prescription patterns, minimum and maximum stock levels, frequency of stock-outs, and length of the procurement cycle. Delivery and distribution of drugs at various levels is not possible without effective drug procurement and inventory control. Various medicine management tools help managers with the process of distributing drugs and supplies to health facilities and ultimately to patients by following a series of steps, forecasting needs, tendering, ordering, receiving, storing warehousing, and distribution (Javid *et.al*, 2017 ).

### 2.1.3 supply chain performance

Supply Chain Performance Measures (SCPM) serve as an indicator of how well the SC system is functioning. Measuring SC performance can facilitate a greater understanding of the SC and improve its overall performance. Effective performance measurement systems characterized as Inclusiveness (measurement of all pertinent aspects), Universality (allow for comparison under various operating conditions), Measurability (data required are measurable) and Consistency (measures consistent with organization goals) (Kazemkhanlou *et al*., 2014 and Sillanpaa, 2012).

A performance measurement system offers the necessary information for the monitor, control, evaluation, and feedback function for operations management. It might help as a motivation driver and a driver for continuous improvement and help achieve strategic objectives through measuring key performance indicators (KPI) of the supply chain (Nicolas G. *et.al,* 2015 and Hosein. *et al,* 2013)

The supply chain operation reference (SCOR) model is a framework which supports communication between supply chain partners and enhances the effectiveness of supply chain management, technology, and related supply chain improvement activities. The model provides a unique framework that links performance metrics, processes, best practices, and people into a unified structure. It was developed in 1994 by the Supply Chain Council (SCC) as a tool to address, improve, communicate and evaluate the performance of SC and assist an organization in its supply chain performance.

The model has five attributes, which are Supply chain delivery reliability, Supply chain responsiveness, Supply chain agility, Supply chain costs and Supply chain asset management efficiency. It describes the business activities of the SC in order to meet customer demand, from the simplest to the most complex, covering many different industries and projects (Supply Chain Council, 2010 and Samuel, 2008).

The SCOR model provides a common process oriented language for communicating among supply-chain partners in decision areas of plan, source, make, and deliver. Recently, the details for the decision area of return have been added to the SCOR Version 5.0 model (Archie *et al*, 2004 and Richardo 2013).

The SCOR model published twelve subsequent versions of the original by updating analysis dimensions related to performance which describe the performance of SC, processes which explain how the SC is configured, practices to see unique ways to configure the SC processes and in terms of people assessing needs, and availability of skills gaps in the workforce SC.

| Performance attribute | | Performance attribute definition | Measurement metrics |
|---|---|---|---|
| 1 | Supply chain delivery reliability | The performance of the supply chain in delivering the correct product, to the correct place, at the correct condition and packaging in the correct quantity, with the correct documentation, to the correct customer | on-time delivery, right quality (perfect order fulfilment), right quantity (fill rate) |
| 2 | Supply chain responsiveness | The speed at which tasks are performed. | Order fulfilment lead time |
| 3 | Supply chain agility (flexibility) | The agility of a supply in responding to market place changes to gain or maintain competitive advantage | Response rate<br><br>Production flexibility |

| | | | |
|---|---|---|---|
| 4 | Supply chain cost | Costs associated with operating the supply chain | Cost of goods sold<br>Total supply chain management costs |
| 5 | Supply chain asset | Effectiveness of an organization in managing assets to support demand satisfaction. This includes the management of all assets: fixed and working capital | Cash to cash cycle |

Table 2.1: Supply chain attributes and SCOR key performance indicators (Supply Chain Council, 2010)

According to SCOR model version 12.0, the supply chain of an organization can be assessed based on five categories of processes which are planning, procurement, manufacturing, distribution and return. The model encompasses all customer interactions including from order to the payment of the bill, all material transactions from the first suppliers to the last customers, and all interactions with the marketplace which is from prediction of aggregate demand to the fulfillment of each request. The SCOR model is structured in 4 levels (Archie *et al*, 2004, Delipinar. *et al*, 2016 and Richardo 2013).

- Level 1: defines the models scope and content by setting core process of plan, source, make, deliver and return.
- Level 2: contains four process categories explains the main process categories that exist in real and created supply chain in an enterprise.
- Level 3: includes information for the supply chain management to plan source and build goals for supply chain management strategy. This also consists of definitions, benchmarks, and system software capabilities.

- Level 4: centers on implementation. Since the supply chain management implementations are special to each company, the specific parts of level 4 are not explained in the SCOR model.( Delipinar *et al*, 2016).

## 2.2 Empirical Review

Supply chains can account for up to 30% of total costs in hospitals. Efficient supply chain management provides hospitals with the opportunity to control rising costs and at the same time improve patient care (Kazemzadeh *et al*, 2014*).*

According to a research study presented to the Medical Device Supply Chain Council in 2011, 40-45% of the hospital operating expense is represented by supply chain and potential savings of 5-15% of supply chain cost can be realized with better supply chain management strategies (lenin 2014) more over An empirical study in South Korea showed that customer satisfaction in healthcare industry is positively related to supply chain performance (Yongyi S, 2014)

According to Nawshad P. *et.al* study on Square Hospitals Ltd, inefficient supply chain management practices will not only hurt a hospitals bottom line but will also reduce its overall performance in a highly competitive industry. Hospital Supply Chain can be considered much more complex than that of other industries. If medicines are out of stock or applied enormously, it can result in the death of a patient. Thus hospital supply chains have to be more responsive than effective. This was observed in the case of Square Hospitals Ltd. The hospital gives more importance to the quick and accurate delivery of medicine to patients and they are quite efficient in this respect. However, there are areas in the supply chain where changes may bring about an improvement in the quality of the service provided by the hospital (Nawshad P. *et.al)*

According to research done on Kenya, the major supply chain management challenges faced in the health sector include poor infrastructure, bulky materials to be transported and uncertainty in terms of demand. Lack of cold chain maintenance and qualified personnel were also considered as supply chain management challenges at Kenya's medical supplies agency (KMSA). The findings imply that KEMSA as an organization has not been able to put in place effective supply chain management practices that can improve the overall performance of its supply chain (Samuel, 2008).

Study on inventory management practice of PFSA revealed that inadequate staff competency, management support are the major factors that affects the inventory management practice at PFSA. The study also showed that majority of respondents are in agreement with the importance of information technology for the improvement of inventory management practice (Mulatu, 2017).

According to a study on Addis pharmaceutical factory (APF) supply chain performance measurement by balanced score card, the supply chain performance of the company is moderate based on external respondents (customers) view. The study reviled that the company has poor IT infrastructure and communication system. Furthermore, the regression analysis showed that internal business, learning and growth and customer perspective parameters of BSC has significant influence on supply chain performance (Alemu, 2017)

According to study done by Amare S. on BLSH, IPLS implementation in the Hospital is encouraging only with respect to some measurements such as availability of logistics reporting and recording tools and stock keeping logistic formats, providing supervision and training, availability of drugs and some measurements of logistic system performance such as having an acceptable resupply period and less frequent emergency order trend (Sisay, 2017).

Even though the hospital showed good logistic and inventory system management practice and logistic system performance with respect to the above mentioned measurements, much gap is observed in some other logistic and inventory system management practice and logistic system performance measurements such as in proper utilization of the logistics recording and reporting tools, LMIS data quality, and perceived order fill rate. In addition, the study showed that certain gaps are observed in Stock status information & Storage condition measurements that include, availability of expired items, gaps in storage conditions for ARV drugs storage (Sisay, 2017).

# CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY

## 3.1 Description of the study area

The study is conducted at Black lion specialized hospital, which was founded in 1972. It's one of the largest serving hospitals of the country which serves approximately 400,000 patients a year. The hospital has 800 beds, with 130 specialists, 50 non-teaching doctors. The emergency department sees around 80,000 patients a year (Amare, 2017). The pharmacy department has 1 big store for pharmaceuticals and 2 other stores for medical supplies. It has 12 dispensary units from this 10 of them operates 24 hours 7 days of the week 1 pharmacy is located at Lideta health center where the hospital provides oncology service.

The pharmaceutical supply chain of the hospital involves selecting, quantification, procurement, storage and dispensing of pharmaceuticals and medical supplies to patients, staffs and customers outside of the hospital. EPSA is the only supplier for this hospital and in rare cases privet suppliers participate in the process through tenders when emergency order is needed. Some program drugs and medical supplies will be donated by foreign organizations in support of specific health situations. Moreover, Federal ministry of health (FMOH) sponsors medications like chemotherapeutic drugs and those for maternity and infants <5 years.

## 3.2 Research approach

The study focused on collecting both qualitative and quantitative data and results are expressed both qualitatively and quantitatively.

## 3.3 Research design

The study uses descriptive method which describes population, situation or phenomena and data from the study were discussed in descriptive statics. Descriptive method is suitable to this research that aims to study the supply chain performance and identify factors affecting supply chain practice of BLSH. Results from the study was assessed and examined against the requirements and standards of SCOR model.

## 3.4 Study Population and sample size

The study populations was staffs working at Black lion specialized hospital in general and health professionals in particular were taken as study population. From this, pharmacy

professionals were taken as sample population. Pharmacy staffs who are not familiar with SCOR model and pharmaceutical supply chain were excluded from the study.

There are about 71 pharmacy professional who are working in the hospital from this 53 are actively working staffs and the remaining are masters students and excluded from the study. it was decided to use purposive sampling technique to select respondents who has knowledge on supply chain activities of the hospital.

### 3.5 Data source and type

Data were collected both from primary and secondary sources. Primary data were collected by conducting interviews with the procurement manager, top management and key informants about performance of supply chain and purchasing policy of the company. Structured questionnaires were given to pharmacy staffs which used to measure the supply chain performance based on SCOR parameter.

Secondary data's were collected from documented data's on purchasing order, budget report, internal facility requisition form (IFRR) and related documents. Observation was conducted during days of visit.

### 3.6 Data collection procedures

Supporting letter from school of commerce were obtained and presented to the hospital head to get permission on data collection. Data were collected through questioners, interview of key informants and documented materials. Respondents were communicated to get their consent. Once their consent known, the prepared questionnaires was distributed to each participant by appreciating their participation and devoting their precious time for the research. The questionnaires were collected by checking the completeness of the data. Documented materials were used to assess financial aspect of the supply chain performance.

### 3.7 Validity and Reliability

Validity implies the degree to which a question measures what it was intended to measure. To assure the validity of the study, questionnaires were developed on the bases of previous studies and review of related literature. The questionnaire was subjected to a validity test. Pre testing was done to see the applicability of the tools and how the questionnaire was acceptable to the respondents. Pre testing was done on selected respondents which were not part of the final research. After the pretest, alterations were made to the tool. Cronbach's alpha is calculated using SPSS version 20.0. An alpha coefficient of 0.70 or higher indicated that the gathered data are reliable as they have a relatively high internal consistency and can be generalized to reflect opinions of all respondents in the target population (Meskerem, 2017).

| Variable | Cronbach's alpha | No of items |
|---|---|---|
| Supply chain responsiveness | 0.762 | 11 |
| Supply chain reliability | 0.781 | 7 |
| Supply chain flexibility | 0.721 | 4 |
| Supply chain cost and asset management | 0.826 | 5 |

Source, own survey, 2019

### 3.8 Ethical consideration

The relevant ethical issues has been given special attention through all phases of the research process. Respondents informed clearly about the purpose of the study, the right to participate voluntarily, the right to ask questions including personal address of the researcher, the right to get the copy of the study, and the right to have their privacy respected; the right not to respond to question that they didn't want to respond. The information provided by participants will not be disclosed in any way. In addition, the researcher acknowledged all materials and sources of data used in this research. Supporting letter were received from AAU school of commerce and presented to the hospital pharmacy directorate. Before data collection, the research has received consents of participants. Names, phone numbers, addresses and other details are not included in the questionnaire to ensure confidentiality.

### 3.9 Data analysis

The collected data were coded, entered, cleaned and analyzed using SPSS version 20.0 software Package by the principal investigator. Descriptive statistics was computed for all the variables and data was presented in the form of frequency distribution tables and figures to summarize responses for further analysis and facilitate comparison. The quantitative reports were presented as tabulations, percentages, and measure of central tendency. Analysis was done in a descriptive and explanatory approach with reference to the different Requirements, tools, procedures and practices demanded by SCOR model.

# CHAPTER FOUR: RESULT AND DISCUSSION

This chapter presents the data analysis, results, and interpretation of the findings. The findings are based on data collected by the use of questionnaire and observation during visit so as to assess the pharmaceutical supply chain activities at BLSH. The analysis is performed around the objectives for this study; however, other relevant details are added for better presentation of findings. A total of 49 experts were participated in the study. However, 6 participants did not return and appropriately fill the questionnaire thus excluded from the analysis making the response rate 43 (89.8%).

## 4.1 Demographic Characteristics of Respondents

The findings of demographic characteristics include: sex, academic qualification, Service year, and work position. Table 2 below shows the details of background information of the respondents.

| Sex | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| Male | 25 | 58.1 | 58.1 | 58.1 |
| Female | 18 | 41.9 | 41.9 | 100.0 |
| Total | 43 | 100.0 | 100.0 | |

Table 2: demographic character of respondents (sex)

As noted in table 2 above, the majority of the respondents (58.1%) were male and the remaining 41.9% were females. From this we can see that the pharmacy staff is well versed on gender.

| Educational background | Frequency | Valid percent | Cumulative percent |
|---|---|---|---|
| Degree | 41 | 95.3% | 95.3 |
| MSc. | 2 | 4.7% | 100.0 |
| Total | 43 | 100.0 | |

Table 3: Educational background of respondents (source: own survey 2019)

As for the educational background 95.3% of respondents were with bachelorette degree and 4.7% were with MSc. This shows that majority of the respondents were mature with appropriate work experience and therefore they were well versed with relevant information on supply chain management which was needed for the study.

As show on the chart below most of the respondents (34.9%) have work experience of more than 5 years, 32.6% has work experience of 3-5 years and 27.9% has 1-2 years of experience. This indicates the pharmacy service is running by senior, chief and expert pharmacists and majority of the respondents were mature with appropriate work experience and therefore they were well versed with relevant information on supply chain practice which was needed for the study.

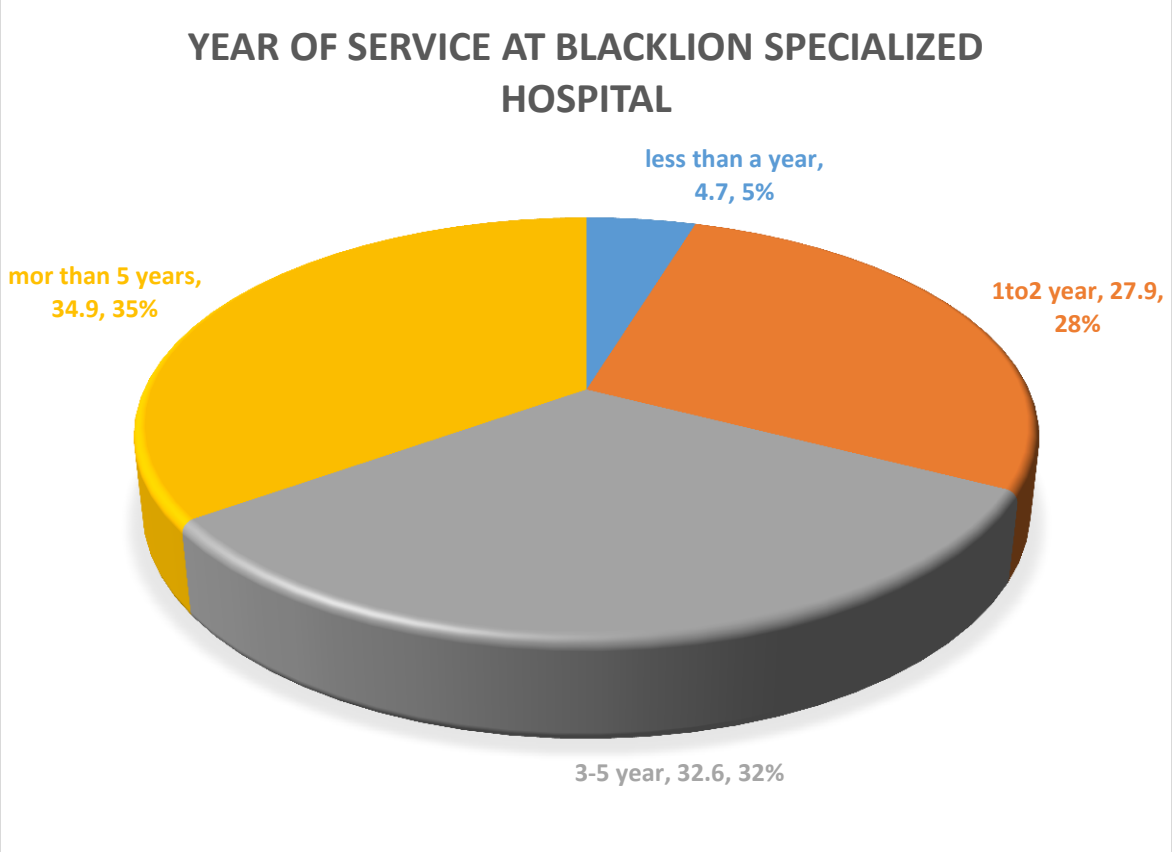


Fig 2: work experience of respondents (source: own survey 2019)

Majority (74.4%) of respondents were from dispensary unit pharmacy

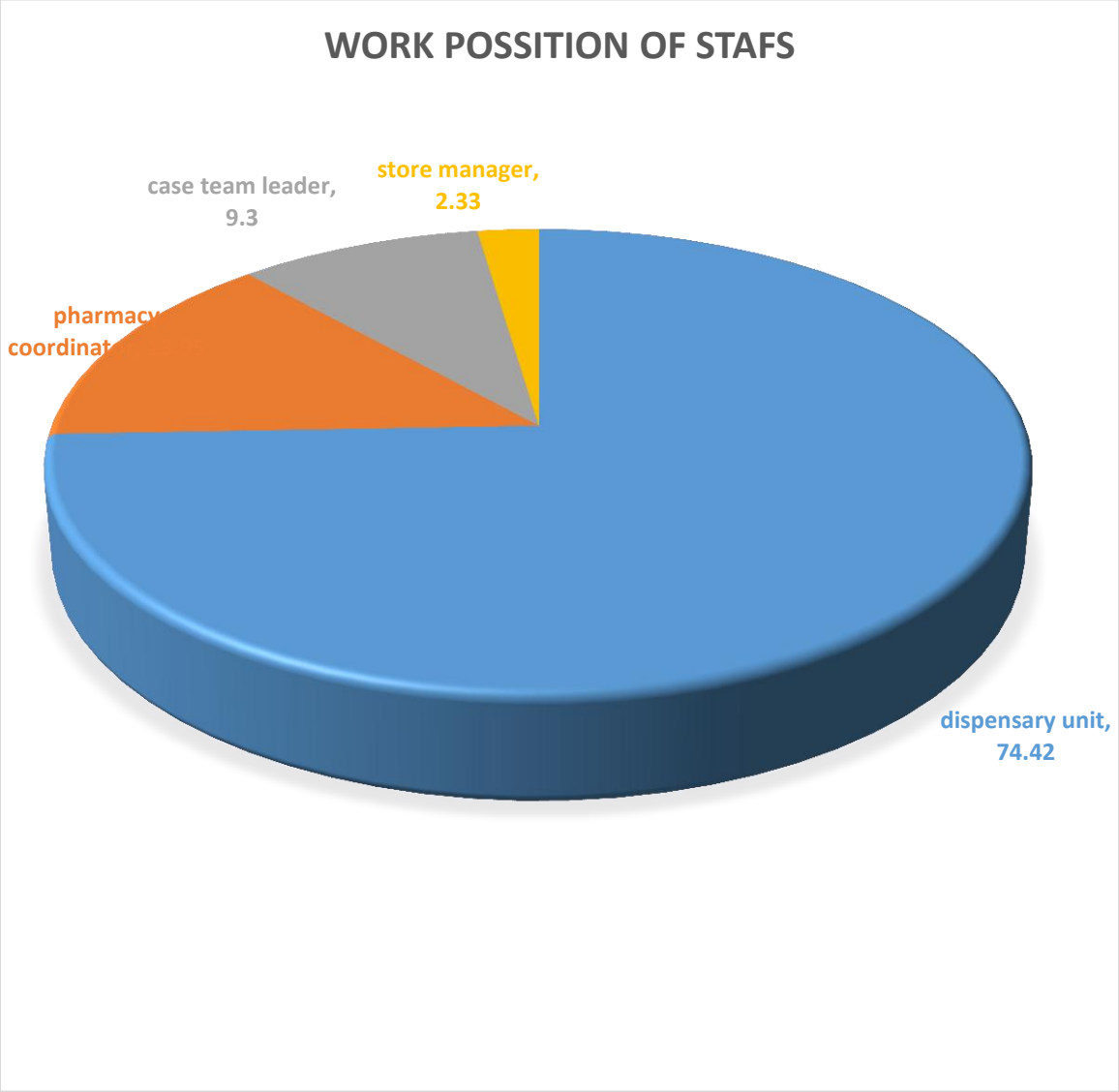


Fig 3: work position of pharmacy staff (source: own 2019)

As indicated on the above figure the number of respondents working on dispensary unite is higher than those working on store who directly involve in the procurement and storage of pharmaceuticals in the hospital. From this we can learn that there is low work force in the area of PSC activity.

### 4.2 Assessment of the overall supply chain activity of the hospital

The overall supply chain activity of the hospital in terms of IPLS was assessed table below shows the supply chain activities in terms of documentation and stock management of the hospital using IPLS system.

| Questions | | frequency | Percent | Valid percent | Cumulative percent |
|---|---|---|---|---|---|
| Are bin cards available? | yes | 43 | 100.0 | 100.0 | 100.0 |
| Are IFRR available? | yes | 43 | 100.0 | 100.0 | 100.0 |
| Are RRF available? | Yes | 41 | 95.3 | 95.3 | 95.3 |
| | no | 2 | 4.7 | 4.7 | 100.0 |
| Do you use bin cards to manage products in this hospital | yes | 43 | 100.0 | 100.0 | 100.0 |
| Availability of SOP for IPLS | Yes | 30 | 69.8 | 69.8 | 69.8 |
| | No | 12 | 30.2 | 30.2 | 100.0 |

Table 4: use of recording formats in the hospital (source; own 2019)

as per the result obtained from questioner of personnel and observation during the day of visit, this assessment showed that all (100% of) the required blank logistics recording and reporting tools such as bin cards, stock card and IFRR formats are available in the hospital. The result was similar with study under taken in 2017 at this hospital on the assessment of IPLS implementation and its challenge except that availability of SOP manual for IPLS is 69.8% and that of RRF is 95.3 this shows there is an improvement on documentation and use of reporting format this may be associated with the implementation of auditable pharmaceutical transaction system (APTS) in 2016 which require extreme documentation throughout the PSC and now days its revolving to electronics based documentation and reporting system.

On the use of reporting formats for requesting and purchasing medications 97.7% of respondents use IFRR format and on RRF use 72.1% of respondents use it as reporting and requisition format.

Table below is result for frequency of sending requisition form to supplier

| | Frequency | Percentage | Valid percentage | Cumulative percentage |
|---|---|---|---|---|
| Monthly | 20 | 46.5 | 46.5 | 46.5 |
| Bi monthly | 10 | 23.3 | 23.3 | 69.8 |
| Quarterly | 11 | 25.6 | 25.6 | 95.3 |
| Other | 2 | 4.7 | 4.7 | 100.0 |
| Total | 43 | 100.0 | 100.0 | 100.0 |

Table 5: frequency of requisition and purchasing of medication (source; own 2019)

On the assessment of Requisition and reporting format sent to EPSA 46.5% says monthly, 23.3% every two month, 25.6% quarterly. From this we can say that the hospital did not have fixed schedule of purchasing medication and make available medication to the patient this in turn results in shortage and interruption of availability of valuable drugs and decrease quality of service.

| Who determines this facility resupply quantity | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| the facility itself | 37 | 86.0 | 86.0 | 86.0 |
| higher-level facility (health center, PFSA/ Woreda/ Zone/ RHH | 6 | 14.0 | 14.0 | 100.0 |
| Total | 43 | 100.0 | 100.0 | |

Table 6: determination of facilities resupply quantity

As shown on the table above, the facility majorly determines resupply quantity of medication to purchase and higher facilities has little impact on it. From this we can learn that stock out of

pharmaceuticals can be as a result of either wrong quantification or poor delivery from the supplier. During the study it was found that short supply and stock out are common phenomenon which ultimate result in non-availability of drug and causes ultimate dissatisfaction among the patients and physicians. Since most of pharmaceutical preparations are exported items as such the suppliers sometimes fail to deliver the drugs in time or not available at all.

### 4.3 Evaluation of the supply chain with respect to SCOR attributes

#### 4.3.1 Supply chain responsiveness

Supply chain responsiveness is an indicator of a supply chain's ability to respond to customer requests. It indicates the continuous average response time to events. Respondents were asked to state the extent to which they agreed or disagreed with the questionnaire items developed to assess the supply chain responsiveness. the respondents were instructed to respond to the statements on a 5 point Likert scale and indicate the extent they agree with the statements that is: 5-Strongly disagree, 4 disagree, 3-Neutral, 2-agree, 1-Strongly agree.. Mean of each item together with their respected dimension was calculated in order to conclude supply chain performance of the hospital. Mean of < 2.5 is said to be respondents are in agreement with the point and >2.5 is respondents are in disagreement. Result is summarized on the table below.

| Supply chain responsiveness | Strongly agree | Agree | Neutral | Disagree | Strongly disagree | Mean | SD |
|---|---|---|---|---|---|---|---|
| The hospital rely on few dependable suppliers | 48.8 | 30.2 | 4.7 | 2.3 | 14.0 | 2.02 | 1.39 |
| The hospital rely on few high quality suppliers | 9.3 | 46.5 | 18.6 | 9.3 | 16.3 | 2.77 | 1.25 |
| BLSH consider quality as number one criterion in selecting suppliers | 7.0 | 48.8 | 20.9 | 16.3 | 10.0 | 2.67 | 1.06 |

Table 7: supply chain responsiveness Source: Own Survey, 2019

Regarding the number of reliable suppliers the hospital depend on, 48.8% strongly agrees that the hospital rely on few dependable supplier with (mean 2.02 and SD 1.39), 14% of respondents

strongly disagree with the subject matter. Respondents' stat that EPSA is the major supplier for the hospital and in rare case privet suppliers involved. Majority of respondents 46.5% agree that the hospital relay on few high quality supplier with (mean 2.77 and SD 1.55) which is EPSA mainly. Regarding selection of supplier, 48.8% stated that quality is the number one criteria for selecting supplier. From this we can learn that supply chain activity and availability of pharmaceuticals of the hospital revolve around the performance of EPSA where the supplier should avail the products with the requested quantity.

| | Strongly agree | Agree | Neutral | Disa gree | Strongly disagree | Mean | SD |
|---|---|---|---|---|---|---|---|
| The hospital strive to establish long term relationship with its suppliers | 14.0 | 46.5 | 27.9 | 4.7 | 7.0 | 2.44 | 1.03 |
| The hospital has continuous improvement programs that include its key suppliers | 11.6 | 18.6 | 25.6 | 34.9 | 9.3 | 3.12 | 1.17 |
| The hospital helps its suppliers to improve their product quality | 4.7 | 14.0 | 44.2 | 25.6 | 11.6 | 3.26 | 1.00 |
| The hospital includes its key suppliers in its planning and goals setting activities of pharmaceutical supply chain | 4.7 | 30.2 | 18.6 | 37.2 | 9.3 | 3.16 | 1.11 |

Table 8: supply chain responsiveness Source: Own Survey, 2019

Regarding the relationship of BLSH with its suppliers, the result showed that there is no much communication and cooperation between the two parties on continuous improvement program and planning and goal setting of their business relationship. Moreover, Its relation with customers (end user) is not improved 44.2% of respondents dis agrees that the hospital frequently evaluates and identify informal and formal complains of patients()M 3.19 SD 1.09). Despite 51.2% agrees that the hospital determines future perspective and expectation of

customers (M 2.72 SD1.00). Again 44.2% (M 3.16 SD 1.15) of respondents disagree that BLSH evaluates the level of customer satisfaction.

### 4.3.2 Supply chain reliability

Supply chain reliability is an indicator for the ability to deliver on-time, in-full, in the right condition, right packaging, with the right documentation to the right customer. Reliability is an indicator that describes the predictability of a supply-chain. Respondents were asked to state the extent to which they agreed or disagreed with the questionnaire items developed to assess the supply chain reliability. Result is summarized in figure below.

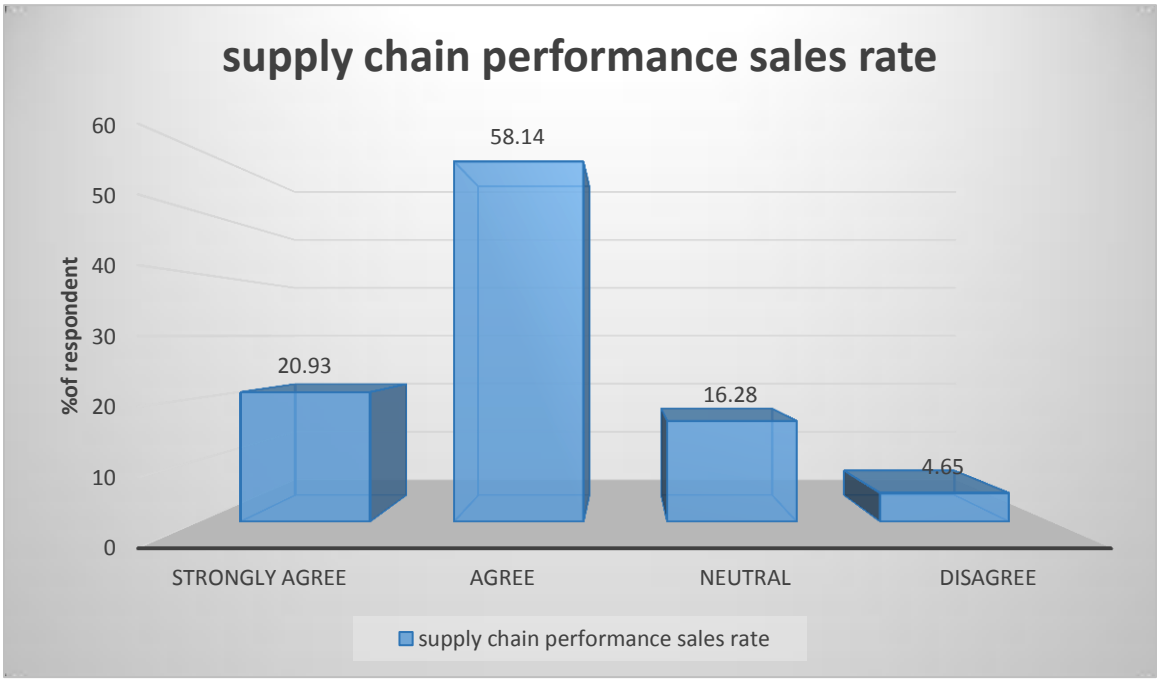


Fig 4: effect of supply chain performance on sales rate (Source: Own Survey, 2019)

On the effect of supply chain performance on sales rate, more than half of respondents (58.1%) agrees that supply chain performance of BLSH results in higher sales rate, 20.93 strongly agrees with the subject matter. This reviles that products are relatively available in the dispensary units moreover, majority of items were circulating throughout the supply chain from the supplier EPSA to the hospital then to each dispensary units.

Order fill rate, which is the percentage of items resupplied (filled) by the supplying EPSA with respect to the total amount of items requested by the Hospital. Resupply quantity shows that, out of 56 items recently requested by the hospital 39 items were resupplied fully (100% order fill rate), 13 of them were resupplied in less quantity and 4 items were not resupplied or stocked out from the supplier (0% order fill rate). As depicted on figure 5 below, order fill rate with respect to availing items from main store to dispensary units (resupply through IFRR) result show that more than (76.8%) of the respondents either strongly agreed or agreed that supply chain performance of the hospital results in higher order fill rate with mean 1.98 and standard deviation of 0.88. This showed that the supply chain performance of the hospital is functioning well with respect to availing basic items.

Similar Study done in 2017 on BLSH shows that out of the 17 types of ARV drugs, the hospital has recently placed order (request of resupply) for 13 items, 9 of the items were received as per requested (100 % order fill rate) while for the remaining four items, 3 items were received with less quantity (90.3 – 40%), while one items is not totally delivered (0% order fill rate) even though requested by the Hospital (Sisay, 2017). Related study in Kenya medical supply agency stated that supply chain management at the agency results in perfect order fulfillment with (M=4.870 SD=1.245). However the respondents disagreed that supply chain management has led to Faster response to customer complaints (M=2.484; SD=0.565), and lower cost of goods sold (M=2.456; SD=0.784) (Samuel, 2008).

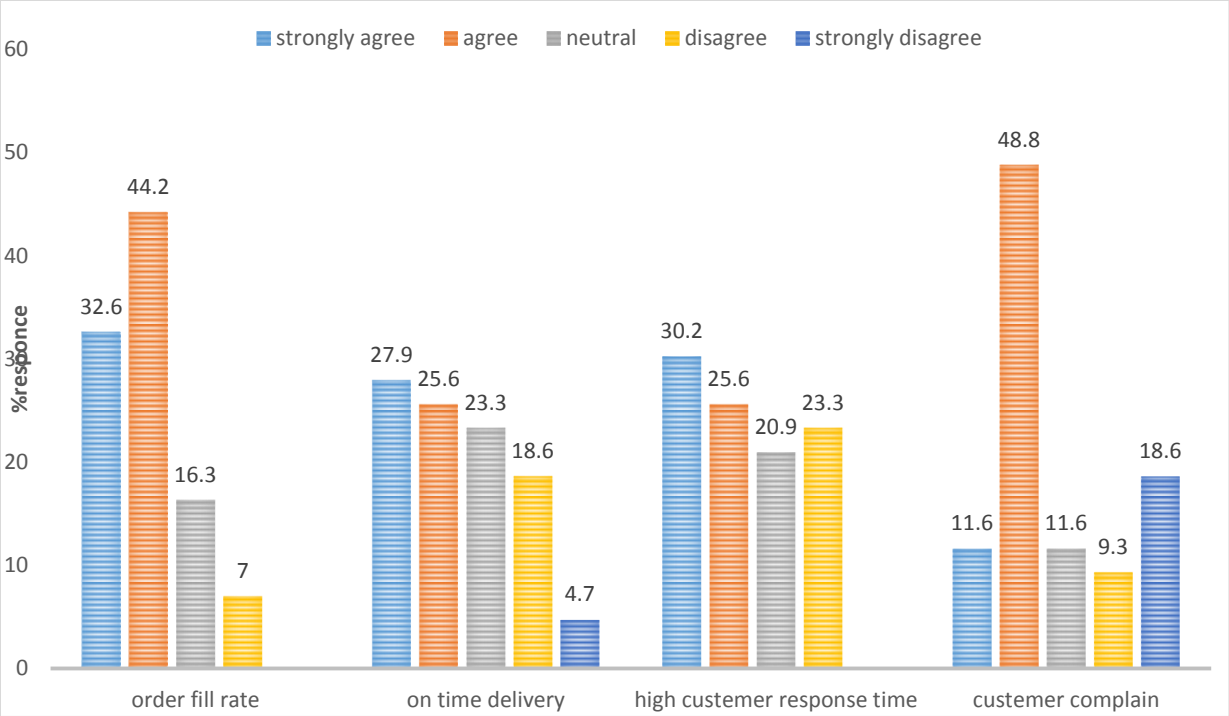


Fig 5: effect of supply chain performance on supply chain reliability

On time delivery of pharmaceuticals is one of the six basic rights of pharmaceutical supply chain where the right drug should be delivered to the patient at the right time so that patient care outcome can be achieved if not disease will progress and patients suffer to buy at high cost or may not find it on market this in turn makes the health service tedious and unaffordable with poor prognosis. On time delivery also express receiving of requested pharmaceuticals from the supplier at the right time or from the main store to dispensary unit. 27.9% of respondents strongly agrees that supply chain performance of the hospital results in on time delivery of items whereas 18.6% disagrees. Each dispensary units has its own date of requesting and receiving of pharmaceuticals from main store. 65.1% of respondents stated that the dispensary units follow their schedule where IFRR mostly hand carried by facility staff and placing emergency order at any time is a common trained throughout the system.

Customer response time measures the time taken from receiving of request from patient to delivering of item. It's also related to availability of products so that the right product will be delivered at the right time. Result of the survey as presented on figure 5 shows that more than half of respondents agrees (30.2% strongly agree and 25.6% agree) that supply chain activities of

the hospital results in high Customer response time. In contrary, 23.3% of respondents disagree with the subject. From this we can state there is still high volume of customer order and customer complain on availability and delivery of pharmaceuticals to the patient with the right quantity through the supply chain process.

Moreover, the survey sought to find that supply chain activity of the hospital is related to customer complain. 48.8% of respondents agree that supply chain activity results customer complain and 11.6% of respondents strongly agree with this. The result is similar with study done in Kenya (KEMSA). From this we can be sure that pharmaceutical supply chain of BLSH is not functioning with respect to meeting patients satisfaction with the service provided and is not responding fast to customer complain.

### 4.3.3 Supply chain flexibility (agility)

Supply chain flexibility indicates a supply chain's ability to respond to changing (market) conditions. One way to estimate flexibility metrics is to take the time it takes to execute each Level Two process in the supply chain, take the longest time parallel processes, and sum sequential processes. It’s related to uncertain conditions the health care face such as unpredictable patient flow, unpredictable disease variation, disaster or disease outbreak, wrong selection of pharmaceuticals, wrong forecasting of demand (poor quantifications), poor performance of supplier and late delivery. If the supply chain sought to tackle the above challenges its said to be flexible. Respondents were asked to state the extent to which they agreed or disagreed with the questionnaire items developed to assess the supply chain flexibility. Result is summarized in the table below.

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| The hospital has ability to respond to and accommodate demand variation, such as seasonality | 43 | 1 | 5 | 2.40 | 1.294 |
| The hospital has ability to respond to and accommodate the periods of poor delivery from supplier | 43 | 1 | 5 | 2.77 | 1.212 |
| The hospital has ability to respond to and accommodate the period of poor supplier performance | 43 | 1 | 5 | 2.86 | 1.226 |
| The hospital has ability to respond to and accommodate new products, new markets or new competitors | 43 | 1 | 5 | 2.63 | 1.215 |
| Valid N (list wise) | 43 | | | | |

Table 9: supply chain flexibility Source: Own Survey, 2019

The study sought to determine that 62.8% of respondents agree that BLSH has the ability to respond to seasonal variation, out of this 30.2% of them strongly agrees (M; 2.40 SD; 1.29). This reflects the hospital has stock level to coup up with seasonality or the mechanism to resupply it immediately with emergency orders considering the fact that is serves patients from all over the country.

51.2% of respondents agrees that the hospital has ability to respond to and accommodate the period of poor supplier performance. During the visit day, documented request and resupply forms show that the normal time between sending request and resupply by the supplier is more than two weeks which is the point to minimum stock level. The fact that request is send through hand carried by staff and EPSA being the only supplier to Government hospitals delay delivery of items.

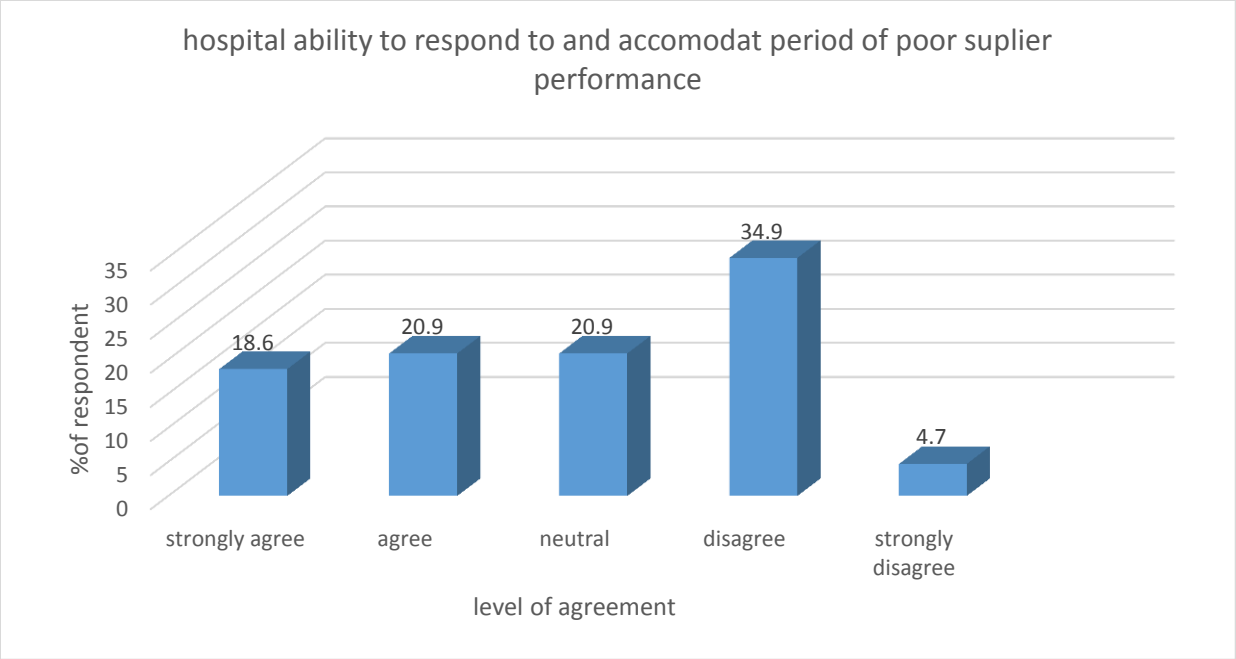


Fig 6: hospital ability to respond to and accommodate period of poor supplier performance

With respect to supplier performance, most respondents 34.5% disagrees with the hospital ability to respond and accommodate to poor supplier performance 20.9% are in neutral state with (M 2.9 and SD 1.2). This shows receiving of valuable pharmaceuticals is solely depends on only one supplier (EPSA) than benefiting the chance of competitive delivery from several suppliers at negotiable cost. Poor performance of EPSA means poor delivery to the hospital which in turn affects service delivery of the hospital but despite this fact the hospital maintain minimum stock level to coup up with poor performance or delivery.

Similar study on hospital pharmacy logistics stated that patients could be affected if their medication doses cannot be delivered in time to the care unit. Several pharmacists mentioned that the procurement cycle might be too lengthy for two main reasons. First, at the reception point, hospital could receive medicines that do not correspond to the purchase order or, in rare but documented cases, could receive altered or counterfeited products. Second, it could take a rather long time to distribute a medicine from the hospital dock to the care unit if the pharmacy staff cannot properly and immediately identify the medicines (Romero, 2013).

Another study on PFSA the then EPSA, 60.7% of respondents has expressed their agreement that the long procurement lead time at PFSA affects the inventory management with mean 2.43 and standard deviation of 0.991 (Mulatu, 2017).

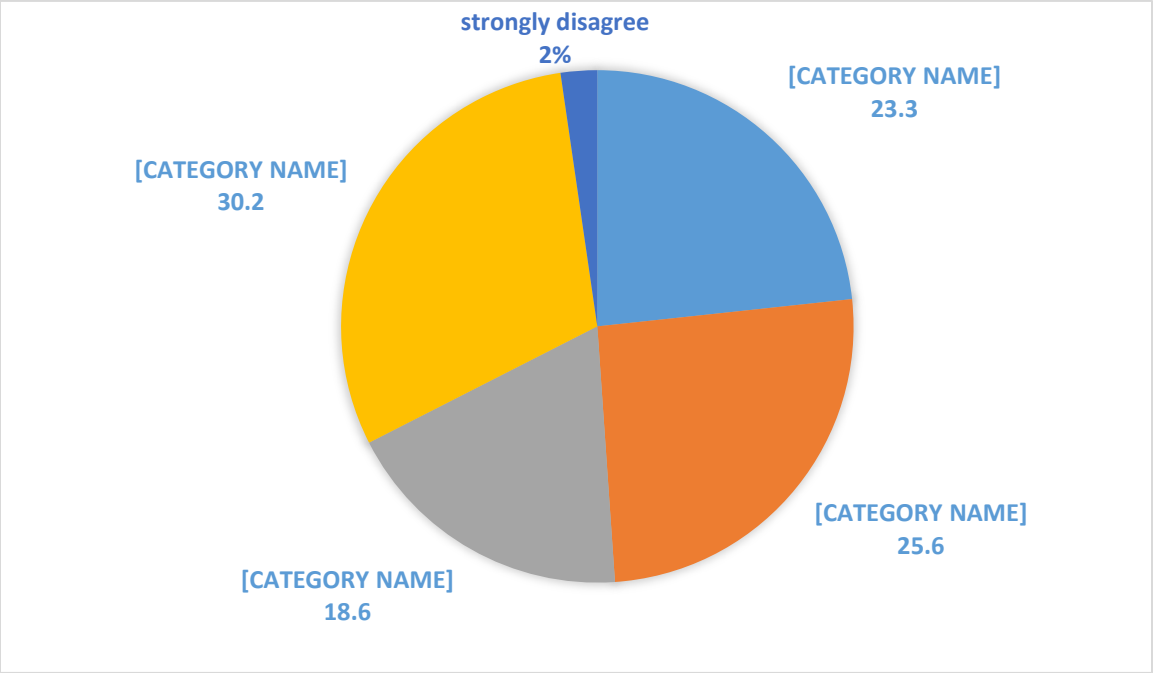


Fig 7: Ability to respond to and accommodate new product, new market or new competitor

Moreover the ability to respond and accommodate to new product and new market depends on the ability of supplier to avail. Sometimes the hospital purchase new and very useful items from privet suppliers which are not available from EPSA. As shown on figure 7, more than half of respondents (23.3% of respondents strongly agrees and 25.6%agrees) that the hospital has the ability to respond to and accommodate new product, new market or new competitor. From the total respondents 30.2% disagrees with the subject. This is associated to the fact that Procurement policy of the hospital is somewhat tight and involve non pharmacy professionals like other consumable products so that its sight for new product and market is somewhat blinded.

### 4.3.4 Supply chain cost and asset management

Supply Chain costs indicate an organization's ability to manage the costs associated with operating the supply chain whereas, Supply chain asset management indicates the effectiveness of an organization in managing assets to support demand satisfaction. This includes the management of all assets: fixed and working capital. Pharmacy logistics processes are related to several issues that impact negatively the cost and quality of the medication services. Several studies show different inefficiencies, namely out-of-stock high costs or emergency purchase, excessive manual labor shrinkage, high frequency of reorders counterfeit products and product recalls.

Respondents were asked to state the extent to which they agreed or disagreed with the questionnaire items developed to assess the supply chain cost and asset management. Result is summarized below.

| | Frequency | Percent |
|---|---|---|
| strongly agree | 15 | 34.9 |
| Agree | 21 | 48.8 |
| Neutral | 5 | 11.6 |
| Disagree | 2 | 4.7 |
| Total | 43 | 100 |

Table 9: supply chain activity total cost of resource used Source: Own Survey, 2019

As shown on table below, 34.9% of respondents strongly agrees and 48.8% agrees that supply chain activity has total cost of resource used. This cost is directly related to pharmaceuticals procured throughout the supply chain and the main resource is budget from the government. Despite huge budget for procurement of pharmaceuticals, the hospital was on debt from EPSA and recently ministry of health announce that it will cover all the debts and allow the hospital purchase cash.

Cost of distribution, transportation and handling are major cost of supply chain where purchased items transported from supplier to hospital then to each dispensary units. Loading and unloading

is done by porters who are permanent staffs of the pharmacy department. At BLSH Transportation is handled by the hospitals vehicle and perform other duties of the hospital so that we can't determine pharmaceutical transportation solely. From the respondents, 18.6% strongly agrees and 55.8% agrees (M 2.1 and SD 0.76) that supply chain has total cost of distribution transportation and handling covered by the hospital.

Documented data revile total cost related to distribution to dispensary units through man power is approximately 95000 birr/year (porter's salary and additional payment). Excluding fuel cost for transportation from supplier to the hospital. The result contradict with a study on Square Hospital Limited's where transportation cost, for pharmaceutical products is negligible. In most cases manufacturers/suppliers bear the costs of transporting pharmaceutical products supplying to the hospital so that it is quite efficient in transportation.

Cost associated with held inventory is related to resource spent on stocked pharmaceuticals and labor force who manage it. Majority of respondents 55.8% agrees and 11.6 strongly agree on supply chain cost of held inventory. A minimum of two weeks stock is kept in each pharmacy section plus to that of expired medication. From this we can learn that stock kept on each pharmacy section and labor spent on inventory is major cost for supply chain at BLSH. The cost depends on the variety of medication each unit use. The figure below shows the level of response of participants.

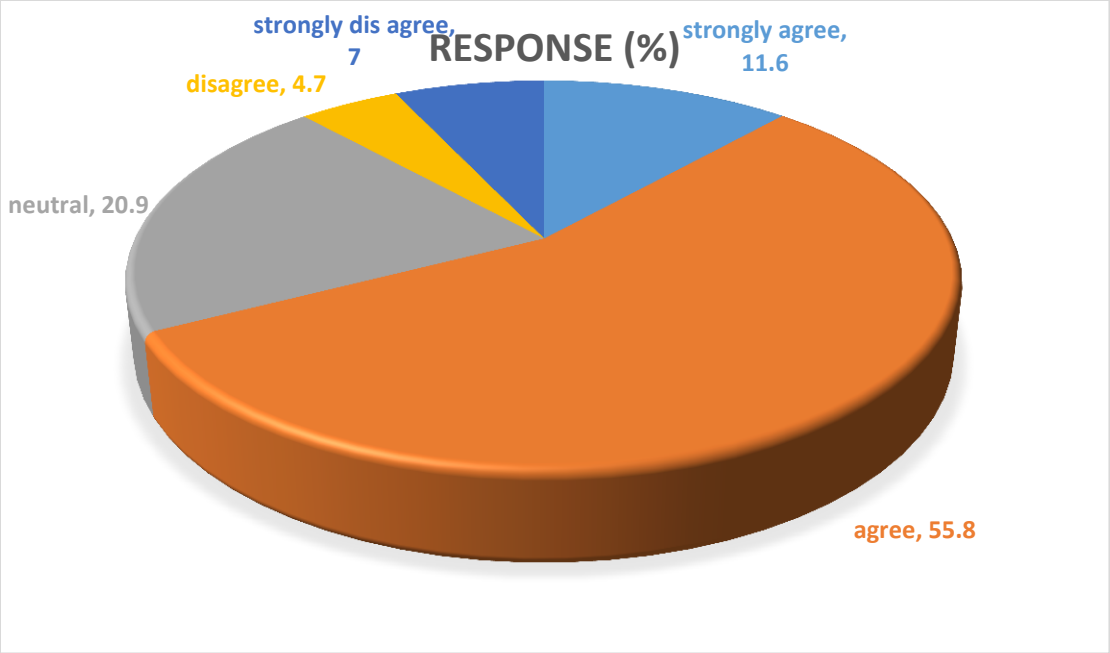


Fig 8: cost associated with held inventory

As being government hospital margin of profit for sales of pharmaceuticals is not more than 15% and some items are given for free. Despite this fact there is still return on investment from sales of pharmaceuticals to paying patients. 41.9% of respondents agree that the hospital has return on investment from sales item and 11.6 strongly agrees. 32.6% of them are in neutral this could be as a result of Purchased items are provided for sales and free patients equally so that it's difficult to determine the level of return on investment unless cost of free patients covered and returned by sponsored body (each kebeles who give free cards or institutions) which is not happening yet. This has been major problem throughout the past year where the pharmacy department could not return sales and forced to purchase credit from EPSA

# CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMENDATION

## 5.1 Summary and Conclusion

The results of the study provide important insights on supply chain activities in terms of SCOR attributes in the health care sector specifically of BLSH and their effect on performance. The way the SC function in the hospital has a significant impact on the selection of and cooperation with best suppliers, increase of SC efficiency, and enhancement of supply chain management practice, which subsequently improves organizational performance. The findings of the study revolves around the supply chain performance that have been practiced at BLSH include: supply chain reliability, supply chain responsiveness, supply chain agility, supply chain cost and asset management.

From finding of the study, the number of respondents working on store is low (2.33%) who directly involve in the procurement and storage of pharmaceuticals in the hospital. From this we can conclude that there is low work force in the area of PSC activity.

Supply chain responsiveness of the study reviles that the hospital depends on few supplier which is EPSA and consider quality as its basic criteria in selecting its supplier. The supply chain is responsive in terms of supplier selection. The level of cooperation, involvement on planning and continuous improvement program with its supplier is low with mean of each >3. Moreover, it's less responsive on identifying and evaluating customer satisfaction but works on meeting future customer expectation.

From the finding mean result of Sales rate order fill rate and on time delivery is 2.05, 1.98and 2.45 respectively which is <2.5where strongly agree (1) and strongly disagrees is (5), revile most respondents are in agreement with supply chain activity of the hospital result in higher order fill rate, one time delivery and higher sales rate . Whereas mean of supply chain effect on customer complain, shipping error, and lead time is >2.5 reviling respondents are in disagreement with the point that supply chain activity result in customer complain shipping error or longer lead time. From this we can conclude Supply chain is functioning well with respect to the above point. From this we can deduce that the supply chain is reliable with respect to the above result.

With respect to supply chain agility (flexibility) elements which are demand variation, poor delivery from supplier, poor supplier performance and ability to accommodate / respond to new product or new market (with mean 2.4, 2.7, 2.8 and 2.6 respectively), results indicate there is still a gap on supply quantity and frequent stock out and its performance depends on supplier performance and ability to avail items. This is directly related to Procurement policy of the hospital that doesn't allow privet suppliers to participate. From this we can conclude that the supply chain is not agile (flexible).

Cost and asset management aspect of the hospital supply chain is somewhat complicated where cash flow of pharmaceuticals is not separated from other service the hospital provide. Despite being the first big revenue source for the hospital. Daily sales is calculated from cash sales receipt and documented by the new APTS system makes it easy to predict level of return on investment but on for items provided to free patients, returning of investment from sponsors of free patient is still a challenge. In addition transportation and labor cost is covered by the hospital.

### 5.2 Recommendation

- Staff work load assessment should be done by higher management to ensure adequate manpower is in place to successfully work towards full scale implementation APTS and proper functioning of the SC.
- In order to have staffs well function in the SC of pharmaceuticals, the hospital needs to improve the competency of its staffs through appropriate capacity building training, mentoring, and supervision. So that selection, quantification, procurement, storage, and distribution of pharmaceuticals flow systematically and avoid stocked out or wastage/ expiry.
- To ensure cost reduction and improve organizational performance in SC of the hospital, organizations and suppliers in the health care sector should try to have a positive relationship and devise approaches to collaboratively solve supply chain challenges in order to improve on efficiency. As a result, the collaborative strategy will provide competitive advantage to both the hospital and suppliers in the sector.

- It’s recommended for the hospital to frequently identify patients complain, evaluate customer’s satisfaction to identify future customers’ expectations and work on its weakness.
- To improve quality in SC activity, organizations such as BLSH and EPSA should create good partnerships with all players in the healthcare sector for better patient outcome.
- The hospital should work on its procurement policy and participate capable privet suppliers to benefit competitive delivery at negotiable price and avoid cost of emergency order.
- Proper documentation and recording through electronics and IT application should be encouraged in PSC.
- It’s recommended that the BLSH separate pharmaceutical cash flow from other service of the hospital so that total supply chain cost and return on investment could be identified to avoid unnecessary cost in the SC.
- Its recommended for the hospital to develop continuous evaluation program for the PSC
- Further study is recommended to assess the SC performance of the hospital with respect to supplier and patients’ perspective.

**5.1 Limitations and Suggestion for further study**

- The major limitation of the study is that the data was collected from a small convenience sample of staff at BLSH. A study on a wider scale within the health sector including supply chain managers, nurses and doctors in the hospitals may provide different results.
- Based on results of the study wider scale research is recommended to cover PSC performance of BLSH with respect to patient and supplier side.
- Another limitation of this study is that the research focused only on the supply chain Performance in the health sector with a relatively small sample size that only targeted one organization, and therefore requires further research covering various organizations and institutions in the health sector and taking into consideration the specific conditions in different institutions.
- Further analysis of PSC using SCOR model should be done in other hospitals and organizations for better outcome in the health system.

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## Annex 1: Questionnaire

Dear sir/madam; Greetings! My name is Haymanot Derbea and I am a post graduate student in Logistics and supply Chain management at Addis Ababa University School of commerce. Currently I am doing my thesis work a research designed to assess pharmaceutical supply chain practice in Ethiopia the case of black lion specialized hospital. You are kindly requested to fill in your response properly in the blank space provided or tick single responses as relevant. This research is intended to get information which will be used and treated confidentiality and solely for academic purposes. The survey will take no more than 20 minutes to complete. I would like to confirm that this is neither a supervisory visit nor performance evaluation of individual staff members. Rather, the findings of this research work will help to provide relevant information to make decisions and to bring improvements your response are kept confidential.

Thank you in advance for agreeing to participate in this assessment and for your valuable inputs/

### SECTION 1: Personal background

| Q no | Question | Alternative |
|---|---|---|
| 1 | Sex | 1. Male<br>2. Female |
| 2 | Educational background | 1. College certificate<br>2. Diploma<br>3. Bachelor degree<br>4. Master's degree<br>Others: Specify_____ |
| 3 | Year of service at black lion specialized hospital | 1. Less than a year |

| | | |
|---|---|---|
| | | 2. 1- 2 years<br><br>3. 3-5 years<br><br>4. More than 5 years |
| 4 | Please indicate Your current position | 1. Pharmacist<br>2. physician<br>3. Nurse<br>4. Management<br>5. Other specify |

## SECTION 2: Assessment of overall supply chain practice of the hospital

**1**. Are the following Logistic Management Information System LMIS formats, Job Aids and SOPs are available at the facility?

a. Bin cards: 1. Yes_____ 2. No_____

b. Internal Facility Report & Requisition Form (IFRR): 1. Yes_____ 2. No_____

c. Facility Report & requisition Form: 1. Yes_____ 2. No_____

d. Standard Operation Procedure (SOP for IPLS: 1. Yes_____ 2. No_____

**2**. Do you use the following stock keeping logistics formats to manage health products in this Facility? (Must be verified by checking sample completed bin cards**)**

a. Bin cards: 1. Yes _____ No_____

b. Stock cards: 1. Yes _____ No_____

c. Others (Specify) _____

**3**. What LMIS forms do you use for reporting/ordering?

Multiple response are possible (must be verified with completed reports)

a. IFRR: 1. Yes _____ No_____

b. RRF: 1. Yes _____ No_____

c. HPMRR: 1. Yes _____ No_____

d. Other. 1. Yes____ (Specify) _____ 2. No_____

**4**. The Hospital compiles and sends RRF reports to higher level?

1. Yes_____ 2. No_____

If No, go to question no. 5.

**5.** If yes, to whom? Multiple responses are possible.

a. PFSA _____

b. RHB_____

c. Zone Health Office_____

d. WHO _____

e. Resupply Health Center _____

f. Don't Know_____

g. Other (Specify)_____

**6**. If Yes, How often are these LMIS reports (RRF reports) sent to the higher level?

Multiple responses are possible.

a. Monthly._____

b. Bimonthly (every two months)_____

c. Quarterly_____

d. Semi-annually _____

e. Annually_____

f. Other _____

**7.** When was the last time the Hospital sent RRF report? (Must be verified with completed reports)

a) Never _____

b) Within the last month_____

c) Months ago_____

d) 3 months ago_____

e) More than 3 month ago_____

**8**. Do all columns in RRF are completed for all medicines? (Must be verified with completed reports)

a. Yes_____

b. No_____

c. Completed reports not available_____

**9.** What is the mechanism that your Hospital sends RRF report to the higher level?

a. Hand carried by facility's staff _____

b. Picked up by supervisor_____

c. Picked up by other higher level staff_____

d. Sent via drivers_____

e. Sent through mail_____

f. Other (specify)_____

**10**. Does the Hospital has a resupply schedule for dispensing units?

Yes_____ No_____

If Yes, Check posted Schedule _____

If No, specify the reason_____

**11.** If yes, do the dispensing units follow their regular schedule?

Yes_____ No_____

If yes, Observe filled IFRR with their schedule_____

If no reason_____

**12.** How did you learn to complete the forms/records used at this facility?

Multiple responses are possible

a. Formal Trainings IPLS_____

b. Pre service Trainings_____

c. Other formal trainings (Specify)_____

d. On-the-job training (other staff from facility_____

e. On-the-job training (someone outside facility_____

f. Never been trained_____

g. Other (specify) _____

**13.** How many emergency orders have you placed in the last three months?

If available ask for documents to verify using RRF

a. None_____

b. 1_____

c. 2_____

d. 3_____

e. More than 3_____

f. NA_____

**14**. What type of formats have you used to place emergency orders?

a. Using RRF_____

b. Using letter_____

c Through phone_____

d Orally_____

e. Other (specify)_____

**15.** Who determines this facility resupply quantity?

**Multiple responses are possible**

a. The facility itself_____

b. Higher-level facility (Health Center, PFSA/Woreda/Zone/RHB)_____.

c. Other (Specify)_____

## Section 3: supply chain analysis based on supply chain operation reference (SCOR) model

**Choose only one level of agreement for each statement related to the current pharmaceutical supply chain practice of BLSH. Tick (/)**

Key =1-Strongly Agree (SA), 2- Agree (A), 3-Netrual (N), 4Disagree

(D), 5-Strongly Disagree (SD)

### 3.1 Supply chain responsiveness

| Q.no | **Question** | **1 SA** | **2A** | **3 N** | **4 D** | **5 SD** |
|---|---|---|---|---|---|---|
| 1 | The hospital rely on few dependable suppliers | | | | | |
| 2 | The hospital rely on few high<br>quality suppliers | | | | | |
| 3 | BLSH consider quality as number one criterion in<br>selecting suppliers | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | |
| 4 | The hospital strive to establish long term relationship with its suppliers | | | | | |
| 5 | The hospital has continuous improvement programs that include its key suppliers | | | | | |
| 6 | The hospital helps its suppliers to improve their product quality | | | | | |
| 7 | The hospital include its key suppliers in its planning and goal setting activities of pharmaceutical supply chain | | | | | |
| 8 | Your organization frequently interacts with customers to set its reliability, responsiveness, and other standards | | | | | |
| 9 | Your organization frequently measures and evaluates customer satisfaction | | | | | |
| 10 | Your organization frequently determine future customer expectations | | | | | |
| **11** | Your organization frequently evaluates the formal and informal complaints of its customers | | | | | |

### 3.2 supply chain reliability analysis

| Q no | Question | 1 SA | 2 A | 3 N | 4 DA | 5 SD |
|---|---|---|---|---|---|---|
| 1 | Supply chain performance results in higher Sales rate | | | | | |
| 2 | Supply chain performance results in higher Order fill rate | | | | | |
| 3 | Supply chain performance results in On time delivery | | | | | |
| 4 | Supply chain performance results in higher Customer response time | | | | | |
| 5 | Supply chain performance results in Customer complain | | | | | |
| 6 | Supply chain performance results in longer Manufacturing lead time | | | | | |
| 7 | Supply chain performance results in Shipping error | | | | | |

**3.3 Supply chain flexibility (agility)**

| Q no | Question<br><br>The hospital has | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| 1 | Ability to respond to and Accommodate demand variations, such as seasonality. | | | | | |
| 2 | Ability to respond to and accommodate the periods of poor delivery from supplier | | | | | |
| 3 | Ability to respond to and accommodate the periods of poor supplier performance | | | | | |
| 4 | Ability to respond to and accommodate new products, new markets or new competitors | | | | | |

**3.4 supply chain cost test**

| Q no | Question<br><br>Supply chain activities | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| 1 | Total cost of resources used | | | | | |
| 2 | Total cost of distribution, including transportation and handling cost | | | | | |
| 3 | Total cost supply chain, including labor, transportation and re-work cost | | | | | |
| 4 | Cost associated with held inventory | | | | | |
| 5 | Return on investment | | | | | |

Thank you for your time!