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CAPSTONE PROJECT ON REDUCING HIGH STOCK OUT OF MEDICATION IN KUYU GENERAL HOSPITAL, KUYU WOREDA, OROMIA REGION, ETHIOPIA

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CAPSTONE PROJECT SUBMITTED TO THE DEPARTMENT OF HOSPITAL AND HEALTH CAREADMINISTRATION, SCHOOL OF PUBLIC HEALTH, COLLEGE OF HEALTH SCIENCE, ADDIS ABABA UNIVERSITY, IN PARTIAL FULFILLMENT OF MASTER OF SCIENCE DEGREE IN HOSPITAL AND HEALTH CARE ADMINISTRATION

MARCH 2020

ADDIS ABABA, ETHIOPIA

Declaration

I am here by to declare, that except for references to other people's work which have been accordingly acknowledged, this capstone project is my own composition and neither in whole nor in part has this capstone project report been presented for the award of a degree or masters in this university or else.

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ACKNOWLEDGEMENT

First of all, I would like to express my deep respect and gratitude to AAU College of public health and all MHA department staff.

I would like to thank for Dr.Anagaw D and Mr. Warrisaw H for their advice and follow up for these capstone proposal.

I was also grateful to Mr. Taye Sime CEO, Dr. Tadesse medical director, Mr. Habte Dejene pharmacy head, all pharmacist Kuyu General Hospital who have provided me with the necessary information whatever is at their hand and at last but not the least, my deep respect and appreciation goes Kuyu Hospital staff that helped me in providing information that needed for my project.

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ACRONYMS

APTS- Auditable pharmaceutical transaction and service

ABC- Always Better Control

CCO- chief clinical officer

CEO- Chief executive officer

CRC- Care, respect and compassionate

DTC- Drug and therapeutic committee

DSM- Drug supply management

FMOH- Federal Ministry of Health

FMHACA- Food Medicine and Healthcare Administration and Control Agency

IFRR- Internal Facility Report and Request

IESO-Integrated Emergency Surgery Officer

IPLS-Integrated Pharmaceutical Logistic System

NGO-Non Government Organization

NICU- Neonatal intensive care unit

OPD- Out patient department

ORHB- Oromia region health bureau

EPSA-Ethiopian Pharmaceutical supply agency

PFSA-Pharmaceutical Fund and Supply Agency

RRF- Report and Requisition Form

RDF-Revolving Drug Fund

SOP- Standard operating procedure

SMT- Senior management team

TOR-Terms of reference

VEN-Vital, Essential, Non-essential

WHO- World health organization

ABSTRACT

Background: Shortages and stock outs of essential medicines have been increasing and become a global problem. High stock out of medication in public hospital specially has high impacts on delivering health care services and reduces the community satisfaction on health services given by the public facilities. Drug stock outs cause unplanned treatment interruptions. Further, repeated drug stock outs interrupt treatment which causes treatment discontinuity, and if not controlled could lead to drug resistance and/or treatment failure.

Objective: To improve availability of essential medication in Kuyu General Hospital from 64% to 85% by the end of June 2020

Methods: Pre-post intervention study was used to identify the percentage of essential medication available in Kuyu general hospital and factors contributing to stock out of medication in the hospital. During pre-intervention the percentage of medication stock out in the last three months was assessed from the documents and intervention strategies were developed to improve the stock out of medication in the hospital. Strengthen DTC committee by onsite training, preparing bin card for medication and ABC-VEN reconciliation for pharmaceutical in the hospital are strategic intervention that was implemented. Pre intervention assessment was done from Dec 25 2019 to February 15 2020 and post - intervention assessment was done from March 2020 to June 2020. Data were analysed using frequencies and percentages were estimated and the results were presented using tables and figures.

Result: Availability of medication in Kuyu General Hospital increased from 64% during pre-intervention to 80% after intervention. Bin cards were prepared for 83.33% of item and updated for 67% of item during pre-intervention and prepared for all item assessed and update for 93.33% of item after intervention. From ABC-VEN matrix analysis done 10.91% of items consumes 65.10% of hospital budget. Vital items took 46.20% of items procured.

Conclusion: Strengthening DTC committee activity by providing training and using stock management tools such as bin cards properly can reduce medication stock out in the hospital.

Recommendation: DTC committee, Hospital management and pharmacy staff should work closely to continuously improve availability of medication in the hospital.

Keywords: Stock out, Medication, Kuyu General Hospital, Bin card

CHAPTER ONE

1. BACKGROUND

1.1.Introduction

Shortages and stock outs of essential medicines have been increasing and become a global problem. High stock out of medication in public hospital specially has high impacts on delivering health care services and reduces community satisfaction on health services given by the public facilities

Medicines are integral part of the health care and limited access to medicines undermines health systems' objectives of equity, efficiency and health development. Availability and accessibility of essential medicines were reaffirmed as key components of primary health care during the Alma Ata declaration. Access to medicine is a key element of any health system. Access is determined by ready availability of essential medicines as well as affordability (1, 2).

Shortages of medication can adversely affect drug therapy, compromise or delay medical procedures, result in medication errors, and cause patient harm. Drug product shortages adversely affect healthcare organization finances by increasing the cost of delivering patient care, largely through the personnel costs required to manage the multiple pharmacy automation systems and electronic medical record changes that must be adjusted in the face of a drug shortage. In addition, shortages create high levels of frustration and stress for everyone involved, including purchasing agents, pharmacists, pharmacy technicians, nurses, physicians, and patients..(1)

Drug stock outs cause unplanned treatment interruptions. Repeated drug stock outs interrupt treatment which causes treatment discontinuity, and if not controlled could lead to drug resistance and/or treatment failure. Furthermore, treatment interruptions affect treatment efficacy and could compromise treatment effectiveness. (3)

Globally Shortages of medication result from manufacturing issues, acute healthcare needs, external political and economic factors, or marketing, procurement, and supply chain management practices. Manufacturing issues resulting in shortages include a lack of raw materials, limited manufacturing capacity, or product quality problems resulting in more stringent inspections and plant closures. Health emergencies, such as disasters and disease outbreaks, can also trigger shortages due to unexpected and large surges in demand. Similarly, changes in recommended clinical practices can dramatically impact availability. (4)

In case of our country medication stock out is high all over the country. Especially in public facilities availability of essential medication is low. Baseline data for health sector development plan 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%(5) .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%(6)

One of the strategic objectives of HSTP of Ethiopia is to improve supply chain and logistics management. Its focus is to ensure access to quality assured, safe, effective and affordable essential medicines with which the sector intends to respond to the majority of health problems of the society; significant reduction in pharmaceutical wastage and improved rational drug use. A strong pharmaceutical supply chain supported by an effective logistic management system ensures that the right quality product, in the right quantities, and in the right condition is delivered to the right place, at the right time, for a reasonable cost. The FMOH have a plan on strengthening integration of supply management into health system development, develop an efficient mix of public-private partnerships, maintain medicines quality in distribution channels and ultimately increase access to essential drugs. There is also a plan to increase per-capita expenditure on essential medicines and health technologies. Focus also given to further ensure proximity of distribution hubs to health facilities at all corners of the country, efficient systems for inventory, fleet and information management, maximizing efficiency in both quantification and procurement, ensuring proper use through health facility-based solutions such as Drug and Therapeutics Committees (DTCs).Equipping existing distribution hubs as well as expansion to realize equitable access, the establishment of pharmaceutical waste management facility, strengthened Revolving Drug Fund (RDF), training competent and adequate number of human resources for health supply chain management at all levels and ensuring strong coordination mechanisms with key stakeholders. During these time FMOH have a plan of increasing availability of essential drugs for primary, secondary and tertiary healthcare to 100% and reduce wastage rate to less than 2% through strategic initiatives of enhancing efficiency in selection, quantification and procurement of essential medicines which is the core activity of DTC committee in health facility.(6)

Establishing and strengthening Drug and Therapeutics Committees (DTC) at health facilities was initiated by the Federal Ministry of Health (FMOH) as part of coordinating sector wide reforms that aim to improve equity and quality of health services. One of these is to improve

accessibility and quality of pharmaceutical products and services. The sector is growing in line the overall growth and transformation plan of the country and the sector is being guided by the health sector transformation plan (HSTP). Drug and Therapeutics Committee is an essential component of a health facility's effort to improve availability and ensure rational use of medicines. (6, 7)

For Efficient budget utilization and improving hospital services all hospitals should develop facility specific drug list prioritized by Vital Essential N-essential (VEN) and enforce its use. Regular ABC value analysis should be conducted and reconciled with VEN categorization and results should be used for guiding decisions during subsequent procurements. Procurement should be conducted only from hospital medicines list. Regular stock status and consumption to stock analysis is conducted to identify medicines at risk of expiry and reducing the stock out of medication. (10)

1.2. Statement of The Problem

Stock out of medication one of the most the reason the service given in the health facility is compromised as lack of essential medication reduces service delivered in health facilities. Especially public health stock out of medication not only reduces quality services it can decrease patient satisfaction with service delivered and reduces health professional work habit.

At national Ethiopian government take many measures to reduce stock out of medication in public health facility. Establishing independent agent that can supply pharmaceutical all over the country Ethiopian pharmaceutical supply agency (EPSA)), increasing pharmaceutical manufacturing, decreasing of medication expiry, strengthening private wholesalers.

At regional and facility level different measures also taken to reduce medication stock out; developing different guideline to reduce medication expiry, establishing the wholesaler that can supplement the national agency for supply pharmaceuticals (Biftu Adugna.s.c.) and increasing the communication between different health facility and exchanging medication to reduce expiry.

Even though different measures taken at national, regional and facility level stock out of medication in public hospital is high. In Kuyu General Hospital, the hospital management takes different measures to reduce stock out medication, but stock out of essential medication are still high. When we assess the average of previous three month (October-December) in the hospital, the percentage availability of medication in the hospital during pre-intervention

medication availability is 64%(96 items from the total of 150 medication we review) in the hospital which is far less than the hospital plan to avail 100% of essential medication and also less than the countries plan to avail 100% of essential medication in the health facilities. Almost 50 % of the patients need one medication from the private market which is very expensive for most of the patients. As no enough competitive private pharmacies are not present in these areas and some medication are also not found there. Patients may need to find from Addis Ababa with additional expenses, which is not affordable for almost all clients of the hospital as they were from the rural area with low income.

In addition to the clients expenses stock out of medication decreases the health workers satisfaction with their works due to lack of essential medication and supplies, which decreases patients satisfaction to the hospital health care services. In order to reduce the stock out of medication in the hospital and decrease the additional expenses from the clients and increase their satisfaction to hospital services these project identify the real root causes, develop best intervention and implement the best intervention with the hospital management to increase the availability of the medication

1.3.**Significance of the Study**

This study will identify the real root causes of medication stock out in Kuyu general hospital and develop best intervention and implement the best intervention with the hospital management to improve the availability of medication. The study is also a source of information for other hospitals in the country and likely to inform them on similar problems and challenges as well as on ways to address them.

CHAPTER TWO

2. OBJECTIVE

2.1.General objective

- ✓ To assess the root cause of medication stock out and improve availability of essential medication in Kuyu General Hospital from 64% to 85% by the end of June 2020

2.2.Specific objective

- ✓ To assess the availability of essential medication in Kuyu General Hospital from December 2019 to March 2020
- ✓ To improve availability of medication in Kuyu General Hospital from 64% to 85% at the end of June 2020

CHAPER THREE

3. ROOT CAUSE ANALYSIs

3.1. Collection of Possible Root causes

Assessment of the hospital medication availability from the hospital medical store documents, prescription prescribed from dispensary and discussion with different dispensary unit we identified different possible root causes which were contributing to stock out of the medication in Kuyu General Hospital. These possible root causes were presented using fish diagram as follows.

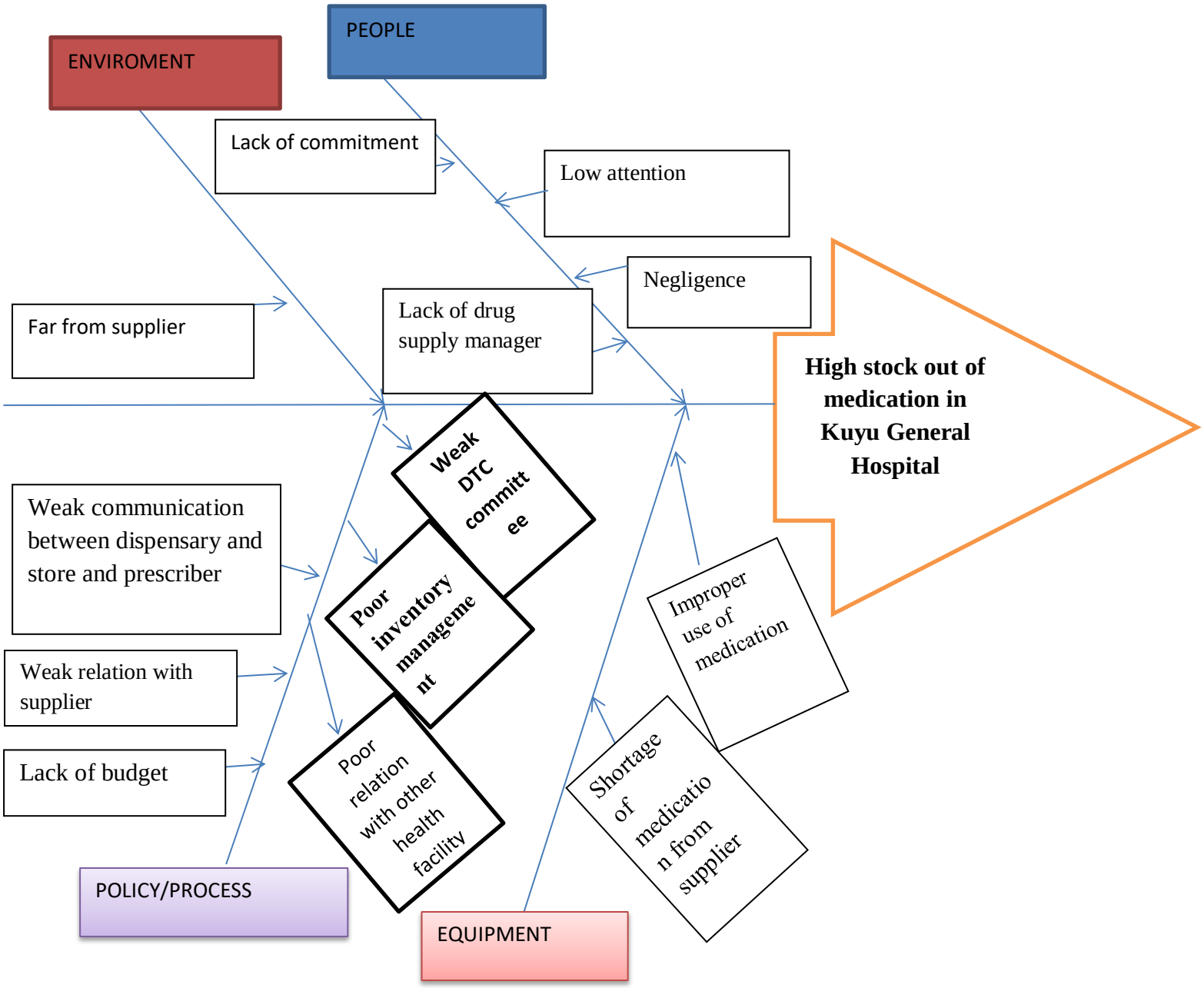

Figure3. 1Fish bone diagram for high stock out of medication in Kuyu general hospital December 2019

3.2. Verification of possible Root Causes of the Problem

After discussing with pharmacy staff and DTC committee, Interviewing with hospital CEO and medical directors, observing different documents, models and stock management tools, the real root causes that can be improved through intervention the hospital can take was identified as follows.

Poor relation with other health facility ; According to ORHB guideline all health facility should have exchange their medication before they expire and they can help each other by the medication they have .On this Kuyu general hospitals done good work especially with the health centers under their catchment area. So this is not real root cause for medication stock out is high in the hospital.

Poor inventory control management system; Management of the stock we have on our hand is the main way we can prevent medication stock out to occur. In most gov't health facility management of medication is too poor. This is also true for Kuyu General Hospital in which inventory management in the hospital is poor. Electronic bin cards were started but not functional and give no information. Some Bin cards were filled in medical store only but the information on there were not used for decision making. They were not updated regularly and stocks out status were not reported to concerning body on time. These were one of the real ro ot causes of medication stock in the hospital.

Far from medication supplier ; Kuyu hospital is located 156 km far from Addis Ababa , so it's not so far to procure medication from supplier even if no wholesaler found in north Shoa zone

Lack of budget; Lack of budget were not the real cause of stock out in the hospital as the hospital had money to buy medication.

No drug supply manager ; The hospital have no separate personnel who manage medication procurement as pharmacy head works all the activities of drug supply manager and other works of pharmacy personnel coordination. These cause that the works of drug supply manager is weakened. But as the pharmacy coordinator of the hospital main duty were to procure and availing the medication this were not the real root cause of stock out.

Poor quantification; all health facility should do quantification of the pharmaceutical every year to improve the availability of medication at supplier (PFSA). But these PFSA does not give what they quantify only as the quantification of most health facility was not in line with their demand. So this was not the real root cause of the hospital

Weak DTC committee: Strong DTC committee plays key role in assuring availability and rational use of medication .As of that Kuyu General Hospital establish DTC committee but not functional as needed. Weakness of the DTC committee is the major and real root cause of medication stock out in Kuyu general hospital

Weak relationship between pharmacy store and dispensers: Communication between dispensary units and medical store manager were important to improve the availability of the medication. In Kuyu General Hospital the communication between store manager and dispensary units were somewhat good. But there was also a gap on communicating newly arrived medication on time.

Weak relationship between pharmacy team and prescriber; There should be always communication and relationship between who prescribe the medication who dispense the medication. It was good to decrease prescribing medication not available in hospital when its best alternatives available in hospital. In addition if prescriber wants brand medication and there is no medication in hospital and there communication pharmacy team can procure that medication on time and decrease prescription written out

Shortage of medication from supplier; Medication stock out is the global problems. Supplier from where medication procured does not have full stock from their store. Especially in our country as the sole supplier for health facility PFSA is always stocked out for essential medicine. But these was not the main cause medication in our hospital

Lack of commitment and attention: pharmaceuticals needs special attention in order to prevent stock out and fulfill our community need. In some case when there is lack of commitment and attention from hospital management, individual staff and the community stock out of medication may occur, which causes dissatisfaction of the clients by the service delivered in the hospital. In Kuyu general hospital all staff has commitment at individual level but in common they have lack of attention to work with each other on how to tackle stock out of medication in the hospital.

Poor communication with medication supplier; If there is good communication between the hospital and drug supplier they have an update on new medication arrived. Kuyu hospital pharmacy coordinator had good communication with EPSA and this was not the real root causes of stock out in the hospital

3.3. Verified root causes of high stock out of medication in Kuyu general hospital

After carefully discussing with pharmacy staff, hospital CEO, Medical director and DTC members we identified the followings causes were the real root causes of high stock out of medication in Kuyu general hospital. Even though there are also many other causes that had contribution; intervening those factors can reduce the stock out of medication in the hospital.

1. Weak DTC committee activities
2. Poor inventory control management in the hospital

CHAPTER FOUR

4. LITERATURE REVIEWS

4.1. MEDICATION STOCK OUT STATUS

Shortages of essential medicines are one of the most serious public health problems. Globally one third of the population lacks the medicines they need. The situation is high in the poorest parts of Africa and Asia where the figure rises to over 50% (11). In many developing countries lack of essential medicines is usually experienced leading to increased mortality and morbidity. 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 (12).

Studies done in India, Mozambique and Tanzania shows that in most of health facilities found in those countries phases stock out of one or more essential medications and medical supplies. In Tanzania the relatively long order cycle, limited funds allocated and disbursed from the central government, difficulty in accessing alternative local funds, and stock-outs at central medical store, of which such challenges depend on the efficiency of procurement and distribution system which comprise stock control system are the factors contributed to the stock out of medication in the health facilities while in Mozambique distance from supplier, stock out from supplier, health staff specially pharmacy, technical ,laboratory and administrative staff are factors contributed to stock out of medication, reagents and medical supplies in health facilities(13,14,15).

In study done Uganda malaria market when there is stock out of medication in public facilities patients pay higher and more widely varying prices on average and are slightly more likely to purchase ineffective malaria drugs, though there is no significant change in the quality of drugs received measured by spectrometer testing in private sector. There is also discrimination by customer demographics on the price of medication. Those with lower levels of education and income appear most likely to drop out of the market in response to stock outs. Frequent public sector stock outs may lead to poorer and less equitable outcomes for patients in the short run and higher equilibrium price levels in the private sector in the long run. **(16)**

The studies done in northern Rwanda and Sudan on availability of essential medicine shows that even though the status of stock out is different from health facilities to health facilities

and from drugs to drug all health facilities in both countries experiences stock out of essential medication. In the study done in Rwanda they classified stock out level based on the range of stock-out levels seen that was between 0.0- 24.2% in which Six health centres (40%) were classified as having high levels of drug stock-out, five health centres (33.3%) as medium levels and four health centres (26.7%) as low levels or no stock-outs. The study also relates lack of human power as factor in causing drug stock out. The availability of medication is high in private facilities than in public facilities which are 90.0% and 93.9% at medicines stores and private sectors respectively. (17, 18)

The most important output of a logistics system is stock availability, which will improve health outcomes. Stock outs in any health system represent a critical system failure. They can result in patients going without life-saving pharmaceuticals and reduced confidence in the health system. Even where stock outs are not high, facilities with too little stock at the time of the visit are either likely to stock out or will require an emergency order before they receive their next routine order; while overstocks can mean waste and inefficiency. The percentage of drugs actually dispensed is one of the indicators of the availability of essential drugs in health facilities. It may indicate the rationality of drug use in terms of optimum cost. An inadequate drug supply has implications for patients' health status, is inconvenient for patients and jeopardizes their trust in the health system. In the study done in southern Ethiopia on of drug use patterns in terms of the WHO patient-care and facility indicators in four hospitals; availability of the key drugs was 65.7 %. The mean percentage of actually dispensed drugs for the patients in different four hospitals is 86.3%. (19, 20, 21)

The other studies done in health centres in Adama town, East shoa and primary health facilities in Gonder town on availability of tracer drugs shows that in all studies the stock out of medications are common. Amoxicillin syrup 125mg/5ml is the most stock outed medication in Adama town and Gonder health centre. In the study done in Adama town health centres Oral rehydration salt (ORS),Tetracycline eye ointment, iron with folic acid tablet and Ergometrine injection were the most frequently stock outed drugs. The average stock out days of all tracer drugs was 40.6 days. While in the study done in Gonder town the average length of days of stock out for the tracer medicines over the six months was 30.5 days with average stock out frequency of 0.8. In the study done in east shoa the mean stock out rate of key essential medicines was around 27.25% with average stock out duration of 35.31 days. On average around 10.43% of medicines were wasted resulting in loss of 174,366.98 Ethiopian birr (ETB). Only (25%of the health facility have full filled good

storage condition criteria. Major challenges in inventory management are budget constraints, lack of human power and over supply of near expiry date medicines. (22, 23, 24)

4.2. The role of DTC in Health facility

Appropriate medicine use is a function of medicine availability. Drug and Therapeutics Committee is an essential component of a health facility's effort to improve availability and ensure rational use of medicines.it plays a crucial role in organization's medicine selection, use, and distribution program (7). This committee has many different functions that will contribute to the goal of improving medicine selection and rational use of medicines. As huge amount of health facilities budget spent on medication, proper management is needed to reduce resource wastage through inappropriate and irrational use of drugs. Well-functioning drug and therapeutics committees (DTCs) are one of the most effective structures in hospitals to address this issue. It is established from different relevant people involved in different aspects of drug management and use in a hospital (managers, clinicians, nurses and pharmacists), to implement strategies to address the problem. Based on the evidence WHO, collaborated with Management Sciences for Health to support PFSA to develop training manuals and facilitate a series of training sessions. Drug and therapeutics committees are gateways for supply chain management and for improving use of pharmaceuticals. PFSA in collaboration with WHO trained more than 1 000 professionals from public health facilities to strengthen product availability and improve the quality of services offered at facility level. They have seen a dramatic improvement in the performance of DTCs in health facilities, including in one of Addis Ababa's biggest hospitals, Zewditu Memorial. In Zewditu memorial hospital DTC committee of the hospital have developed a medicines list for the hospital, review prescriptions, have developed leaflets in Amharic [Ethiopia's official language] so patients understand how to take their medicine better, and have prepared manuals and standard operating procedures for staff to help reduce shortages and waste. The saw DTC committee as a backbone of the hospital their biggest budget investments are on medicines and medical equipment **(25).**

The DTC's role is to optimize rational use of medicines by evaluating the clinical use of pharmaceuticals, developing the policies for managing medicine use and administration, and managing the formulary system. The committee has broad responsibilities in determining what medicines will be available, at what cost, and how they will be used**. (26**)

In Ethiopia FMHACA, PFSA, and FMOH, in collaboration with development partners different efforts made to establish and strengthen DTC committee at different level. Establishing and strengthening Drug and Therapeutics Committees (DTC) at health facilities has long been one of the capacity building focus areas so as to improve the supply management and rational use of medicines at health facilities. The national survey conducted in August 2013 to assess the performance of DTCs at public hospitals showed that most hospitals have established DTCs. However, the functionality of the committees varies significantly from hospital to hospital. Functional DTCs were able to develop medicines list for hospitals, undertake drug use studies, improve rational prescribing, dispensing and patient utilization, develop manual on supply management and use of medicines and establish and strengthen drug information services. Hospitals have reported increased availability of medicines, reduced wastage, improved use of medicines and budget utilization as a result of DTCs. Inadequate follow-up and support, lack of performance monitoring and evaluation system, training gaps, and staff turnover were the major challenges identified for DTC performance. There is a lot to be done so as to fully exploit the potential benefits of health facility DTCs **(5, 6**). In order to address knowledge, skill and attitude gaps identified to establish and functionalize DTC to improve the supply management and rational use of medicines at health facilities, Ethiopian FMOH with other agencies prepare training manual and give training for health workers(**7)**.

4.3. Pharmaceutical Inventory control management

Pharmacy inventory management is a complex but critical process within the healthcare delivery system. Without adequate pharmacy inventory management practices, hospitals run the risk of not being able to provide patients with the most appropriate medication when it is most needed (27). Inventory control is the process of managing inventory in order to meet customer demand at the lowest possible cost and with a minimum of investment. It is a scientific system which indicates as to what to order, when to order, and how much to order, and how much to stock so that purchasing costs and storing costs are kept as low as possible. It helps to protect against the fluctuation in supply and demand, uncertainty and minimise waiting time. A successfully implemented inventory control program takes into account such things as purchasing goods commensurate with demand, seasonal variation, changing usage patterns, and monitoring for pilferage. (28, 29)

There are various methods involved for inventory control but two are commonly used: Always, better and 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% items consume about 70% of the budget (Group A). The next 20% inventory items take away 20% of the financial resources (Group B) and the remaining 70% items account for just 10% of the budget (Group C). VEN analysis is based on critical values and shortage cost of the item. Based on their criticality, the items could be classified into three categories: Vital, essential and Non-essential. Reconciliation of ABC and VEN analysis (ABC–VEN matrix) can be gainfully employed to evolve a meaningful control over the material supplies. Category I includes all V and E 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). Reconciliation of ABC–VEN analysis for the drugs available in the drugs store of the department would help in improving the quality of health care services being delivered at lesser inventory and would help to reduce stock outs of some important drugs.29, 30).

ABC value analysis is an important tool used worldwide, in identifying items that need greater attention for control and seek major cost reduction by setting interventions on class A items where saving will be more noticeable. Subsequent analysis by VEN is useful to determine the relative expenditure by public health value which reflects public health needs and morbidity patterns. In the study done in Tikur Anbessa specialized hospital the overall expenditure of the hospitals medicines budget deviated from the recommended values for medicines procurement, in which less than 5% of medicines consumed greater than 75% of the overall medicines budget. Although large proportion of budget is spent on the vital and essential medicines, there is still quite a large amount of budget being spent on medicines that are not within the hospitals medicines list which reduces the budget needed for the medication found in the hospital list and causes stock out of medication. (31)

In the study done in Arba Minch town in southern Ethiopia shows that out of total of 218 items, 33 (15.14%) items in the A category which consumes 70.08% of medicines budget and 22.47% of medicines were in category B the rest 62.39% of medicines were in category C. in these study controlling only 15.14% of medicine saves up to 70.08% of hospital medication budget. The ABC-VEN reconciliation analyses allow them to make intensive inventory control to the 96 (44%) items in category I (AV, AE, AN, BV and CV) which are either vital or with high cost .The stock level of these medicines should always be at optimal stock level

because they are either lifesaving or essential. The ordering method for AV, AE and BV subgroups of category I medicines should be a two-bin method in order to avoid a shortage(33)In Ethiopia Integrated Pharmaceuticals Logistics System (IPLS) was implemented in 2010 to integrate the supply management of pharmaceuticals and the Revolving Drug Fund (RDF). Routine monitoring reports show that IPLS is improving information recording and reporting, storage and distribution systems, as well as the availability of essential commodities at service delivery points (SDPs). The national survey conducted in January 2014 on IPLS to measure system performance at public health facilities (hospitals, health centres and health posts) indicated that the system significantly improved the availability of essential pharmaceuticals at health facilities. Even though the improvements but, there are still problems in record-keeping, forecasted data quality, timely requisition and consumption reporting from health facilities for PFSA. (6)

Accurate and complete stock data are critical for logistics system performance. Various records (such as bin card stock record cards) and reports (RRF and IFRR) are used in IPLS for recording and reporting of various logistics data sets. The study done in Addis Ababa on availability and level of utilization of such formats by product and facility types and evaluation of the level of completeness and accuracy of such records and reports shows that bin cards, IFRRs and RRFs were available among 25 (96.2%) of the health facilities. Among these facilities, 16 (61.5%) health facilities update bin cards regularly, and 22 (84.6%) of them complete and send IFRR to their respective facility stores, while 24 (92.6%) of the facilities were completing and sending RRF to supplying PFSA every two months. In most health facilities bin cards are not recorded and updated regularly and most of the facilities do not know their consumption and request huge amount of laboratory reagents". These may causes artificial stock out within the system where some facilities will be out of stock and others overstock. (33)

Consistent and accurate use of bin cards is essential for inventory management. In the assessment done in in different facilities on availability and utilization of the bin cards for selected essential pharmaceuticals. Across all facility levels, availability of bin cards for the selected products was reasonable. However, a discrepancy was observed by level of facility and product types. In these assessment although a higher percentage of hospitals and health centres utilized bin cards for the assessed products, the percentage of updated bin cards was found to be similar across all health facility levels. Almost two-thirds of the bin cards that had been used were updated .The availability and use of bin cards varies slightly between

facilities at phases of IPLS implementation; phases I and II facilities showing relatively better performance than the IPLS newly implemented facilities. The accuracy of bin cards is also different from health facilities to health facilities (21).

The studies done in East Shoa zone and east Wollega in Oromia region on inventory management performance shows that there is a problem in preparing and updating bin cards accurately and continuously. From the study done east shoa out of 400 bin-cards selected 40.50%of they were not updated and only 28.50% of bin-cards were accurately filled and from the study done east Wollega in Oromia of the total sampled bin-cards, they found 647 (80.36%) were found to be accurately recorded , and 129 (16%) were inaccurate. In health centres 82.3% bin cards were recorded correctly and 67.7% were accurately recorded in the hospital. Major challenges in inventory management are budget constraints, lack of human power and over supply of near expiry date medicines (22, 35)

In the study done in Saint Paul Hospital Millennium Medical College on Pharmaceutical expenditure analysis and assessment of pharmaceutical inventory control management practices shows 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. The hospital 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. In these study medicines stock-out was one of the major problems affecting the hospital. 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 are the factors contributing to stock-outs in SPHMMC.(28)

CHAPTER FIVE

5. METHODS AND MATERIALS

5.1. Project area and period

The study was conducted at Kuyu General Hospital found in Kuyu Woreda, North Shoa Oromia region, Ethiopia. Kuyu General Hospital is found in North shoa; Oromia National Regional state; 156 Km from Addis Ababa. It was established in 2002 Ethiopia calendar and in 2009 it was expanded to a General hospital by the Regional Health Bureau. The hospital has more than 280 clinical and non-clinical staff members that provide medical services to patients who come from Kuyu Woreda, Werra Jerso Woreda, Hidebu Abote, and Degam Woreda and also for people travelling from and to Addis Ababa from Amhara region. While the inpatient capacity is more than 70 beds, the hospital sees an average of 300 emergency and outpatient clients daily. The hospital has 10 pharmacy workers (three druggists and seven clinical pharmacists). The hospital has two stores for program and RDF pharmaceutical, and has three dispensaries (OPD, emergency and ART pharmacy). The hospital spends around 15 million birr for medication in the last fiscal year of 2011. (36)

Pre-intervention was done from January 2020 to February 2020 and post intervention was conducted from March 2020 June 2020

5.2. Project design

Pre-post interventional study design was used in this project to assess status of medication stock out of medication Kuyu General Hospital after and before implementing different interventional strategies to improve stock out of medication in the hospital. In these study design the outcome of interest is measured before intervention and after the intervention to know if the intervention improves the problems or not. Pre-intervention baseline data were collected in December 2019. Based on the baseline assessment it was found that medication stock out in the hospital was high. Therefore, an intervention was conducted to reduce stock of medication in the hospital and a follow- up data was collected in May 2020.

5.3. Population

5.3.1. Study population

Kuyu General Hospital community and staffs

5.3.2. Study sample

All stakeholders (all Hospital management, all DTC committee members, all pharmacy personnel) of the hospital staff who had contacts with medication and have role on availing medication were participated in these project and all documents which have related with medication stock out was reviewed (prescription, invoice, bin card stock and models)

5.4. Data collection procedures

During both pre-intervention and post –intervention different documents in medical store (model 22, 19, bin cards stock cards), pharmacy dispensary (daily summary of prescription paper, bin cards, APTS daily summary and APTS monthly report)) and financial documents (vouchers from EPSA) that were used in procurements were reviewed and there were also discussion with hospital management, DTC committee and pharmacy staff.

5.5. Inclusion and exclusion criteria

5.5.1. **Inclusion criteria**: - All staff in Kuyu General Hospital who has contacts with medication stock out

5.5.2. **Exclusion criteria**: - Staffs who had no contacts with medication and no effects on medication stock out

5.6. Study variable

5.6.1. Dependent variables

Percentage or number of item of medication available in hospital

5.6.2. Independent variables

Organizational factors: pharmacy human power, evaluation, working load, budget monitoring system of the hospital

Staff related factors: activities of DTC committee, pharmacy staff commitment

5.7. Operational definition(s)

ABC analysis: Classification of inventory items into three categories (A, B and C) according to the value of their annual usage, which is used for analysing drug consumption and utilization, comparing actual versus planned purchases, justifying procurement budgets, guiding procurement patterns, and setting priorities for stock management.

ABC value analysis: Method by which medicines are divided, according to their annual usage (unit cost times annual consumption), into class A items (the 10–20% of items that account for 75–80% of the funds spent), class B items (with intermediate usage rates), and class C items (the vast majority of items with low individual usage, the total of which

accounts for 5–10% of the funds spent). ABC analysis can be used to give priority to class A items in procurement, inventory control and port clearing.

Bin card: used to identify the products on the pharmacy shelves. It is report of issue and receipt of stocks from retailing business department.

Dispenser: A general term for anyone who dispenses medicines. Also specifically used to mean an individual who is not a graduate pharmacist but is trained to dispense medications, maintain stock records and assist in procurement activities.

Inventory: The total stock kept on hand at any storage point to protect against uncertainty, permit bulk purchasing, minimize waiting time, increase transportation efficiency and buffer against seasonal fluctuations.

Inventory control: The function of supply management that aims to provide sufficient stocks of medicines at the lowest costs possible.

Medicine: Any substance in a pharmaceutical product that is used to modify or explore physiological systems or pathological states for the benefit of the recipient. In this manual the words ‘drug’ and ‘medicine’ are used interchangeably.

Stock records: A generic term that applies to card record systems, stock ledgers and computer files. These provide basic information for inventory management by recording all transactions for an item, including receipts, issues, orders placed, orders received and stock losses.

Stock out: Complete absence of an item that is normally expected to be on hand. In many cases, this can be misleading as an indicator, because a warehouse may always reserve a small stock – the warehouse is not literally out of stock, but there is a functional stock out because the warehouse will not issue the reserved stock.

Supplier: Any individual or company that agrees to provide medications, regardless of whether that party is the manufacturer.

VEN system: A system of setting priorities for purchasing drugs and keeping stock, in which drugs are divided according to their health impact into vital, essential, and nonessential categories.(33,37)

5.8. Method of data analysis

As the percentage availability of medication can be measured in different ways we use one of the methods to measure the availability of medication in the hospital. We collect data from prescription by comparing total prescribed medication to the one actually dispensed for patients in three consecutive months for both before and after intervention. Percentage and

frequency were used to calculate number of item available and percentage of medication available. The percentage availability of medication was done manually by simple scientific .The results were presented by using tables and figures.

Qualitative data was analysed manually by thematic method of data analysis. Group discussion was conducted, audio-recorded and transcribed verbatim in Afan Oromo 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

For ABC-VEN reconciliation the data of medication purchased in 2011 E.C budget year was used. As the hospital have list of medication classified based on VEN no need of classifying the vitality of the lists. For ABC all medicines purchased in the financial 2011 year were listed and entered their unit cost. Then the number of basic units purchased was entered. This unit cost was multiplied by the number of units purchased. The percentage of total value represented was calculated. The total expenditure of each medicine was organized in descending order. The cumulative percent total cost of all medicines and the percent order of medicines were calculated. This list was then portioned into three groups: Always (A), Better (B) and Control (C), based on the cumulative percentage total cost of 70%, 20% and 10%, respectively. The reconciliation ABC-VEN was framed by combining the ABC and VEN analysis.

5.9. Ethical considerations

Ethical clearance and Official letter for permission was obtained from Addis Ababa university school of public health, department of health care and hospital administration and was given to Kuyu General Hospital for cooperation. The way how to collect data's will be clearly explained to concerned bodies by CEO and formal letter was written to those concern bodies.

5.10. Data dissemination plan

The findings of this study will be disseminated to local and external partners including Kuyu General Hospital, Addis Ababa University and North shoa zone health bureau

6. CHAPTER SIX
INTERVENTIONS

6.1.Alternative interventions/ strategies

After discussing with pharmacy staff, DTC committee members and hospital SMT members' different alternative intervention were developed to reduce medication stock out in the hospital.

Table 6: 1 Alternative interventions to reduce medication stock out in Kuyu general Hospital, North shoa, Oromia, Ethiopia May 2020

Root cause		**Intervention**
1.	Weak DTC committee	Training for all members of the committee
		Assigning the members with low work load
		Continuous evaluation of the activities of the committee
2.	Poor inventory management in the hospital	Using of VEN-ABC reconciliation in purchasing of medication in the hospital
		Preparing bin cards and stock cards for pharmaceutical in the hospital and follow updates continuously
		Use of computerized system continuously without interruption
		Applying all of the above at once

6.2.Comparative analysis of alternative intervention

After we develop alternative intervention we analysis those different intervention by creating decision matrix qualitatively and quantitatively based on the impact of the intervention on the problem under study, time it will have impacts, feasibility to different stakeholders and the cost of implementing these intervention

1. **Weak DTC committee activity**

Create decision matrix qualitative

Table 6: 2 Qualitative Comparative analysis of alternative intervention for Weak DTC committee activity, in Kuyu General Hospital, North shoa, Oromia, Ethiopia May 2020

No.	Alternative intervention	Impact	Time	feasibility	Cost	Total
1	Training for all members of the committee	High	3 Day	Very Good	Good	
2	Assigning the members with low work load	Good	1 month	Low	Very Good	
3	Continuous evaluation of the activities of the committee	High	1 month	Very Good	Good	

Create decision matrix quantitative (high=5, Very Good=4, Good=3, Low=2, Very Low=1

Table 6: 3 Quantitative Comparative analysis of alternative intervention for weak DTC committee activity, in Kuyu General Hospital, North shoa, Oromia, Ethiopia May 2020

No.	Alternative intervention	Impact	Time	feasibility	Cost	Total
1	Training for all members of the committee	5	5	4	3	**17**
2	Assigning the members with low work load	3	3	2	4	12
3	Continuous evaluation of the activities of the committee	5	4	4	3	16

Training for all members of the committee: All most all members of Kuyu hospital DTC committee members have no training and information on what is the function of the committee and how it works. The committee was established to fulfill the existence of the committee in the hospital. But if all members of the committee were trained and have awareness on the function of DTC committee and how it works, the activities of the committee improved and the problem related with the pharmaceuticals will be solved. There may be also the shortage of medication from supplier in Ethiopia which has an effect on the activities of DTC committee. But if the committee have good coordination and always work with hospital management with full potential, even though eliminating medication stock out

is impossible not in our country but in developed country they can minimize stock out of medication in the hospital .Therefore training all members of the DTC committee is the core intervention activities to strength the committee and plays a crucial role in availing and proper usage of medication in Kuyu General Hospital. Training has good impacts on improving the activities of the committee and feasible to apply in short period of time but it need some cost.

Impact; Training all members of DTC committee have an effects on strengthening the activity of the committee in ensuring the availability and proper use of medication in hospital.

Time :Training have an impacts in short period as it sensitize all members what they have to do to decreases stock out of the medication and overall in the rational use of medication in the hospital.

Feasibility: It is mandatory that members of DTC should have an awareness on what is DTC committee is and its responsibilities in the hospital. Therefore to give training for all DTC members is feasible for hospital management and DTC committee members itself.

Cost: Training needs some resources but in case of these we give training onsite in the hospital and with resources available in the hospital it does not need as such big cost. It is affordable by the hospital. DTC committee of Kuyu hospital have twelve members and giving onsite training for three days have cost around 13500 ETB.

Assigning the members with low work load: Work load have some effects on DTC committee on they undergo their activities correctly and continuously. But the person who have no work load in the hospital have no connection with the committee activity and difficult to do so.

Impacts: Assigning members with low work load have good impact on the activity of DTC committee and indirectly on availability of medication in the hospital. But due to lack of such type of staff it is difficult to assign members of no work load.

Time; Assigning members with low work load have impacts on activity of DTC members in short period of time as the members have no load they can undergo activities DTC committee on time and continuously without interruption.

Feasibility; as most of the workers have their own duty these is not feasible. Due to lack of human power assigning person with no work load is difficult in the hospital.

Cost: due to lack of human power in the hospital it has high cost to assign staff with low work load.

Continuous monitoring and evaluation of the activities of the committee: Monitoring and evaluating the activities of DTC committee identify the gaps and improves their activities.
Impacts; It have high impacts in improving their activities and ensuring the availability of medication in the hospital.
Time: These have impacts on improving of the activities of the committee in short period of time
Feasibility: monitoring and evaluating the activities of DTC committee are feasible to

2. **Poor stock management in the Hospital**

Create decision matrix qualitative

Table 6: 4 Qualitative Comparative analysis of alternative intervention poor inventory management in Kuyu General Hospital, North shoa, Oromia, Ethiopia May 2020

No.	Alternative intervention	Impact	Time	Feasibility	Cost	Total
1.	Preparing bin cards and stock cards for pharmaceutical in the hospital and follow updates continuously	High	Very good	Very good	Very good	
2.	Use of computerized system continuously without interruption	High	Very good	Very good	Good	
3.	Using of VEN-ABC reconciliation in purchasing of medication in the hospital	High	Very good	Very good	Very good	
4.	Applying all of the above at once	High	High	Very Good	Very Good	

Create decision matrix quantitative (high=5, Very Good=4, Good=3, Low=2, Very Low=1

Table 6: 5 Quantitative Comparative analysis of alternative intervention for poor inventory management, in Kuyu General Hospital, North shoa, Oromia, Ethiopia May 2020

No.	Alternative intervention	Impact	Time	feasibility	Cost	Total
1.	Preparing bin cards and stock cards for pharmaceutical in the hospital and follow updates continuously	5	4	4	4	17
2.	Use of computerized system continuously without interruption	5	4	4	3	16
3.	Using of VEN-ABC reconciliation in purchasing of medication in the hospital	5	4	4	4	17
4.	Applying all of the above at once	5	5	4	4	**18**

- **Preparing bin cards and stock cards for pharmaceutical in the hospital and follow updates continuously:** using bin cards and stock cards are the most important tools in any store to manage the stock of medication, supplies and others logistics we have. In Kuyu general hospital store pharmacy uses bin cards for some of the medication and not for all medication, medical supplies and equipment's available in the store. So we prepare bin cards for all of logistics in the store which have no bin cards and follow their updates continuously.

  Impacts ; Preparing and updating bin cards for all products of medication the hospital have high impacts in managing stocks available in the hospital and plays a crucial role in reducing medication expiry and reducing medication stock out.

  Time ; It have an impacts in short time when updated regularly and communicated with other stakeholders on time in reducing medication stock out and wastage by expiry .

  Feasibility: Preparing and updating bin cards are feasible for every one as it only need commitment and motivation to do so.

  Cost: It does not need high cost if bin card cards available. In Kuyu hospital bin cards available as it is distributed by regional health bureau and no need additional cost. As the members of DTC committee and pharmacy staff will do these works it needs no additional cost.

- **Use of computerized system continuously without interruption:** use electronic stock management tool is one of the best ways to manage the availability of pharmaceutical in

health facilities. In Kuyu General Hospital we start to use electronic health commodity management system (HCMS) to manage medication in the hospital. But due to lack of commitment of workers it is not used continuously. Therefore we start using of this system and the hospital adds human power that helps in entering necessary data into the computer.

Impact: using electronic bin card have high impacts in inventory management in the hospital which is important to know how medication we have on hand, for how long we can use and how excess we have or how we need for the next consumption.

Time; it have an impacts in short period of time

Feasibility: Kuyu hospital got computer with system from NGO so using computerized system is feasible to all stockholders

Cost: As the hospital have computer no additional cost needed so motivating the workers to use this system is the only cost needed.

- **Using of VEN-ABC reconciliation in purchasing of medication in the hospital:** ABC-VEN reconciliation helps to use scarce resources in the hospital by purchasing the medication that is needed in the hospital and also shows the way we have use our money.

  Impacts; have high impacts in reducing medication stock out as we purchase medication based on their vitality we do not pay for less necessary medication in the hospital we can save our resources and use that for buying vital and essential medication in the hospital

  Time; have impacts in short period of time

  Feasibility; it is feasible to hospital management and it may add work load on pharmacy staff but it is better for them to use it as it helps in availing medication in the hospital and reduce critics from patient on them.

  Cost: no need of high cost as it is the matter of preparing hospital medication list and classifying them based on their importance in the hospital and the money that is used to pay that medication. As it is also the duty of DTC committee these can be covered by the same cost used in training.

6.3.Select the Best Strategy

After we comparatively analyse alternatives intervention the best strategic intervention chosen by DTC committee ,hospital management and pharmacy staff include onsite training for DTC committee members, Preparing bin cards and stock cards for pharmaceutical in the hospital and follow updates continuously ,use of computerized system continuously without interruption and using of VEN-ABC reconciliation in procurement of medication in the hospital. Improving availability of medication in health facility needs different activities that supplement each other and coordination of different stakeholders (supplier, regulatory, user service provider, finance) to satisfy the needs of the community. In this project we want to implement different strategies that can improve availability of medication in Kuyu general hospital.

CHAPTER SEVEN:

7. IMPLEMENTATION

Before we start this capstone project we assess the status of the hospital pharmaceutical availability (in percentage) in the last three months prior to start of the projects. We assess the availability of one hundred fifty items of medication hospital lists as an essential for delivering services. Then we got the percentage of medication available in the hospital were 64% which is far less than hospital plan of availing 100% of essential medication in the hospital. After identifying the root causes of medication stock out we develop alternative intervention that can reduce stock out of essential medications in the hospital.

Four day onsite training was given to 12 DTC committee members and four other health workers, training was given by pharmacist and medical doctors who got training of trainers (TOT) on Drug and therapeutic committee (DTC).

After training we prepared and update bin cards for all pharmaceutical in the hospital medical store and give direction for medical store manager to prepare and follow their update for all pharmaceuticals continuously without any interruption. We have also plan to use computerised system (HCSMS) which was installed by EPSA and CDC, due to internet interruption in the country we do not proceed to do so at that time. We also update the list of the hospital essential medication that was classified by VEN system and done ABC analysis of medication purchased in the hospital during the year of 2011 E.C and reconcile with VEN classification to guide the procurement system in the hospital.

7.2.Indicators

7.2.1. Process indicators

These were indicators that show input, activities and output. Number of DTC committee trained, Number of bin card and stock card prepared and updated.

7.2.2. Outcome indicators

These are indicators which indicate the result of an intervention or project. Improvement in percentage availability of essential medication was the outcome indicators of these projects

CHAPTER EIGTH

8. RESULTS

8.1.Pre-intervention

8.1.1. Quantitative Findings

The analysis of each indicator during pre-intervention (base line assessment) was presented as follows. To identify if there was an improvements in stock out of the medication in the hospital we evaluate the percentage and number of items available in the hospital. During pre- intervention 150 items of medication were assessed to know if they were stocked in the hospital or stocked out. From 150 items assessed during pre-intervention 96(64%) items were available in the hospital. As assessment took place on the three months we took the average of the three months, as some items present in one month and stocked out in the other. As shown in figure 8:1 below 112(74.66%) available in the hospital in October and it decrease to 74(49.33%) item in November.

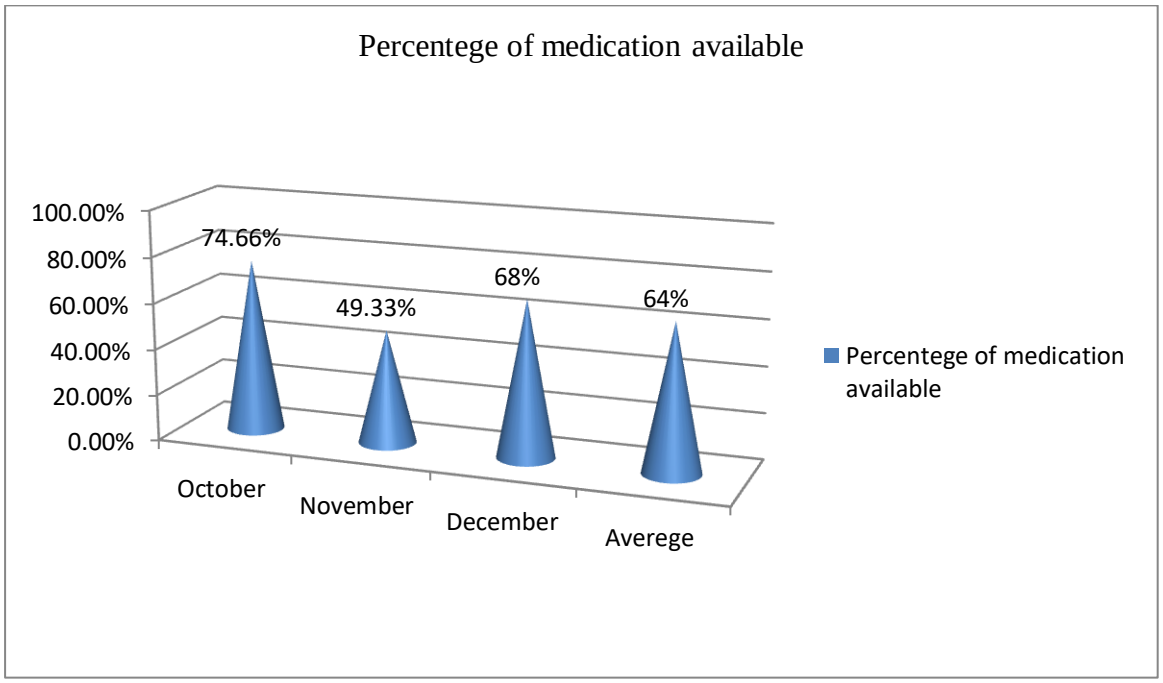

Figure8. 1Percentage of medication items available during pre-intervention in Kuyu General Hospital North shoa Zone, Oromia Ethiopia May 2020

i. Use inventory control management tool

Regarding use of stock record control tools, of assessed medication bin cards were prepared for 128(85.33%) items. From those items of medication which had bincards only 87(58%)) bin cards were updated continuously. Stock control card were not prepared and updated in the

hospital at all. There were beginnings on use of electronic bin cards in the hospital at the time we assess the baseline data. But only data was entered and data accuracy was not checked and used for decision making.

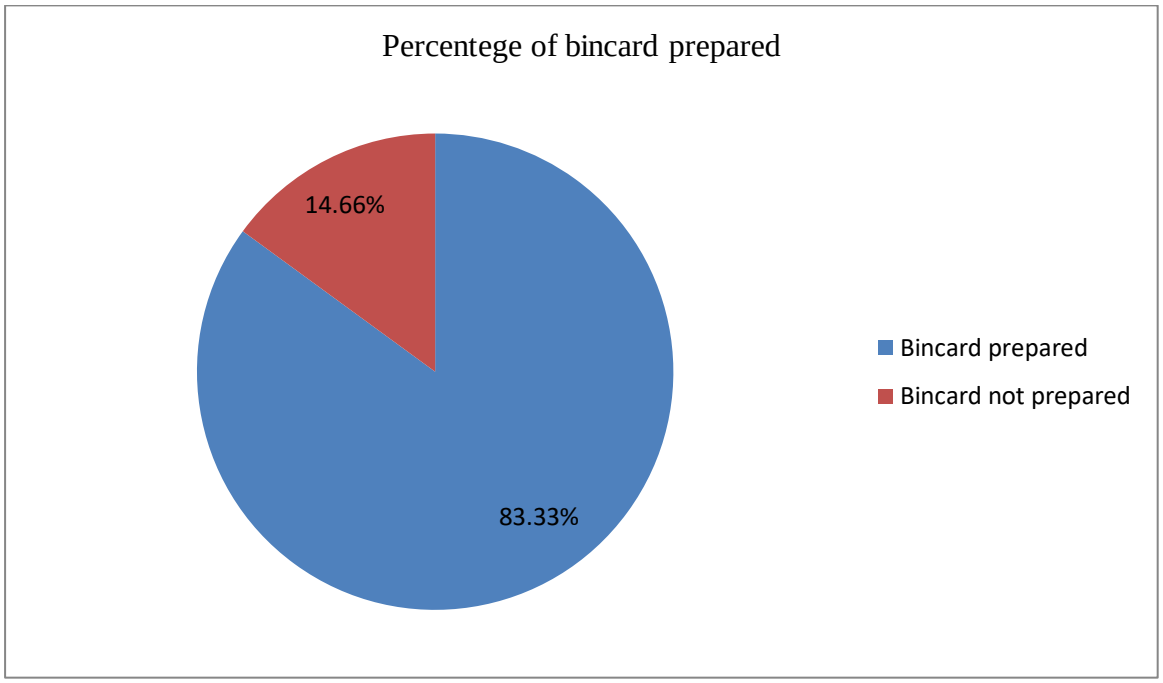

Figure8. 2 Percentages of bin cards prepared during pre-intervention in Kuyu General Hospital North shoa Zone, Oromia Ethiopia May 2020

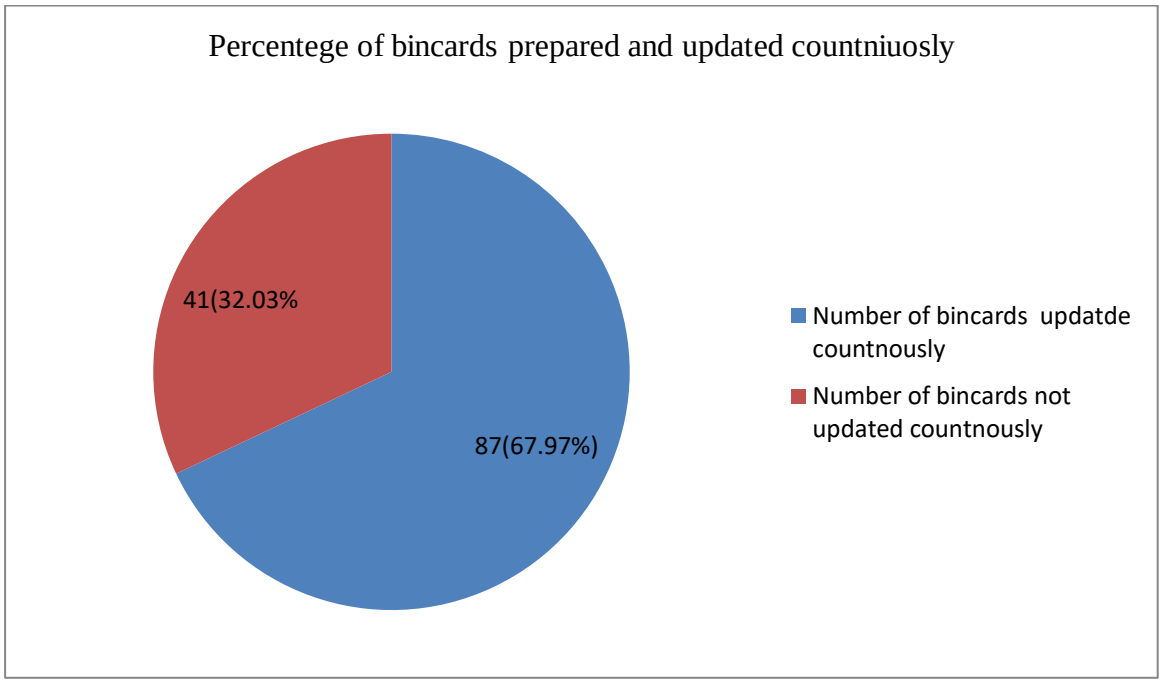

Figure8 3 Percentages of bin cards updated during pre-intervention in Kuyu General Hospital North shoa Zone, Oromia Ethiopia May 2020

8.1.2. Qualitative Findings

Focus group discussions were held with pharmacy staff, DTC committee and hospital management. The qualitative finding was on three thematic areas

Drug and therapeutic committee activity in the hospital

As we notice from the documents and discussed with DTC committee it was found that DTC committee was established in Kuyu General Hospital in 2007 E.C, but the activities of the committee was very weak. DTC committee had played a crucial role in availing and controlling the rational use of medication. DTC committee of Kuyu General Hospital activity was weak in ensuring the availability of medication in the hospital. The committee should have done medication use evaluation, prescription evaluation and should have taken different measure to reduce the stock out of essentials medication in the hospital but nothing had done yet. The committee presents on the paper and did not held meeting on schedule to communicate the problems related with medication in the hospital.

One of the participants of the discussion states that

"In our hospital different committee was established but their functionality was not seen specially as DTC committee was playing vital role in ensuring the hospital rational medication use and availability of medication in the hospital it should be functional. The committee should have meeting as of plan and take necessary measure in ensuring the availability of medication in the hospital in addition we should monitor the rational use of medication in our hospital."

The other participants of DTC members also said that,

"DTC committee was one of the most important committee in this hospital but I didn't saw the activities of this committee that helps the community. As of most of as were new to these committee and not took any training all most of the members not know the responsibilities of these committee and training should be given for us."

As we noticed from the focused group discussion all most all of the committee members were not took training and some of them also do not know what DTC committee was. Only one members of the committee took DTC training and lack of training weakens the activity of the committee then indirectly affects the availability and rational use of medication in the

hospital. Double burden was also the other problems that decrease the activity of DTC committee as all members of the committee were busy on other duties.

Inventory management practice and problems in the hospital

From group discussion, with pharmacy staff medical storage of Kuyu General Hospital uses a manual inventory record control system which includes bin card but not stock record card. Bin cards were not updated continuously for all items, the reason being high work load by store keeper. In dispensary unit there was start in use of bin cards but not updated continuously and stopped for almost a year. Physical inventory count was conducted every three months in store and every month in dispensary unit.

One of the participants of the discussion said that:

"We started to use bin cards in dispensaries but now we have stopped due to shortage of man power. As patient flow was high, we couldn't manage both dispensing and updating bin cards at the same time. There was also medication shortage and most of time we took medication from store unscheduled and at the time patient flow was at peak so at that time updating bincards was impossible and later it was forgotten."

After APTS was started in the hospital inventory management in the hospital was slightly improved but now due to lack of support from management and shortages of human power inventory control management in the hospital was reduced.

As pharmacy coordinator of the hospital said,

"When we start APTS management of the hospital supports us by all means. At that time during the inventory was counted on the end of the months we get per-diem and all pharmacy staff had took responsibility and held monthly inventory count at dispensary and quarterly at store, but after the hospital CEO was changed supports from management and per-diem during inventory count was stopped, management of the hospital did not had places for pharmacy staff. The other human power was reduced as some workers were changed to other hospital and other staffs were at school. "

Stock out of medication and cause of stock out

As we noticed from the discussion from pharmacy staff and DTC committee members stock out of the essential medications were a huge problems that need attention in the hospitals. From the discussion, most of the participants agreed that stock out of medication from EPSA

and lack of proper inventory control management were the main reasons that stock out were high in the hospital.

One of the participants said that,

"As we know stock out of medication were the main problems the patients complain in our hospital. It was known that stock out of medication was not Kuyu general hospital only problems as health facility all over the countries phases these problems. In our hospital stock out was not only came from shortage of medication from supplier (EPSA, Biftu Adugna S.C and private whole sellers), but the way we manage the stock we have on our hands were very poor. We didn't know for how long we use stock we have (months of stock), maximum or minimum stock level of each item. In addition we had to control the stock on hand strictly until they were used by patients. We should have evaluated rational use of medication in our hospital"

Other participants said,

"*When we order medication from EPSA the number of item we order and the amount of each item we order didn't was too far from what we got from EPSA. When we order 120 or more number of items we got less 40 items. In addition when we order for example 400 bottle of Amoxicillin we got only 100 or less bottle of Amoxicillin. In addition to these we had also problems in manging and rationally using the medication we had on our stock. There should be a communication between prescribers and dispensers and also dispensers and store managers*."

8.2. Post intervention

After implementing different intervention that improves availability of medication in Kuyu general hospital there were an improvements on availability of medication. The analyses of medication availability during post-intervention come up with the following findings. In March the number of item available in the hospital were 132(88%) from one hundred fifty item assessed (table 8.1)

Table8. 1Shows number of medicine item available during post-intervention in Kuyu General Hospital North shoa Zone, Oromia Ethiopia May 2020

Months	Number of item assessed	Number of item present	Percentage
March	150	132	88%
April	150	107	71.33%
May	150	121	80.67%
Average	150	120	80%

After implementation of intervention bin cards were prepared for all medication we assessed but there were a gap on continuously updating bin cards especially for fast moving items. Bin cards were prepared for all one hundred fifty items we assessed and updated continuously for 143 (95.33%)) items. During pre-intervention stock record card were not in use but in post intervention they started filling stock record card even though it were not continuous due to work load on pharmacy head. Electronic inventory management tool totally stopped.

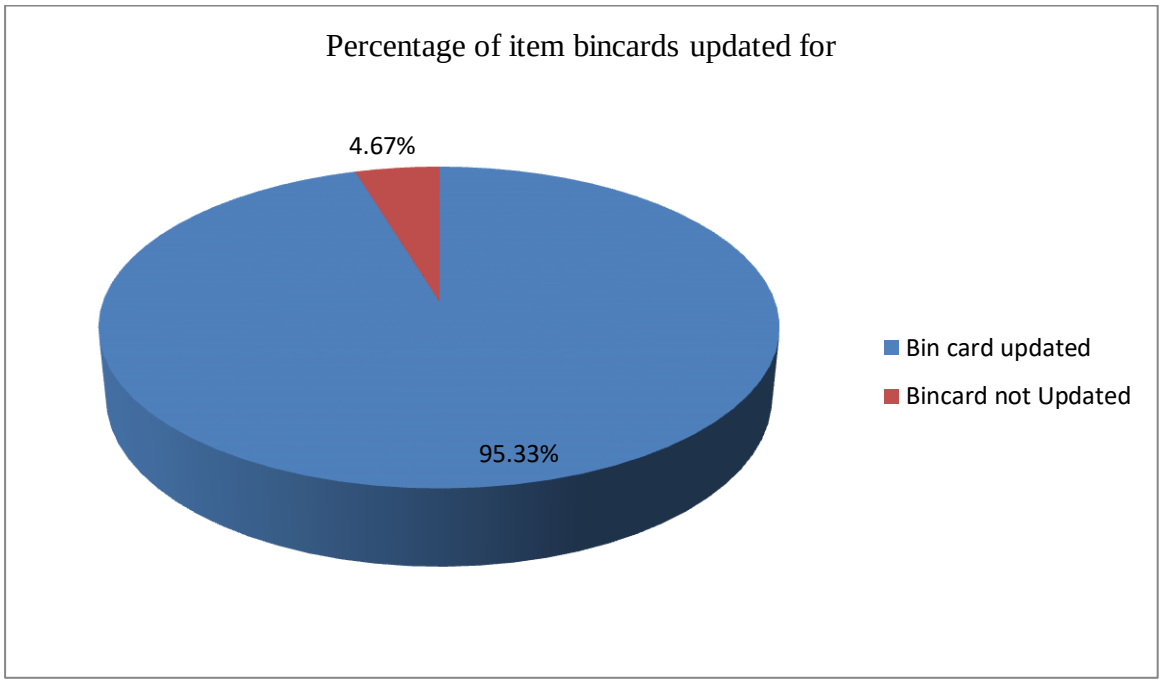

Figure8 4 Percentages of bin cards updated during post-intervention in Kuyu General Hospital North shoa Zone, Oromia Ethiopia May 2020

8.2.1. ABC analysis, VEN analysis and ABC-VEN Matrix (reconciliation) in Kuyu Hospital

i. ABC analysis findings

ABC analysis was done for medication procured in 2011 E.C budget year. The total numbers of items procured in Kuyu general hospital in this year were 275. The total costs of items procured in this year were 4,462,334 ETB. From the total items procured 30 items which accounts 10.91% of total items take 65.12% of the hospital budget (class A). Whereas large numbers of items 163 (59.27.2%) account for only (8.21%) for money paid for procurement (Class C).

Table8. 2ABC analyses of medicines procured in Kuyu General Hospital North shoa Zone, Oromia Ethiopia May 2020

	Class A		Class B		Class C		Total items and money consumed	
Number of item procured	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
	30	10.91%	82	29.82	163	59.27	275	100
Money consumed	2905996	65.12%	1190200	26.67	366137.9	8.21	4462334	100

ii. VEN Analysis

When we perform VEN analysis of the procured medication in 2011 E.C in Kuyu General Hospital 127 items were in vital category (V -class) which constitute 41.6% of the procured value, and 23 of items were non-essential (N-class) medicines consumes only 8.36% of total medicines procured in Kuyu general hospital in 2011 E.C. The total numbers of medication on hospital pharmaceuticals list were 708 including medical supplies laboratory reagent and hmedical equipment's.

Table8. 3VEN analyses of medicines procured in Kuyu General Hospital North shoa Zone, Oromia Ethiopia May 2020

VEN category	Number of items	Percentage of items	Amount of money spent (ETB)	Percentage from total budget spent
Vital	127	46.19%	2894080	64.86%
Essential	125	45.45%	1456616	32.64%
Non-essential	23	8.36%	111637.9	2.50%
Total	275	100%	4462334.08	100%

iii. ABC-VEN Matrix (reconciliation) *results*

When analysis of ABC-VEN matrix were done only 17 (6.18%) of procured items were vital and belonging to Class A (AV) but consumes the highest procured percentage amount (46.8%). The majority of items 80 (29.09%) were essential belonging to class C (CE), but consumes only (4.25%) of procured amounts followed by 65 item which belongs to class C (CV) and vital item and consumes 3.28% of procured amounts .

Table8. 4 ABC-VEN coupled matrix of medicines in Kuyu General Hospital North shoa Zone, Oromia Ethiopia May 2020

ABC-VEN		V class		E class		N class		Total	
		Number	%stage	Number	%stage	Number	%stage	Number	%stage
A class	Number item	17	6.18%	12	4.36%	1	0.36%	30	10.91%
	Amount spent	2088306	46.80%	778130.1	17.44%	39560	0.89%	2905996.1	65.12%
B class	Number of item	45	16.36%	33	12%	4	1.45%	82	29.82%
	Amount spent	659257.2	14.77%	488908.9	10.96%	42034	0.94%	1190200.1	26.67%
C class	Number of item	65	23.64%	80	29.09%	18	6.55%	163	59.27%
	Amount spent	146517	3.28%	189577	4.25%	30043.88	0.67%	366137.88	8.02%
Total	Number of item	127	46.18%	125	45.45%	23	8.36%	275	100%
	Amount spent	2894080	64.86%	1456616	32.64%	111637.9	2.5%	4462334.08	100%

From ABC-VEN matrix three categories were created and each of three categories would need different inventory control management in order to prioritized procurements of medicine. Top priority should be category I which took huge budget with small number of item and reconsideration should also give to category II which contain two thirds of number of item and took small budget. Category III did not need special attention as it only contain non-essential item and took very small amount of budget. (Table 8.5)

Table8. 5 Prioritization categories of medicines procured in Kuyu General Hospital North shoa Zone, Oromia Ethiopia May 2020

Category I	AV		AE		AN		BV		CV		Total	
	No of items	17	No of items	12	No of items	1	No of items	45	No of items	65	No of items	140
Category II	BE		CE		BN						Total	
	No of items	33	No of items	80	No of items	4					No of items	117
Category III	CN										Total	
	No of items	18										18

8.3. Comparison of pre-intervention with post intervention

The comparison of each indicator in terms of number of medication item available, bin card prepared and updated for pre-post-intervention were as follow. Numbers of item available were increased from 96(64%) items during pre-intervention to 120 (80%) items during post intervention assessment. Bin card were prepared for 128 (85.30%) items during pre-intervention and prepared for all item assessed during post intervention.

Table8. 6 Comparison of pre-post intervention of different indicators in Kuyu general hospital North shoa, Oromia, Ethiopia May 2020

Indicator	Pre-intervention	Post intervention	Point change	P-value (at 1%)
Item available	0.64	0.80	0.16	<0.00099
Bin card prepared	0.85	1.00	0.15	<0.00001
Bin card updated	0.68	0.95	0.27	<0.00001

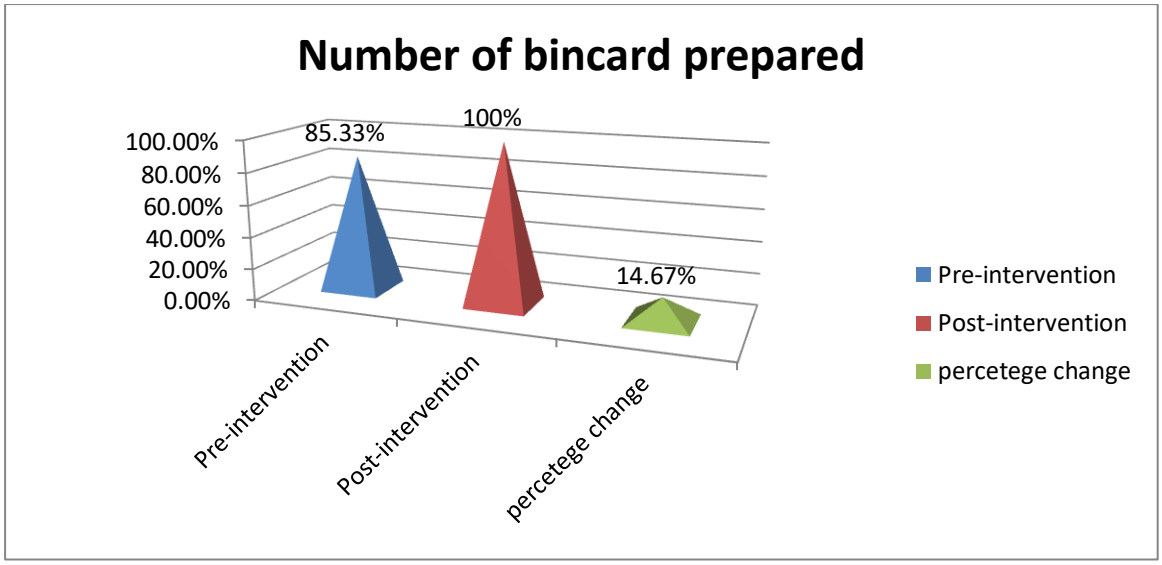

Figure8. 5 Comparison of pre-post intervention of number of bin card prepared in Kuyu general hospital North shoa, Oromia, Ethiopia May 2020

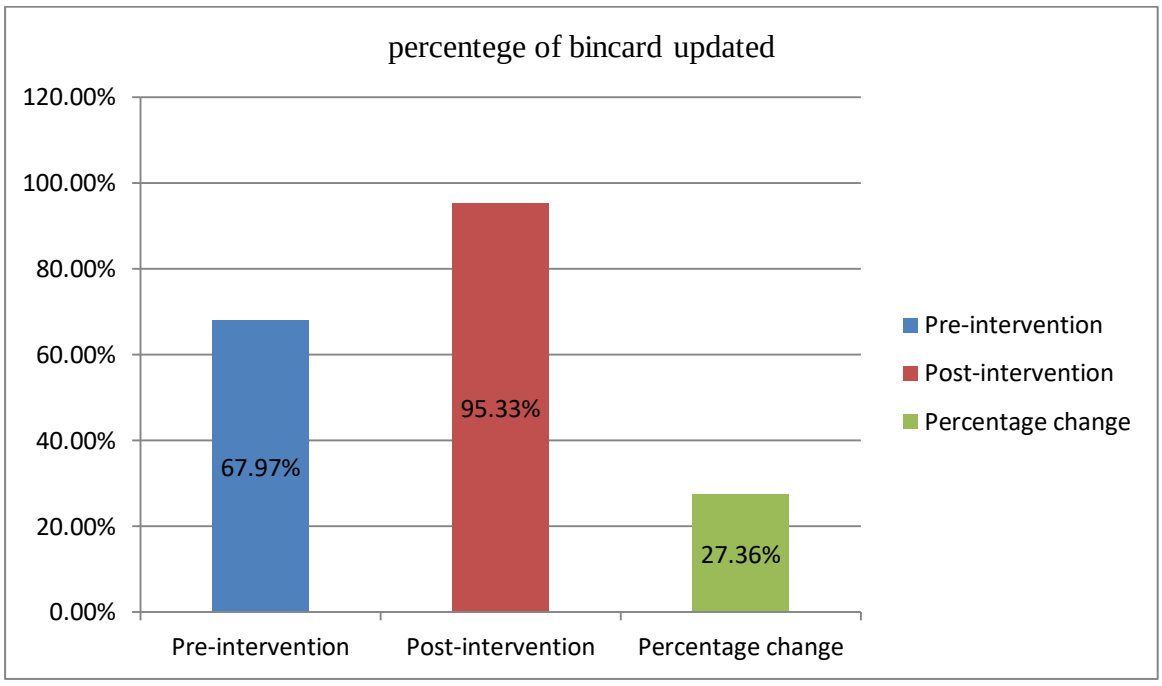

Figure8. 6 Comparison of pre-post intervention of number of bin card prepared in Kuyu general hospital North shoa, Oromia, Ethiopia May 2020

CHAPTER NINE

9. DISCUSSSION

The aim of this project was to improve the stock out essential medicines in Kuyu general hospital. To improve these project designed interventions like training DTC committee, preparing and follow continuous update of bin card and undergoing of ABC-VEN reconciliation which improves our stock management by helping which medication should be given priority while procurement were implemented.

Availability and accessibility of essential medications was a key component of primary health care. Access to medicine is a key element of any health system. Access is determined by ready availability of essential medicines as well as affordability (1, 2). There were significant improvement on availability of essential medication in these projects in which the availability of medication increased from 64% to 80 %.(P-value<0.00099) which was significant at 1%. It was low when compared the hospital plan of availing 100% of essential medication. These may be due to the stock out of medication from government and private wholesalers due to covid 19 pandemic. The availability of essential medication were high in Kuyu general hospital when compared to the study done in southern Ethiopia in four hospitals in which the availability of the key drugs which were 65.7 %(19). These may be due to the difference in time of the study and the achievements of these projects. It was also higher than that of the study done in Adama and Gondor town health centre in which the stock out of essential medication were 27.25% and 20% respectively(23,24). The difference may be due to project achievements and the duration of time the two studies took. In both studies done in Adama and Gondar town studies takes an average of six months medication availability but in these projects the average of three months were taken.

In these projects it was found that activities of DTC committee were low in hospital. Drug and Therapeutics Committee is an essential component of a health facility's effort to improve availability and ensure rational use of medicines. It plays a crucial role in organization's medicine selection, use, and distribution program (7). In Kuyu General Hospital weakness of activities of DTC committee was one of the reason essential medication stock out was high. This was due to lack of training of the committee members on the function and role of DTC committee in the hospital. These was not in line with the study done in the Zewditu Memorial hospital on the of role of DTC committee in the hospital in which , they realize that DTC committee was a backbone of the hospital as their biggest budget were spent on medicines

and medical equipment's (25). DTC committee had broad responsibilities in determining what medicines will be available, at what cost, and how they will be used (26). During the HSDV performance review many Hospitals have reported increased availability of medicines, reduced wastage, improved use of medicines and budget utilization as a result of DTCs activities in health facilities. Inadequate follow-up and support, lack of performance monitoring and evaluation system, training gaps, and staff turnover were the major challenges identified for DTC performance (5, 6). In order to address knowledge, skill and attitude gaps identified to establish and functionalize DTC to improve the supply management and rational use of medicines at health facilities, Ethiopian FMOH with other agencies prepare training manual and give training for health workers , in which the activities of the committees were improved(7).

Poor stock control management was the other root causes of hospital high stock of essential medication. In these projects improving stock control managements improves availability of essential medication in the hospital. Inventory control records such as bin cards, stock records and computerized system were play crucial role in minimizing the risk of medication stock out and medication wastage. Without adequate inventory management practices, hospitals run the risk of not being able to provide patients with the most appropriate medication when it is most needed (27). It helps to protect against the fluctuation in supply and demand, uncertainty and minimise waiting time. A successfully implemented inventory control program takes into account such things as purchasing goods commensurate with demand, seasonal variation, changing usage patterns, and monitoring for pilferage (28, 29). Paper based bin card inventory record system was used in Kuyu Hospital. Uses of bin cards were improved from 85.33% during baseline assessment to 100 %(P-value<0.0001) after intervention. These were somewhat comparable to the study done in Addis Ababa health facilities in which use of bin cards were 96.2%. In this project updating bin cards continuously were increased from 67.97% to 95.33 %(P-value < 0.0001) after intervention. This was higher than that of the study done in Addis Ababa health facility in which 61.5% of bin cards updated. In most health facilities bin cards are not recorded and updated regularly and most of the facilities do not know their consumption and request under or over their needs. These may causes artificial stock out within the heath system where some facilities will be out of stock and others may overstock (33). This was also the problems in Kuyu general hospital in which medications were requested over consumption or under consumption due to lack of proper usage of inventory records tool. This was also higher

than that of the studies done East Shoa and East Wollega in which 40.50% and 80.36% of bin cards were updated and accurately filled respectively. In both studies major challenges in inventory management are budget constraints, lack of human power and over supply of near expiry date medicines (22, 35). These comparable to that of Kuyu general hospital as lack of human power, lack of incentives for store man and negligence were the major challenges in recording and updating bin cards in medical store. This was also the same to the study done in Saint Paulus Hospital and medical college in which lack of human power was the major reason for not continuously recording and updating bin cards (28).

The ABC analysis of the present study showed that only about 10.91% pharmaceuticals consumed about 65.12% of annual medication expenditure and classified as 'class A'. About 29.82% pharmaceuticals had consumed about 26.67% of budget and classified as 'class B'. The rest 59.27% consumed about 8.21% of annual medication expenditure budget and categorized as 'Class C' .These was greater than that of studies done in Tukur Anbessa specialized hospital and Saint Paulus hospital in which only 5%and 10% of the items consumes 70% and 80% of hospital medication expenditure respectively (28,31). These may be due to the budget difference, as the two hospitals procure medication in bulk and the consumption of medication was also different. Regarding to VEN analysis 46.19% of procured items were Vital and consumes 64.86% of hospital annul budget. While 45.45% of items were essential and consumes 32.64% of hospital. The rest 8.36% of items were non-essential and consumes 2.5% of hospital annual budget. These also different to that of study done in Tikur Anbessa specialized hospital and that of Saint Pauolos hospital, in Tikur Anbessa hospital the proportion amount of budget was spent on Vital and essential item while in Saint Pauolos hospital essential medication took higher proportion of budget 58.5%. In Kuyu general hospital higher emphasis was given to vital items and most of hospital budget was spent on vital items.

The ABC-VEN matrix is a combination of the two analyses to evolve a management system, which can be used for prioritization and recommended for determining the subgroups in greatest need in special care. Combining ABC and VEN analysis forms a powerful tool for a critical analysis of medicine use and assists in containing the cost especially by restricting the expenditure on non-essential items. In these case we combine and analysis ABC-VEN matrix. If ABC analysis is carried out alone for drug procurement, it would effectively control a few items in Class A, 30 (10.91%) which almost amounting for 65.12% of procurement budget, however it would compromise on availability of items from B and C classes (245 items,

89.09%). Similarly, if only VEN analysis is considered, only Class V (46.19%) will be procured. But combining the advantage of ABC and VEN analyses more useful in prioritization and makes possible to focus on 140 (50.90%) items belonging to Category I for strict managerial control as these items are either expensive or vital medicines. Category II items which contain 117(42.54%) should be overlooked with special consideration to ensure the availability of essential medicines which has significant impact on the quality of pharmaceutical services provided. Category III which include only18 (6.54%) should be decided based on the hospital budget as their needs in the hospital were low. The study done in Arba Minch also shows ABC-VEN reconciliation analyses allow them to make intensive inventory control to the 96 (44%) items in category I (AV, AE, AN, BV and CV) which are either vital or with high cost .The stock level of these medicines should always be at optimal stock level because they are either lifesaving or essential. The ordering method for AV, AE and BV subgroups of category I medicines should be a two-bin method in order to avoid a shortage (33). As stock out of medication in category I had huge effects on hospital services there should be always under strict control.

CHAPTER TEN

10. STRENGTH AND LIMITATION

10.1. STRENGTH

Even though this project was done in the time of corona virus pandemic and information collection was difficult it improves the activities of DTC committee after training were given. The study was conducted using a baseline and follow up information and it used a mix of quantitative and qualitative method for data analysis. This helps to triangulate information obtained from alternative methods and to address the limitations of using quantitative and qualitative data analysis separately.

10.2. LIMITATION

As limitation these projects uses different strategic intervention that complement each other to improve the high stock out of medication in the hospital, the projects did not identify which strategic intervention was more effective on improving the percentage availability of the medication in the hospital. Due to covid 19 pandemic infection, change in the hospital management there were also a problem on getting information from hospital management during post intervention. There was also a limitation of literature on capstone projects done on medication stock out. It should be also noted that even if there were significant changes in the outcomes between the baseline and follow up periods. Since we use simple descriptive statistics without controlling for other co-variates; we cannot claim that the reported change values in the outcomes are all due to the impact of DTC committee intervention being implemented.

CHAPTER ELEVEN

11. CONCLUSION AND RECOMMENDATIONS

11.1. Conclusion

Stock out of medication in health facilities are caused by different factors within and outside the organization. Pre-post intervention was used to identify possible root cause of medication stock out in the hospital. It is found that, after the implementation of the interventions stock out of medications were reduced from 36% to 20%; stock control management and DTC committee activity were improved

From these projects we conclude that strengthening the activities of DTC committee in the hospital, improving the hospital inventory management control and inventory record system can reduce the stock out of medication. Using the inventory record system accurately and continuously can reduce stock out of essential medication and reduce medication wastage due to expiry and theft. ABC-VEN matrix analysis could help by identifying which medication items should be given priority during procurement and gave critical attention in medical store can reduce stock out of essential medication and improves medication wastage due to theft, expiry and lack of budget

11.2. Recommendation

Based on the evidence from evaluation in order to continuously minimize medications stock out in the hospital we recommend the following for stakeholders

Hospital management

- ✓ Hospital SMT has to strengthen the inventory management control system
- ✓ The Hospital management should motivate and prepare training for all DTC committee members continuously as the committee members were changed time times due to staff turnover or other organizational reason.
- ✓ The Hospital have to encourage and motivate store manager to accurately and continuously use inventor record system

Pharmacy staff

- ✓ All pharmacy staff members should update and use bin cards and other stock management tool

- ✓ They should always communicate with the prescriber on stock available in the hospital
- ✓ They should always ensure rational use of medication with DTC committee
- ✓ With DTC committee ABC-VEN matrix analysis should be done on regular basis to prioritize and make decisions for quantity and frequency of ordering medication based on the result of ABC-VEN matrix analyses.

DTC committee

- ✓ DTC committee should always works with hospital management and ensure availability of essential medication in the hospital
- ✓ DTC should strength its activity in improving the hospital medication availability and monitor and medication use in the hospital.
- ✓ They should update the VEN list of the pharmaceuticals with strong recommendation on review of purchased pharmaceuticals that were not included in the list regularly.

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ANNEXES

I. Checklist to assess the possible root causes of medication for pre-intervention phase

1. Presence of separate unit to inventory management unit?

2. Presence of Drug supply manager in hospital?

3. The incidence of the stock-outs tends to vary seasonally with the drug procurement cycle?

4. Once products go out of stock, is the hospital take measure on time?

5. Presence of good communication between prescriber and dispenser?

6. Presence of good communication between pharmacy dispenser and store manager?

7. Are there procedures for therapeutic substitution by pharmacists or dispensers?

8. Presence of strong relation with other neighbouring health facility to exchange medicine

9. Presence of enough budgets for medication procurement?

10. Presence of other source of medication supply other than government supplier?

11. Presence of management commitment on ensuring availability essential medication in the hospital?

12. Use of manual and computerized inventory control management in the hospital?

13. Presence of good inventory control management system?

II. Group Discussion points

a. Role of DTC committee
b. Root causes of medication stock out that hospital can handle
c. Role of pharmacy staff on availing medication
d. Role of hospital management on improving medication stock out
e. Role of other staff on medication stock out
f. Other

III. Over all pharmacy services checklist for hospital

No	Checklist	Yes	No
1.	A Drug and Therapeutics Committee has been established.		
2.	Terms of reference for the Drug and Therapeutics Committee are defined		
3.	A Medicines Formulary is created and is shared with staff		
4.	The hospital develops, utilizes and annually updates a comprehensive list of pharmaceuticals prioritized by VEN		
5.	Pharmacy services are integrated in the emergency, outpatient and inpatient case teams.		
6.	The hospital implements transparent and accountable pharmaceuticals transactions		
7.	The hospital has a functional compounding service with SOPs to describe different compounding procedures.		
8.	A Drug Information Centre is established to provide drug information to staff and patients alike.		
9.	Procedures are established to receive, investigate adverse drug reactions.		
10.	Procedures are established to monitor prescriptions and drug utilization		
11.	There is a drug procurement policy.		
12.	An inventory management system to manage drug supply and distribution is established.		
13.	There is process to dispose of expired drugs.		
14.	Adequate personnel to provide pharmacy services are in place		
15.	Facilities and equipment needed to provide pharmacy services are in place		

IV. Bin Card form

Hospital Name: Kuyu General hospital

Product Name, Strength and Dosage Form: Ciprofloxacillin 500mg tablet

Unit of Issue: Pack (10x10)

Date	Doc. No. (Receiving or Issuing)	Received from or Issued to	Quantity			Balance	Batch No.	Expiry Date	Remark
			Received	Issued	Loss/Ad				
02/01/2012	000234	EPSA	50			50	0012	12/2023	BB
05/01/2012	00123	OPD pharm.		30		20	0012	12/2023	

V. Drug and therapeutic committee establishment and functionality checklist

Name of the hospital: KUYU GENERAL HOPITAL

Town/city: GERBA GURACHA

Name of work site: KUYU WOREDA NORTH SHOA

Region: OROMIA

DTC question	Answer	Comments
Does your hospital have a DTC? If yes, how many years has the DTC been established?	Yes--- No ---- If yes how many year?	
Does your DTC have a Subcommittee on Antimicrobials?	Yes ---------- No ----------	
Does your hospital have an Infection Control Committee?	Yes ------- No ---------	
What are the major functions of your DTC?		
Does your DTC have guidelines and procedures that regulate the functions of the DTC?	Yes No------	
What professional staff members are represented on the committee? Please list them		
How many members typically attend DTC meetings? Please list those who usually attend		
Who serves as the DTC chairperson? Who serves as the secretary?		
How often does the DTC meet?		
What topics are covered in the regular meetings of the DTC?		
Do you maintain minutes of the DTC meeting?	Yes------ No ------	
Does your committee routinely evaluate new requests for the formulary or essential medicines lists?	Yes ------- No---------	
Does your committee regularly review the formulary for availability of the most effective, safe, and cost-effective medicines?	Yes ---- No -------	
How many medicine products (including different formulations and		

different banded products of the same chemical entity)?		
Approximately how often do prescribers Prescribe medicines that are not in the formulary list?		
Is there a medicine information centre in your hospital? If no, does your hospital have plans to institute one?	Yes ------ No --------	
What sources of pharmaceutical information are used to evaluate medicines for the formulary? (Please list each source.)		
Does your DTC have an Internet connection for pharmaceutical information searches?	Yes---- No----	
Who provided the medicine information sources for your hospital and when did this occur?		
What is the role of pharmaceutical companies or suppliers in providing information on new medicines and promoting medicines in your institution?		
Does your DTC have established policy for evaluating adverse drug reactions?	Yes----- No-----	
Does your DTC have established policies to assure product quality?	Yes----- No-----	
Does your DTC participate in evaluating pharmaceutical costs?	Yes---- No----	
Does your DTC have established methods for periodically evaluating the use of medicines in the hospital? If yes, what methods are used?	Yes------ No--------	
Has the committee detected any problems in the use of medicines? If yes, please describe the problems.	Yes----- No------	
Does your DTC have programs or strategies to Improve pharmaceutical use problems? What are these strategies?	Yes----- No------	
Does your DTC participate in preparing technical specifications for procurement of medicines?		
What are some major accomplishments of the committee?		
What are major problems of your committee?		
What would you like to see accomplished with your committee?		

VI. Pharmaceutical store Performance Indicators and Performance Targets

Performance Indicator	**Performance Target**
Using stock cards correctly 85%	85%
Stock records correspond with physical counts 90%	90%
Practicing FEFO (First to Expire, First Out) 90%	90%
Inventory Performance Indicators	
Percentage of stock records (not cards) that correspond with physical Counts	100%
Percentage of indicator drugs (tied to top 38 disease-states) that are in Stock	100%
Average percentage of time out of stock for indicator drugs (top 38 disease-states)	<5%
Average lead time from suppliers	<60
Average difference between stock records and physical count (all drugs)	<5
Value of expired drugs as % of total drug purchases last year	<3%

VII. Data collection sheet for ABC -VEN analysis of medication procured in 2011 E.C

s.no	**Item Name**	**Therapeutic**	**VEN classification**	**Basic Unit**	**Unit cost**	**Total cost**
1.						
2.						
3.						
4.						
5.						

VIII. Checklist to identify stock out medication in Kuyu general hospital

s.no	Name of medication	Available during review (Yes, No)	Duration of stock out	Have bin card	Bin card updated regularly	Remarks
1.	Acetylsalicylic acid 81 mg tablet					
2.	Acyclovir 200mg tablet					
3.	Adrenalin(Epinephrine) 0.1% injection					
4.	Aluminum Hydroxide + Magnesium Trisilicate suspension					
5.	Aluminum Hydroxide + Magnesium Trisilicate tablet					
6.	Aminophylline 250mg/10ml injection					
7.	Amitriptyline 25 mg tablet					
8.	Amoxicillin 250 mg capsule					
9.	Amoxicillin 500mg capsule					
10.	Amoxicillin 125mg/5ml suspension					
11.	Amoxicillin 250mg/5ml suspension					
12.	Amoxicillin + Clavulinic acid					
13.	Amoxicillin + Clavulinic acid					
14.	Amoxicillin + Clavulinic acid					
15.	Ampicillin 500mg injection					
16.	Atropine Sulphate1mg/ml injection					
17.	Bisacodyl 5mg suppository					
18.	Bisacodyl 5mg tablet					
19.	Bismuth subgalet compound (Bismuth subgalet + Bismuth oxide + Peru bulsom + Zinc oxide) suppository					
20.	Bismuth subgalet compound (Bismuth subgalet + Bismuth oxide + Peru bulsom + Zinc oxide) ointment					
21.	Bupivacaine 0.5% injection					
22.	Captopril 25 mg tablet					
23.	Carbamazepine 200mg tablet					
24.	Castor Oil 30ml syrup					
25.	Cephalexin 500mg capsule					
26.	Cephalexin250mg/5ml suspension					
27.	Ceftiaxone 0.25mg injection					
28.	Ceftiaxone Injection, 0.5gm					

29.	Ceftiaxone 1gm injection					
30.	Ceftazidime 1gm injection					
31.	Clarithromycin 500mg tablet					
32.	Chlorpromazine 100mg tablet					
33.	Chlorpromazine 25mg/ml injection					
34.	Chlorpromazine 25mg tablet					
35.	Cimetidine 200mg/ml injection					
36.	Cimetidine 400mg tablet					
37.	Cloxacillin 250mg capsule					
38.	Cloxacillin 500mg capsule					
39.	Cloxacillin 125 mg suspension					
40.	Cloxacillin 250mg/5ml suspension					
41.	Cloxacillin 500mg injection					
42.	Dextromethorphan hydrobromide 15mg/5ml syrup					
43.	Diazepam 5mg/ml injection					
44.	Diazepam 5mg tablet					
45.	Diclofenac sodium 25mg/3ml injection					
46.	Diclofenac sodium 50mg tablet					
47.	Digoxin 0.25mg tablet					
48.	Dopamine hydrochloride 40mg/ml injection					
49.	Enalapril Maleate 10mg tablet					
50.	Enalapril Maleate 5mg tablet					
51.	Ephedrine + Theophyline 11mg + 120mg tablet					
52.	Frusemide 10mg/ml injection					
53.	Frusemide 40mg tablet					
54.	Glycerin 1gm suppository					
55.	Glycerin 900mg suppository					
56.	Haloperidol 2mg tablet					
57.	Haloperidol 5mg/ml injection					
58.	Halothane 250ml liquid					
59.	Hydralazine 20mg/ml injection					
60.	Hydrochlorothiazide 25 mg tablet					
61.	Hyoscine 20mg/ml injection					
62.	Hyoscine 10mg tablet					
63.	Ibuprofen 400mg tablet					
64.	Indomethacin 25mg capsule					
65.	Ketamine HCl 50mg/ml in 10ml injection					
66.	Lidocaine + Adrenalin 2%+1:200000 in 20ml					

67.	Lidocaine HCl 2% injection					
68.	Methyldopa 250mg tablet					
69.	Metoclopramide 5mg/ml injection					
70.	Metoclopramide 10mg tablet					
71.	Metoclopramide 2mg/ml drop					
72.	Neostigmine 2.5mg/ml injection					
73.	Nifedipine 20mg tablet					
74.	Omeprazole 20mg capsule					
75.	Oral Rehydration Salt Powder,each sachet for 1lit					
76.	Oxygen(white Collard Cylinder)					
77.	Pancuronium 2mg/ml injection					
78.	Paracetamol 120mg/5ml syrup					
79.	Paracetamol 500mg tablet					
80.	Paracetamol 125mg suppository					
81.	Penicillin G Benzathine 2.4 MIU injection					
82.	Penicillin G Benzathine 1.2MIU injection					
83.	Penicillin G sodium, Crystalline 1MIU injection					
84.	Pethidine HCl 50mg/ml injection					
85.	Phenytoin 100mg tablet					
86.	Phenytoin 50 mg tablet					
87.	Phenobarbitone 100mg tablet					
88.	Phenobarbitone 30mg tablet					
89.	Phenobarbitone 15mg tablet					
90.	Promethazine HCl 25 mg tablet					
91.	Propranolol 40mg tablet					
92.	Ranitidine 150mg tablet					
93.	Salbutamol 0.1mg/dose inhalation					
94.	Salbutamol 2mg/5ml syrup					
95.	Salbutamol 2m,g tablet					
96.	Thiopental 0.5gm injection					
97.	Tramadol 50mg/ml injection					
98.	Tramadol 50mg capsule					
99.	Vecuronium 10mg injection					
100.	Erythromycin 250mg tablet					
101.	Erythromycin 125mg/5ml suspension					
102.	Gentamycin 80mg/2ml					
103.	Ciprofloxacin 500mg tablet					
104.	Norfloxacin 400mg tablet					
105.	Doxycycline 100mg capsule					

106.	Chloramphenicol 1gm injection					
107.	Metronidazole 250mg capsule					
108.	Metronidazole 125mg oral suspension					
109.	Metronidazole 5mg/ml iv infusion					
110.	Sulphamethoxazole + Trimethoprim 400mg + 80mg tablet					
111.	Sulphamethoxazole + Trimethoprim 800mg + 160mg tablet					
112.	Sulphamethoxazole + Trimethoprim 240mg suspension					
113.	Griseofulvin 125mg tablet					
114.	Fluconazole 200mg capsule					
115.	Ketoconazole 20gm cream					
116.	Ketoconazole shampoo					
117.	Clotrimazole vaginal tablet					
118.	Miconazole 1% oral gel					
119.	Clotrimazole 2% cream					
120.	Tinidazole 500mg tablet					
121.	Albendazole 200mg tablet					
122.	Albendazole 200mg/5ml suspension					
123.	Mebendazole 100mg tablet					
124.	Mebendazole 100mg/5ml suspension					
125.	Dexamethasone 4mg/ml injection					
126.	Prednisolone 5mg tablet					
127.	Hydrocortisone 100mg injection					
128.	Glibeclamide 5mg tablet					
129.	Insulin(HPB) 100IU solution					
130.	Insulin 100IU zinc suspension					
131.	Metformin 500mg tablet					
132.	Folic acid 5mg tablet					
133.	Iron gluconate 300mg tablet					
134.	Iron + Folic acid 150mg + 0.5mg tablet					
135.	DNS iv infusion					
136.	D/W%5 iv infusion					
137.	N/S iv infusion					
138.	R/L iv infusion					
139.	40% GLUCOSE iv infusion					
140.	Chloramphenicol 1% eye drop solution					
141.	Gentamycin 0.1% eye/ear drop					
142.	Tetracycline 1% ointment					
143.	Hydrocortisone 1% ointment/cream					

144.	Ciprofloxacillin 1% eye/ear drop					
145.	Dexamethasone 0.25% eye drop					
146.	Tetracycline 3% skin ointment					
147.	Hydrogen peroxide 3% solution					
148.	Risperidone 1mg tablet					
149.	Fluoxetine 25mg capsule					
150.	Dexamethasone cream 0.25% cream					