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Tracer drugs stock out in Durame hospital SNNPR Ethiopia

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Operational Definition

Drug and Therapeutics Committee (DTC): The committee that evaluates the clinical use of drugs, develops policies for managing drug use and administration, and manages the formulary system

Ethiopian Hospital Reform Implementation Guidelines (EHRIG): Is the handbook contains a common set of guidelines to help hospital managers and health providers in steering the consistent implementation of these reformed processes in hospitals throughout the country. These EHRIG focus on selected management functions, including hospital governance, service quality, patient flow, medical records, pharmacy and laboratory services, infection prevention, nursing care human resources, facility and equipment management, finance management, as well as monitoring and reporting.

Standard Treatment Guidelines: A systematically developed collection of statements designed to assist practitioner and patient in making decisions about appropriate health care for specific clinical circumstances.

Stock-outs: When a pharmacy (in a medical store or health facility) temporarily has no medicine on the shelf, it is known as a "stock-out". It may affect one medicine or many medicines, or in the worst case, all medicines.

Tracer drugs: Tracer drugs should always be available at the hospital. If there is any stock out of tracer drugs, the hospital should take action to identify and address the cause. The availability of hospital specific essential (tracer) drugs is a measure of service availability.

Abbreviations

AAU AddisAbabaUniversity
ADR Adverse Drug Reactions
AIDS Acquired Immunodeficiency Syndrome
DACA Drug Administration and Control Authority
DOTS Directly Observed Treatment, short-course
DTC Drug and therapeutic Committee
EHRIG Ethiopian Hospital Reform Implementation Guidelines
FMOH Federal Ministry of Health
KPI Key Performance Indicator
PFSA Pharmacy Fund Supplier Agency
PICT Provider Initiaed HIV Counseling and Testing
WHO World Health Organization

Abstract

Introduction: Although availability of tracer drugs was the most important objectives of national drug policy, the unavailability of tracer drugs remains to be a major problem for poor countries.

Objective: Toimproved tracer drugs availability in the Durame hospital drug stores

Design: Pre–post intervention study during August 2011 to March 2012, using tracer drug stock out registration form and physician inventory.

Setting: Durame Primary hospital in Ethiopia.

Participants: Pharmacist and pharmacy technicians, hospital administrator (CEO), clinical staff and DTC members.

Implementation: The intervention included the following components:(1) Developing tracer drug monitoring form (2) enhanced DTC training on drug management, (3) Improving drug procurement, and (4) Improving communication between Pharmacy staff and Physicians. Communication is the most important to provide quality of health care for the client. The work plan progresses of implementation were monitored by check list.

Main Outcome Measure: We measured tracer drugs stock out and availability. The tracer drugs stock out rate reduced significantly from 167 stock out days (34%) to 31 (6%) (P, <0.02) based on pre- and post-intervention comparisons.

Lessons Learned: Our findings indicate that a well-organized tracer drugs monitoring management system should be effective in improving patient outcome in hospitals in low-income countries despite the lack of resources.Longer follow-up is required to assess the sustainability of the hospital improvements accomplished.

Key words: tracer drugs, Stock-out, Availability, Durame hospital, Ethiopia.

1. Introduction

1.1 The Health Facility

Durame district hospital is the only hospital found in the KembataTambaro Zone capital, Durame, which is one of major towns in the Southern Nation Nationalities and Regional. The hospital has 70 inpatient beds capacity. There are 133 employees among whom 70 are health professionals and 63 administrative staffs. Among the 70 health professionals, there are 6 Physicians (one gynecologist, one internist and four general practitioners) and 35 Nurses (6 Midwifery and the rest are clinical and ophthalmic nurses). The hospital management, Pharmacy Fund Supplier Agency (PFSA) and zonal health department are responsible bodes to avail all tracer drugs.

Mission: To reduce morbidity, mortality and disability and improve the health status of the KembataTembaro Zone people through preventive, promote, and providing basic curative and rehabilitative health services.

1.2 Problem and Objectives

1.2.1 Problem statement

Pharmaceutical services are essential components of health care delivery in Ethiopia. Good pharmaceutical services promote safe, therapeutically effective, rational and cost-effective use of drugs, thus, maximizing health gain and minimizing risk to patients. A well-organized pharmaceutical service ensures the continuous availability of all drugs that are required for patient care. At the same time, an effective pharmaceutical service should be able to respond to sudden increase in drug demand, ensuring that adequate supplies are available to deal with any emergency that arise.

The availability of hospital specific tracer drugs was a measure of service availability. Tracer drugs should always be available at the hospital. If there is any stock out of tracer drugs, the hospital should

take action to identify and address the cause. For the hospital, knowledge of the stock out of specific tracer drugs in its dispensary helps to assess the capability of the inventory control process. However, no records are available about the inventory control process at the dispensary level.

The baseline study found high stock out rate of tracer drugs. As stated earlier, about 60% of the annual hospital budget was spent on buying materials and supplies, including tracer drugs. The hospital pharmacy is one of the major section on which a large amount of money is spent on it periodically. This emphasizes the need for planning, designing and organizing the pharmacy in a manner that results in efficient clinical and administrative services. Generally, the goal of the hospital supply system is to ensure that there is adequate stock of the required items so that an uninterrupted supply of all essential items is maintained. The baseline study also revealed that not only the quantity of medicines received from Pharmacy Fund Supplier Agency (PFSA) and zonal health department fall short of the required amount but also inconsistent with the demand of the beneficiaries. Even some of the tracer drugs repeatedly get out of stock for a long period of time.

For the hospital, knowledge of the stock out of specific tracer drugs in the dispensary helps to assess the adequacy of the inventory control process. Yet, the baseline assessment indicated that as there was shortage of tracer drugs. The duration of stock out tracer drugs at the hospital's drug store was also 167 days (34%). In addition to this, there was no record available regarding the inventory control process at the dispensary level.

1.2.2 Objective

General objective

To seeimproved tracer drug availability in the hospital medicine stores/dispensary.

Specific objective

To reduce the duration of stock out of tracer drug from 34% (167days) to 6%(31days) in Durame hospital by the end of March 2012.

*1.3 **Root Couse***

We worked in a collaborative team of eleven Drug and therapeutic committee (DTC) committee and senior management members to apply problem solving and quality improvement techniques. They held discussion in August 2011and reached at the root causes that contribute to the fish-bone analyses tools, to define the problem, understand its root cases, set objectives, consider alternative strategies to address the problem and fulfill the objective, select a strategy, implement a set of planned tasks and evaluate the impact of the intervention. We defined the problem as high stock out of tracer drugs. The pre-intervention assessment revealed that the hospital had no tracer drug controlling and reporting system, Poor communication between pharmacy department and physicians and Luck of essential drug list in the hospital.

Table 1: Identified problem, root causes and selected strategies according to evaluation criteria

Problems	root causes	Selected strategies
High stock out rate of tracer drugs	Absence of tracer drugs monitoring system	Developing tracer drugs monitoring format.
	Poor communication	Enhancing communication between clinicians and pharmacy department
	Poor warehouse inventory system	Introducing computerized inventory management system
	Training	Arranging on job training on tracer drugs and introducing hospital drug formulary.
	Shortage of budget	NOT selected
	Inadequate supply of PFSA	NOT selected
	Drug procurement system is not transparent	NOT selected
	Shortage of pharmacy staff	NOT selected

Rationale of the project

This capstone project indicated that the tracer medicines are those that satisfy the priority health care needs of the population. They are selected with due regard to disease prevalence, evidence

of efficacy, safety and comparative cost-effectiveness. Basically, such medicines are intended to be available within the context of functioning health systems at all times in adequate amounts. When there is good stock management systems in place, the stock-out duration will be minimal or, ideally, never. As a result, the patient satisfaction is expected to increase. However, there is no study conducted on improving tracer drugs availability, it is important as it would provide information that may help to patient outcome in prevention and intervention programmers.

1.4 Literature Review

Pharmaceutical services are an essential component of hospital care. Essential medicines are those that satisfy the priority health care needs of the population. They are selected with due regard to disease prevalence, evidence of efficacy, safety and comparative cost-effectiveness. Essential medicines are intended to be available within the context of functioning health systems at all times and in adequate amount, in the appropriate dosage forms, with assured quality and adequate information, and at a price the community can afford. Formularies or essential medicines and formulary systems are the backbone of the Drug and Therapeutics Committee. The formulary provides many benefits in providing improved patient care at decreased cost through improved selection and rational drug use. The formulary system also improves efficiency within the procurement and inventory management programs.One-third of the global population does not have regular access to essential medicines and in some of the lowest-income countries in Africa and Asia, more than half of the population has no regular access to essential medicines (1).

The quality of a public health care system is evaluated by the patients, primarily on the basis of the presence of appropriate medical staff members and availability of needed quality

medicines.[1]Essential medicines should be selected in accordance to the public health care needs, which must be associated with appropriate efficacy and safety, and comparative cost effectiveness (2)

On the average, availability of selected essential medicines at the public pharmacy, medicine stores and the private pharmacies was found to be 80.6%, 90.0% and 93.0%, respectively. The survey found the mean duration of stock out at medicines store was 26.5 days and no records available about inventory control at the pharmacy level. Among the states, the study found low availability of medicines at NorthKordufan public pharmacies. The study found no statistical significant difference as far as a Developing country concerning availability of medicines at rural or urban areas ($p > 0.05$) (3).

There is no denying that stocking hospital pharmaceuticals and supplies can be expensive and tie up a lot of capital, and bringing efficiencies to such important cost drivers - often 50-70% of a hospital's budget - can present meaningful savings. Thus, a hospital materials manager must establish efficient inventory system policies for normal operating conditions that also ensure the hospital's ability to meet emergency demand conditions (4).

WHO conducts surveys of countries' pharmaceutical sectors to measure various aspects of the sector's functioning, including the stock-out duration of medicines? This is done through retrospective analyses of stock-cards from the pharmacy records. The survey shows the number of days a list of key essential medicines were out-of-stock in middle-level public health facilities in a year. The stock-out duration ranges from 25 to 89 days (5).

2. Methodology

2.1 Project setting:

The project was conducted in Durame hospital, Pharmacy department main drug store and drug dispensary.

2.2 Project design:

The project wascarried out by using the Ethiopian Hospital Reform Implementation Guideline for Assessing and Monitoring Pharmaceutical and developing tracer drugs attendance format for data collectionbefore and after implementation**.** Institution based, before and after project design was conducted to improve the availability of essential tracer drugs in the hospital or to reduce the stock out rate of tracer drugs.

2.3 Sampling procedure:

The sixteen tracer drugs were identified by their physical availability and duration of stock-out. The availability percentage was measured by counting the number of medicines available out of the total sampled on the list at the hospital (in drug store and dispensary pharmacies) divided by the number of medicines in the list and then multiplied by 100 to find the percentage of availability at the hospital.

2.4 Data collection:

The baseline data was collected in August 2011; the post intervention data was collected in March 2012. The hospital pharmacies and medicine stores were monitored on daily basis by using tracer drugs checklistform Annex 3. These tracer drugs were expected to be available at the hospital in any day of the week. If there is any stock out of tracer drugs the hospital should take action to identify and address the issue of this project.

2.5 Data management:

Microsoft Excel (2007) was used to enter and calculate the average percentage of pre and post entry data of the tracer drugs. Consistency and completeness of data was done before analysis.

2.6 Data analysis:

The data analysis by comprehensive overview of the results for all 16 tracer drugs that takes into account the relative difference between baseline and end line values.Descriptive statistics including mean, standard deviation and Paired t- test were used. Statistical significance level used was 0.05 with a confidence interval of 95%.

Calculation $SD = \sqrt{\sum \frac{(di-do)2}{n-1}}$

$$=\sqrt{(24-8.5)^2 + (0-8.5)^2 +(0-8.5)^2 +(0-8.5)^2 +(0-8.5)^2 +(0-8.5)^2+(0-8.5)^2 + (31-8.5)^2+(0-8.5)^2+(24-8.5)^2+(0-8.5)^2+(0-8.5)^2+(0-8.5)^2+(21-8.5)^2+(24-8.5)^2+(12-8.5)^2}{n-1}$$

$$SD = \frac{\sqrt{720.75+722.5+506.25+156.25+12.25}}{16-1} = \frac{\sqrt{2118}}{15} = \sqrt{41.2} = \quad \textbf{SD= 11.88}$$

DF = n-1 =16-1 = **15,** **Paired t** = $\sqrt{\frac{d-\Delta}{sd/\sqrt{n}}} = \sqrt{\frac{8.5-0}{11.88/\sqrt{16}}} = \frac{8.5}{2.97} =$ **2.86**

Now that we have calculated the t statistic, look on the t table with α = 0.05 (2 tailed) and DF = 15, the 'critical value' is 2.1315. Thus, since our calculated t value exceeds the critical value, we would reject the null hypothesis and concluded that the mean difference is significantly different from zero. On the t table t table DF is 15, Paired t value 2.86 is between 2.602 and 2.9467 (which is between t.99 and t.995). The P value is between 0.01 and 0.02.

95% CI = □d ± t (n-1), $1-\frac{\sigma}{z} \times \frac{sd}{\sqrt{n}}$95% CI = 8.5 ± 2.1315x11.88/√16= 8.5 ± 2.1315x 11.88/4

=8.5 ± 2.1315x 2.97 = 8.5 ± 6.32=**14.82 and 2.18**

Our mean different is 8.5, which is in between 14.82 and 2.18. We are 95% sure that the true different in mean stock out is between lower 2.18 and higher 14.82

2.7 Data quality assurance:

Discussion with data collectors and senior management team was held accordingly based on the results of pre and post data collection periods. Three days training was given to the DTC Committee and one day orientation for data collector. The data was checked for completeness, accuracy, clarity, and consistency by the pharmacy head on daily basis. Any error, ambiguity or incompleteness was checked accordingly and on timely basis.

2.8 Ethical consideration:

Ethical clearance and approval was obtained from the Ethical Committee of the School of Public Health at Addis-Ababa University and SNNPR Health Bureau. Official letter was written to the respective hospital and permission was secured at KembataTembaro zone health department. Confidentiality of the collected data was maintained throughout the project period and consent for the data collection was obtained from the hospital administrator

2.9 Dissemination of results:

The findings of this project will be communicated to different stakeholders like Addis Ababa University, Yale University USA, Ethiopian Public Health Association, Ministry of Health, SNNPR Health Bureau and others.

3. Intervention

We worked in a collaborative team of seven senior management members, six physicians and six nurses who are represents deferent case team to apply problem solving and quality improvement techniques to define the problem, understand its root cases, set objectives, consider alternative strategies to address the problem and fulfill the objective, select a strategy, implement a set of planned tasks and evaluate the impact of the intervention.

3.1 Intervention Chosen

We identify root causes and scope of the problem; we conducted a pre-implementation August 2011. Furthermore, if a returning tracer drug monitoring system could not be found, the patient was dissatisfied. In addition, there was no standardized format or daily monitoring processes. The tracer drugs list was written on agreed format. Pharmacists who work in drag store and dispensary room provider's tracer drugs records were kept in the drag store every day. Strategies that combine strengthening of existing systems and the introducing monitoring format to address the identified problem those are amenable to change. By using a simple and inexpensive approach to work both with clinical and pharmacy staff, the strategy package has the potential to significantly address this problem.

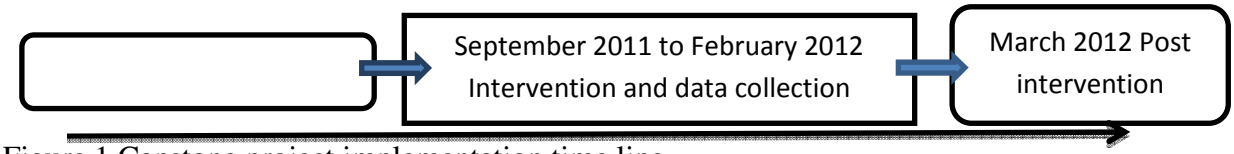


Figure 1 Capstone project implementation time line

3.2 Implementations Accomplishment

The intervention included the following components: (1) Developing tracer drag monitoring form (2) enhanced DTC Training on drug management, (3) Improving drug procurement, (4) Improving communication between Pharmacy staff and Physicians. Communication is the most important to provide quality of health care for the client. All activities were performed in coordination with the hospital senior management team and DTC committee.

1. **Developing tracer drugs stock out control format**

This implementation was performed at the end of July 2011with DTC committee and hospital senior management committee. The providers (drug store man, dispensary pharmacy technicians and clinical staff) gate information on which tracer drugs are, and which are not, on the shelves on the day of the implementation period. This gives useful information about the tracer drugs

stock out immediate situations, although it provides information about the duration which the tracer drug is off the shelves.

2. **Training on drug management system**

This implementation was performed from December 2011 to March 2012. For this a 3-days training workshop were given for front-line health workers (for six pharmacy technicians and DTC committees) on the Operational standards of pharmacy services. The training was conducted in the hospital. The teaching modalities included lectures and theoretical case scenarios based on the recommendations in the new guidelines (EHRIGL). The training included drug selection for the formulary, management of drug expenditures, and identifying/resolving drug use problems and given by two pharmacists and investigator. Participants received training on the application of the tracer drug monitoring instruments. The knowledge, attitude and skill of the participants were evaluated by information collected during the pre and post training sessions. A list of the tracer drugs is attached as Annex 2.

3. **Improving drug procurement**

The next implementation was on how to shorten the drug procurement length. This provided information on which medicines are/are not on the hospital dispensary shelves on the daily basis. This provided useful information about the availability of the tracer drugs in the hospital. These activities were performed in coordination with the hospital senior management team and DTC committee.

4. **Improving communication between Pharmacy staff and clinicians.**

Communication is the most important to provide quality of health care for the client. All health professionals' in the health facilities have to exchange information about available and stock out

drugs every day. Arranging regular DTC meeting on weekly bass; these activities were performed in coordination with the hospital senior management team and DTC committee. The work plan or progresses of implementation using a check list annexed.

Indicators

Process Indicator of the capstone project:

1. Availability of essential drugs list or formulary. There is one essential drugs list developed; i.e. this process indicator accomplished 100%.
2. Establishing monthly meeting between physicians and pharmacy staff. There was every month meeting minutes observed. This is 100% accomplishment.

Outcome Indicator:

1. Reduce duration of Stock-out days of tracer drugs. The tracer drugs reduced from 167 duration days (34%) to 31 days (6%).
2. Number of physical inventory performed/year. It was planned to perform two times per year, but we performed one time 50%.

Results

The data collection included all 16 tracer drags in the Durame hospital. The hospital gained support from different relevant stakeholders, including the PFSA and Zonal health department store; they are responsible to distribution this tracer drugs to the hospital.

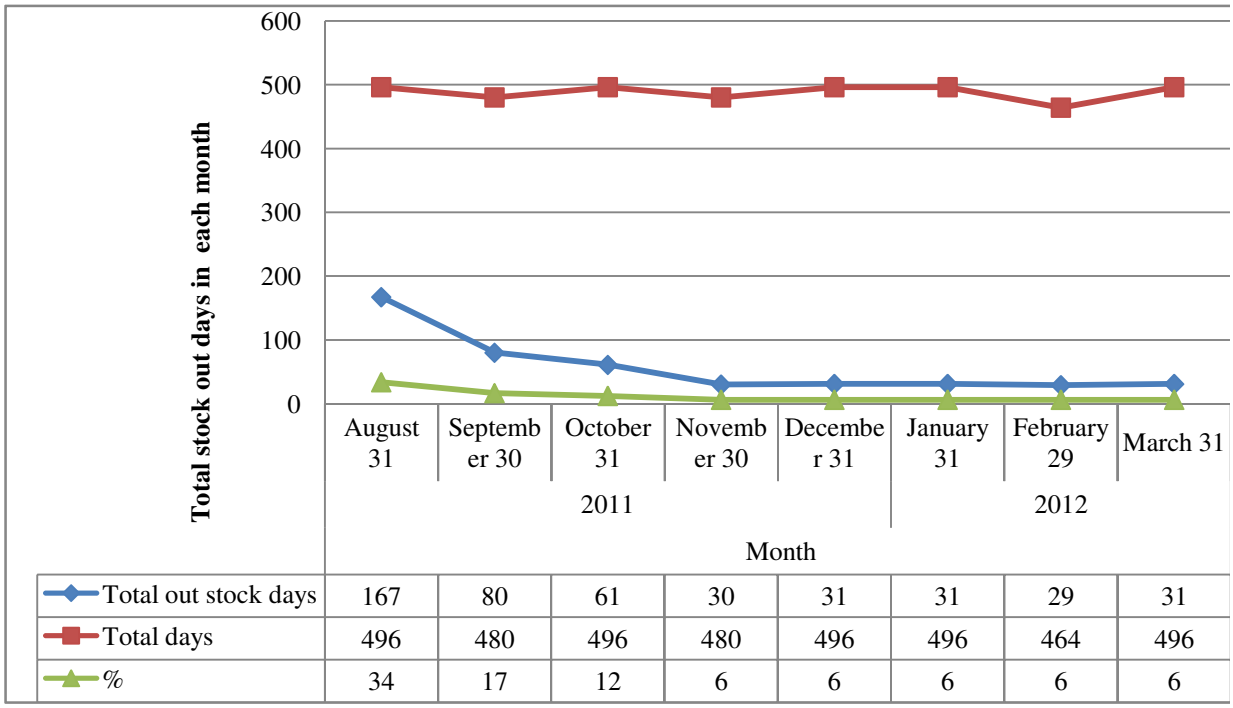
To implement the tracer drag availability, all staff members needed to be trained about important of tracer drugs. It enhances staff capacity to use the tracer drag availability form such as records, reports and using an inventory control system. 12 DTC members were trained.

Table 2: Number of Pre and Post implementation Stocked out days in Durame hospital March 2012.

S no	Tracer drugs	Pre total stock out days, 2011 August 31	Post total stock out days, 2012 March 31	Difference mean
1	Amoxicillin	24	0	24
2	Oral Rehydration Salts	0	0	0
3	Arthemisia/Lumphantrine	0	0	0
4	Mebendazole Tablets	0	0	0
5	Tetracycline Eye Ointment	0	0	0
6	Paracetamol	0	0	0
7	Rifampicin/Isoniazid/Pyrazinamide/Ethambutol	0	0	0
8	Medroxyprogesterone(depo) injection	31	0	31
9	Ergometrine Maleate Injection/Tablets	0	0	0
10	Ferrous Sulphate plus Folic Acid	24	0	24
11	Pentavalent DPT-Hep-Hib Vaccine	31	31	0
12	Hydrazine	0	0	0
13	Adrenaline	0	0	0
14	Ceftrazole	21	0	21
15	Quinine	24	0	24
16	Regular insulin	12	0	12
	Total stock days	167	31	136
	Total days	496	496	0
	%	0.34	0.06	0.27
	Mean of the difference			8.5
	SD	12.5	7.5	11.5
	Mean	10.4	1.9	8.5
	P Value			<0.02

To measure the stock out of the tracer drugs after implementation at the end of March, 2012, data were collected about inventory and stock out rates for 16 tracer drugs. Table 2shows the results for the stock out rates for malaria medicine Quinine was reduced from 24 stocks out days (77%) to 0 day (0% i.e. no stock out days); for antibiotics Ceftrazole medicine stock out days were reduced from 21days (67%) to 0day (0% i.e. no stock out days); Amoxicillin stock out days were reduced from 24days (77%) to 0days (0% i.e. no stock out days); the stock out rate for Diabetic Melts medication Regular insulin was reduced from 12 stock out

days (38%) to 0day (0% i.e. no stock out days); Ferrous Sulphate plus Folic Acid was reduced from 24 stock out days (77%) to 0day (0% i.e. no stock out days); the stock out rate for family planning medication Medroxyprogesterone(depo) injection was reduced from 31 days (100%) to 0days (0% i.e. no stock out days); but Pentavalent DPT-Hep-Hib Vaccine in stock out rate comparison where no changes; its stocked out an average of 31 days (100%). During implementation period various measures was taken to reduce the tracer drugs stock out rate; improving communication with suppliers (PFSA and Zonal health department) supply chain.



	August 31	Septemb er 30	October 31	Novemb er 30	Decembe r 31	January 31	February 29	March 31
Total out stock days	167	80	61	30	31	31	29	31
Total days	496	480	496	480	496	496	464	496
%	34	17	12	6	6	6	6	6

Figure 2. Eight months tracer drags stock out trends in Durame hospital, March 2012.

Figure 2: Show that most of the tracer drugs availability indicators have shown improvement trends; however one of the tracer drug still stock out throughout the month during implementation period.

Table 3: t-test paired two samples for means of the tracer drugs stock out pre versus post implementation.

	Pre	Post	t-test
Number of tracer drugs	16	16	
Mean	10.4	1.9	
Variance	155	56	
SD	12.5	7.5	
Degrees of freedom	15	15	
Critical t-value (two-tail, alpha = 0.05)			2.13
Calculated t-value			2.86
P-Value			<0.02

Table 3 summarized the results of the t –test analysis performed on the pre and post intervention data. The mean score for the 16 tracer drugs pre intervention results was10.4 with variance of 155. The mean score for the 16 tracer drugs post intervention results was 1.9 with variance of 56. The calculated t-value was 2.86, with a degree of freedom of 15. This evaluation suggested that as a result of the intervention, there was statisticallysignificant difference in tracer drugs stock out from pre and post intervention (i.e. the tracer drugs stock out rate reduced on the post intervention).

Discussion

The hospital DTC found that a simple set of interventions could be accomplished to significantly reduce the tracer drugs stock out rate in the hospital. This project produced results demonstrate that a continues monitoring of the tracer drugs intervention can improve management and system operations that can facilitate better patient out come in rural setting. The objective of this project is to improve the availability of tracer drugs at hospital by reducing stock out rate. The findings show the pre and post intervention tracer drug stock out rate was reduced from 34%, to 6%. The pre interventional data show hospital recording systems were not daily monitoring mechanism to update the data. The tracer drugs are not being used properly which makes it difficult to quantify and monitor drug utilization.

Decrease % facilities with a stock out rate from 35% to 0 %.(FMOH, Health Sector Development Program IV 2010/11 – 2014/15). The availability of hospital specific essential (tracer) drugs is a measure of service availability. Tracer drugs should always be available at the hospital. (EHRIG -Vol 1).These findings were consistent with the survey found the mean duration of stock out at medicines store was 26.5 days (p>0.05).(Availability of Essential Medicines in Sudan.2010, VOL5 NO.1).The survey found stock-out duration at the drug store was found to be 25 days which is consistent with findings of a neighboringin Kenya (WHO and HAI. 2003). The average stock-out duration of key medicines was 6.5 days Malaysia (Malaysia 2008,One-third ed).The project found stock-out duration at the drug store was found 31 days (6%) which is consistent with other findings.

Challenges, Limitations and Strengths

Challenges

- Time constraint which influenced both data collection and analysis.
- Limited access to internet

Limitations

- The tracer drug doesn'trepresent same group of drugs; for example, Anesthesia and ARV drugs.
- This study doesn't indicate the drugs stock label.

Strengths

- The full support from hospital leadership and staff was the key to success.
- Developing tracer drug monitoring tool.

Conclusion

A list of tracer drug monitoring tool is useful to quickly assess the status of tracer drugs. The tracer drug list should include drugs that are commonly used and cover a range of key therapeutic categories should be available at hospital. The *Ethiopia Hospital Reform Implementation Guideline (EHRIG)* contends only eleven tracer drug lists, which has no daily monitoring system. The list of tracer drugs included drugs used to treat the most common health problems based on treatment guidelines and estimated drug requirements to treat leading causes of morbidity in the country by level of health facility.

The project was conducted in a single rural hospital in Ethiopia; results may differ in other settings. Our findings indicate that applying problem solving and quality improvement techniques to improve the availability of tracer drugs system can be effective in improving patient out come in hospitals in low-income countries in the face of the lack of resources. The approach was simple and inexpensive, and the results indicate significant improvement in reducing the tracer drugs. The full support from hospital leadership and staff was the key to success. Longer follow-up would be required to assess the sustainability of the hospital improvements accomplished.The project found stock-out duration at the drug store was found 31 days (6%) which is consistent with findings of a neighboring African country Kenya, which was found 25 days (13).We learned several key lessons during the implementation process. The communication between the hospital staff (physicians, pharmacists and other staff) takes time to attain and is supreme to success. Our implementation required 8 months from August, 01, 2011 to March, 31, 2012; we take the month August, 2011 data as base line and the March/ 2012 month data as post. The findings of the project were interpreted in some of its limitations. First, the sample size was modest, which limits the statistical power to detect significant differences in the pre- and post-intervention data, particularly among the 16 tracer drugs measures.

Nevertheless, we did have adequate power to detect significant differences in the tracer drug stock out. Therefore, we believe that the sample sizes were appropriate for the purposes of the project. Second, we used the same observation methods in the pre and post-intervention periods; therefore, we do not think this potential bias substantially affected our conclusions.

Recommendations

The findings of this project suggest a number of implications for health professionals in the hospital. Based on the findings of the project the investigator recommends the following

- **Ministry of Health (MOH)**
  - MOH should develop a plan to choose appropriate methodologies for tracer drug monitoring which will be implemented at all hospital of the health care delivery system. The Ethiopia Hospital Reform Implementation Guideline (EHRIG) contends only eleven tracer drug lists, which has no daily monitoring system.
  - Pentavalent DPT-Hep-Hib Vaccine tracer drug was frequently stock out throughout implementation period; it may be due to high dropout rate; I recommend that this drug should be replaced by other drugs.
  - These groups of tracer drugs don't represent same groups of drugs; So, MOH have to include one of the ARV drug.

- **For Hospitals**
  - OtherHospitals should monitor the tracer drags of stock out rate of daily base by this developed format.

- Pharmacy staff and clinicians should improve their communication capacity to reduce stock-outs and for the better patient outcome.

➢ **For researchers**

- Further study needs to be conducted to evaluate the effectiveness of tracer drugs monitoring.

Appendices

Annex 1

Table 4: ***Implementation Checklist***

S. no	Activities	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 List is created and is shared with staff.		
4	Pharmacy services are integrated for the emergency & delivery, outpatient and inpatient services		
5	There are SOPs to that describes daily dispensaries		
6	A Drug Information service is available to provide drug information to staffs like new drugs available, drug choices and integrated morning education to patients.		
7	Procedures are established to receive, investigate adverse drug reactions.		
8	Procedures are established to monitor prescriptions and drug utilization		
9	There is a drug procurement policy.		
10	An inventory management system to manage drug supply and distribution is established.		
11	There is process to dispose of expired drugs.		
12	Adequate personnel to provide pharmacy services are in place.		
13	Facilities and equipment needed to provide pharmacy services are in place.		
14	SOPs for patient counselling are present		
15	Standard prescription is being used		
16	There is a mechanism to cross check and identify the prescriber and dispenser if there is a medication error		
17	There is a mechanism to know the number of patients served by a single dispenser		
18	There is a mechanism to know if patients are charged more or less than the actual price of the medication dispensed		
19	There are records that enables the pharmacy to be auditable		
20	There is a mechanism by which one can get the total prices of the medication dispensed in the last month		

Annex 2

Table 5: Work plan to reduce the duration of stock out of tracer drug in Durame hospital from of August 2011 to March 2012 Gantt chart.

S. No	Selected Strategies	Responsible Body/ Facilitator	Aug-September 2011	Oct – November 2011	Dece 2011-Janu 2012	February March 2012	April - May 2012
1	Organizing the committee and selecting members	SMT	X				
2	Set objectives and initiatives (job description)	SMT & DTC	X				
3	Orientation and identification of specific tracer drugs	CEO, MD	X	X			
4	Baseline Survey conduct	Pharmacy head and envestigetor	X	X			
5	Create job description for the committee	M. Director& Pharmacist	X	X			
6	Training Pharmacy services (Essential and tracer drugs, KPI)	TOT Trains			X	X	
7	Develop an efficient and cost-effective formulary system	DTC Committee		X	X	X	X
8	Enhancing communication between clinicians and pharmacy department	Pharmacy head and Medical director.		X	X	X	X
9	Ensure tracer drug availability	Pharmacy head		X	X	X	X
10	Data collected	Pharmacy head and data collectors		X	X	X	X

Appendix 3

Table 6. The availability of hospital specific essential (tracer) drugs monitoring checklist

The availability of hospital specific essential (tracer) drugs checklist (Format)

Durame Hospital Date from to

Name of Store man (Pharmacy tech/Pharmacist)

Use (0) if the drug is available and (1) if not available.

S.N	specific tracer drugs	Month -																													tock out days
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
1	Amoxicillin																																
2	Oral Rehydration Salts																																
3	Arthemisin/Lumphantrine																																
4	Mebendazole Tablets																																
5	Tetracycline Eye Ointment																																
6	Paracetamol																																
7	Refampicine/Isoniazid/Pyrazinamide/Ethambutol																																
8	Medroxyprogesterone(depo) injection																																
9	Ergometrine Maleate Injection/Tablets																																
10	Ferrous Sulphate plus Folic Acid																																
11	Pentavalent DPT-Hep-Hib Vaccine																																
12	Hydrazine																																
13	Adrenaline																																
14	Ceftrazole																																
15	Quinine																																
16	Regular insulin																																
	Total																																

Appendix 4

KPI 26: Average stock out duration of hospital specific tracer drugs

Why is this important?	The availability of hospital specific essential (tracer) drugs is a measure of service availability. Tracer drugs should ALWAYS be available at the hospital. If there is any stock out of tracer drugs the hospital should take action to identify and address the cause. For the RHB, knowledge of the stock out of hospital specific tracer drugs in hospitals helps to assess the adequacy of hospital inventory control processes and the Regional Pharmaceutical Supply Chain Management System.
Definition	The number of days in which a hospital specific tracer drug was not available averaged over all hospital specific tracer drugs. The hospital specific tracer drugs are as follows: • Amoxycillin • Oral Rehydration Salts • Arthemisin/Lumphantrine • Mebendazole Tablets • Tetracycline Eye Ointment • Paracetamol • Refampicine/Isoniazide/Pyrazinamide/Ethambutol • Medroxyprogesterone(depo) injection • Ergometrine Maleate Injection/Tablets • Ferrous Sulphate plus Folic Acid • Pentavalent DPT-Hep-Hib Vaccine • Plus an additional 5 drugs, whose availability is mandatory, to be selected by the hospital
Unit of measurement	Days
Numerator	∑Stock out days of hospital specific tracer drugs (Q40)
Denominator	Number of hospital specific tracer drugs (Q41)
Formula	∑Stock out days of hospital specific tracer drugs (Q40) ÷ Number of hospital specific tracer drugs (Q41)
Data sources	Pharmacy Bin Cards
Frequency of reporting	Monthly

KPI 26 Data Entry Form: Average stock out duration of hospital specific tracer drugs

Formula: ∑Stock out days of hospital specific tracer drugs (Q40) ÷ Number of hospital specific tracer drugs (Q41)

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DECLARATION

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

Name: EshetuAdinew

Signature: _____

Place: Addis Ababa

Date of submission _____

This thesis work has been submitted for examination with our approval as university advisors.

Advisor's name	**Signature**	**Date**
A. _____	_____	
B. _____	_____	