

# Maputo Provincial Hospital DTC training: Technical Report

April 2015



**USAID**  
FROM THE AMERICAN PEOPLE

**SLAPS**   
Systems for Improved Access  
to Pharmaceuticals and Services





# **Matola Provincial Hospital DTC Training: Technical Report**

Neusa Bay  
Lucilo Williams

April 2015



**USAID**  
FROM THE AMERICAN PEOPLE

**SIAPS** 

The SIAPS logo features the word "SIAPS" in a bold, green, sans-serif font. To the right of the text is a stylized blue graphic of a person with arms raised in a 'V' shape, suggesting movement or achievement.



This report is made possible by the generous support of the American people through the US Agency for International Development (USAID), under the terms of cooperative agreement number AID-OAA-A-11-00021. The contents are the responsibility of Management Sciences for Health and do not necessarily reflect the views of USAID or the United States Government.

## **About SIAPS**

The goal of the Systems for Improved Access to Pharmaceuticals and Services (SIAPS) Program is to ensure the availability of quality pharmaceutical products and effective pharmaceutical services to achieve desired health outcomes. Toward this end, the SIAPS result areas include improving governance, building capacity for pharmaceutical management and services, addressing information needed for decision-making in the pharmaceutical sector, strengthening financing strategies and mechanisms to improve access to medicines, and increasing quality pharmaceutical services.

## **Recommended Citation**

This report may be reproduced if credit is given to SIAPS. Please use the following citation.

N Bay, L Williams. 2015. *Matola Provincial Hospital DTC training: Technical Report*. Submitted to the US Agency for International Development by the Systems for Improved Access to Pharmaceuticals and Services (SIAPS) Program. Arlington, VA: Management Sciences for Health.

## **Key Words**

Drug and Therapeutics committee, essential medicines, rational medicine use, medicine use study, standard treatment guidelines, prescription analysis, aggregate medicine consumption study

Systems for Improved Access to Pharmaceuticals and Services  
Pharmaceutical and Health Technologies Group  
Management Sciences for Health  
4301 North Fairfax Drive, Suite 400  
Arlington, VA 22203 USA  
Telephone: 703.524.6575  
Fax: 703.524.7898  
E-mail: [siaps@msh.org](mailto:siaps@msh.org)  
Website: [www.siapsprogram.or](http://www.siapsprogram.or)

## CONTENTS

Contents .....	iii
Acronyms .....	iv
Introduction.....	1
Medicine Use Studies Training and Testing SOPS AT Matola Provincial Hospital DTC.....	4
Background and Objectives .....	4
Methodology .....	5
Medication Error Study.....	5
Study Design.....	5
Sampling Procedure .....	5
Research Instrument.....	5
Review Procedure .....	7
Results.....	8
Prescriptions Indicators Study .....	9
Study Design.....	9
Data source and sampling procedure .....	9
Data collection and analysis.....	9
Results.....	11
Aggregate Medicine Use Study .....	11
Study Design.....	12
Data Source and Sampling Procedure.....	12
Data Analysis .....	15
Limitations .....	15
Results.....	15
Annex A. Facilitators and participants in the DTC and medicine use studies SOP training .....	20
References.....	21

## ACRONYMS

DFH	Departamento de Farmacia Hospitalar (Hospital Pharmacy Department)
DNAM	Direcção Nacional de Assistência Médica (National Directorate of Medical Assistance)
DTC	Drug and Therapeutics Committee
EML	essential medicines list
FNM	Formulário Nacional de Medicamentos (National Medicines Formulary)
MISAU	Ministério da Saúde (Ministry of Health)
MUE	medicine use evaluation
NEML	National Essential Medicines List
OPD	outpatient department
SIAPS	Systems for Improved Access to Pharmaceuticals and Services [Program]
SOP	standard operating procedure
STG	standard treatment guidelines
TOR	terms of reference
WHO	World Health Organization

## INTRODUCTION

Inefficient and irrational use of medicines is a well-documented problem in both developed and developing countries and it leads to increases in costs and adverse clinical effects to patients. This inappropriate use of medicine could be reduced if various health care professionals involved in different aspects of drug use are involved in promoting good practices of drug management and use. An appropriate forum for developing and implementing drug policies is the Drug and Therapeutics Committee (DTC). DTC is also a forum for promoting more efficient and rational use of medicines (Green & Holloway, 2003).

In Mozambique, establishing hospital DTCs was officially requested by Ministério da Saúde (MISAU [Ministry of Health]) in the document Diploma 29/2013. The diploma states that all health facilities should have a DTC. It also guides the composition and functions of the DTCs. The Departamento de Farmacia Hospitalar (DFH, Department of Hospital Pharmacy) in the Direcção Nacional de Assistência Médica (DNAM, National Directorate of Medical Assistance) of MISAU also took the establishment of hospital DTCs as a priority intervention to improve the appropriate use of medicines at the hospital level. Consequently, 13 hospitals have established DTCs by August 2013.

The Systems for Improving Access to Pharmaceuticals and Services (SIAPS) Program Mozambique has been working with DFH and partners in the pharmaceutical sector and in priority health programs to assist pharmaceutical services in improving the availability of pharmaceutical products and appropriate use at the service delivery points with the aim of achieving desired health outcomes. SIAPS technically assists hospitals to create DTCs to improve medicine use, as well as the collection and analysis of medicine use information for decision-making as part of its support to its counterparts in the pharmaceutical sector.

In August 2013, SIAPS supported the DFH to conduct a two-day DTC orientation workshop. This orientation covered the DTC's main functions, roles, and responsibilities, as well as how to monitor and identify medicine use problems, and to implement interventions and strategies, including use of standard treatment guidelines (STGs) and essential medicine list, to improve medicine use. During the workshop, the participants presented the status of their hospital DTC, and reviewed Mozambique's current official DTC's terms of reference (TOR) and made recommendations for additions and modifications. In addition, with SIAPS technical guidance, the participants conducted a brief study on prescribing indicators in a clinic in Maputo. The study found that more than 60% of patient encounters received an antibiotic. This orientation was attended by 49 health professionals, including physicians, pharmacists, dentists, laboratory technicians, and hospital administrators from the 11 hospital DTCs, the Ministry of Health (MOH), and nongovernmental organizations that support clinical services and supply chain operation.

Prior to the orientation, DFH and SIAPS agreed to choose two hospitals<sup>1</sup> to pilot DTC activities. The objectives were to document lessons learned from the pilot and use them to improve the

---

<sup>1</sup> Hospital Geral Jose Macamo and Hospital Geral de Mavalane

quality of other DTCs. Following the DTC orientation, SIAPS met with DFH/DNAM and the two DTC pilot hospitals to discuss and identify medicine use problems and to plan interventions.

In the DTC orientation and pilot hospitals' meetings, major issues regarding DTC status and medicine use problems were identified as follows (Green, 2013):

#### DTC status

- DTCs are just beginning to set up activities of a functioning DTC. DTC members represented at the orientation have enthusiasm and motivation to implement a DTC, but they lack the necessary training and tools to do so at this early stage.
- Knowledge about the specific functions of a DTC is poor. An orientation provided information, but much more is needed to fully orient and train DTC members.
- A TOR for DTCs is currently available from MISAU. There are some contradictions in the TOR and important activities are missing. Participants of the orientation made suggestions for expanding and improving the TOR.
- Standards (STGs, protocols) are limited in Mozambique—this will hinder the DTCs to rationalize medicine use. Where standards exist, they may not actually have been distributed or used in the hospitals.
- Support from MISAU is provided for DTC implementation but does not provide sufficient material, financial, and technical assistance.

#### Medicine use problems

- There is a shortage of essential medicines including various antibiotics.
- Health professionals did not follow prescription regulations regarding codes, names, etc.
- Most of the medicines prescribed were antibiotics, non-steroidal analgesics and anti-inflammatories, and antimalarial medicines.
- Some STGs exist but not enough for the situation on the ground; there are many different providers at different levels from different countries so country standards are required for most diseases and medical conditions.
- Even though a national essential medicines list exists in Mozambique, it has never been disseminated. Hospital staff did not know that this document exists.
- There is insufficient staff to conduct medicine use studies and address medicine use problems.
- Tools are lacking to implement medicine use interventions (training, medicine use studies, STGs, essential medicines list).

Based on these findings, SIAPS worked with DFH to develop an action plan for strengthening DTCs, which included developing tools for medicine use studies and on-the-job training on implementing DTC activities. As a result, in July 2014 SIAPS and DFH agreed that SIAPS will provide technical assistance for reviewing or developing the Hospital Pharmacy Guidelines and SOPs to enhance the capacity in pharmaceutical management and services and include guidance in conducting medicine use studies at health facility level. Since then, SIAPS has been supporting DFH to draft SOPs and tools to measure or analyze the following medicine use issues:

- Medication errors (in-patients)
- Prescription problems (out-patients)
- Medicine use patterns (ABC/VEN analysis) at the health facility level

After the SOPs were developed, SIAPS also assisted DFH to test the standards at Maputo Provincial Hospital.

Figure 1 illustrates SIAPS's approach to build the capacity of DTCs in Mozambique.

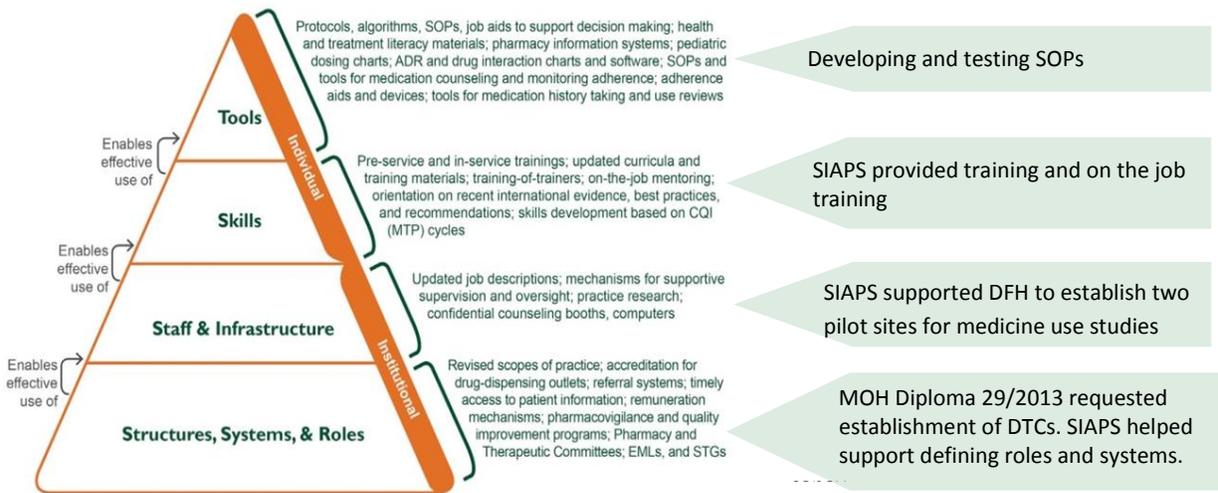


Figure 1. SIAPS's approach to build DTCs' capacity

## MEDICINE USE STUDIES TRAINING AND TESTING SOPS AT MATOLA PROVINCIAL HOSPITAL DTC

### Background and Objectives

Based on the findings from the meetings with DFH /DNAM and the DTC pilot hospitals, SIAPS Mozambique in collaboration with DFH prioritized three studies and started to draft the SOPs. After the first draft was finalized, SIAPS conducted a workshop in April 2015 to review the SOPs with DFH to ensure that the SOPs are in accordance with the existing approved guidelines and regulations. The two SIAPS staff and three HPD staff that participated in the workshop became the technical working group (TWG) responsible for testing the SOPs.

The TWG conducted a four-day DTC training between April 27 and 30, 2015 at the Matola Provincial Hospital. It was attended by nine of the hospital's DTC members, and one staff from the DFH (annex 1). The objectives of the training were:

- To support DFH to build capacity of Maputo Provincial Hospital DTC members on how to monitor and identify medicine use problems
- To have DTC pharmacists participate in testing the draft SOPs for the following three areas:
  - Medication errors
  - Prescription problems
  - Purchasing patterns (ABC/VEN analysis) at the health facility level

The object of having DTC pharmacists participate in the test was to train them on how to conduct the studies, and to collect their inputs to improve the SOPs. The SOP testing and capacity building approach is illustrated in figure 2.

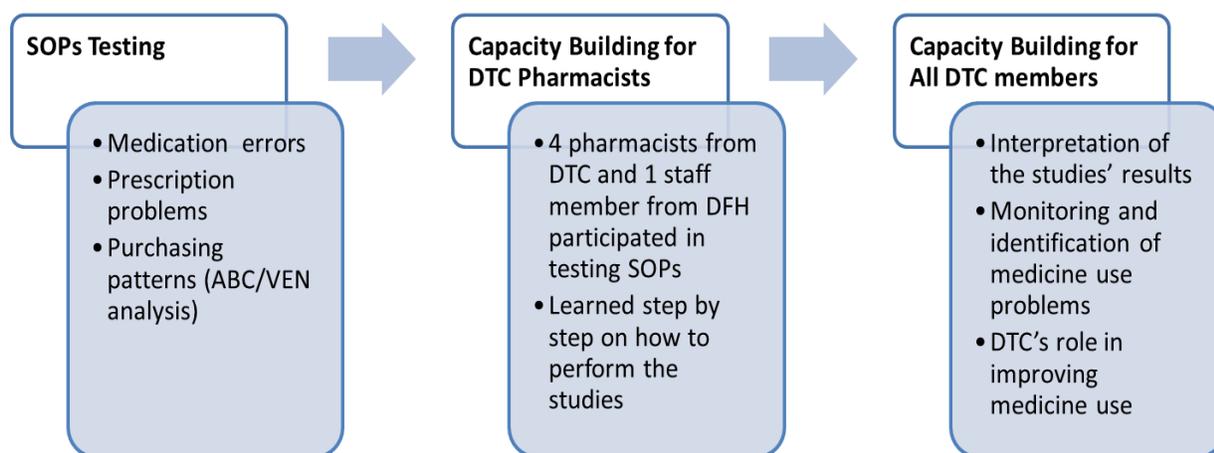


Figure 2. SOPs testing and capacity building for DTC members

## **Methodology**

Through mentoring by SIAPS and HPD staff, the DTC pharmacists were able to conduct the studies. The training started with an orientation on how to conduct each study, going through each SOP step by step. Then, five pharmacists (four from the hospital, one from the DFH) participated in the data collection. Each pharmacist was assigned a trainer from the TWG, and together they worked to review clinical charts and collect data according to the SOP. The trainers' role was to observe if the trainees were able to collect the data from the right source and classify and capture data in the data collection form correctly, and to provide advice whenever necessary. The trainers were also responsible for documenting all the gaps in the SOP or the study method.

## **Medication Error Study**

### ***Study Design***

This was a retrospective descriptive study aiming to learn the extent to which the medication errors occur.

The inpatients' clinical charts from the Maputo Provincial Hospital pediatric ward were the data source. Each patient has a set of four types of clinical charts: medical charts, treatment charts, nurse charts, and discharge records. The medical charts contain the patients' diagnosis and prescriptions; the prescriptions in the medical charts are rewritten in the treatment charts by the prescribers. The details of nursing care are documented in the nursing charts and, when patients are discharged, their prescribed take-home medicines are noted in the discharge records. The data was collected through clinical review.

### ***Sampling Procedure***

The inclusion criterion for this study was all admissions to the pediatric ward from July to August 2014. Five hundred sets of patient charts were available during this time period. Due to time constraint, 270 sets of patient charts were randomly selected by the trainees for review.

### ***Research Instrument***

The data collection and analysis tool was a predefined Microsoft Excel template with 15 criteria for searching and collecting medication errors in the clinical charts (figure 3). The national STGs and national medicines formulary were used for the justification of medication errors. Since the STGs only cover few prioritized health programs, other international treatment guidelines (Alldredge, 2013) were also used for the review of the clinical charts.

District	Number of Processes analyzed																	
US	270																	
# of prescribers	1																	
Date	# of Process	A- The medication prescribed not given to patient	B- Administration of medication that was not prescribed	C- Medication administered / delivered to the wrong patient	D- The wrong medication was administered/unnecessary	E- Wrong dosage, or quantity	F- Wrong pharmaceutical formulation	G- Wrong administration route	H- Wrong time or frequency	I- Incorrect time duration	J- Incorrect preparation	K- Incorrect administration technique	L- Medication given to patient with known allergy	M- Visual deterioration of the product (disconnect)	N- Absence of therapeutic effect	O- Adverse Drug Reaction		
	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	
	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

The marks under each criterion are: "1" stands for "presence of error"; and "0" stands for "no error was found"

**Figure 3. A predefined Excel template for data collection and analysis**

**Review Procedure**

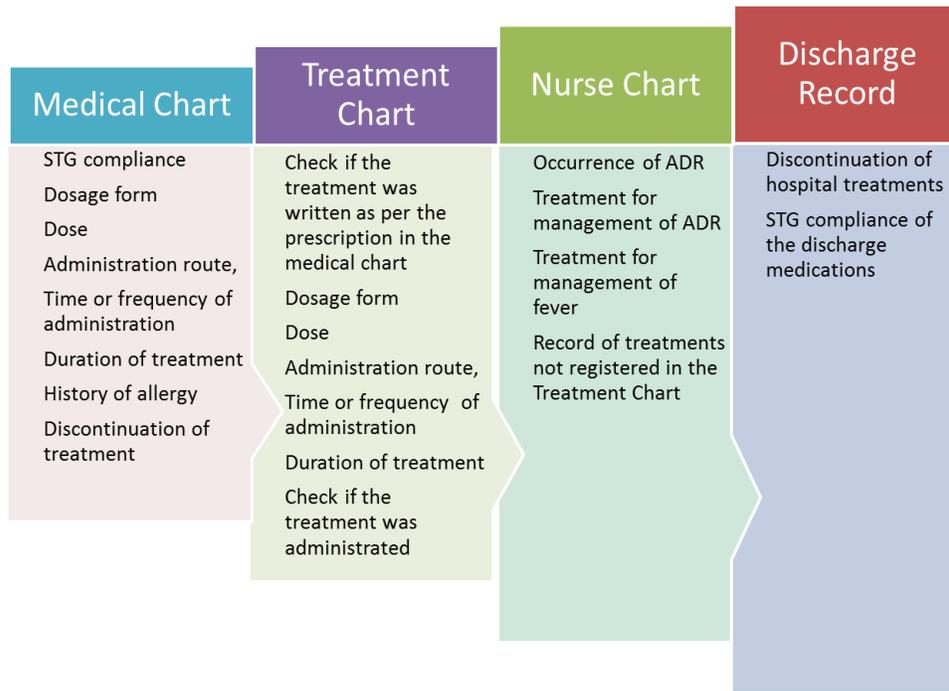
Based on the draft SOP, the trainees searched the clinical charts for the medication errors outlined in figure 5.

The process of identifying medication error starts with checking the medical chart to find out the diagnosis and the prescriptions for such diagnosis. The researchers also verified if the prescriptions were in line with the national standard treatment guidelines and National Medicines Formulary or international guidelines in terms of indication, dosage form, dose or quantity, administration route, time or frequency of administration, duration of treatment and history of allergy as well as discontinuation of the treatment.

The researchers then reviewed the treatment charts and verified if the medicine, dosage form, dose or quantity, administration route, time or frequency of administration, duration matches those prescribed in the medical chart, as well as if it was administered.

After the charts review, the researchers looked for additional information in the nursing diary, such as if an adverse drug reaction (ADR) occurred, if the patient received additional treatment not prescribed by doctor to manage the ADR or fever. The researchers also checked if treatment that was prescribed and not registered in the treatment chart was recorded in the nurse chart, and if there was any record regarding preparation of the medicines.

Finally, the researchers reviewed the discharge records to check if the hospital treatment was discontinued as well as to verify if there was any ambulatory treatment prescribed and if it was in line with the STGs. The above review stages are summarized in the Figure 4. As the charts were reviewed, identified problems were classified and registered in the Excel data sheet.

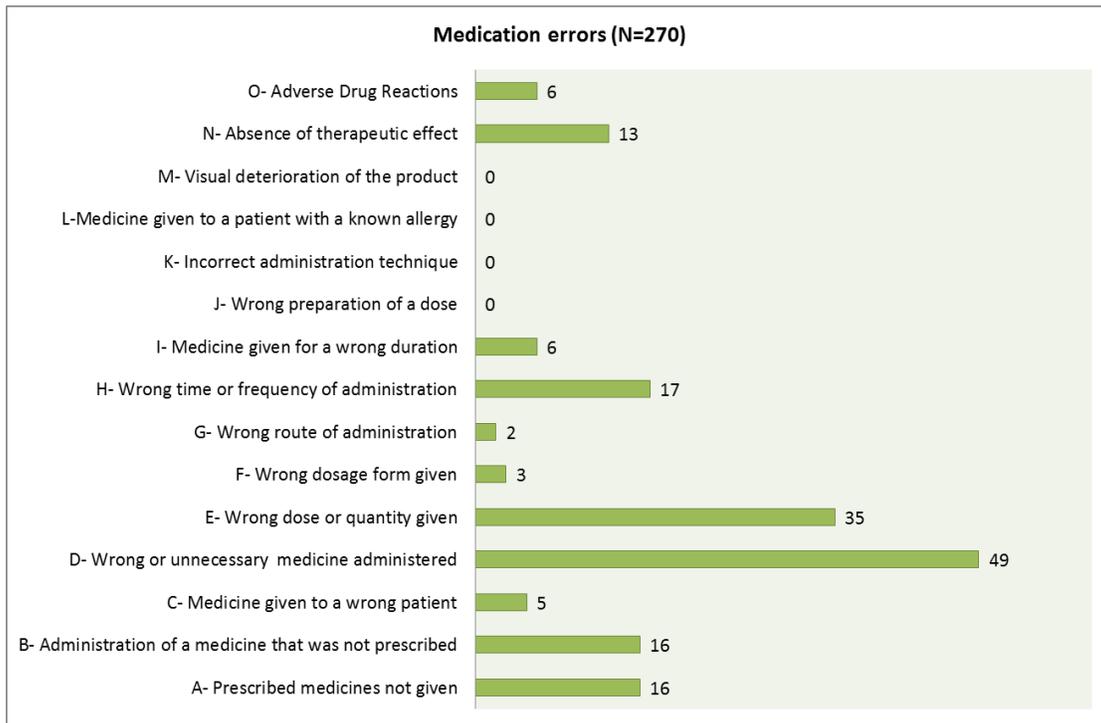


**Figure 4. Review of the clinical charts for medication error study**

The chart-review methodology was limited because it did not allow proper identification of the medication errors on criteria C, G, J, K, and M because they were originally defined for collecting the data through direct observation of the practice. However, criterion C could be detected if the incidents were reported and recorded in the nursing chart. Regarding criterion G, only the prescribed route of administration or if a wrong route of administration caused any adverse reactions were recorded could be identified.

## Results

The results of the study are presented in figure 5.



**Figure 5. Medication errors**

Regarding the medication errors, the major problem was the administration of wrong or unnecessary medicine to patients, where a total of 49 cases out of a total of 270 patients were identified. This error was caused by not complying with therapeutic guidelines and therefore needing to discontinue treatment, and no diagnosis to support the treatment, treatment was written in treatment sheet but not in the clinical charts, and medicines differed in nursing files and clinical charts.

Despite the fact that the samples were randomly selected, most of the problems identified involved the following diseases: malaria, bronchopneumonia, and acute intestinal infection.

## **Prescriptions Indicators Study**

### ***Study Design***

This was a retrospective descriptive study by reviewing prescriptions. The objectives are to describing drug utilization patterns and to identify problems deserving further studies at the health facilities.

### ***Data source and sampling procedure***

Data were collected from outpatients' prescriptions retained at the Matola Provincial Hospital Pharmacy. Prescriptions from all clinical departments were included. About 900 prescriptions issued in March 2015 (30 prescriptions per day for 30 days) were requested, of which 300 were randomly selected. Because of time constraints, only 265 prescriptions were analyzed.

### ***Data collection and analysis***

The tool used to collect data from the outpatients' prescriptions was a predefined Excel template (figure 6). It contains the variables and formulas necessary to calculate the 10 drug use indicators below that SIAPS and DFH agreed. The prescriptions were randomly selected.

The following drug use indicators were assessed:

1. Average number of medicines per encounter\*
2. % of prescriptions that have the required patient's information completed
3. % of prescriptions that have prescriber's/service's complete information
4. % of medicines prescribed by generic name\*
5. % of medicines prescribed that are in the National Medicines Formulary\*
6. % of encounters with any injection prescribed\*
7. % of prescriptions with any antibiotic prescribed\*
8. % of prescriptions that have both antibiotic and antimalarial medicines
9. % of prescribed medicines were dispensed
10. Average number of antibiotics prescribed per encounter

\*The indicators with a asterisk are adapted from World Health Organization. 1993. *How to Investigate Drug Use in Health Facilities: Selected Drug Use Indicators* - EDM Research Series No. 007. Geneva.

Date	Prescription #	contains patient's full information (1,0)	contains clinician's/ service's full information (1,0)	# of prescribed medicines	# of medicines by generic name	Contains antimalarial medicine (1,0)	# of antibiotics that are not antimalarial	Contains antibiotic and antimalarial (1,0)	Contains injectable (1,0)	# of medicines in the essential medicines list	# of medicines dispensed	Prescription for AMM (1.0)	Had National Formulary codes for the medicines
06/03/2015	1	0	0	3	3	0	0	0	0	0	1	0	0
	2	0	1	2	1	1	0	0	0	2	2	0	0

Figure 6. Pre-defined and formulated Excel template for data entry for the prescription study

## Results

The Excel workbook was formulated for automatically displaying one summary table and a bar chart for presenting the indicators as shown in (table 1).

**Table 1. Results for the prescription study**

1. Average number of medicines per medical encounter*	2.40
2. Average number of antibiotics prescribed per encounter	0.38
3. % of prescriptions that have clinician's/service complete information	49%
4. % of medicines prescribed by generic name*	89%
5. % of medicines prescribed that are in the National Medicines Formulary*	98%
6. % of medical encounters with any injection prescribed*	0%
7. % of medical encounters with any antibiotics prescribed*	38%
8. % of prescriptions that have both antibiotic and antimalarial medicines	2%
9. % of prescribed medicines dispensed	84%
10. % of prescriptions that have patients' complete information	28%

\*Adapted from World Health Organization. 1993. *How to Investigate Drug Use in Health Facilities: Selected Drug Use Indicators - EDM Research Series No. 007*. Geneva.

The prescription indicators study showed that the results related to medicine use (such as indicators 1, 4, 5, 6, 7, 8, and 9) were better than the identification of the prescriptions (indicators 2 and 3). The participants agreed that in most of the cases that the prescribed medicines were not dispensed, the cause was that the medicine was either prescribed with a brand name or was not part of National Medicines Formulary.

In addition to the numerical data, other observations were also recorded, such as:

- Prescriptions without patient contact or identification number
- Prescriptions without National Formulary code
- Prescriptions signed by one clinician and stamped by another
- Prescriptions with two signatures
- Azithromycin for 5 days plus amoxicillin and clavulanic acid both for 7 days in the same prescription
- Prescriptions with brand names such as Coartem<sup>®</sup> and Clavamox<sup>®</sup>
- Use of abbreviations such as CTZ = cotrimoxazol
- Prescription indicating one tablet only that was dispensed without other administration instructions.

## Aggregate Medicine Use Study

Unlike the medication error and prescription indicator studies which require individual patients' medicine use information, aggregate data are assembled information, and are often routinely available. They give an overview of medicine use for a defined time period for a health facility. Depending on the purposes (consumption, purchase, inventory, or distribution) of the study, the data can be obtained from many sources within the health care system, such as dispensing

records, procurement records, pharmacy stock, warehouse inventory records, or distribution records.

Due to time constraints in the training, this study was conducted by SIAPS and DFH in the week after the training. The results were discussed by the DFH and SIAPS to detect medicine use problems and propose further investigation for the Matola Province Hospital DTC. The report was prepared by the DFH and shared with the DTC members on May 18, 2015.

### ***Study Design***

This is a descriptive study which seeks to describe the consumption patterns of the medicines through the analysis by therapeutic categories and ABC/VEN analysis. However, instead of using monetary value, this study applied defined daily dose (DDD)<sup>2</sup> methodology for the analysis. This design was selected because in Mozambique, the public health facilities order medicines from the Central Medical Stores (CMS) without budget limits and do not pay CMS for the medicines received. In addition, only prices for 129 (82%) medicines were known. Therefore, the health facility DTCs' primary concern is the high volume of medicines used rather than costs or monetary values. Therefore, this study converted the supplied quantities to number of DDDs to replace the monetary value.

### ***Data Source and Sampling Procedure***

The medicines data used in this study were those supplied by the CMS to Matola Province Hospital for the period of April to June 2015. Because the medicine consumption data was difficult to obtain in the hospital because of a hardware deficit at the time of the study, the DFH technical group used an Excel copy of the medicines' issue order provided by the CMS. The issue order contained 157 medicines the hospital was expected to consume from April to June 2015.

### ***Data collection***

The tool for data collection and analysis was a predefined Excel template (Figure 8) which contains the variables below. The medicines with corresponding supplied quantities in the issue order were transferred to this template.

1. Description of medicine, including strength
2. Defined Daily Dose (DDD)
3. DDD Unit
4. Number of DDD units
5. Price (US dollars [USD])
6. Price unit
7. Therapeutic categories<sup>3</sup>

---

<sup>2</sup> The DDD is the assumed average maintenance dose per day for a drug used for its main indication in adults. It does not necessarily reflect the recommended or Prescribed Daily Dose. Drug consumption data presented in DDDs only give a rough estimate of consumption and not an exact picture of actual use. DDDs are not established for topical products, sera, vaccines, antineoplastic agents, allergen extracts, general and local anesthetics and contrast media. (WHO Guidelines for ATC classification and DDD assignment 2013)

<sup>3</sup> The Therapeutic categories are the classification of pharmaceuticals or medicines in various groups according to their pharmacological properties or therapeutic purposes.

8. VEN classification<sup>4</sup>
9. Supplied quantities
10. Cost
11. % of Consumption
12. Cumulative % of consumption
13. ABC<sup>5</sup> classification

The data of 1 to 10 were included in the master list of the template. Users were required to capture the medicines to be analyzed and their supplied quantities. The data of 11 to 13 were to be calculated by the defined formularies.

If a DDD was not available for a medicine, the prescribed daily dose (PDD) recommended by the National Medicines Formulary was used. The “therapeutic categories” for the medicines were based on the categories in the National Medicines Formulary.

Since Mozambique does not have Vital (V), Essential (E), N (Non-essential) classification system for essential medicines, all the reviewed medicines were categorized based on the VEN classifications in the National Essential Medicines Lists of Namibia, South Africa, Uganda, and Jamaica. The categorization was only for testing the SOPs for the medicines used in this test, it did not represent any official VEN categorization in Mozambique.

Medicine prices were determined based on MSH International Drug Price Indicator Guide (2014). For those medicines whose prices were not found in the Drug Price Indicator Guide, average national market prices were used. However, prices were obtained for only 82% of the medicines.

---

<sup>4</sup> Item classification based on the importance of the item or health impact of the item due to prevailing diseases. V=Vital, E = Essential, N = Nonessential (<http://scms.pfscm.org/scms/ecatalog/definitions>)

<sup>5</sup> ABC analysis: A method by which medicines are classified as Pareto category A, B, or C according to the monetary value of their usage (unit cost multiplied by consumption volume). The class A items typically account for a large proportion (such as 80%) of the overall value with a small percentage of number of items. In the business management, they are the priority items to be managed or controlled.

Medicamentos fornecidos ao Hospital Provincial de Maputo Provincia									
	FNM	Descrição	DDC	DDD U	Price USD	Priceunit	Terapeutic Group	VEN	Quantidade Fornecida
9	1 01A02	Digoxina;GotasOrais(2.5mg/50mL)	0.25	mg	0.1473		Cardiotónicos	E	200
10	2 01B01	Adenosina;Inj(6mg/2mL)	15	mg	1.4427		Antiarrítmicos	E	50
11	3 01B03	Amiodarona HCL;Inj(150mg/3mL)	0.2	g	0.6044	ml	Antiarrítmicos	E	250
12	4 01C01	Hidralazina;Inj(25mg/5mL)	0.1	g	n	n	Anti- Hipertensivos	V	200
13	5 01C02	Hidralazina;Comp(25mg)	0.1	g	0.05	tab	Anti- Hipertensivos	E	10,990
14	6 01E01Z	Atenolol;Comp(100mg)	75	mg	0.0228	tab	Antianginal medicines (12.2.) Antiarrhythmic medicines (12.3.) Antihypertensive medicines	N	500
15	7 01F01	Amlodipina;Comp(10mg)	5	mg	0.0821	tab	Bloqueadores dos Canais de Cálcio	E	9,900
16	8 01F02	Nifedipina accao prolongada;Comp(30mg)	30	mg	0.0264	tab	Bloqueadores dos Canais de Cálcio	E	14,000
17	9 01J02	Sinvastatina;Comp(20mg)	30	mg	0.0235	tab	Anti- Dislipidémicos	E	3,000
18	10 02A04	Omeprazol;Caps(20mg)	20	mg	0.0213	tab	Anti-Ácido e Outros Medicamentos Anti-Ulcerosos	E	30,000
19	11 02A05	Omeprazol;Inj(40mg/10mL)	40	mg	n	n	Anti-Ácido e Outros Medicamentos Anti-Ulcerosos	E	100
20	12 02A06	Ranitidina;Comp(150mg)	0.3	g	0.026	tab	Anti-Ácido e Outros Medicamentos Anti-Ulcerosos	E	30,000
21	13 02A07	Ranitidina;Inj(50mg/2mL)	n	n	n		Anti-Ácido e Outros Medicamentos Anti-Ulcerosos	E	400
22	14 02B01	Butilescopolamina;Comp(10mg)	60	mg	0.033	tab	Anti- Espasmódicos	E	15,000
23	15 02B02	Butilescopolamina;Inj(20mg/mL)	60	mg	0.1748	ml	Anti- Espasmódicos	E	5
24	16 02C01	Metoclopramida;Comp(10mg)	30	mg	0.0055	tab	Estimulantes da Motilidade Digestiva	E	40,000
25	17 02C02	Metoclopramida;Inj(10mg/2mL)	30	mg	0.0568	ml	Estimulantes da Motilidade Digestiva	E	50
26	18 03A03	HIDROCORTISONA;INJ(100MG/ML)	30	mg	0.5586	vial	Endocrinologia e Metabolismo (Corticosteróides)	V	550
27	19 03A04	Prednisolona;Comp(5mg)	10	mg	0.011	tab	Endocrinologia e Metabolismo (Corticosteróides)	V	20,000
28	20 03A05	Prednisolona;Comp(20mg)	10	mg	0.1678	tab	Endocrinologia e Metabolismo (Corticosteróides)	E	25,000

Figure 8. A partial image of the pre-defined Excel template for aggregate medicine consumption analysis

## **Data Analysis**

The ABC/VEN analysis was performed in the following steps:

1. Converted the dosage units to DDD units for each medicine
2. Calculated the number of DDD units by dividing the supplied quantities by DDD units for each medicine. (The number of DDD units was the data to be used for ABC/VEN analysis and therapeutic category analysis).
3. Sorted the number of DDD units in descending order.
4. Summed up the total number of DDD units
5. Calculated the percentage of DDD value of each medicine by dividing the number of DDD units by the total number of DDD units.
6. Calculated the cumulative percentage of the total DDD value for each medicine.
7. Identified cutoff points for class A, B, and C medicines.

The formula for performing ABC analysis was predefined in the Excel template, so steps 1 to 6 were performed automatically once data was transferred to the template. Once steps 1 to 7 were finished, the therapeutic category analysis was performed by sorting the data by therapeutic categories.

## **Limitations**

- Using the supply data was not able to represent the consumption pattern as what was planned.
- The DDD is the assumed average daily maintenance dose for the medication's main indication for adult. However, there were pediatric medicines in the medicine list. There may be bias in the results due to this factor.

## **Results**

The Excel template was formulated to present the results by automatically displaying a summary table and bar charts.

### *Therapeutic Category Analysis*

Data analysis verified that antibiotics were the most supplied group of medicines (43%), and amoxicillin 500 mg capsules represented 7.4% among all medicines supplied. It was followed by vitamins and minerals group (11%) where multivitamin syrup accounted for 6.9 % of overall medicine supplied. The cardiotonics and antidotes only accounted for less than 1%.

### *ABC Analysis*

Data demonstrates that, of 157 items, 24 (15%) items represented 81% (class A items) of the medicines supplied, 26 items (17%) represented 15% (class B items), and 107 (68%) items represented only 5% (class C items) of medicines supplied (figure 9).

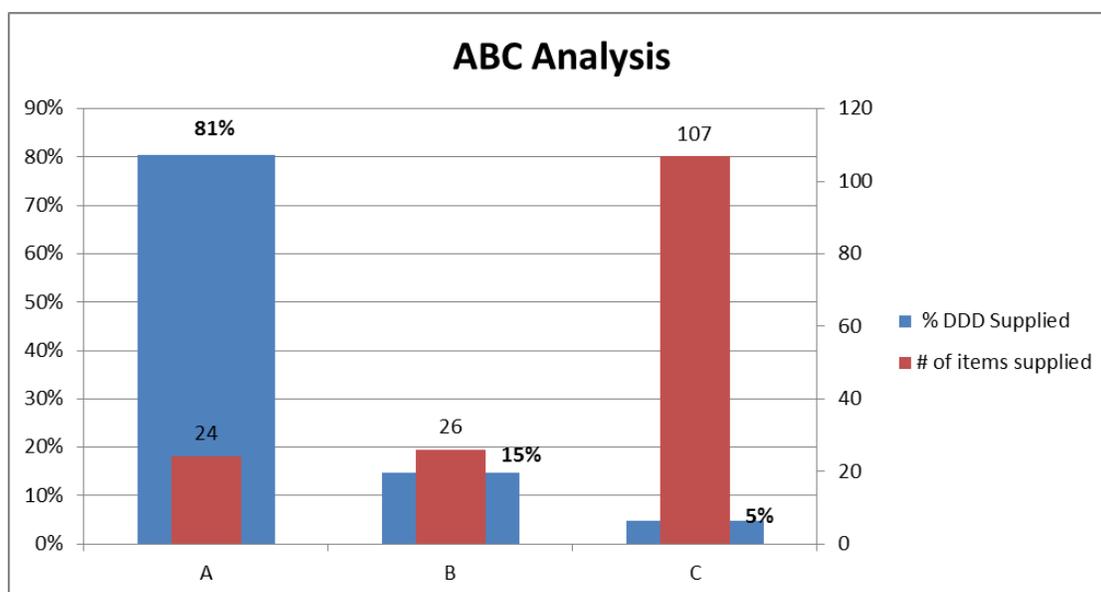


Figure 9. The result of ABC analysis

In the class A items, antibiotics, vitamins, and steroidal medicines were supplied most often (table 2).

Table 2. Therapeutic groups of medicines in class A items by ABC analysis

Categories	Supply, %
Antibiotics	35
Vitamins	10
Antianemics	6
Steroids	5
Diuretics	4
Antihypertensives	3
Analgesics	3
Antacids	3
Hydroelectric equilibrium	3
Antiasthmatics	3
NSAIDs	2
Medicines to treat glaucoma	2
Digestive motility stimulants	1
<b>Class A total</b>	<b>80</b>

### *ABC/VEN Analysis*

The VEN analysis showed that 13% of medicines supplied were the medicines classified as vital, 65% as essential, and 21% as non-essential. The ABC/VEN analysis revealed that, among class A items, 3 vital and 17 essential medicines accounted for 8% and 57% of the total DDD supplied, respectively. There were four nonessential medicines among class A, which accounted for 15% of total DDD supplied (table 3).

**Table 3. Results of ABC/VEN analysis**

	Class A		Class B		Class C		Total	
	N*	%**	N*	%**	N*	%**	N*	%**
<b>V</b>	3	8	6	4	31	1%	40	13%
<b>E</b>	17	57	13	5	60	3	90	65
<b>N</b>	4	15	7	5	16	1	27	21
<b>Total</b>	24	81	26	15	107	5	157	100

\*N: Number of items

\*\*%: Percentage of total DDD supplied

### *Training Results*

Using the ABC/VEN analysis, the trainees learned how to collect and analyze the data. At the end of the training, the trainees had group discussions with other DTC members on the results of the medication error and prescription indicator study, and how the study results should be used by the DTC to make evidence-based decision to improve medicines use. Following are the group’s recommendations to address medicine use issues.

- Identify the problems and recognize the need for action
- Investigate underlying causes and motivating factors
- Develop strategies or interventions for improvement
- Monitor the implementation of the interventions
- Evaluate the results

### *Lessons Learned and Suggestions*

- During the group several lessons learned and suggested that they be applied to the medication errors study.
  - The Excel data collection tools for medication error and prescription studies require setting data validation to avoid data capturing errors. Whenever possible, formulas should be added to allow calculation to reduce data discussion at the end of the training, attendees identified processing time.
  - The criteria “wrong preparation of a dose (J), incorrect administration technique (K), and visual deterioration of a product (M)” should be removed from data collection tool because they require direct observation of the practice—these steps could not be confirmed through clinical chart reviews. The criteria “medicine given to a wrong patient (C)” and wrong route of administration (G)” should be redefined to accommodate chart review, or to be removed.

- The following suggestions were made for the prescription indicators study:
  - The DTC members suggested two or more prescriptions with the same patient name, date, and same prescriber should be excluded from the review because they will not allow assuming that each prescription is a medical encounter. However, it would not be practical in the sample selection. For practical purpose, one prescription will still be considered as one encounter.
  - DFH decided to disaggregate the following indicators to identify specific issues:
    - Disaggregate “percentage of prescriptions in which patient’s information is complete” into two indicators:
      - Percentage of prescriptions with patient’s name
      - Percentage of prescriptions with patient’s identification number
    - Disaggregate “percentage of prescriptions in which prescriber’s information is complete” to two indicators below:
      - Percentage of prescriptions with clinical department’s stamp
      - Percentage of prescriptions with prescriber’s signature
  - Include service levels (number of patients) data and diagnosis on data collection tools would improve the depth of analysis.
  - The indicator of “number of prescriptions containing antibiotics that are not antimalarial” should be changed to “number of prescriptions with at least one antibiotic prescribed.”
  - The variable “number of antibiotics that are not antimalarial” seems to be misleading, and it was difficult to calculate “the number of prescriptions with an antibiotic,” so an additional column should be created, asking if contain antibiotic or not.
  - To minimize data entry workload, the following data should be generated automatically and be protected:
    - Contains antibiotics and antimalarials
    - Contains antibiotics (yes or no)
  - Prescription study results should be compared with reference values.
  - The indicator 10 “average number of antibiotics prescribed per encounter” should be removed because the indicator “percentage of medical encounters with any antibiotics prescribed” exists and provides clearer information.
  - The bar chart should only be used to present the indicators of “percentages” (indicators 2–9).
- The data used for aggregate analysis represent supplied medicines to the health facility, instead of the existing stock or consumption. Therefore, interpretation of the results should be based on the data source and purpose of the study.
- DDD analysis was not adjusted for pediatrics, therefore interpretation of the analysis results should be done with care.
- All LMIS prices should be obtained to do aggregate analysis based on monetary value.

Due to time constraints, further consultation and discussion would continue after the training.

### *Next Steps*

The pilot test results and the discussions with DTC during the training and further discussions and consultation with DFH and DTC provided feedback to improve the SOPs and way forward for implementation. The next steps are outlined below.

Step 1. Revise the SOP based on the lessons learned from the pilot test, accompanying discussions, and consultations; and implement it

- Discuss all SOP changes with DFH
- Revise the SOPs
- Have DFH approve the revised SOPs
- Use the revised SOPs to train DTCs
- Implement the medicine use studies in the trained hospitals: conduct the studies regularly (quarterly or monthly) according to the available resources

Step 2. The DFH will help hospital DTCs coordinate with the partner that provides technical support for pharmaceutical logistics management information, and with the CMS for obtaining consumption information and medicine prices for aggregate medicine consumption studies.

Step 3. DTC to apply study results to implement interventions to improve medicine use in the hospitals

- Investigate root causes of medicine use issues
- Prioritize issues and root causes to be addressed
- Develop strategies or interventions to address root causes based on available resources
- Monitor the implementation of the strategies or interventions
- Evaluate the results through continuous medicine use studies

## ANNEX A. FACILITATORS AND PARTICIPANTS IN THE DTC AND MEDICINE USE STUDIES SOP TRAINING

### List of Facilitators

Name	Organizations
Natacha Mbeve	Hospital Pharmacy Department
Hélio Gemo	Hospital Pharmacy Department
Aminoforo Langa	Hospital Pharmacy Department
Neusa Bay	SIAPS
Lucilo Williams	SIAPS

### List of Trainees

Names	Organizations	
Randes Natussa, Azarias Elvis Sage Rafael de Sousa Doria Cacilia dos Santos Ana Chilenge	Matola Provincial Hospital Matola Provincial Hospital Matola Provincial Hospital Hospital Pharmacy Department (DFH)	Participated in data collection, analysis, and discussion of results
Jose Sousa Margarida Chagunda Luciana Massinga Domingos Mapasse Carlos Salgado	Matola Provincial Hospital Matola Provincial Hospital Matola Provincial Hospital Matola Provincial Hospital Hospital	Participated in the discussion of results

## REFERENCES

Koda-Kimble MA editor. *Applied therapeutics : the clinical use of drugs*. 9th ed. Philadelphia: Wolters Kluwer Health, Lippincott Williams & Wilkins

Green T, Holloway K. *Drug and Therapeutics Committes, a Practical Guide*. 2003. Geneva: World Health Organization.

Green T, Qawwas R, Bay N, Mariano A. *SIAPS Trip report* . 2013. Maputo: Management Sciences for Health.

Management Sciences for Health. *International Drug Price Indicator Guide*, 2014 ed. 2015. Medford, MA.: MSH

WHO Collaborating Centre for Drug Statistics Methodology. *Guidelines for ATC classification and DDD assignment*. 2013. Oslo.

WHO. INRUD. *How to investigate drug use in health facilities: selected drug use*. 1993. Geneva: WHO.