Pharmaceutical expenditure analysis and assessment of pharmaceutical inventory control management practices in Saint Paul Hospital Millennium Medical College

Nanati Legese (B.Pharm)

Addis Ababa, Ethiopia

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Pharmaceutical expenditure analysis and assessment of pharmaceutical inventory control management practices in Saint Paul's Hospital Millennium Medical College

By: Nanati Legese (B. Pharm)

Advisor: Teferi Gedif (B. Pharm, MPH, PhD)

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This is to certify that the thesis prepared by Nanati Legese, entitled: *Pharmaceutical expenditure analysis and assessment of pharmaceutical inventory control management practices in Saint Paul Hospital Millennium Medical College,* and submitted in partial fulfillment of the requirements for the Degree of Master of Science in Pharmacoepidemiology and Social Pharmacy complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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External Examiner: _____Signature_____ Date_____

Internal Examiner: _____Signature_____ Date_____

Advisor: _____ Signature _____Date _____

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CONTENTS

ABBREVIATION AND ACRONYMS

ABC:	Always, Better, Control
ADE:	Annual Drug Expenditure
AMC:	Average Monthly Consumption
APE:	Annual Pharmaceutical Expenditures
DSM	Drug Supply Management
DTC	Drug and Therapeutic Committee
EDL	Essential Drug List
ETB	Ethiopian Birr
FIFO	First Expired First Out
FMOH	Federal Ministry of Health
GC	Gregorian Calendar
GDP	Gross Domestic Product
HSDP	Health Sector Development Plan
HSTP	Health Sector Transformation Plan
IFRR	Internal Facility Request and Requisition
LMIC	Low and Meddle Income Countries
MSH	Management Sciences for Health
NHA	National Health Account
RDF	Revolving Drug Fund

ROL	Re Order Level
ROP	Re Order Point
PFSA	Pharmaceutical Fund and Supply Agency
SPHMMC	Saint Paul Hospital Millennium Medical College
TASH	Tikur Anbesa Specialized Hospital
THE	Total Health Expenditure
TPE	Total Pharmaceutical Expenditure
VEN	Vital, Essential, Non-essential
VED	Vital, Essential, Desirable
WHO	World Health Organization

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ABSTRACT:

Background: Inadequate allocation of fund for the purchase of pharmaceuticals and inefficiencies in the supply chain are major causes of stock-outs in public hospitals. Analyzing purchased pharmaceuticals based on their budgetary consumption and importance (i.e. ABC & VEN) is expected to increase efficiency, save budget and diminish costs associated with overheads and wastages in the pharmaceutical supply chain. This study used ABC and VEN approaches to analyze medicine expenditures and explored inventory control practices of Saint Paul Hospital Millennium Medical College (SPHMMC).

Objective: To conduct pharmaceutical expenditure analysis and asses pharmaceutical inventory management practices of Saint Paul Hospital Millennium Medical College.

Method: Facility based descriptive cross sectional study using quantitative and qualitative data collection method was conducted. For the quantitative part, three years (2013/14-2015/16GC) Annual Pharmaceutical Expenditures (APE) were collected and Always, Better and Control (ABC); Vital, Essential and Non-essential (VEN) and ABC-VEN matrix techniques were applied for the analysis. For the qualitative part, data was collected through in-depth interview with the pharmacy professionals and analyzed thematically.

Results: St. Paul Hospital allocated 12 9 million (9.4%), 24 million (13.2%) and 31. 4 million (9.04%) for pharmaceuticals from its budget for the year 2013/14, 2014/15 and 2015/16, respectively. However, 45.3 million, 49.2 million and 79.0 million Birr (ETB) were used to purchase pharmaceuticals for the financial years 2013/14, 2014/15 and 2015/16 respectively. In the year 2015/16, the share of medical supplies, medicines and laboratory reagents were 45%, 28% and 27% respectively. Of the share of medicines, endocrine medicines accounted the highest percentage (20%) followed by anti-infectives (16.7%). On ABC analysis, about 17%, 18% and 10% of the pharmaceuticals consumed 79%, 80% and 80% APE and classified as 'class A' from year 2013/14 to 2015/16 respectively. From class A items; gauze surgical 90x100 in 2013/14, surgical glove sterile latex no 7.5 in 2014/15, and examination glove in 2015/16 consumed the lion shares; 20%, 7.8% and 32% of the APE respectively. On VEN analysis, of 539 analyzed in 2013/14; 25.6%, 59.5% and 5.4% were 'V','E' and 'N' respectively while 588 pharmaceuticals were analyzed in 2014/15 out of which; 24.5%, 54.4% and 4.4% were 'V','E' and 'N' respectively. And of 661 items analyzed in 2015/16; 21.8%, 58.7% and 8.9% were

'V','E' and 'N' respectively. There were also pharmaceuticals; 9.5%, 16.7% and 10.6% in the respective years, that were purchased and not included in the hospital's medicine list. On ABC-VEN matrix analysis, 35%, 34% and 27% items were found to be category I (AV, AE, AN, CV, BV) accounting more than 80% of APE in 2013/14, 2014/15 and 2015/16 respectively. About 51%, 46% and 54% items were found to be category II (BE, CE, BN) accounting about 12% of APE from 2013/14 to 2015/16 respectively. 4.8%, 3.6% and 8.3% items from 2013/14 to 2015/16 respectively, were found to be category III (CN) accounting less than 1% of APE. Inadequate storage space, lack of adequate supply of pharmaceuticals and provision of new and near to expiry pharmaceuticals were identified to be the major challenges in inventory management leading to stock-outs and expiry of pharmaceuticals in SPHMMC.

Conclusion and recommendation: On ABC-VEN matrix, the study indicated; top level management for control of AV items, limiting use of N items (AN, BN and CN) and bulk purchase of CV which would help in saving costs. In general, the ABC and VEN techniques need to be adopted as a routine practice for optimal use of resources. The priority for the purchase of pharmaceuticals should be based on VEN list which again should be updated regularly. In general, poor performance of inventory control management was indicated in the hospital with arbitrary decisions on quantity and frequency of ordering leading to frequent stock-out and expiry of pharmaceuticals indicating a need for follow-up actions in order to curb the challenges and hence, efficient use of limited resources.

Key words: ABC analysis, VEN analysis, ABC-VEN matrix, pharmaceuticals, Inventory management, Saint Paul Hospital Millennium Medical Collage

1. INTRODUCTION

1.1. Background

Lack of essential medicines is one of the most serious public health problems. Globally one third of the population lacks the medicines they need. The situation is worse in the poorest parts of Africa and Asia where the figure rises to over 50% (WHO, 2004). In many developing countries lack of essential medicines is usually experienced leading to increased mortality and morbidity (WHO, 2008). In addition, it undermines the ability of healthcare professionals to respond appropriately to patient needs and this often erodes the confidence and trust patients and their families have in health systems. Studies imply that as availability of pharmaceuticals decreases, patients reduce their positive perception of the facility (Mugisha et al., 2004; Hanson et al., 2005; Nabbuye-Sekandi et al., 2011).

Health institutions especially hospitals in this context have to make sure that a given fund is spent according to planned budgets and not otherwise so as to ensure availability of essential medicines. This calls for effective cost analysis as well as proper inventory control management which would help to identify opportunities for cost savings and improve efficiencies in the system (Kokonya, 2016; Sushil and Chakravarty, 2014). Therefore, the present study was undertaken to analyze pharmaceutical expenditures and inventory management practices in one of the largest hospitals in Addis Ababa, Ethiopia. The information gained from this study would help in decision making and policy formulation in the future.

Global health expenditures

World Health Organization (WHO) reported that, Organization for Economic Cooperation and Development (OECD) countries spend a larger share of their GDP on health (12.33%), as compared to 6.15% in the African (AFR) and 3.64% in South East Asian (SEAR) regions of WHO. This translates to per capita spending of US$ 4584 in OECD countries compared to US$ 93.65 in Sub Saharan Africa (SSA) (WHO, 2014).

According to Ethiopian National Health Accounts (NHA) for the year 2010/2011, the total health expenditure (THE) per capita spending was US$ 20.77 which accounted for only 5.2% of the GDP. Expenditure for health as a total of all government expenditure was only 5.6%

(FMOH/NHA, 2014). This is less than the 15% recommended by the Abuja declaration (Musango et al., 2012). There is also a persistent budget deficit in the health sector in Ethiopia. For instance, the budget committed for the different strategic health objectives during the 2011/12 financial year was 30% less than the required amount for that year. During the same period, various strategic objectives within the HSDP IV did not have adequate budgets (Dibaba et al., 2014; FMOH, 2011/12). Despite the increase in government spending on health, its share as percent of GDP is below the WHO recommended level of 5%, ranging between 0.8% and 1.6%. Even after adding health spending through government and development assistance, share as percent of GDP has only reached a maximum of 3.4% during the five NHA years (Alebachew, 2015).

The low expenditure on health is likely to have negative impact on the money spent on medicines as Total Pharmaceutical Expenditure (TPE) has been found to be closely related to THE. Pharmaceuticals represent one of the single largest components of health expenditure, accounting for more than a mean proportion of 19.7% in high income countries and 30.4% in low income countries. There is generally low per capita expenditure on medicines in low income countries which may affect availability of medicines in public health facilities (WHO, 2011; MSH, 2012).

Inventory control techniques

There are various methods involved for inventory control but the two commonly use ones are Always, Better, Control (ABC) and Vital, Essential and Non-essential (VEN). ABC analysis helps in identifying the items that require the greater attention for control. In this, 10-20% of items that consume about 75-80% of the budget are considered Class A. The next 10-20% inventory items that take away 15-20% of the budget and the remaining 60-80% items that account for just 5-10% of the budgets are considered as class B and C respectively. This is based on a principle known as Pareto principle. VEN analysis classifies pharmaceuticals based on their criticality and utility for the patients into three categories: Vital, Essential and Non-essential, i.e., VEN (MSH, 2012). Vital pharmaceuticals can be given values based on their potential for lifesaving, being crucial for health services and prevention of death or disability of the patient (MSH, 2012). Essential pharmaceuticals are effective against less severe but significant illness, not vital; it is between vital and less essential. They are lifesaving; without which patient may be

in difficulty but may be somehow substituted while non-essential pharmaceuticals are effective for minor illnesses and low therapeutic advantage (MSH, 2012).

A combination of ABC and VEN analysis (ABC–VEN matrix) can be employed to evolve a meaningful control over the material supplies. Category I includes all V and A items (AV, BV, CV, AE, AN). Category II includes the remaining items of the E and B groups (BE, CE, BN). Category III includes the non-essential and cheaper group of items (CN) (Devnani, et al., 2010). Of all the inventory control systems ABC and VEN matrix is most suitable for medical stores. Hence, the coupling of ABC and VEN matrix for pharmaceutical inventory in a hospital is recommended (Roy, 2010; Gupta, et al., 2007).

Pharmaceutical's management perspective

The key role of managing medicine supply is to ensure that essential medicines are available at affordable cost according to a given budget, they are well managed or controlled and that they are used rationally (USAID/DELIVER, 2007). Managing medicine supply is summarized as the 4 basic functions of pharmaceutical management cycle which are selection, procurement (including quantification), inventory management (this also includes storage and distribution) and serving customers/use (MSH, 2011). Product selection is a critical first step in logistics management of medicines. The purpose is to select the most effective and cost-efficient medicines so as to support the goals of a health care system (MSH, 2011). Once the medicines have been selected, the needs must be quantified. Quantification is referred to as critical logistics management activity that links the quantities of medicines being used and patient or hospital needs on the ground to financing and procurement decisions. It involves estimating the quantities and the costs of products required to meet customer demand and maintain adequate stock levels in the supply pipeline. Quantification must rely upon accurate, up-to-date information on: service provision and consumption/use of medicines, stock levels and funding sources and amounts for medicines procurement (MSH, 2012). Procurement deals with preparation of tendering processes, choice of reliable suppliers and purchasing of medicines so that they are available for use. An effective medicine procurement process ensures the availability of the right medicines in the right quantities, at the reasonable prices, and at recognized standards of quality (MSH, 2011).

Pharmaceutical Inventory control management

Inventory control is a system which indicates as what to order, when to order, and how much to order, and how much to stock so that purchasing and storing costs are kept as low as possible. It helps to protect against the fluctuation in supply and demand, uncertainty and minimize waiting time (Nursing Management, 2011). It is also defined as a process of managing inventory in order to meet patient demand at the lowest possible cost with minimum investment (Anil et al., 2012). Inventory of medicines can be controlled, and the pharmacy department normally decides how much inventory investment to make, when to reorder and how much, that is in what quantities. For instance, Integrated Pharmaceutical Logistics System of Ethiopia (IPLS) introduced minimum and maximum (Max-Min) inventory levels for the main stores of health facilities, at all levels. Main stores of hospitals and health centers should have a minimum inventory of two months of stock and a maximum of four months, while health posts should have a minimum of one month of stock and a maximum of two months. Proper commodity management should ensure that inventory levels remain within this set range (Shewarega et al., 2015). On the other hand, accurate and current stock records are essential for proper inventory management. They are the sources of information used to calculate the needs and inaccurate records produce inaccurate demand estimations, which bring about problems of stock outs and expiry (Santhi and Karthikeyan, 2016). There are four types of costs associated with inventory in pharmacy practice: acquisition costs, procurement costs, carrying costs (inventory holding cost), and shortage costs. Acquisition cost is the net amount of money the pharmacy pays for the products. Procurement costs are costs associated with purchasing the products, which include placing and receiving orders, stocking and paying invoices. Carrying costs (inventory holding cost) refer to costs associated with product storage, which also include costs incurred as a result of crises, e.g. theft or damage. Shortage costs also known as stock-out costs are the costs of not having the product on the shelves when needed (MSH, 2007; MSH, 2012).

1.2. Statement of the problem

With the advent of advanced medical technology and drugs, the expenditure on health care delivery is increasing disproportionately as compared to the resources available (Gupta et al.,

2007). About one-third of hospital budget is spent on purchasing materials and supplies including medicines (Kant et al., 1997). This growing expenditure on pharmaceuticals is a major concern for healthcare systems worldwide but the situation is more worrying in developing countries because of the scarcity and inefficient use of resources (WHO, 2008). Therefore, there is a need for an efficient supply chain system and priority setting to reduce the negative impact of stock-outs (WHO, 2011; MSH, 2012). Better use of medicines could save countries up to 5% of their health expenditure (WHO, 2014).

In Ethiopia, baseline data for health sector development plan (HSDP IV: 2010-2015) showed that stock-out for essential drugs was found to be 35% and national average rate of medicines expiry was found to be 8.24% (FMOH, 2010). In 2014, national survey conducted at public health facilities in Ethiopia indicated that the average availability of essential tracer medicines at health facilities on the day of visit was 89%; while average availability of the tracer pharmaceuticals during six months prior to the study was 78.1% (Shewarega et al., 2015). On the other hand, assessment made in Federal and Addis Ababa city government hospitals during collection of Auditable Pharmaceutical Transaction and Services (APTS) baseline data, in the year 2013/2014, indicated that the availability of key medicines at the dispensaries on the day of visit ranged from 33.3% to 100%; while the three years (2012, 2013, 2014) average wastage rate of medicines in 8 hospitals was found to be 4.8%, amounting to 11,078,910.52 ETB (Tadeg et al., 2014).

Literatures have shown that regular inventory control practice in health care bring substantial improvement in patient care as well as optimal use of resources (Devnani et al., 2010; Thawaniet al., 2004; Vas et al., 2008; Gupta et al., 2007). For instance, a study suggested that analysis of medicine expenditure could bring about 20% savings in pharmacy store budget (Pillans, 1992). Another study revealed that ABC analysis, if practiced, would allow effective control over two third of the total expenditure by controlling only one fourth of the items (Kant et al., 1997). Analysis of medicine expenditures has an impact on the inventory management particularly on the type of medicines to be ordered and on the management of financial resources especially on budget allocation (Devnani, et al., 2010;Thawani et al., 2004; Kokonya, 2016). Another study showed the importance of VEN classification in reducing stock-out situation in which the percentage of stock-out situations at hospitals using VEN analysis was found to be less (0, 99%) compared to hospitals without this inventory classification (3, 94%) (Chungsiwapornpong,

2007). However, medicines expenditures are rarely analyzed and reported in most hospital pharmacy departments especially in developing countries despite inadequacy of budgets (Tumaini, 2013). In Ethiopian there are limited studies on regular inventory control practice in health facilities despite inadequacy of resources. For instance, of 17 Federal, Addis Ababa, and Teaching hospitals, only four hospitals (23.5%) reported adequate budget was allocated for the purchase of pharmaceuticals in the year 2012/13. On average, only 7.84 months were covered in hospitals where the allocated budget was inadequate. In the same study it was found that, of 17 hospitals, VEN analysis was performed by ten hospitals (58.8%) and ABC value analysis was conducted by three hospitals (17.6%), of which only one performed ABC-VEN reconciliation, indicating that ABC value analysis was rarely used for decision making purposes (Tadeg et al., 2014). This study also pointed out that there was no medicine expenditure analysis done in SPHMMC despite inadequacy of budget allocation and medicines stock-outs. In 2012/13, the availability of key drugs in the hospital was only 75.9% and the minimum and maximum stock-out duration was 15 and 90 days respectively (Tadeg et al., 2014).

Therefore, the author chose ABC–VEN analysis for the pharmaceuticals available in the pharmacy store of SPHMMC since it is the second biggest teaching hospital where the government is investing a lot and enormous expansion is going on. Besides, no such analysis was carried out in the hospital. The findings of the study would help to improve the quality of health care services being delivered and to reduce wastage and stock-outs of important pharmaceuticals. Moreover, the findings from this study will contribute to fill research gaps on identifying pharmaceuticals that requires higher inventory control monitoring and exploring inventory control management practiced and challenges involved.

2. LITERATURE REVIEW

2.1. Pharmaceutical expenditure analysis

There are several analytical tools in the pharmaceutical supply system that help managers quantify costs and identify areas where costs can be reduced; the information provided is also essential in designing and monitoring interventions to control costs. The techniques include; total cost analysis, VEN system, ABC analysis, therapeutic category analysis, price comparison analysis, lead-time and payment-time analysis, expiry-date analysis, hidden-cost analysis (MSH,2012).

Several studies analyzed pharmaceutical expenditures by using ABC, VEN and by reconciling the two (ABC-VEN matrix) tools.

In Asia for instance, several studies on medicine expenditure were conducted by using ABC VEN analysis tools. ABC analysis conducted in 190 bedded hospitals in India revealed that, out of 325 items analyzed, 14.6% consumed 70% of Annul Drug Expenditures (ADE) (Group A), 22.46% consumed 19.99 % of ADE (Group B) and the rest 63% items consumed just 9.99% of the total expenditure (Gupta, et al., 2007). Another study in Indian Armed Forces revealed that out of 1536 drugs considered for the study, only 400 drugs of the total inventory consumed about 90% of the operating budget of the pharmacy, the remaining 1136 (73.95%) drugs consumed only 10% of the total expenditure (Kumar and Chakravarty, 2015). Study conducted in Thailand also showed that from 336 medicines, 7.74% consumed 70.84% of annual value and classified into class A, 11% consumed 19% of annual value classified into class B, and 81.25% of items consumed only 9.93% of annual value forming class C (Junita and Sari, 2012). A study conducted at Kolaghat thermal power hospital, a public sector undertaking hospital in West Bengal also narrowed down pharmaceuticals to be managed based on their cost and criticality (Roy et al., 2010).

In Africa, a study that analyzed medicine expenditures by using ABC -VEN tools at Muhimbili National Hospital (900 bedded) in Tanzania found that from the total of 394 medicines procured during the financial year, 46(12%) medicine belong to class A and 67(17%) to the vital category, about 70% medicines were essential and consumed 70% of the budget. The study classified the items into A, B and C classes after classifying them based on their source of purchases (MSD

which is a government agency and other suppliers). Of 143 medicines procured from the MSD ceftriaxone 1gm injection alone contributed 15% of the total cost and of 251 medicines procured from other suppliers, meloxicam and augmentin tablets together contributed 16% of the total cost (Tumaini, 2013).

Another study done in Kenya on total cost analysis for fiscal year 2014/2015 at 200 bedded referral hospital revealed that in combination of ABC and VEN analysis, from the total of 201 items,74(37%) items consuming 82% of ADE was classified as category I. In the study AN subgroup of category I was only one item (Haematinic syrup 200ml) that consumed 2% of the ADE. The study insisted that this item should be considered for removal from the essential medicines list to save costs. Category II items consist of 110 (55%) of items consuming 17% budget. Category III consisted 17(8%) of items that consumed 1% of the ADE. In the same study, Artemether/lumefantrine tablets contributed the highest percentage of the ADE accounting 7.94% of the total ADE (Kokonya, 2016).

In Ethiopia, medicine expenditure analysis was performed in Tikur Anbessa Specialized Hospital (TASH) which is the largest hospital in Ethiopia with 700 beds. A five years (2009-2013) ABC-VEN analysis was conducted in the hospital. In 2012 and 2013 of the studied years, 293 and 263 pharmaceuticals were analyzed with an Annual Pharmaceutical Expenditure (APE) of (20,963,104.7 and 24,248,908.17ETB) respectively. In VEN analysis of year 2012, 60% of the items were considered 'Vital', 15% were 'Essential' and 25% of items were out of the hospital's drug list (of these, 9 items were class A consuming 7% of APE). In 2013, 70% of pharmaceuticals analyzed were considered 'Vital', 19.7% were 'Essential' and 10% of items were out of the hospital's drug list (of these 1 item were class A consuming 4.5% of APE). The ABC-VEN matrix analysis of the study revealed that, category I items consumed (86.8 and 89.9%) of the total APE and category II consumed (2 and 4.4%) of APE in 2012 and 2013 respectively. There was no category III item as there was no non-essential pharmaceutical in the years 2012 and 2013. From category I pharmaceuticals of the studied years, Insulin /NPH/ 100u/ml in 10ml, Examination glove, Gauze bandage, Surgical gloves sterile latex number 7.5 of 50 pairs, Vicryl (Polyglycoliq) different size and shape, and Normal Saline (Sodium chloride 0.9%) injection of 1000ml existed through five years (2009-2013) by covering huge amount of money (Migbaru et al., 2016).

Most of the above studies were focused on only drugs for cost analysis. Other pharmaceuticals including laboratory reagents or materials and medical supplies were not included. In addition, the previous studies did not undergo therapeutic category analysis which better help for prioritizing and decision making of purchases.

2.2. Challenges in pharmaceutical inventory control management

Inventory management is the core of pharmaceutical supply system. It is all about ordering, receiving, storing, issuing, and again reordering of limited list of products (Kokilam et al., 2015). Studies conducted in the area of inventory management practices revealed that, poor pharmaceutical inventory management system has resulted in wastage or blockade of financial resources, shortage and overage of essential drugs, increase in out-of-pocket expenditure and decline in quality of healthcare services (Mungu, 2013; Kokilam et al., 2015) while well-organized inventory management system reduces the problems of over stock, out of stock and also decrease the time spent in gathering and taking care of drug stock control (Viboonsunti, 2003; Iqbal et al., 2017). According to a study in a hospital found in Thailand, after purchasing and inventory management system were adopted, rate of correctly received products was improved, rate of destroyed or expired products was decreased and rate of product shortages for all observed times was decreased (Monton et al., 2014).

Several studies were conducted in Africa to explore the challenges faced in managing inventory in hospitals.

A qualitative study on assessment of health commodities management practices in selected hospitals in Ghana revealed that, challenges in managing inventories in the hospitals were; inadequate availability of health commodities, poor procurement practices, undermined distribution, unavailability of storage facilities, unavailability of skilled labor, internal bureaucracy, lack of funding and logistical problems (Adzimah et al., 2014).

A study on inventory management practices at public and mission hospitals in Kenya explored that, the challenges experienced by the inventory management team were; stock-outs, inadequate storage space, budget constraints, poor inventory record keeping, lack of teamwork, delayed supplies, delay in getting suppliers and inadequate staffing in department. Ad-hoc decisions about order frequency and quantity, incomplete stock records, lack of Standardized Operating

Procedures (SOPs) to guide staff and lack of regular performance monitoring were other challenges faced in the studied hospitals (Shadrack et al., 2015).

According to a study on challenges in the management of drug supply in public health care facilities in Sedibeng district, South Africa, of studied facilities, twenty percent of the clinics admitted that the Re Order Level (ROL) has not been calculated for all tracer items in the store. As a result, staff relied on their working experience to determine the quantities to be ordered. Only 40% of the facilities counted stock prior to ordering and only 28% recorded their order level of each item on the order. More than 96% of the clinics cited the most predominant reasons for the experiencing of out of stock is because the district is out of stock (Tayob, 2012).

In India, indicator based assessment for inventory management practices in various public hospitals was done that revealed, good inventory management practices were deficient due to inadequate storage space, non-availability of computerized inventory system, delay in delivery and excessive lead times for purchasing products and lack of human resource (Iqbal et al., 2015).

Poor inventory control management of medicines may lead to incorrect ordering, leading to under-stocking or over-stocking of the medicines. Over-stocking of medicines normally produces high number of expired medicines while under-stocking may also lead to increase in number of stock-out medicines (MSH/WHO, 1997). Study that explored reasons for stock-out of medicines in South Africa identified that, lack of adhering to Re Order Level (ROL), shortage of space in the store and lack of DSM training affected availability of medicines. In addition, not updating bin cards regularly and inaccurate consumption records were reasons for stock-outs (Tayob, 2012). On the other hand, long lead time period can cause drug shortages in the health facilities, as it was reported in a study conducted in Malawi (Lufesi et al., 2007).

With regard to expiry of pharmaceuticals, there were studies conducted to explore the possible reasons for its occurrence. According to a study conducted at a large urban tertiary hospital in Johannesburg, South Africa, when exploring the possible reasons why medicines expire, it was mainly attributed to ineffective inventory management. Additionally, stocks were ordered in excess regardless of the minimum and maximum ordering system and re-ordering level of available medicines. In addition, pressure to receive short dated stocks and unable to dispense these items before expiry were among the factors (Sauls, 2016). Other studies identified that;

over-stocking, prescribing tendencies by medical practitioners and poor stock control as reasons for pharmaceuticals expiry (Mashishi, 2015; Mansah, 2015). Another study in Uganda reported that high contributors for expiry of medicines to be due to storing medicines that treat rare diseases (81.8 %) and drug donation (56%) (Silumbe, 2011).

In Ethiopia, a study conducted to assess essential medicines availability and inventory management practices in public primary health facilities of Gondar town revealed that, the mean duration of stock-out of tracer medicines in the six months' period was 30.5 days. Inventory management problems were observed in most of the health facilities that was indicated by the discrepancy between physical count and stock record count of essential medicines ranging from 0% to about 60%. The total loss of money due to medicines expiry over six months' period was 1337.6 USD from the six health facilities (Fentie et al., 2015).

3. OBJECTIVE

3.1. General objective

- To conduct pharmaceutical expenditure analysis and asses pharmaceutical inventory management practices in Saint Paul Hospital Millennium Medical College.

3.2. Specific objectives

- To determine the annual pharmaceutical expenditures from 2013/14 to 2015/16 GC.
- To identify pharmaceuticals category that requires higher inventory control monitoring.
- To explore inventory control management practiced and challenges involved.

4. METHODS

4.1. Study setting

The study was conducted in St. Paul's Hospital Millennium Medical College located in Addis Ababa. It is the second largest specialized hospital established in 1968. It is governed by a board under the Federal Ministry of Health (FMOH). The hospital has more than 2800 clinical and non-clinical staff members that provide medical specialty services to patients who are referred from all over the country, teaching medicine and nursing students and doing basic and applied researches. While the inpatient capacity is more than 700 beds, the hospital sees an average of 1200 emergency and outpatient clients daily. The hospital recently opened a new kidney transplant center where the first organ transplant was performed in 2015 (SPHMMC, 2017). It is a huge hospital in the country where a large amount of budget is utilized. In the fiscal year 2008 EC for instance, more than 629.4 million and 346.9 ETB capital and recurrent budget were utilized in the hospital. There are two pharmacy stores (for budget and RDF pharmaceutical's), three dispensaries (OPD, RDF and ART pharmacy) and Drug Supply Management (DSM) unit in the hospital.

4.2. Study Design and period

A retrospective facility based cross-sectional study was conducted by using mixed-method, quantitative and qualitative study design to analyze the annual medicine expenditures and to explore the pharmaceutical inventory control management practices respectively. The data collection period was from March-April, 2017.

4.3. Inclusion and exclusion criteria

For the quantitative study, pharmaceuticals i.e., all medicines, laboratory reagents and consumable medical supplies that are purchased by hospital, procured through Revolving Drug Fund (RDF) or donated to the hospital and recorded by good receiving vouchers (Model 19, Goods Receiving Notes(GRN), Delivery notes) in years 2013/14, 2014/15 and 2015/16 were included. All program pharmaceuticals like; antiretroviral drugs, anti-tuberculosis drugs, family planning drugs and Implantable pharmaceutical equipment were excluded from the study.

For the qualitative study, pharmacy personnel who were working in the store, supply management coordinator, purchasers, dispensary coordinator and head of pharmacy case team were purposively selected and included for the interview as a key informant (because they are supposed to be information rich than other health professionals). These were included if they were available during the data collection period and were willing to participate in the study.

4.4. Data collection and management

4.4.1. Data collection procedure

The quantitative data was collected by using data abstraction formats. These Data collectors were four pharmacists including the principal investigator, one pharmacist working in SPHMMC and two pharmacists outside the hospital.

For an in depth interview, interview guide was first prepared in English language, and translated into Amharic and then back to English. The back translation was done with colleagues to check message consistency. The Amharic version was used for the interview with key informants. The qualitative data was collected by the principal investigator. Digital voice recorder was also used for the interview after getting consent from participants and the information was transcribed immediately after the interviews.

4.4.2. Data collection instrument

Quantitative study

The quantitative data was collected through document review by recording each pharmaceutical on the data abstraction form. This was done by reviewing the hospital's database system. Key documents that were reviewed include: the hospital’s VEN list, delivery notes and pharmaceuticals recorded by good receiving vouchers (model 19) in the Fiscal Years covered by the study.

Qualitative study

Interview guide was prepared to explore current inventory management methods used by the hospital, to identify challenges faced in controlling inventories and also to collect information about how the participants describe the supply chain performance of the hospital's relating to stock-out, expiry and supply with the reasons for their occurrence and measures taken to prevent these problems. The interview guide was developed after extensive literature review (Lufesi et al., 2007; Adzimah et al., 2014; Theptong, 2010; Kagashe et al., 2012; Kokilam et al., 2015; Iqbal et al., 2015; MSH, 2012).

4.5. Data quality control

For the quantitative study, data collectors were trained for half a day on the data collection instruments and processes prior to data collection. The training focused on pharmaceuticals with same name but different strength and dosage. Data was checked by the principal investigator for the consistency, regularity and completeness and any inconsistencies amended on time. The quality of the data was confirmed by using different types of documents containing the same information such as GRN with delivery notes.

For the qualitative part, the validity of the findings was enhanced by; sharing the transcript with the research participants (member checking), and using quotations from different participants. Whereas, the consistency of the finding was indicated by repeated reading of the transcription in line with the audio recording.

4.6. Data analysis

The data of annual consumption and expenditure that incurred on each item of the pharmacy was recorded in an MS Excel spreadsheet. The statistical analysis of quantitative data was carried out using the MS Excel statistical functions. First, ABC analysis was done by multiplying unit cost of each drug by its annual consumption. The resulting figures were summed and percentage was calculated for each pharmaceutical and arranged in descending order of value. The pharmaceuticals were then classified into A, B and C categories according to cumulative cost consumed. Lastly, the results were presented into tables and figures showing proportions of items in different classes and the proportion of budget utilized. VEN analysis was the second

phase which was done based on the hospital's VEN list. The proportions of the medicines in each of these categories were then computed together with their respective percentage expenditures. Finally, the ABC-VEN matrix was formulated by cross-tabulating ABC and VEN analysis that was used to get the different categories of medicines that the first and second alphabets represent the medicine's place in the ABC and VEN analysis, respectively and presented on tables.

The analysis of qualitative data was done manually. All interviews were conducted, audio-recorded and transcribed verbatim in Amharic and translated to English. Each transcript was early coded line by line, concurrently with data collection and after multiple readings of the text, detailed coding and sub-coding were made to themes and relevant quotations were used to illustrate themes in the presentation of study findings.

4.7. Ethical considerations

Ethical approval was obtained from the Ethics Review Committee of the School of Pharmacy, Addis Ababa University. In addition, permission to conduct the research was obtained from the Institutional Review Board (IRB) of SPHMMC.

Participants of the study were asked for verbal consent before participating in the study. During the consent process, the study participants were informed about the purpose of the study and the importance of their participation in the study. The study participants were also informed that they could skip question/s that they did not want to answer fully or partly and also to quit the process at any time if they wanted to do so and their participation was voluntary. Participants were also assured about confidentiality of the information obtained in the course of the study by not using personal identifiers.

4.8. Operational definitions

Pharmaceutical/s- in this study indicates any item or product which includes medicines, laboratory reagents or materials and medical supplies.

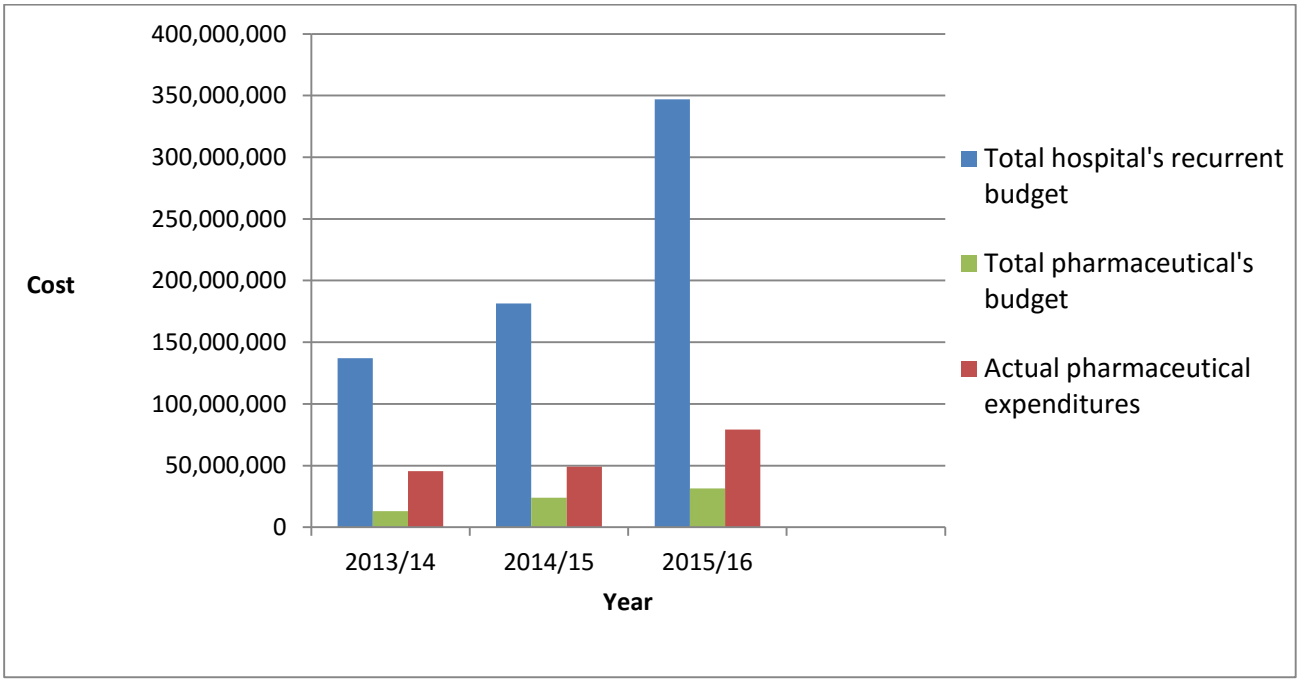
5. RESULTS

5.1. Quantitative findings

5.1.1. Annual pharmaceutical expenditures of SPHMMC

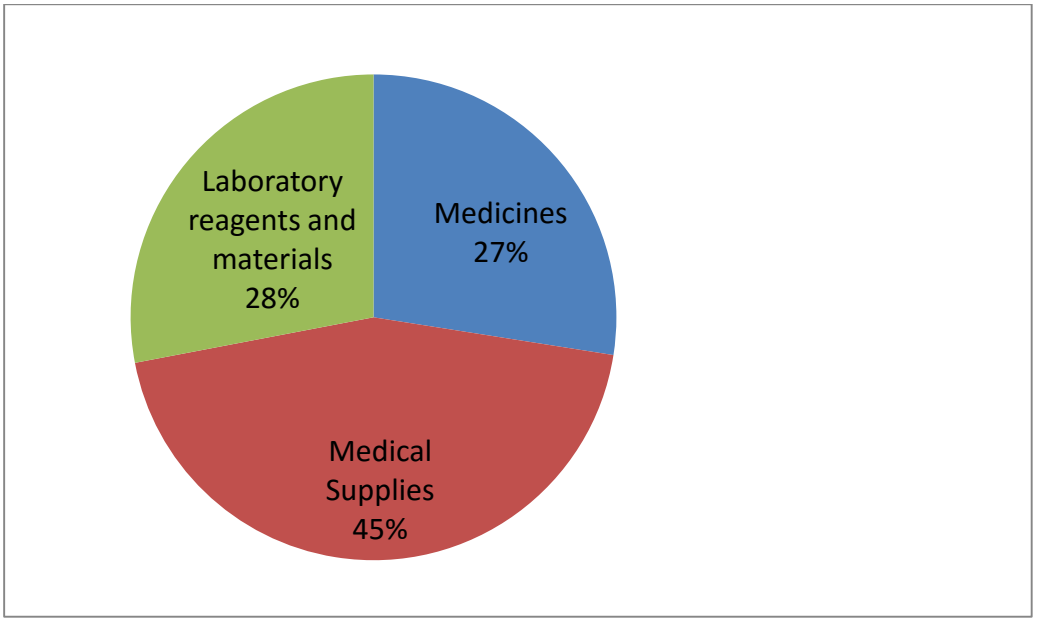
Saint Paul Hospital Millennium Medical Collage had total recurrent annual budgets (in Birr): 137,110,021; 181, 360,410.55 and 346,962,464.74 in Fiscal Years 2013/14, 2014/15 and 2015/16, respectively which showed increment in successive years. However, as can be seen on Figure 1, the proportions of pharmaceutical's budget to total hospital budget was asymmetric in successive years which were 9.4% in 2013/14, 13.2% in 2014/15 and 9.04 % in 2015/16. On the other hand, a successive increase in Annual Pharmaceutical Expenditures (APE) was observed in the hospital between 2013/2014 and 2015/2016.

Figure 1: Comparison of annual budgets and pharmaceutical expenditures in SPHMMC (2013/14-2015/16), Addis Ababa, March 2017



From the total pharmaceutical expenditures (79,096,521 ETB) in 2015/16, the share of medical supplies was much higher than the shares of medicines and laboratory reagents (Figure 2).

Figure 2: Share of pharmaceutical expenditures (based on type) in SPHMMC (2015/16), Addis Ababa, March 2017



The top three medicines in terms of cost from total medicines' expenditures were, normal saline 1000ml (7.8%) followed by propylthiouracil 100mg tablet (5.9%) and insulin zinc suspension/ lente), 100units/ml in 10ml (5.6%) (Figure 3). Based on therapeutic classes, the top three in terms of cost were, endocrine medicines (20%) followed by anti-infectives (16.7%) and water, electrolyte and acid base balance correcting medicines (12.9%) (Figure 4).

Figure 3: Ten top medicines (value) in SPHMMC (2015/16), Addis Ababa, March 2017

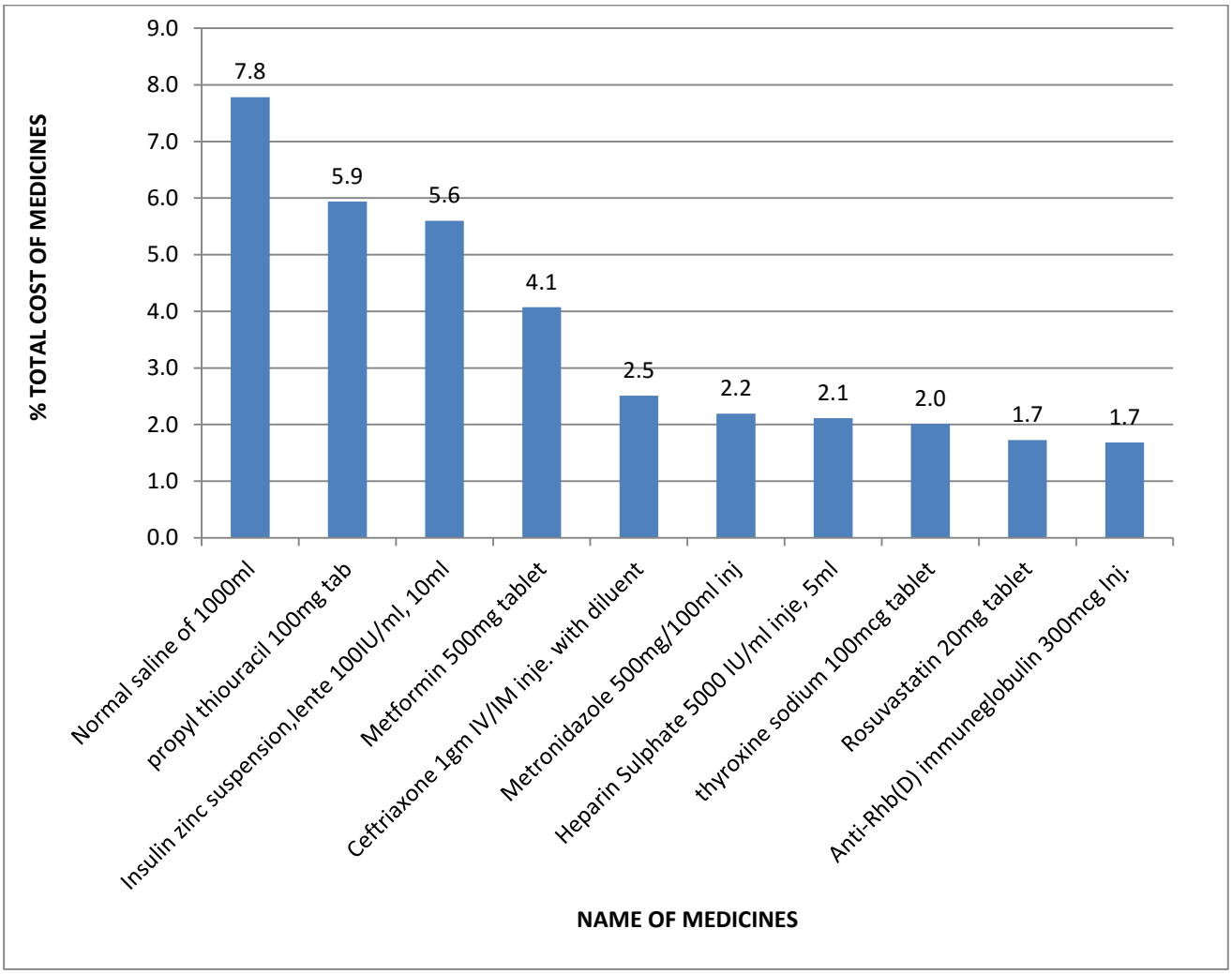
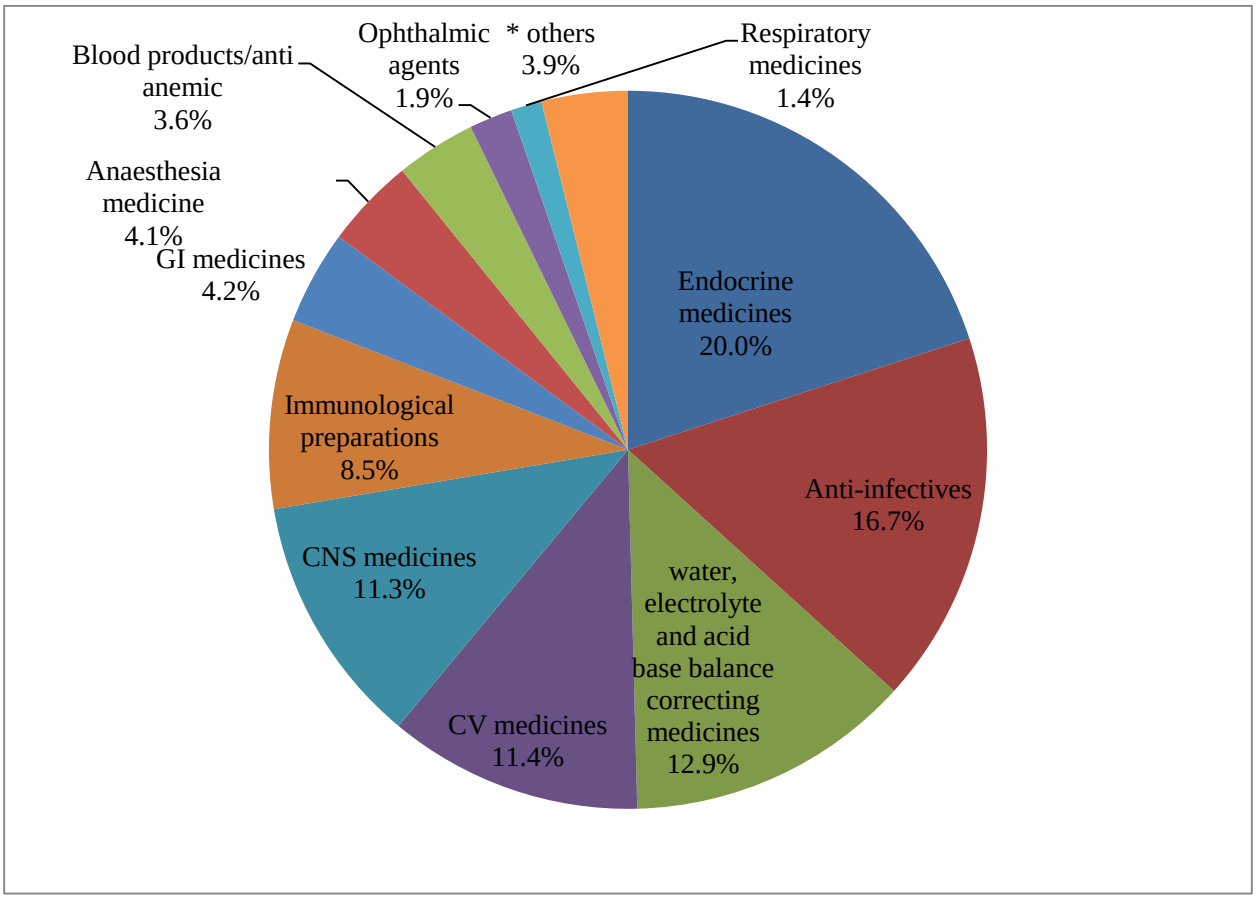


Figure 4: Share of medicine's expenditures based on therapeutic classes in SPHMMC (2015/16), Addis Ababa, March 2017



CNS: Central Nervous System, CV: Cardio Vascular, GI: Gastro Intestinal

**others: medicines for musculoskeletal and joint disease (1%), vitamins (0.8%), dermatological agents (0.7%, antihistamines (0.5%), anti-neoplastic and related agents (0.47), obstetric and gynecologic agents (0.4%)*

Of laboratory reagents and materials, glucose test kit consumed the highest percentage of expenditures (23.9%) followed by gadolinium 0.5mm 01/5ml 15ml (contrast agent) (13.5%), and serum separator tube (6%) (Figure 5). On the other hand, examination glove alone consumed 71.6% of the total expenditures of medical supplies (Figure 6).

Figure 5: Ten top laboratory materials and reagents (value) in SPHMMC (2015/16), Addis Ababa, March 2017

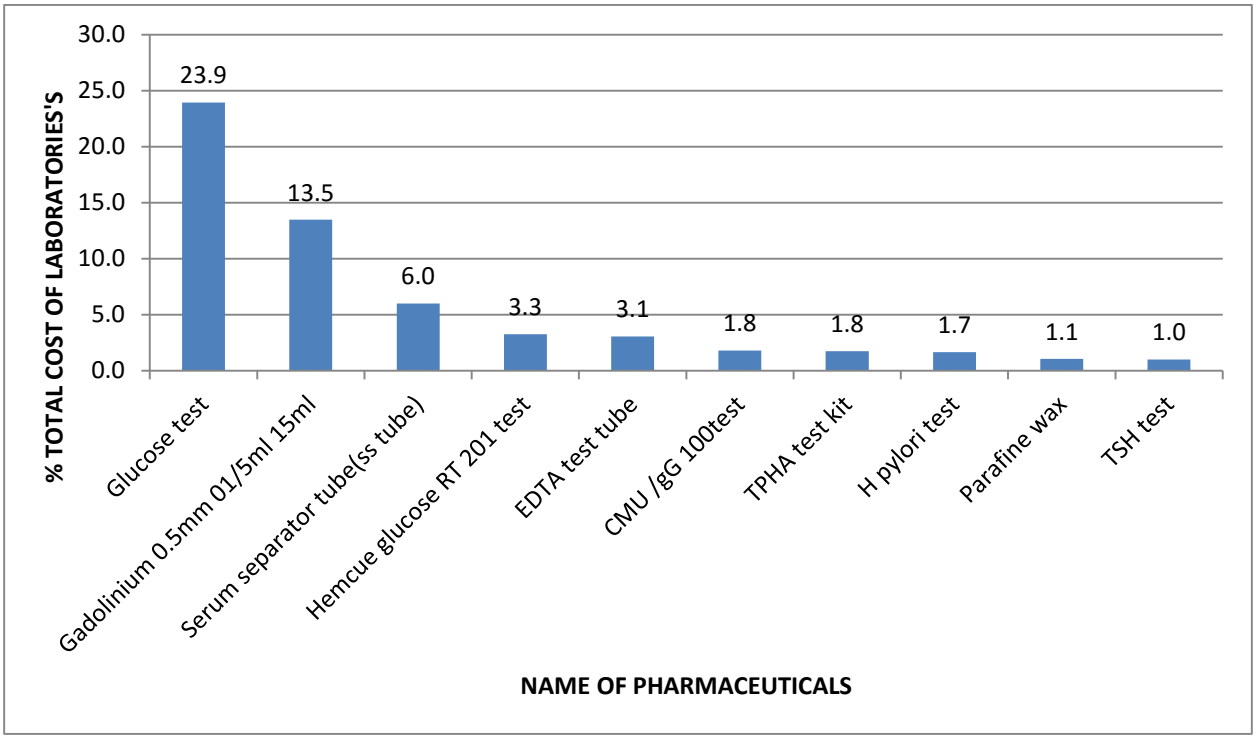
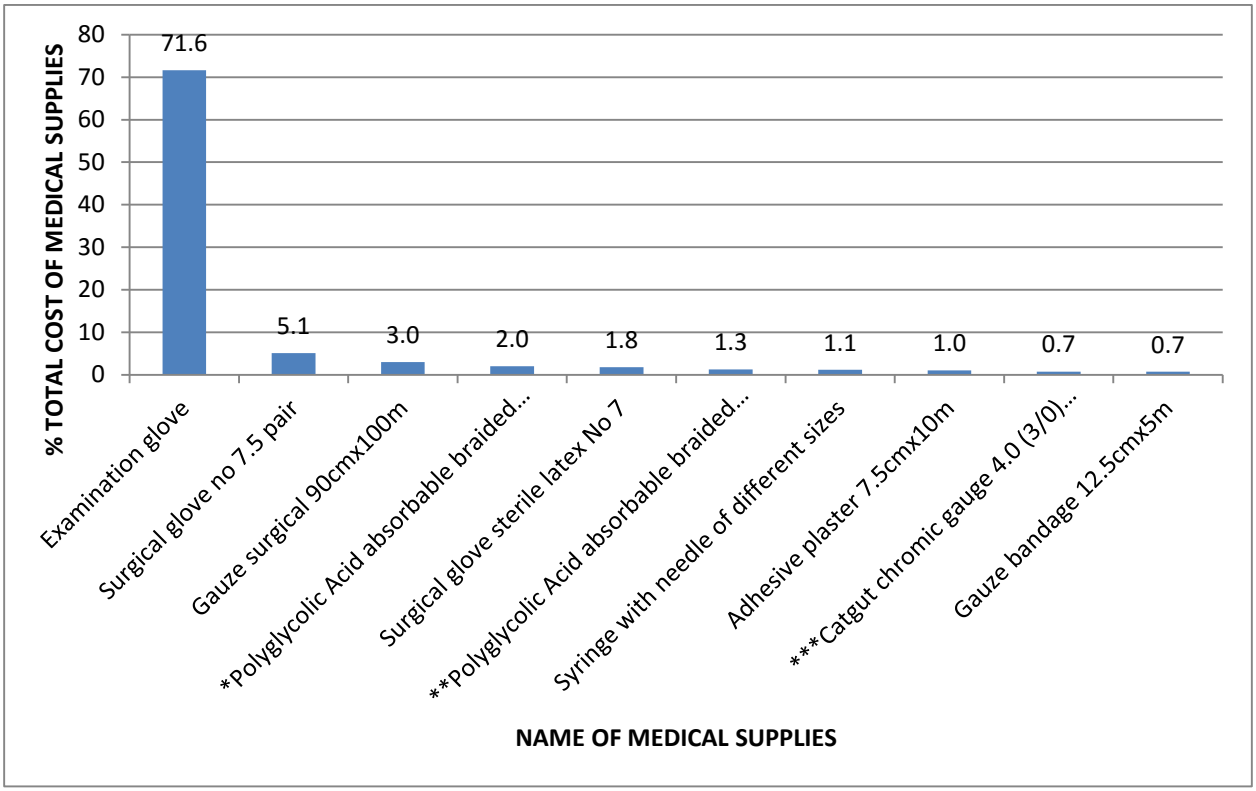


Figure 6: Ten top medical supplies (value) in SPHMMC (2015/16), Addis Ababa, March 2017



*NB: *Polyglycolic Acid absorbable braided violet gauge 5.0 (2) 75cm on 48-50mm ½ circle, **Polyglycolic acid absorbable braided violet gauge 4.0 (1) 75 cm on 45 mm ½ circle, *** Catgut chromic gauge 4.0 (3/0) 75cm on 30 mm ½ circle round bodied needle*

5.1.2. ABC analysis

The ABC classification in the current study was done based on Pareto principle (MSH, 2012). The boundaries for classification of A, B, and C groups are somewhat flexible. It depends on how volume and value are dispersed among items and how the results of the ABC analysis are going to be used (MSH, 2012). The three years ABC analysis of pharmaceuticals in SPHMMC is summarized in Table 1 and Figure 7. In all the three years studied, class A pharmaceuticals consumed the maximum budget percentage range. In 2015/16 for instance, 661 items were analyzed out of which about 10% consumed 80% of APE comprising class 'A'. These are pharmaceuticals requiring strict monitoring as it has fewer items consuming most of the budget.

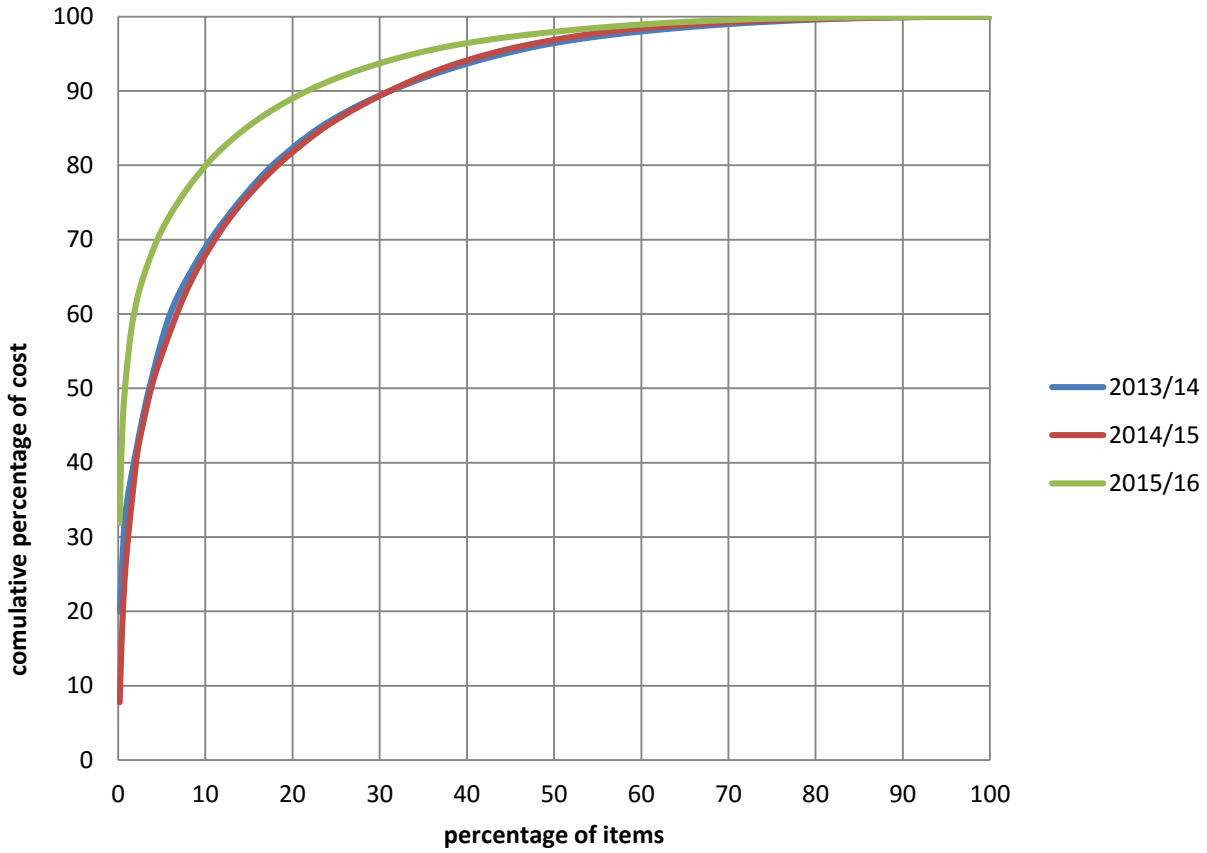
About 15% items consumed 11.6% of the APE forming class 'B' that need moderate degree of control while the rest 75% items consumed only about 8% of APE, classified as class 'C' which need the least monitoring as they took a limited percentage of the expenditures. In studied years, gauze surgical 90x100 in 2013/14, surgical glove sterile latex no 7.5 in 2014/15 and examination glove in 2015/16, were the first top pharmaceuticals that consumed about 20%, 7.8% and 32% of the total APE, respectively (Figure 3). Top twenty (20) class 'A' pharmaceuticals that consumed about 56% of the total expenditure in the year 2015/16 are presented in Figure 8.

Table 1: Three years ABC analysis result of pharmaceuticals in SPHMMC (201314/2015/16), Addis Ababa, March 2017

Year	Class	No of items	% of items	APE	% of APE
2013/14	A	90	16.7	35767032	78.9
	B	95	17.6	5721245	12.6
	C	354	65.7	3872050.00	8.5
	Total	539	100	45360327	100
2014/15	A	107	18.2	39322678.3	79.9
	B	100	17	6009410.9	12.2
	C	381	64.8	3876327.95	7.9
	Total	588	100	49208417	100
2015/16	A	67	10.14	63365473.9	80.1
	B	98	14.8	9152712.3	11.8
	C	496	75	6578335.05	8.3
	Total	661	100	79096521.3	100

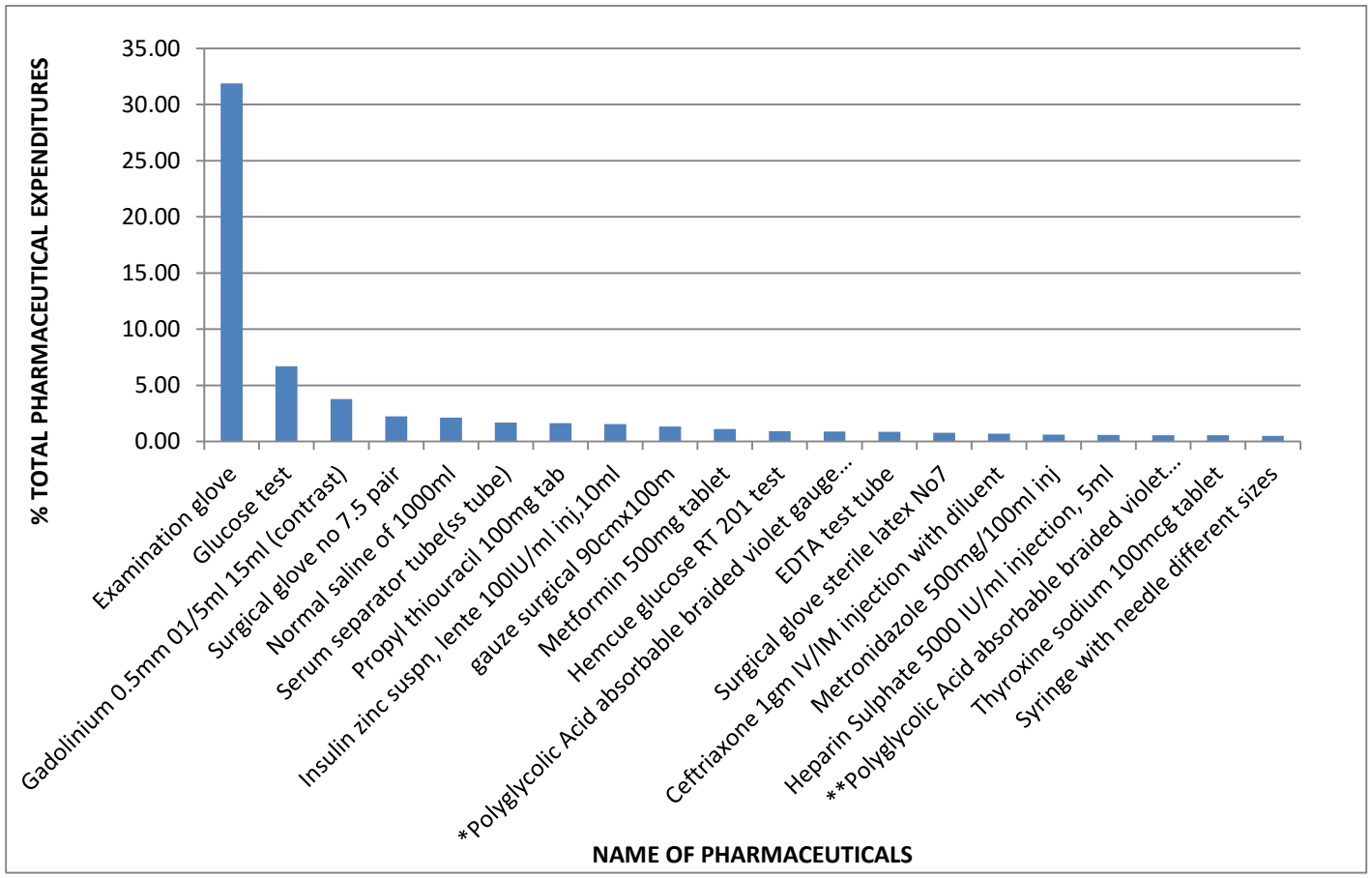
APE: Annual Pharmaceutical Expenditures, No items: Number of item

Figure 7: Pharmaceutical's ABC analysis curve in SPHMMC (2013/14-2015/16), Addis Ababa, March 2017



The study result (Figure 7) showed that all three years' pharmaceuticals ABC analysis was compatible under the V. Pareto curve. From this figure in 2015/16 class A pharmaceuticals took the maximum of budget percentage range (80%) than other years. But in 2014/15 class A items took lower portion of budget range and maximum of items proportion (10-20%).

Figure 8: Twenty top (value) 'class A' pharmaceuticals in SPHMMC (2015/16), Addis Ababa, March 2017



*NB: *Polyglycolic acid absorbable braided violet gauge 5.0 (2) 75cm on 48-50mm ½circle round bodied needle, **Polyglycolic acid absorbable braided violet gauge 4.0(1)75cm on 45 mm ½ circle round bodied heavy needle*

5.1.3. VEN analysis

For VEN analysis of the current study, SPHMMC's pharmaceuticals list VEN classification was used. The VEN list of SPHMMC contains a total of 1477 items which includes drugs, laboratory reagents and medical supplies. Of these, 62.8% were classified as 'Essential' and 25.7% as 'Non-essential' while the rest 11.6% were classified as 'Vital'.

The VEN analysis of the present study is summarized in Table 2. In 2015/16, out of 661 pharmaceuticals analyzed, about 22% of items consuming 62.8% of APE were vital, 58.5% items consuming 33.8% of APE were essential and 8.9% items consuming 1.2% of APE were non-essential. The rest 10.6% items consuming 2.2% of APE were out of the hospital's VEN list. From the total utilized items, more than 315 had been purchased every year while about 150 newer items were purchased in 2015/16 relative to the rest of two years. However, 37 of these newer pharmaceuticals were non-essential and 56 were out of the hospital's drug list. Only 2 (Isoflorane 100ml and lithium electrode) of newer pharmaceuticals were vital.

Table 2: VEN analysis of the annual pharmaceutical expenditures in SPHMMC (2013/14-2015/16), Addis Ababa, March 2017

Year	Category	No of items	% of items	APE	% of APE
2013/14	V	138	25.60	26508473	58.44
	E	321	59.55	16045844	35.37
	N	29	5.38	1085501	2.39
	NA	51	9.46	1720509.2	3.79
	Total	539	100	45360327	100
2014/15	V	144	24.49	26280772.6	53.41
	E	320	54.42	17614331.3	35.80
	N	26	4.42	3098007	6.30
	NA	98	16.67	2215306.1	4.50
	Total	588	100	49208417	100
2015/16	V	144	21.79	49667293	62.79
	E	388	58.70	26763767.5	33.84
	N	59	8.93	929855.46	1.18
	NA	70	10.59	1735604.87	2.19
	Total	661	100	79096521.3	100

APE: Annual Pharmaceutical Expenditure NA: pharmaceuticals not included in the VEN classification of the hospital

5.1.4. ABC-VEN matrix analysis of pharmaceuticals purchased in SPHMMC

Table 3 shows the result of ABC-VEN matrix analysis in the three years studied. Nine subcategories were created by cross tabulation of ABC and VEN categories. The nine subcategories are then grouped into category I that contain (AV, AE, AN, BV, CV) subgroups that need the practice of the principle of management by exception. Category II (BE, BN, CE) subgroups, and category III (CN) need moderate and low monitoring, respectively (Devnani, et al., 2010; Roy, 2010; Gubta, et al., 2007) (Table 5). In 2015/16, from a total of 661 items, 27% consumed 85% of APE and classified as category I (Table 6, Annex 2); while 53.8% and 8.3% items were classified as category II and III, respectively. From AN subgroup of category I pharmaceuticals, adhesive plaster zinc oxide size 7.5x10m were found in all studied years by consuming a huge amount of money (Table 4).

Table 3: ABC-VEN matrix analysis of pharmaceuticals in SPHMMC (2013/14-2015/16), Addis Ababa, March 2017

	ABC	A			B			C			Total		
	VEN	APE	%APE	items	APE	%APE	Qua	APE	%APE	Qua	APE	%qua	qua
2013/14	V	23781008.2	52.43	36	1645243	3.63	29	1082221.21	2.39	73	26508473	25.6	138
	E	10430970.7	23.00	48	3435078	7.57	55	2182829.05	4.81	217	16045844	59.6	321
	N	827725.95	1.82	3	138605	0.31	2	171214.13	0.38	26	1085501	5.4	29
	NA	727327	1.60	3	502318	1.11	9	435785.34	0.96	38	1720509.2	9.5	51
	Total	35767032	78.85	90	5721245	12.61	95	3872050.00	8.54	353	45360327	100.0	539
2014/15	V	23619130.3	48.00	50	1735663	3.53	29	925979.83	1.88	65	26280773	24.5	144
	E	12286955	24.97	51	3254878	6.61	53	2072497.85	4.21	216	17614331	54.4	320
	N	2765990.7	5.62	2	199275	0.40	3	132741.33	0.27	21	3098007.1	4.4	26
	NA	650602.33	1.32	4	819595	1.67	15	745108.94	1.51	79	2215306.1	16.7	98
	Total	39322678.3	79.91	107	6009411	12.21	100	3876327.95	7.88	381	49208417	100.0	588
2015/16	V	45037564.8	56.94	30	3323528	4.20	36	1306200.63	1.65	78	49667293	21.8	144
	E	17570939.3	22.21	35	4937541	6.24	51	4255286.98	5.38	302	26763768	58.7	388
	N	356085.96	0.45	1	205489	0.26	3	368280.47	0.47	55	929855.46	8.9	59
	NA	400883.8	0.51	1	686154	0.87	8	648566.97	0.82	61	1735604.9	10.6	70
	Total	63365473.9	80.11	67	9152712	11.57	98	6578335.05	8.32	496	79096521	100.0	661

APE: Annual Pharmaceutical Expenditures, NA: pharmaceuticals that were not included in the VEN classification of the hospital, Qua: Quantity of the pharmaceuticals (number of items)

Table 4: AN sub groups of category I pharmaceuticals in SPHMMC (2013/14-2015/16), Addis Ababa, March 2017

Year	Item name	Total cost (ETB)	% APE
2013/14	Surgical scalpel blade size no 15	359,509	0.79
	Adhesive plaster zinc oxide size 7.5x10m.	312,780.95	0.69
	TG GPO- PAP	155,436	0.34
	Total	827,725.95	1.82
2014/15	Valganciclovir HCL 450 mg tablet	2,505,583	5.09
	Adhesive Plaster zinc oxide size 7.5cm x10cm	260, 407.7	0.53
	Total	2,765,990.7	5.62
2015/16	Adhesive plaster 7.5cmx10m	356,085.96	0.45

APE: Annual Pharmaceutical Expenditure, ETB: Ethiopian Birr

Table 5: ABC-VEN matrix analysis sub-groups in SPHMMC (2013/14-2015/16), Addis Ababa, March 2017

Year	Category	Groups in the category	No of items	% no of items	APE	% APE
2013/14	I	AV,AE,AN,BV,CV	189	35	37767170	83.2
	II	BE,BN,CE	274	51	5756511.9	12.7
	III	CN	26	4.5	171214.13	0.4
	NA		50	9.5	1720509.2	3.79
2014/15	I	AV,AE,AN,BV,CV	197	34	41333718	83.9
	II	BE,BN,CE	272	46	5526651.4	11.2
	III	CN	21	4	132741.33	0.3
	NA		98	16.7	2215306.1	4.6
2015/	I	AV,AE,AN,BV,CV	180	27	67594319	85.4
	II	BE,BN,CE	356	54	9398317.2	11.8

	III	CN	55	8.4	368280.47	0.4
	NA		70	10.6	1735604.9	2.4

APE: Annual Pharmaceutical Expenditures, No items: Number of items

Table 6: Thirty category I pharmaceuticals in SPHMMC (2015/16), Addis Ababa, March 2017

	No	Pharmaceutical's name	ABC-VEN
Medicines	1	Normal saline of 1000ml	AV
	2	Propylthiouracil 100mg tablet	AE
	3	Insulin zinc suspension 100IU/ml injection (NPH), lent 10ml	AV
	4	Metformin 500mg tablet	AE
	5	Ceftriaxone 1gm IV/IM injection with diluent	AV
	6	Metronidazole 500mg/100ml inj	AV
	7	Heparin Sulphate 5000 IU/ml injection, 5ml	AV
	8	Thyroxine sodium 100mcg tablet	AE
	9	Rosuvastatin 20mg tablet	AE
	10	Anti-Rhb(D) Immune Globulin 300mcg Immune globulin Inj	AV
Medical supplies	1	Examination glove	AV
	2	Surgical glove no 7.5 pair	AV
	3	Gauze surgical 90cmx100m	AV
	4	Polyglycolic Acid absorbable braided violet gauge 5.0 (2) 75cm on 48-50mm ½ circle round bodied needle	AE
	5	Surgical glove sterile latex No7	AE
	6	Polyglycolic Acid absorbable braided violet gauge 4.0 (1) 75 cm on 45 mm ½ circle round bodid heavy needle	AV
	7	Syringe with needle of different sizes(3cc,5cc,10cc,20cc)	AV
	8	Adhesive plaster 7.5cmx10m	AN
	9	Catgut chromic gauge 4.0 (3/0) 75cm on 30 mm ½ circle round bodied needle	AE
	10	Gauze bandage 12.5cmx5m	AE
	1	Glucose test	AV
	2	Gadolinium 0.5mm 01/5ml 15ml (omniscan-MRI (contrast agent)	AE

Laboratory reagents and materials	3	Serum separator tube (SS tube)	AV
	4	Hemcue glucose RT 201 test	AV
	5	EDTA test tube	AV
	6	TPHA test kit	AE
	7	H pylori test	AE
	8	Parafine wax	AE
	9	TSH Elecsyscobas	AE
	10	Troponin (roch-cobas E-411)	AV

There were pharmaceuticals that were not classified in the three categories of ABC-VEN matrix since they were not included in the VEN classification of the hospital. As can be seen from Table 7, significant cost was spent on these pharmaceuticals especially on class A groups.

Table 7: Class A pharmaceuticals that were not included in the VEN classification of SPHMMC, Addis Ababa, March 2017

Year	Item name	Total cost (ETB)	% APE
2013/14	Assay Tip Elecsys Assay Cup Elecsys T4 Elecsyscobas e 200	727,327	1.6%
2014/15	Cobas c integra CSA II tests Stromatolyserwh 3x500ml TP urine +CSF test	650,602.33	1.32%
2015/16	Ckprest 5(PTT) Cmu /gG test	400,883.8	0.51%

APE: Annual Pharmaceutical Expenditures, ETB: Ethiopian Birr

5.2. Qualitative Findings

In-depth interviews were held with a head of pharmacy, store keepers, drug supply management coordinator, purchasers and coordinator of dispensaries in the hospital. From 8 key informants interviewed, 5 of them were males. Majority of them were in the age group of 27 to 34 years with a bachelor degree. Their work experience ranged from 4 to 9 years. The qualitative exploration was on three thematic areas:

Inventory control management practices and its challenge

As per the key informants, the pharmacy store department in SPHMMC uses a manual pharmaceutical record system which includes bin and stock cards. Physical inventory count was reportedly conducted every 6 months. However, the bin cards were not updated strictly, the reason being high work load by store keepers. In the dispensaries of the hospital, physical inventory count was reported to be done every three months because of the quarterly rotation of pharmacists to different units in the hospital. However, there were no bin cards in dispensaries of the hospital.

One of the key informants said that:

"Storekeeper's work burden is high. Filling Internal Facility Request and Requisition (IFRR) form, filling bin cards of a large number of items, receiving items and issuing items, all of this is done by a store keeper. Because of this, we are not updating the bin cards all the time." (Pharm.02, M,34)

Another one added that:

"Previously, we used to update bin cards in dispensaries but now we have stopped due to shortage of man power. Since patient flow is very high, we couldn't manage both dispensing and updating bin cards at the same time." (Parm.07, F,27)

Most of the key informants said, max-min inventory control management was not properly practiced in the hospital. There was no specific time to order, quantity to order or how much stock to hold. Almost all the respondents mentioned inadequacy of storage space as a reason for not using max-min system of inventory control system. The other reasons listed were, limited capacity of PFSA to supply the requested quantity in the required time.

"Trigger for ordering is usually when the medicines are near to stock-out. The quantity to order is determined by guessing based on experience of storekeepers and based on our storage space." (Pharm.04, M,34)

Other challenges listed by the key informants as a reason for inappropriate inventory control practice were shortage of staff and lack of commitment and initiation by the staffs. Key informants differ with regard to limited number of staffs influencing inventory control practices;

"In my opinion I don't think the problem is inadequacy of staff that hinders implementation of appropriate inventory management practices, rather the existence of uneven distribution of responsibilities within staffs across different units of the Pharmacy department including DSM unit.*" (Pharm.02, M,34)*

When asked how they prioritize one medicine over the other upon ordering, most of the respondents said that they give priority for vital and fast moving items. However, there was no list of fast moving pharmaceuticals rather they order based on daily experience of the store keeper. Lack of consistency on how to prioritize pharmaceuticals was observed in SPHMMC.

"We usually give priority for fast moving items such as normal saline & ceftriaxone and drugs for chronic cases e.g. diabetes. Drugs that are requested infrequently are given the least priority." (Pharm.03, F,29)

Another respondent adds on this:

"Especially, for products that are purchased from private suppliers, vital and fast moving medicines are given first priority because the budget limitation does not allow us to purchase each and every item." (Pharm.06, M,31)

Stock-out situations, reasons

All key informants agreed that medicines stock-out was one of the major problems affecting the hospital. The following quotes demonstrate the same.

"Even today I ordered about 115 drugs that are out of stock. From these, only 10 to 15 items could be found from PFSA." (Pharm.03, F,29)

"*We follow vital items routinely and their availability usually ranges from 76 to 90%. However, the stock-out is much higher for essential and non-essential medicines." (Pharm.01, M,30)*

Most of the respondents mentioned inadequacy of storage space, failure to update stock status and maintain the reorder level by storekeepers, disregard to the lead time coupled with the low order fill rate by the PFSA and the time it takes to process purchasing products that are not available in PFSA as factors contributing to stock-outs in SPHMMC.

Respondents explained:

"Our storage space is inadequate which make us to limit the quantity of medicines to purchase which leads to stock-out. Sometimes I order medicines when stock quantity becomes zero and the time i order the medicines and its availability in PFSA might not much leading to stock-out." (Pharm.03, F,29)

"…….when medicines get out of stock in PFSA, the stock-out period is usually prolonged because, before purchasing from private suppliers, we should get a stock-out letter from PFSA. Then go for proforma (tendering) which is very time taking process. Convincing the difficulties of buying from private section for the concerned body takes time which prolongs stock-out period." (Pharm.06, M,31)

Expiry problems, contributing factors

With regard to expiry, all key informants stressed that it was a major problem in the hospital due to acceptance of donation of near to expiry medicines and medicines which are not familiar to the prescribers in the Hospital.

"The main reason for expiry is donation of medicines as the hospital receives each and every medicine without considering their significance to the hospital and physicians' exposure and experience with these products. Sometimes, medicines which are important but with short half-life are donated." (Pharm.04, M,34)

According to the Key informants there are situations that PFSA provides near to expiry items to health facilities, an additional factor for medicines expiry in the hospital. Other contributing factors for medicines expiry in the hospital indicated by the informants were purchasing slow moving items in bulk, overestimation of an item to order, issuing excess quantity of products to wards, not using First Expired First Out (FEFO) for issuing medicines from stores to different departments and lack of communication between different units in the hospital.

"I think the reasons for expiry in our hospital are lack of communication within different units in the hospital and not prioritizing based on expiry date status while issuing items from store to different units." (Pharm.07, F,27)

6. DISCUSSION

In the present study, pharmaceutical expenditure analysis including ABC-VEN matrix was conducted to identify pharmaceuticals that require strict management and control. Besides, the current inventory control management practices and its challenges were assessed in SPHMMC.

The proportions of the pharmaceutical budgets allocated to the total recurrent annual hospital budgets in SPHMMC were found 9.4%, 13.2% and 9.04% in 2013/14, 2014/15 and 2015/16, respectively. These proportions are much lower that what is expected based on different studies that indicated pharmaceutical budgets to be about one third of the total hospital budgets (Kant et al., 1997; WHO, 2011). On the other hand, the actual pharmaceutical expenditures in SPHMMC were much higher than pharmaceuticals' budget allocated in SPHMMC implying that the budget was allocated arbitrary without consideration of the actual forecasting data of the pharmacy.

In the present study it was found that in the year 2015/16, the share of medical supplies (45%) was much higher than that of medicines (28%). Of share of medicines, normal saline contributed the highest percentage (7.8%) followed by propyl-thiouracil 100mg (5.9%). In similar study conducted in Tanzania, of medicines procured from MSD (a government agency), the highest cost was on ceftriaxone 1gm injection contributing 15% of the budget (Tumaini, 2013) which is much higher than the current result (2.5%). Of medicines procured from other suppliers in the same study in Tanzania, augmentin and meloxicam tablets together contributed 16% of the total cost (Tumaini, 2013) which is different from the present study's result where the former contributed 0.53% and the later was not purchased at all. In another study conducted in Lowdar County Referral Hospital in Kenya, artemether/lumefantrine tablets contributed the highest percentage of the ADE accounting 7.94% of the total ADE (Kokonya, 2016). These differences in percentage of medicine expenditure would be due to differences in disease profiles in different countries. It could also be because different institute have different service profile, depending on the specialty service available. Endocrine medicines contributed the highest percentage (20%) in the present study of which, medicines for diabetes mellitus contributed about 11%. On the other hand, of laboratory reagents and materials, glucose test contributed the highest percentage (23.9%). According to the ten top classifications of diseases in SPHMMC in 2015/16, diabetes mellitus was ranked as the 10^{th} with a prevalence of 6.61%, which might be the reason for the higher expenditures on diabetic related pharmaceuticals. On the other hand, of expenditures on

medical supplies in SPHMMC in 2015/16, examination glove alone contributed the highest percentage (71.6%). This figure is very high suggesting that strict control on its use would be gainful in saving costs.

The ABC analysis of the present study showed that only about 10% pharmaceuticals in 2015/16 consumed about 80% of APE and classified as 'class A'. About 15% pharmaceuticals had consumed about 12% of APE and classified as 'class B'. The rest, 75% consumed about 8% of APE and categorized as 'Class C'. The present study showed that if ABC analysis is considered alone for drug inventory, it would help effectively control the recommended 10% items in the A category, with almost 80% of APE of the pharmacy, but it would compromise on the availability of items of vital nature from B and C categories (15% and 75%). Similar studies in hospitals in India (Vaz et al., 2008; Manhas et al., 2012; Kumar and Chakravarty, 2015), Thailand (Junita and Sari, 2012), Tanzania (Tumaini, 2013), Kenya (Kokonya, 2016) and Ethiopia (Migbaru et al., 2016) are in line with the present study indicating that class A items are very few but very expensive requiring a close day to day control. If these items are not properly managed in terms of selection, procurement and inventory management, there will be a raise in expenditures which will affect the pharmaceutical services provided by the hospital. Class B pharmaceuticals can be controlled by middle management. Low safety stock policy is applied to this class with longer time orders. Class C items do not need to be highly controlled since the items have the lowest value compared to the class A and B hence, orders can be placed at a greater volume to take advantage of quantity discount. Rough estimates are sufficient to manage class C materials (MSH, 2012; Theptong, 2010).

The major uses of VEN analysis are assigning priorities for pharmaceuticals selection, procurement, and use in a supply system; guiding inventory management activities; and determining appropriate medicine prices (MSH, 2012).

The VEN classification of the present study revealed that out of 661 pharmaceuticals analyzed in 2015/16, 22% were 'Vital', 58.5% were 'Essential', 8.9% were 'Non-essential and the rest 10.6% were out of the hospital's drug list. If VEN analysis alone is considered, ideal control can be exercised on the identified vital and /or essential items, accounting for 96.6% of APE of the pharmacy. However, class A also contains six non-essential items with 3.34% of APE of the pharmacy and hence, it is not possible to ignore the non-essential group completely.

Comparisons with similar studies showed high variation in the percentages of vital, essential and non-essential items' availability. For instance, 12.11%, 59.38% and 28.51% items were V, E, and N respectively (Devnani et al., 2010), about 13.2%, 38.8% and 48.0% items were found to be V, E and N items, respectively (Anand et al., 2013) and 32.41%, 61.38% and 6.2% items were V, E, and N items, respectively (khurana et al., 2013). These variations could be because different institutes have different srvice profiles, depending on the speclalty services available. The number of non-essential pharmaceuticals has been increasing from year to year in SPHMMC (26 items in 2013/14 and 59 items in 2015/16). The current result is much different from a study in TASH where there was no any non-essential item purchased in three years studied (Migbaru et al., 2016). On the other hand, the total cost that vital, essential and non-essential items consumed respectively were 62.8%, 33.8% & 1.2% of APE in 2015/16. This is comparable to a study done in Kenya at Lodwar County referral hospital that revealed vital, essential and non-essential items accounting for 64, 33 and 10% of the ADE, respectively (Kokonya, 2016). The result in the present study implies that the pharmacy department has tried to ensure that most of the budget is used for vital and essential items than the non-essential ones. However, about 2.2% of the expenditures were taken by pharmaceuticals that were not on essential drug list. Almost all of these pharmaceuticals were laboratory pharmaceuticals that were purchased from local private wholesalers suggesting that these items should be reviewed by drug and therapeutic committee (DTC) of the hospital hence, consideration of adding these items on the hospital's VEN list.

Emphasizing on cost only, less costly but vital items might be missed. For better monitoring of the inventory and for avoiding stock-outs, focusing on both cost and criticality is important (Khurana et al., 2013).

ABC - VEN matrix analysis in the present study showed that 37% of items consuming 85% APE belonged to category I in 2015/16. These items need the practice of the principle of management by exception. AV, AE and BV subgroups of category I consists of 101 items (15.27%) that consumed 83.35% APE and their being out of stock is unacceptable as they are either vital or essential. To prevent locking up of capital due to these items, low buffer stock needs to be maintained while keeping a strict control on the consumption level and stock on hand (MSH, 2012; Theptong, 2010; Kokonya, 2016). A two-bin method of ordering needs to be followed for

these as this will eliminate the risk of item shortage. CV items (78, 11.8%) are pharmaceuticals of low cost but high criticality and take up 1.65% of APE of the pharmacy. Because this amount is negligible, these items can be procured once a year and stocked as their carrying cost is low. On the other hand, a single AN item (Valganciclovir HCL 450 mg tablet) consumed more than 5% of APE in 2014/15 whereas in 2015/16, adhesive plaster 7.5cmx10m consumed 0.45% of APE. In similar study conducted in TASH, there was no any AN subgroup in the studied five years (2009-2013) (Migbaru et al., 2016). As this subgroup is expensive and non-essential, studies insist its removal from the list if possible, or replacement with equivalent but less cost medicine can bring cost savings without affecting patient care (Theptong, 2010; Kokonya, 2016). Category II items (356, 54%) consumes 11.8% of the APE. These items can be ordered once or twice a year, thereby saving on ordering cost and reducing management hassles at a moderate carrying cost and without blocking substantial capital. Category III items (55, 8%) consume 0.4% of the APE. These items can also be ordered once or twice a year, thereby saving on ordering cost at a moderate carrying cost and without blocking substantial capital.

The ABC-VEN analysis of different hospitals may show related percentage of items however, magnitude of total budget show difference since there may be different representative pharmaceuticals and budget in each health setting. In general, for better control of inventories, narrowing pharmaceuticals down based on their cost and criticality is insisted by different studies in different settings (Gupta and Nigar, 2010; Anand et al., 2013; Kumar and Chakravarty, 2014; Kokonya, 2016; Theptong, 2010; Kritchanchai and Meesamut, 2015). Thus, ABC-VEN analysis needs to be adopted as a routine practice for optimal use of resources and elimination of out of stock situations in the hospital.

The present study found that the pharmacy store department in SPHMMC uses a manual pharmaceuticals record system. For excellent reconciliation of stock data however, it is highly recommended to apply both computerized and paper based systems. When used effectively, computerized system allows smooth performance of the tedious work of medicine inventory management, save personnel time and promotes quality of services. Besides, timely and accurate information on inventory helps to reduce incidence of stock-outs as well as controlling wastage (Baghdadi-Sabeti et al., 2009; Gray and Suleman, 2009).

High work load on store keepers was mentioned as a reason for not regularly updating records like bin cards in SPHMMC. Similarly, different studies identified lack of personnel and workload as factor influencing stock level monitoring and other medicines management functions (Tayob, 2012; USAID, 2011). Thus, redistribution of workload among existing staff should be done to reduce workload and hence, improved inventory control management. In addition, establishment of electronic tools and effective application manual systems of stock recordings should be emphasized in the hospital.

The current study indicated that, inventory control management method is applied haphazardly in the hospital. There was no rule for quantity to order or how much stock to hold in the pharmacy store. This might have resulted in ordering excess or insufficient quantity, consequently leading higher inventory and ordering cost (MSH, 2012). The reasons mentioned by most of respondents for not using Max-Min system of inventory control management in SPHMMC were inadequate storage space and unreliable supply of pharmaceuticals from PFSA. This result is different from a study done in Uganda (Tumwine et al., 2010) and South Africa (Tayob, 2012) where the reason for not practicing inventory management were due to lack of training of personnel involved in inventory control management. On the other hand, the current study found out that the time (frequency) of ordering pharmaceuticals in the hospital was done arbitrarily. A study revealed that if order frequency is not carefully handled, unexpected situations of stock-out and over-stock might occur. In response to stock-out situation, local emergency purchase must be made which is costly to the pharmacy department (Theptong, 2010). According to the present stud's exploration, sometimes pharmaceuticals are ordered when a stock level becomes zero. As per IPLS, however, if the stock on hand is below two weeks, it is recommended placing emergency orders to avoid stock-outs (Shewarega et al., 2015).

The present study explored that stock-out of pharmaceuticals was a major problem in SPHMMC. Inadequacy of storage space was the major reason mentioned for occurrence of stock-outs in the hospital. This result is different from a study done in different hospitals in Tanzania that indicated lack of funds as a major reason for stock-out (Kagashe and Massawe, 2012). The other reasons mentioned for stock-out in the hospital were, unavailability of medicines in suppliers like PFSA. Even though hospitals rely on PFSA for their medicine needs, PFSA is able to supply only about 45% of their requirements (Tadeg, et al., 2014). Similar results were reported in

Tanzania (Kagashe and Massawe, 2012) and Malawi (Lufesi et al., 2007) where inadequate supply from government agency resulted in occurrence of stock-out of pharmaceuticals.

The present study identified that pharmaceutical's expiry was a major problem in the hospital the reason being, donation of new and near to expiry pharmaceuticals. Similarly, a study in supply outlets at the public and private health facilities in Uganda identified that high contribution of the expiry medicines to be due to drug donation (Silumbe, 2011). Provision of near to expiry medicines by PFSA was another contributing factor identified in the present study. Similarly, different studies conducted in Africa indicated provision of medicines that were about to expire as a factor for its expiry (Mashishi, 2015; Sauls, 2016; Kagashe and Massawe, 2012; Tumwine et al., 2010). A study in selected public health facilities in South West Shoa Zone, Oromia Regional State, Ethiopia also found that delivery of nearly expired medicines (< 6months) to the health facilities by the suppliers, in the health facilities as major contributing factors for medicines wastage (Tadesse and Gedif, 2016). Lack of communication between different units in the hospital for identifying pharmaceuticals that were about to expire and not using FEFO for issuing medicines from stores to different departments, were another factors mentioned as reasons for expiry in the current study. Study indicated properly managing stock by using medications before they expire and processing returns regularly can help keep medication expenditures down (Santhi and Karthikeyan, 2016). Apart from hampering therapeutic benefits, the financial burden resulting from medicines wastage (expiry) is very huge (MSH, 2010). Therefore, it is important to decrease medicines expiry to optimize over all financial loss incurred and to compromise frequent stock-out of pharmaceuticals in the SPHMMC which in turn would have a positive implication for the achievement of HSTP target of below 2% average rate of medicine wastage in Ethiopia (FMOH, 2015).

7. LIMITATION OF THE STUDY

- The pharmaceutical expenditure analysis was limited to pharmaceutical acquisition costs only. Other costs like procurement cost, inventory holding cost and shortage costs were not included in the study
- The pharmaceutical expenditure analysis of the present study did not include program pharmaceuticals like; antiretroviral drugs, anti-tuberculosis drugs, family planning drugs and implantable pharmaceutical equipment.
- The accuracy of the study is dependent on accuracy of documentation system in SPHMMC.

8. CONCLUSION AND RECOMMENDATION

8.1. Conclusion

There were a large number of pharmaceuticals (more than 500 excluding program pharmaceuticals) in SPHMMC which would make it difficult to give equal attention to all. This necessitates application of scientific inventory management tools such as ABC-VEN matrix, for effective and efficient management of pharmacy stores and priority setting and close supervision on items that belong to important categories. The priority for the purchase of pharmaceuticals in SPHMMC was not strictly based on VEN list which was indicated by the successive increase non-essential items in the three years studied. Besides, there were large number of laboratory pharmaceuticals that were purchased out of the hospital medicine list, indicating a need for better communication of laboratory unit with DTC of the hospital. As of the qualitative study findings, poor performance of inventory control management was indicated in the hospital. The arbitrary decisions on quantity and frequency of ordering lead to frequent stock-out and expiry of pharmaceuticals in the hospital. Inadequacy of storage capacity and unreliable supply of pharmaceuticals were identified as the major contributing factors that hinder proper practice of inventory control systems in the hospital. In general, the limitations on the practice of inventory control management in SPHMMC requires follow-up actions in order to curb the challenges and hence, efficient use of limited resources.

8.2. Recommendations

Based on the findings of this study the following recommendations have made:

- For finance office of SPHMMC, to allocate budget for pharmacy based on review of pharmaceutical expenditures.
- For administrative office of SPHMMC, to work on betterment of pharmaceuticals storage space capacity so as to practice Max-min inventory control system in the hospital.
- For the pharmacy department of SPHMMC, to prioritize and make decisions for quantity and frequency of ordering pharmaceuticals based on the result of ABC-VEN matrix and which should be done regularly because of the dynamic nature of the medical sector.
- For pharmacy department of SPHMMC, to make purchasing of pharmaceuticals based on reliable estimates of actual hospital needs and restricting to the list of essential medicines.

- For Drug and Therapy Committee of SPHMMC, to update the VEN list of the pharmaceuticals with strong recommendation on review of purchased pharmaceuticals that were not included in the list.
- Computerized/electronic inventory management tool should be used in the hospital to allow for proper quantification and monitoring of stock levels.
- For the pharmacy department to undergo an even distribution of work with the pharmacy professionals so as to reduce workload and in turn to improve pharmaceutical inventory management.

SUGGESTION FOR FUTURE WORK

- Total cost analysis (which includes all inventory management related costs) should be done to better help in making procurement decisions.

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ANNEXES

Annex 1: Assessment Tool

Section I: Data Abstraction formats

Instruction: Communicate the head pharmacist. Then being guided by store manager, review and take secondary data from the facility pharmaceutical records; such as Model 19 documents and delivery notes.

A. Data abstraction format for budget and information utilization

Hospital name: _____Date_____ (G.C.)

1. Total budget of the hospital (Ethiopian birr)

   a) 2013/14 _____
   b) 2014/15 _____
   c) 2015/16 _____

2. Pharmaceutical budget (in Ethiopian Birr)

Years	Budget requested	Budget approved	Budget utilized
2013/14			
2014/15			
2015/16			

B. Data collection sheet for Pharmaceutical acquisition cost/ABC VEN analysis (2013/14-2015/16)

Item	Item	Therapeutic	VEN	Basic	Unit	Total	Total

No	name	Category		unit	cost	units	cost
1							
2							
3							

Section II: Semi structured guiding for key informant interview (English Version)

Introduction

I want to thank you for taking time to meet with me today. My name is NanatiLegese. I came from Addis Ababa University School of Pharmacy attending a post graduate study in Pharmacoepidemiology and Social Pharmacy. I am the principal investigator for the study entitled *"ABC-VEN analysis and assessment of pharmaceutical inventory control management practices in Saint Paul's Hospital Millennium Medical College"*. And I would like to talk with you about pharmaceutical inventory control management which is significant for optimal utilization of resources and saving costs. The aim of this study is to conduct pharmaceutical expenditure analysis and to asses pharmaceutical inventory management practices of Saint Paul Hospital Millennium Medical College, Ethiopia. Considering that the findings and recommendations emanated from this study will help the policy makers and other organizations to design intervention activities, you are kindly requested to participate in this study. The interview should take less than an hour. I will be taping the session because I don't want to miss any of your comments. Although I will be taking some notes during the session, I can't possibly write fast enough to get it all down. Because we're on tape, please be sure to speak up so that I don't miss your comments. All responses will be kept confidential. This means that your interview responses will only be shared with research team members and we will ensure that any information we include in our report does not identify you as the respondent. Remember, you don't have to talk about anything you don't want to and you may end the interview at any time.

Are you willing to participate in this interview Yes No

If yes, the interview will be continued

Date of interview_____ Venue:

1: Back ground information of the key informant

1. Gender:
2. Age:
3. Educational level:
4. Job title:
5. Work experience:

2: Guiding questions for in-depth interview

1. In your opinion, why does pharmaceutical inventory management is needed?
2. What inventory management methods do you know?
    a. Probe: Which inventory management methods are you using in the hospital? Why?
3. How do you set priorities for medicines to be stocked in the hospital; determine quantities and determine time for ordering?
    a. Probe: presence of specific budget allocation based on therapeutic class of medicines. E.g. % of the budget for ant diabetic
4. challenges faced in setting the above variables
5. How do you describe the pharmaceutical supply chain performance of your hospital?
    a. Probe: stock-outs, expiry, wastage and of pharmaceuticals; supply, staff
    b. Reason for the above problems,
    c. Measures taken to prevent these problems?

Thank you for your time!!

አዲስ አበባ ዩኒቨርሲቲ

የፋርማሲ ትምህርት ቤት

የፋርማሲዩቲክስና ሶሻል ፋርማሲ ዲፓርትመንት

በቅዱስ ጳውሎስ ሆስፒታል ሚሊኒዬም ሜዲካል ኮሌጅ ዉስጥ የሚገኙትን የመዳኒት፣የላቦራቶሪ እንዲሁም የህክምና መገልገያዎችን የገንዘብ ወጪ እንዲሁም የመድኃኒት ግምገማ ቤት ቆጠራ እና ቁጥጥር ሁኔታን በተመለከተ ከሚመለከታቸው አካላት ጋር የሚደረግ ቃለ-መጠይቅ የተዘጋጀ መመሪያ፡፡

መግቢያ

ጤና ይስጥልኝ ስሜ ናናቲ ለገሠ ይባላል፡፡ በአሁኑ ሰዓት በአዲስ አበባ ዩኒቨርሲቲ የፋርማኮኢፒዲሞሎጂ እና ሶሻል ፋርማሲ የሁለተኛ ዲግሪ ተማሪ ስሆን በቅዱስ ጳውሎስ ሆስፒታል ሚሊኒዬም ሜዲካል ኮሌጅ ዉስጥ ያለውን የመዳኒት፣የላቦራቶሪ እና የህክምና መገልገያዎችን ወጪ እንዲሁም የመድኃኒት ግምገማ ቤት ቆጠራ እና ቁጥጥር ሁኔታን የሚገመግመው ጥናት ዋና ተመራማሪ ነኝ፡፡ በመጀመሪያ ውድ ጊዜዎን ሰውተው ለቃለ መጠይቁ ፍቃደኛ ስለሆኑልኝ ከልብ አመሰግናለሁ፡፡

የዚህ ጥናት ዋና ዓላማ በቅዱስ ጳውሎስ ሆስፒታል ሚሊኒዬም ሜዲካል ኮሌጅ ዉስጥ የሚገኙትን የመዳኒት፣የላቦራቶሪ እና የህክምና መገልገያዎችን የገንዘብ ወጪ ማወቅ እና መዳኒት፣ ላቦራቶሪ እንዲሁም የህክምና መገልገያዎችን በመቆጣጠር እና በማስተዳደር ሂደት ውስጥ ያጋጠሙ ችግሮችን ማወቅ እና የችግሮቹን መንስኤዎች መለየት ነው፡፡ ይህ ደግሞ ወደፊት ፖሊሲ አውጪዎች እና ሌሎች ጉዳዩ የሚመለከታቸው አካላት አስፈላጊውን የማሻሻያ እርምጃ እንዲወስዱ ከፍተኛ አስተዋፅኦ ያደርጋል። በመሆኑም በ ጤና ተቋማቹ ውስጥ የተገለፀውን ሁኔታ በሚመለከት ያሎትን የግል አስተያየት በግልፅ እንዲነግሩን በአክብሮት እንጠይቃለን፡፡

በቃለ-መጠይቁ ወቅት የሚያነሱዋቸውን ነጥቦች ሙሉ በሙሉ ለማስቀረት ይረዳን ዘንድ የርሶ ፍቃድ ከሆነ ይህ ቃለ-መጠይቅ በመቅረጸ-ድምጽ የሚቀዳ ይሆናል፡፡ ይህም በመሆኑ ድምፅዎን በሚሰማ መልኩ ጮክ ብለው እንዲናገሩ አሁንም በማክበር እጠይቃለሁ፡፡ ይህም ከጊዜዎት ከአንድ ሰዓት ያነሰ ጊዜ ይወስዳል፡፡ በዚህ የቃለ-መጠይቅ ሂደት የሚገኙ ማናቸውም መረጃዎች በምስጢር የሚጠበቁ ይሆናል፡፡ ይህም ማለት የሚሰጡንን መረጃ ከጥናት ቡድኑ አባላት ውጭ ለማንም ግሌፅ የማናደርግ ሲሆን የሚዘጋጁት የቃለ መጠይቁ ዘገባዎችም እርስዎን እንደመረጃ

ሰጪ የማይጠቅሱ ይሆናል፡፡ እርስዎ መናገር ስለማይፈልጉት ነገር ለመናገር እንደማይገደዱ እና ቃለ-መጠይቁን በማንኛውም ጊዜ ማቋረጥ እንደሚችሉም ላስታውስዎት እወዳለሁ፡፡

በቃለ- መጠይቁ ለመሳተፍ ፍቃደኛ ነዎት?

አዎ _____ አይደለሁም _____

በቃለመጠይቁ ለመሳተፍ ፍቃደኛ ከሆኑ ቃለ-መጠይቁ ይቀጥላል::

Semi structured guiding for key informant interview (Amharic Version)

1. የመነሻ መረጃ

1.1. እድሜ _____

1.2. ፆታ _____.

1.3. የትምህርት ደረጃ _____

1.4. የስራ ልምድ _____

1.5.የስራ ድርሻ _____

2: ቃለ-መጠይቅ መረጃ መሰብሰቢያ ነጥቦች /የመነሻ ጥያቄዎች

2.1. በ እርሶ አስተያየት የመድኃኒት ግምገ ቤት ቆጠራ እና ቁጥጥር ወይም ኢንቬንተሪ ለምን ያስፈልጋል?

2.2. ምን ምን አይነት የመድኃኒት ማስተዳደርያ ወይም ቁጥጥር (ኢንቬንተሪ ኮንትሮል) ዘዴዎችን ያውቃሉ?

ሀ.በሆስፒታላችው ውስጥ የትኛውን የመድሃኒት ማስተዳደርያ ወይም ቁጥጥር ዘዴዎችን ነው የምትጠቀሙት?

ለ. የምትጠቀሙበትን ዘዴ ለምን መረጡ?

2.3. በሆስፒታሉ ውስጥ ለምትገዙአቸው መድሃኒቶች አንዱን ከአንዱ ቅድምያ የምትሰጡት በምን መለያ ነው? ማለትም የመድኃኒቱን፣ የመድኃኒቱን ብዛት ወይም መጠን እንዲሁም ጊዜ (በየ ስንት ጊዜው) መግዛት እንዳለባችው የምትወስኑት በምን መለያ ነው?

ሀ. ለተወሰኑ የመዳኒት፣የላቦራቶሪ ወይም የህክምና መገልገያዎች የተወሰነ የ በጀት መጠን ወይም ልዩነት አለ? ለምሳሌ ለስኳር ህመም መድሃኒቶች የተወሰነ የበጀት መጠን?

2.4. ከላይ የተጠቀሱትን የመድኃኒት ግምጥ ቤት ቆጠራ እና ቁጥጥር (የኢንቬንተሪ) ሁኔታዎችን በማስኬድ ሂደት ውስጥ ያጋጠሙ ችግሮች ምን ምን ናቸው?

2.5. በሆስፒታሉ ውስጥ ያለውን የመድኃኒት አቅርቦት ሁኔታ እንዴት ይገመግሙታል?

ሀ. የመድሀኒት ማለቅ፣ብክነት ወይም የመጠቀሚያው ጊዜ ማለፍ፣መበላሸት

ለ. ከላይ ለተዘረዘሩት ችግሮች መንስኤዎቹ ምን ይመስሎታል?

ስለትብብራችሁ ከለብ አመሰግናለሁ።

Annex 2: Category I pharmaceuticals in SPHMMC, 2015/16

No	Pharmaceuticals	Total cost	% Total cost	ABC-VEN
Medicines				
1	Normal saline of 1000ml	1691706.84	2.14	AV
2	Propylthiouracil 100mg tab	1291028.68	1.63	AE
3	Insulin zinc suspension 100IU/ml injection, lente, 10ml	1217024	1.54	AV
4	Metformin 500mg tablet	885384.24	1.12	AE
5	Ceftriaxone 1gm IV/IM injection with diluents	545654.2	0.69	AV
6	Metronidazole 500mg/100ml inj	477060	0.60	AV
7	Heparin Sulphate 5000 IU/ml injection, 5ml	459888.3	0.58	AV
8	Thyroxine sodium 100mcg tablet	437433	0.55	AE
9	Rosuvastatin 20mg tablet	375981.6	0.48	AE
10	Anti-Rhb(D) Immune Globulin 300mcg Inj	366140.58	0.46	AV
11	Hepatitis B vaccine	363752	0.46	AV
12	Iopamirol 370mg injection	330443	0.42	AV
13	Vancomycin 500mg injection	319280	0.40	AE
14	Dextrose in NS 5%+0.9% in 1000ml IV infusion (Inj)	314836.9	0.40	AV
15	Hepatitis C vaccine	289175	0.37	AE
16	Ceftriaxone 500mg IV/IM injection with diluents	283132.8	0.36	AE
17	Esomeprazole tablet, 20mg (enteric coated)	277365	0.35	AE
18	Vancomycin 1g injection	268545	0.34	AV
19	Tramadol hydrochloride 50mg/ml in 2ml inj	250235.99	0.32	AE
20	Rosuvastatin (crestor) 10mg tablet	235984	0.30	AE
21	Dextrose 40% in 20ml injection	232132.3	0.29	AV
22	Halothane 250ml inhalation	228790.8	0.29	AE
23	Amitriptyline 25mg tablet	219320	0.28	AE
24	Resperidone 4mg tablet	208000	0.26	AE
25	Enalarpil(korandil) maleate 10mg tab	206387.5	0.26	AE
26	Hydralazine 20mg/ml in 1ml amp injection	205877.64	0.26	AV
27	Amoxacillin 500mg capsule	195800	0.25	AE
28	Ringer's Lactate solution with giving set(Na 147+k+cl 155mEq) , 1000ml	191324.5	0.24	AV
29	Tetanus antitoxin, Equine Injection, 1500 units	179051.52	0.23	AV

30	Levodopa + carbidopa 250mg+25mg tab	172708.45	0.22	AE
31	Clarithromycin 500mg tablet	170406.6	0.22	AE
32	Acetylsalisyclic acid 81mg tab	169523.23	0.21	AE
33	Resperidone 2mg tablet	168655	0.21	AE
34	Omeprazole 4mg/ml in 10ml injection	167835.5	0.21	AE
35	Frusamide 10mg/ml in 2ml ampule injection	141952.4	0.18	BV
36	Atropin 1mg/ml injection	139323.52	0.18	BV
37	FluphenazineDecanoate Injection, 25mg/ml in 2ml	137745.5	0.17	BV
38	warfarin 5mg tablet	125911	0.16	BV
39	Isoflorane 100ml bottle	117268	0.15	BV
40	Ampicillin sodium 500mg injection	109922.6	0.14	BV
41	Vecuronium Bromide10mg powder for injection	97945.6	0.12	BV
42	Insulin soluble 100IU/ml injection, 10ml	90750.2	0.11	BV
43	Metocloprimide 5mg/ml in 2ml ampule inj	90480	0.11	BV
44	Propofol 10mg/ml In 20ml inj	87996.5	0.11	BV
45	Neostigmine 2.5mg/ml in 1ml	79531.85	0.10	BV
46	Hydrocortison 50mg/ml injection, 2ml	79351.25	0.10	BV
47	Lidocaine Hydrochloride Injection, 2% in 50ml	71794.85	0.09	BV
48	Paracitamol 125mg suppository	69884.8	0.09	BV
49	Phenytoin 50mg tablet	67740	0.09	BV
50	Hepatitis B immunne globulin 100Iu/ml 1ml/2ml	61100	0.08	BV
51	Lithium carbonate 300mg capsule	56699.2	0.07	BV
52	Pethidine hydrochloride 50mg/ml in 2ml injection	55669.1	0.07	BV
53	Ultra sound gel	52578	0.07	CV
54	Dexamethasone 4mg/ml injection	48820.62	0.06	CV
55	Water for injection 5ml injection	44051.7	0.06	CV
56	Benzhexol (trihexyphenidy HCL) 5mg tab	38474.94	0.05	CV
57	Pancroniumbromide 2mg/ml in 2ml ampule inj	36864.3	0.05	CV
58	SuxamethoniumHcl 50mg/ml in 10ml injection	35770.2	0.05	CV
59	Ergometrine maleate 0.25mg/ml, 1ml injection	32953.8	0.04	CV
60	Potassium chloride 150mg/ml in 10ml ampule injection	31263	0.04	CV
61	Adrenaline 0.1% in 1ml ampule inj	29648.6	0.04	CV
62	Bupivacaine hydrochloride 0.5%, 10ml injection	24503.95	0.03	CV

63	Cimitidine 200mg/ml in 2ml ampule injection	24441.2	0.03	CV
64	Regular insulin 1000iu/10ml	24020	0.03	CV
65	Mannitol 20% inj, 500 ml	18943.2	0.02	CV
66	Gentamycin 40mg/ml in 2 ml injection	17130.57	0.02	CV
67	Ketamine HCL 50mg/ml in 10ml inj	16798	0.02	CV
68	Oxytocin 10 units/ml, 1ml injection	16718.88	0.02	CV
69	Nitrofurazone soluble dressing 0.2% ointment, 30gm	16554	0.02	CV
70	Anti rabies vaccine	15430	0.02	CV
71	Sulphametoxazole + trimethoprim 200mg +40mg /5ml	15132	0.02	CV
72	Water for injection 10ml injection	14118.7	0.02	CV
73	Salbutamol oral inhalation (Aerosol) 0.1mg per dose	13400	0.02	CV
74	Oral rehydration salt	12241	0.02	CV
75	Fentanyl 50mcg/ml injection, 2ml	10830	0.01	CV
76	Ciprofloxacin (0.3%) eye /ear drop, 5ml	9901	0.01	CV
77	Diazepam 5mg injection in 2ml injection	6681.6	0.01	CV
78	Acetylcysteine 200mg/ml injection, 10ml	4948	0.01	CV
79	Pyridoxine HCL(Vit B6) 100mg	4220	0.01	CV
80	Morphine sulphate 20mg/5ml syrup,125 ml	2782	0.00	CV
81	Tetracycline 1% eye ointment,4 gm	1890	0.00	CV
82	Prednisolone 5mg tablet	1045	0.00	CV
83	Pencillin G benzantine2.4m IU powder for injection	487.74	0.00	CV
84	Vitamin K1(Phytomenadione) 10mg/ml, 1ml injection	350.8	0.00	CV
85	Glyceryl trinitrate (nitroglycerine) 0.5mg tablet	135.15	0.00	CV
Medical supplies				
1	Examination glove	25211028	31.87	AV
2	Surgical glove no 7.5 pair	1778813	2.25	AV
3	Gauze surgical 90cmx100m	1049665.5	1.33	AV
4	Vicryl absorbable braided violet gauge 5.0 (2) 75cm on 48-50mm ½ circle round bodied needle	715371.5	0.90	AE
5	Surgical glove sterile latex No7	619133.6	0.78	AE
6	Vicryl absorbable braided violet gauge4.0 (1) 75 cm on 45 mm ½ circle round bodied needle	445625.59	0.56	AV
7	Syringe with needle of different sizes(3cc,5cc,10cc,20cc)	402739.04	0.51	AV

8	Adhesive plaster 7.5cmx10m	356085.96	0.45	AN
9	Catgut chromic gauge 4.0 (3/0) 75cm on 30 mm ½ circle round bodied needle	260921.46	0.33	AE
10	Gauze bandage 12.5cmx5m	251940	0.32	AE
11	Vicryl absorbable braided violet gauge 3.0 (3/0) 75 cm on 27 mm 3/8 circle rounded body needle	216163.8	0.27	AE
12	Vicryl absorbable braided Violet gauge 3.0 (2/0) 75 cm on 34 mm ½ circle round bodied needle	199907	0.25	AE
13	Vicryl absorbable braided violet gauge 3.0 (2/0) 75 cm on 27 mm 3/8 circle reverse cutting needle	189770.82	0.24	AE
14	Crescent knife	184618.5	0.23	AV
15	Keratome blade	174204	0.22	AV
16	Vicryl absorbable braided violet gauge 3.5 (0) 75 cm on 48 mm 1/2 circle round bodied needle	172440.86	0.22	AV
17	Disposable Insulin syringes 1cc 30 gauge and 8 mm fixed needle	171256.54	0.22	AV
18	Catgut chromic gauge 6.0 (2) 75cm on 35 mm ½ circle round bodied heavy needle	134025.08	0.17	BV
19	Catgut chromic gauge 5.0 (2/0) 75cm on 48 mm ½ circle round bodied heavy needle	130708.2	0.17	BV
20	Intravenous canula no 18G	130364	0.16	BV
21	Disposable syringes (sterile) 3 parts, 10ml luer fitting with 21G needle	102815.35	0.13	BV
22	ECG paper	95995	0.12	BV
23	Intravenous canula no 24G	92251.81	0.12	BV
24	Urine Bag of 2000ml	87007.5	0.11	BV
25	Mersilk braided black gauge 3.5 (0), 75cm on 28 mm ½ circle round bodied	71333.8	0.09	BV
26	Umbilical cord clamp	70849.6	0.09	BV
27	Carbon Dioxide adsorbent 4.5kg (Soda lime)	66691.04	0.08	BV
28	Intravenous canula no 20G	45282.2	0.06	CV
29	Intravenous canula no 22G	43098	0.05	CV
30	Disposable syringes (sterile) 3 parts, 5ml luer fitting with 21G needle	36516	0.05	CV
31	Mersilk braided black gauge 5.0 (2), 75cm on 40 mm 1/2 Circle reverse cutting	29554	0.04	CV
32	Mersilk braided black gauge 4.0 (1), 75cm on 30 mm ½ circle round bodied	19079.8	0.02	CV
33	Catgut chromic gauge 5.0 (1) 75cm on 48 mm ½ circle round bodied heavy n	11718	0.01	CV
34	Naso gastric tube infant size sterile No. 4	10022.82	0.01	CV

35	Spinal needle 19G	8640	0.01	CV
36	Endothrachial tube CH 4.5	6618.18	0.01	CV
37	Face mask	5849	0.01	CV
38	Spinal needle 23G 10cm	4584	0.01	CV
39	Disposable syringes (sterile) 3 parts, 20ml luer fitting with 21G needle	4251.6	0.01	CV
40	Nasogastric Tube adult size sterilech18	3897.84	0.00	CV
41	Endothrachial tube CH 3.5	2536	0.00	CV
42	Endothrachial tube CH 5	1902	0.00	CV
43	Naso Gastric tube adult size CH 16	1771.3	0.00	CV
44	Endothrachial tube CH 6	1697	0.00	CV
45	Endothrachial tube CH7.5	1697	0.00	CV
46	Autoclve tape sterilizer	1682.1	0.00	CV
47	Air way(gudeal air way) size 90mm	1518	0.00	CV
48	Air way(gudeal air way) size 120mm	1246	0.00	CV
49	Air way(gudeal air way) size 60mm	1246	0.00	CV
50	Rectal tube rubber size 20 Fr	524.5	0.00	CV
Laboratory reagents and materials		Glucose	5300247.5	6.70
1	Hand sanitizer gel of 25kg	3960000	5.01	AE
2	Gadolinium 0.5mm 01/5ml 15ml(Omniscan-MRI contrast)	2985900	3.78	AE
3	Serum separator tube (SS tube)	1329505	1.68	AV
4	Hemcue glucose RT 201 4x25	721440	0.91	AV
5	EDTA test tube	679722.68	0.86	AV
6	TPHA test kit	389700	0.49	AE
7	H pylori test	368132	0.47	AE
8	Paraffin wax	234172.35	0.30	AE
9	TSH Elecsyscobas	224943	0.28	AE
10	Troponin (roch-cobas E-411)	221679.16	0.28	AV
11	T3 elecsys	206849	0.26	AE
12	LDL cholesterol test	195607.42	0.25	AE
13	Iodine 2%tincture 1000ml	178355.97	0.23	AV
14	Uragraphin (magluminet +Sodium diatrizoate) 76%	172786.7	0.22	AV
15	HCG test reagent	111290.4	0.14	BV
16	Ck MB	104682.25	0.13	BV

17	Alcohol denatured 70%	78229.31	0.10	BV
18	Microscope slide	75143.25	0.10	BV
19	Urine multitestloparameter test	61735.68	0.08	BV
20	PTT-EL 240 test 6x4ml	61119.34	0.08	BV
21	Sodium citrate test tube	57220	0.07	BV
22	Alkaline phosphatase	41056.6	0.05	CV
23	Anti D	40294.76	0.05	CV
24	Anti A	39043.45	0.05	CV
25	Anti B	39043.45	0.05	CV
26	Urea	33220.15	0.04	CV
27	Bilirubin direct and total	30027.25	0.04	CV
28	Fluid pack	111000	0.14	BV
29	Creatinine	26517.4	0.03	CV
30	SGOT	25406.2	0.03	CV
31	Sodium electrode test	21600	0.03	CV
32	Iodine (povidone)10% solution	21409.82	0.03	CV
33	Chloride test	15000	0.02	CV
34	SGPT	14153.95	0.02	CV
35	Cholesterol test	13670.35	0.02	CV
36	Calcium electrode test	12000	0.02	CV
37	Lithium electrode test	12000	0.02	CV
38	Potassium electrode test	12000	0.02	CV
40	Widal O & H antigen	7917	0.01	CV
41	C reactive protein	5616.5	0.01	CV
42	Cell pack	5371.6	0.01	CV
43	Iodine 2% solution 500ml	3286.86	0.00	CV
Total		**67,594,318.7**	**85.46**	

Annex 3: Declaration

I, the undersigned, declare that this thesis is my original work and has not been presented for a degree in any other university, and that all the resources and materials used for the thesis, have been fully acknowledged.

Name: Nanati Legese

Signature: _____

This thesis has been submitted for examination with my approval as university advisor.

Name: Teferi Gedif (PhD)

Signature: _____

Place and date of submission: School Pharmacy, Addis Ababa, Ethiopia

December, 2017