NORTON UNIVERSITY
GRADUATE SCHOOL
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KINGDOM OF CAMBODIA
NATION RELIGION KING

EVALUATION OF THE LABORATORY SERVICES PROGRAM OF MOPOTSYO PATIENT INFORMATION CENTRE

A Research Report in Partial Fulfillment of
The Requirements for the Degree
Master in Development Management

KEM BORETH

February 2011

EVALUATION OF THE LABORATORY SERVICES PROGRAM OF MOPOTSYO PATIENT INFORMATION CENTRE

A Research Report

Presented to

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By

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APPROVAL SHEET

This Research Report entitled as an **Evaluation of the Laboratory Services Program of MoPoTsyo Patient Information Centre** was prepared and submitted by **Kem Boreth** in partial fulfillment of the requirements of the degree.

Master in Development Management

Approved by the Committee with a grade of **_____**

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ABSTRACT

This study attempted to evaluate the laboratory services program of MoPoTsyo Patient Information Centre particularly in Ang Roka Operational District, Takeo Province, Cambodia. Specifically, it sought to answer the following questions: (1) what are the factors that influence MoPoTsyo patients to submit themselves for blood testing; (2) how does Mopotsyo assess its current laboratory services program in terms of quality control, logistics, cost recovery, and sustainability; and (3) what does MoPoTsyo suggest to improve its current laboratory services?

In order to answer the above stated research questions, this study has made used of basically primary data and secondary data. ***The primary data,*** *the study was conducted by interviewing the key concerned personnel Mr. Maurits Van Pelt, Director of MoPoTsyo, Mr. Suy Vannak, Finance and Admin Manager, Mr. Mao Ngeav, Medical Service Access Manager, Mr. Pov Sothrearin, Peer Program Manager, and Mr. Thoung Sovanara, Urban Peer Program Manager as well as a diabetic of MoPoTsyo, and Mr. Bun Socheath, Peer Trainer and* ***the secondary data****, the study was conducted based on real expenditures and consumption data through the Test request-Payment Slip Form of MoPoTsyo, used the monthly reports of lab test results, stock request report and the annual report of Laboratory Services Program of MoPoTsyo for 2010. Moreover, this study has found that in the Ang Roka OD, there are 664 patients who came to do the blood tests with MoPoTsyo because the laboratory of MoPoTsyo is acceptable with the quality control of lab tests, the price of lab tests are very cheap_ seven tests the patients have to pay 1800 riel only, the fast lab test result, MoPoTsyo has its own doctor, MoPoTsyo has cooperated with the pharmacy to sell the drug in cheap price. Additionally, the laboratory has enrolled with the Bio-Rad Laboratories which located in* California, USA *for EQAS and using the HumaTrol N for controlling the quality of blood tests, the patients can access to the most affordable of the LSP and come to join with MoPoTsyo more and more every month and they can access to cost effective for their blood testing. However, the LSP of MoPoTsyo has not yet fulfilled its financially sustainable. Based on the research study during one year of 2010 of the LSP of MoPoTsyo in Ang Roka Operational District, the figure shows that the cost recovery from blood testing has only 14.38% which equals USD 160 to ensure the payment in this Operational District.*

These achievements could be successfully replicated in other Operational District in Cambodia with the similar contexts in Ang Roka Operational District in Takeo province.

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ACRONYMS & ABBREVIATIONS

AAT	Aspartate Aminotransferase
ALT	Alanine Transaminase
ALAT	Alanine Aminotransferase
AST	Aspartate Transaminase
ASAT	Aspartate Aminotransferase
AspAT	Aspartate Aminotransferase
BIP	Blood In Plasma
DM	Diabetes Mellitus
DPPM	District Peer Program Manager
EQAS	External Quality Assurance Services
EQC	External Quality Control
FBG	Fasting Blood Glucose
HBP	High Blood Pressure
HDL	High-density lipoprotein
HQ	Head-Quarter
IDF	International Diabetes Federation
IQC	Internal Quality Control
KHR	Khmer Riel
LSP	Laboratory Services Program
MSF	Cambodia Medicins Sans Frontieres
MDM	Master of Development Management
MD	Medical Doctor
MoH	Ministry of Health
MoPoTsyo	Patient Information Centre
MSH	Management Sciences for Health
NCD	Non-communicable Disease
NGO	Non-governmental Organization
OD	Operational District
PA	Provincial Administrator
PEN	Peer Educator Network

PPBG	Postprandial Blood Glucose
PPPM	Provincial Peer Program Manager
PWD	People with Diabetes
QAC	Quality Assurance Cycle
RDF	Revolving Drug Fund
SGPT	Serum Glutamic Pyruvic Transaminase
SGOT	Serum Glutamic Oxaloacetic Transaminase
UPPM	Urban Peer Program Manager
USD	United State of America Dollar
WHO	World Health Organization

CHAPTER I

INTRODUCTION

1.1. Background of the study:

International Diabetes Federation (2010) reported that around the world have shown that many people taking less exercise and eating less healthy types of food in larger quantities than they ever did before. That is why they confront with many diseases, especially chronic diseases such as diabetes or hyperglycaemia (high concentration of glucose in the blood), hypertension (high blood pressure), and dyslipidemia (abnormal amount of lipids in the blood) and it will be spiraling out of control.

World Health Organization (2005) reported that there were 1.1 million people died from diabetes. In 2010, there were more than 220 million people worldwide have diabetes, 80% of diabetes deaths occur in low and middle-income countries and almost half of diabetes deaths occur on people under the age of 70, and 55% of diabetes deaths were women. WHO has projected those diabetes deaths will be double between 2005 and 2030. Thus, people should practice like this healthy diet, regular physical activity, maintaining a normal body weight, and avoiding tobacco use, so it will be able to prevent or delay the onset of diabetes.

Cambodia Medicins Sans Frontieres (2002 to 2009) reported that in Cambodia, there was a diabetes prevalence of 11% in a semi-urban community and an unexpectedly high prevalence of 5% in a relatively poor, traditional, rural community and there are 255, 000 people living with diabetes in Cambodia. Moreover, **Maurits Van Pelt,** director of MoPoTsyo revealed in the article of Improving Access to Education and Care in Cambodia published in Diabetes Voice in 2009, 90% of diabetes-patients have not been taken professionals care, or some of them have been, but still not exist, and the fund to pay the services is not available in the society.

MoPoTsyo Patient Information Centre is a Cambodian-non-governmental organisation has been working closely with health authorities and focusing on improving access to reliable information for Cambodian diabetics, especially those who are poor people. MoPoTsyo wants to make living with diabetes and other chronic diseases more affordable and feasible for Cambodian in the poor communities. Nowadays, **2560** people with diabetes have registered with MoPoTsyo patient information centre. Each patient information centre is part of a local network supervised by the Diabetes Program Manager, who is also a diabetic. After registered with the patient information centre, diabetics living in the same community get to know each other easily because they meet each other during weekly sessions at the home of the peer educator or at the home of another diabetic. MoPoTsyo has set up a **Laboratory Services program (LSP)** to make reliable and useful information about chronic non-communicable disease accessible to all Cambodians who want to learn about their disease and drawing their blood to analyze at the laboratory of MoPoTsyo in Phnom Penh.

Most Cambodians who are diagnosed with diabetes do not have access to good information. Public service health staff is severely underpaid and they have no time to listen to the patient's questions and provide needed answers. Without patient involvement and understanding of the disease, treatment adherence is more likely to fail. In addition, many people cannot afford to pay for their testing at the hospitals or private clinics because the fee charge is very expensive as well as the laboratory services are not available. Therefore, MoPoTsyo has set up the Laboratory Services Program with the low cost and high quality of blood testing for its members, who registered with MoPoTsyo since January, 2010.

The **LSP** of MoPoTsyo has been giving opportunity to all its members to do their blood testing twice per year. This program, MoPoTsyo has a range of eight blood tests including *Glucose, Potassium, Cholesterol, Triglycerides, HDL, Creatinine, and*

Transaminase (SGPT and SGOT). Within this program, all members of MoPoTsyo will pay lower fee for their blood test.

At the end of 2010, MoPoTsyo has one year experience since January 2010 with one laboratory in Phnom Penh which has been processing more than 2,000 lab test results for its members to consult with the doctor.

The evaluation will be done to understand the impact of the intervention on the laboratory services program of MoPoTsyo on Cambodian people with diabetes and blood pressure for one year after MoPoTsyo has started the laboratory services program in the poor communities. The evaluation will mean to give answers to the questions whether the laboratory services program of MoPoTsyo assess the current laboratory services in what way, what factors influence MoPoTsyo's patients to submit themselves for blood testing, and how MoPoTsyo can improve its current laboratory services. This evaluation is also to document access to laboratory department of MoPoTsyo as well as to improve the laboratory services program of MoPoTsyo as well, such as making the patients understand what they need to know about laboratory tools and can make the laboratory services program create more patients demand for the tests.

1.2. Statement of the problem

This study attempted to evaluate the laboratory services program of MoPoTsyo Patient Information Centre particularly in Ang Roka Operational District, Takeo Province, Cambodia. Specifically, it sought to answer the following questions:

1. What are the factors that influence MoPoTsyo patients to submit themselves for blood testing?
2. How does MoPoTsyo assess the current Laboratory Services Program in terms of:

   A. Quality control

B. Logistics

C. Cost recovery

D. Sustainability

3. What does MoPoTsyo suggest to improve its current laboratory services program?

1.3. Objectives of the study

This study aimed to achieve the following objectives:

1. To identify the factors that influence MoPoTsyo patients to submit themselves for blood testing.

2. To describe how does MoPoTsyo assess its current Laboratory Services Program in terms of:

A. Quality control

B. Logistics

C. Cost recovery

D. Sustainability

3. To enumerate what does MoPoTsyo suggest to improve its current laboratory services?

1.4. Signification of the study

The research report will benefit for MoPoTsyo Patient Information Centre in improving laboratory services program. With this information the organization can set targets and can convince people with the quality control of lab test result for patients with chronic diseases, especially diabetes in Cambodia and come to joint with MoPoTsyo more and more. It is also a document for inventory management for laboratory services program of MoPoTsyo. It is a guideline that shows the gaps about the practices of current laboratory services program of MoPoTsyo with suggested solutions to address the problems in order to stimulate the laboratory services program to improve better in the present as well as the future.

1.5. Scope and delimitation of the study

This study focused mainly at evaluating the laboratory services program of MoPoTsyo Patient Information Centre particularly in Ang Roka Operational District, Takeo Province, Cambodia.

To delimit its scope, the study has concentrated particularly at identifying the factors that influence MoPoTsyo patients to submit themselves for blood testing. It further delved into describing how MoPoTsyo assesses its current laboratory services program in terms of quality control, logistics, cost recovery, and sustainability. Finally, the study ended by enumerating what does MoPoTsyo suggest to improve its current laboratory services.

1.6. Research methodology

To answer the above stated research questions, this study has made used of basically primary data and secondary data which gather from:

- **Primary Data:** The study was conducted by interviewing the key concerned personnel Mr. Maurits Van Pelt, *Director of MoPoTsyo*, on the key points of the quality control, logistics, cost recovery, sustainability of the current laboratory services program of MoPoTsyo, Mr. Suy Vannak, *Finance and Admin Manager of MoPoTsyo*, on the cost recovery and the sustainability, Mr. Mao Ngeav, *Head of Laboratory Services of MoPoTsyo*, on the quality control of lab test and lab improvement, Mr. Bun Socheath, *Peer Trainer*, Mr. Pov Sothrearin, *Peer Program Manager*, and Mr. Thoung Sovanara, *Urban Peer Program Manager* as well as a *diabetic of MoPoTsyo*, on the keys factors that the patients interested in the LSP of MoPoTsyo and submit themselves for the blood tests.

- **Secondary Data:** The study was conducted based on real expenditures and consumption data through the Test request-Payment Slip Form of MoPoTsyo, used the

monthly reports of lab test results, stock request report and the annual report of Laboratory Services Program of MoPoTsyo since it started its Laboratory Services Program in 2010.

CHAPTER II

REVIEW OF RELATED LITERATURE AND DISCUSSION

This chapter is divided into two parts. First is the review of related literature and second is the discussion on the research questions raised in chapter I.

2.1. Review of related literature

2.1.1. Background of MoPoTsyo

The **MoPoTsyo** is a Cambodia nongovernmental organization established in 2004 by five Cambodians and one Dutch to provide an institutional and practical response to the information needs for people with chronic disease such as diabetes (*high concentration of glucose in the blood*), hypertension (*high blood pressure*), and dyslipidemia (*abnormal amount of lipids in the blood*) in Cambodia, especially in poor communities. Until 2010, there are totally **2560** people with diabetes registered with MoPoTsyo patient information centre.

Each patient information centre is a part of a local network supervised by the Diabetes Program Manager, a supervisor who also has diabetes. After registering in the patient information centre, diabetics living in the same community get to know each other easily because they meet each other during weekly sessions at the home of the peer educator or at the home of another diabetic.

Nowadays, MoPoTsyo has **65** patient information centres in Cambodia including 40 centres in Takeo with 5 ODs and 74 Health Centres, 14 centres in Kampong Speu with 1 OD and 19 Health Centres, 7 centres in Banteay Meanchey with 1 OD and 14 Health Centre, and 5 centres in Phnom Penh with 1 OD. The first rural Diabetes Network started in June 2007 in **Ang Roka** Operational District (OD) in Takeo province and the most people there living with

diabetes mellitus (DM) and high blood pressure (HBP) are undiagnosed. Moreover, the people who have been diagnosed with DM or HBP do not have access to good information that would help them keep their disease under control. Without patient involvement and understanding of their disease, treatment adherence is more likely to fail. **MoPoTsyo** has peer educators to help Cambodians with DM and HBP to get them-selves organized.

- **The goal of MoPoTsyo**

The MoPoTsyo's goal is to make reliable and useful information about chronic non communicable disease accessible to all Cambodians who want to learn about their disease and drawing their blood to analyze at the laboratory of MoPoTsyo in Phnom Penh.

- **The vision of MoPoTsyo**

The MoPoTsyo's vision is a society in which people with chronic disease are actively involved in managing their own disease. This can be realized by training **passive patients to become active people** able to manage their disease and share their knowledge and skills with others.

- **The mission of MoPoTsyo**

The MoPoTsyo's mission is to improve access to reliable information for Cambodian diabetics and associated disorders, especially those who are poor. MoPoTsyo wants to make living with diabetes and other chronic diseases more affordable and feasible for Cambodian's poor.

- **The objective of MoPoTsyo**

The MoPoTsyo's objective is to create maintain affordable access to basic good quality supportive diagnostic services for Cambodians Chronic disease.

2.1.2. Setting up the laboratory services program

MoPoTsyo has been increasing its scope of action with laboratory activities (Biochemistry) facilitating regular access to the most relevant tests for MoPoTsyo's patients. The lab test result is very important for the patients before they go to meet the doctor of MoPoTsyo. The lab test result will be available and their implications will have been discussed with patient as part of the counseling. So that the quality control is very important to monitor the laboratory process of the organization because the quality control of the lab test is a process or system for monitoring the quality of laboratory test, the accuracy, and the precision of results and routinely collects and analyzes data from every test run or procedure and it also allows for immediate corrective action. For the Doctor it is also much easier to examine the patients with the lab test result. Furthermore, it is going to save the patient's time and money and help produce better health outcomes and it is a source of cost recovery of our intervention making it again more financially sustainable. In order to improve regular access to good quality and more affordable basic tests for its own membership, MoPoTsyo has set up a laboratory services program. In this program, twice per year, MoPoTsyo's patients or members will have the opportunity to give their fasting venous blood sample at a convenient hour such as between 6 and 7 in the morning close to their village to the laboratory of MoPoTsyo to analyze in the lower cost. The need is known and can be organized so it can be met in a more efficient way, thus the cost is cut down. If all patients in one village agree to this idea, the lab of MoPoTsyo can come to them, instead of them going to the laboratory in Phnom Penh.

- **Setting up patient information centers in poor communities**

A meeting point, usually the home of a person with diabetes, where other people living with diabetes can get good information about their disease and meet fellow patients.

Moreover, the people can exchange their experiences, support each other and find out about good health service providers.

- **Coaching diabetes and hypertension people how to deal with the health system**

MoPoTsyo trained peer educators to protect the vulnerable diabetes patients against taking unnecessary loans to pay for health care costs. Unprotected patients often lose their assets, paying too much money for very low quality care. Informed patients do not just save money, but they are healthier, more confident and better equipped to voice their concerns to improve their situation. From passive victims, many diabetics have become responsible actors.

- **Provision of Equity fund**

If an individual has a problem related to accessing care or they cannot afford the usual care, then MoPoTsyo patient information centre tries to help the person overcome the problem. The main barriers that patients encounter are related to user fees, transport costs and costs of pharmaceuticals. As long as people suffer from very high blood sugar and hypertension, they are too sick to work and earn income. MoPoTsyo patient information centre has helped many patients to become "productive again" and earn their own income or stop being a drain on the household income. Few have remained financially dependent on MoPoTsyo patient information centre.

2.1.3. Organizational Structure of MoPoTsyo

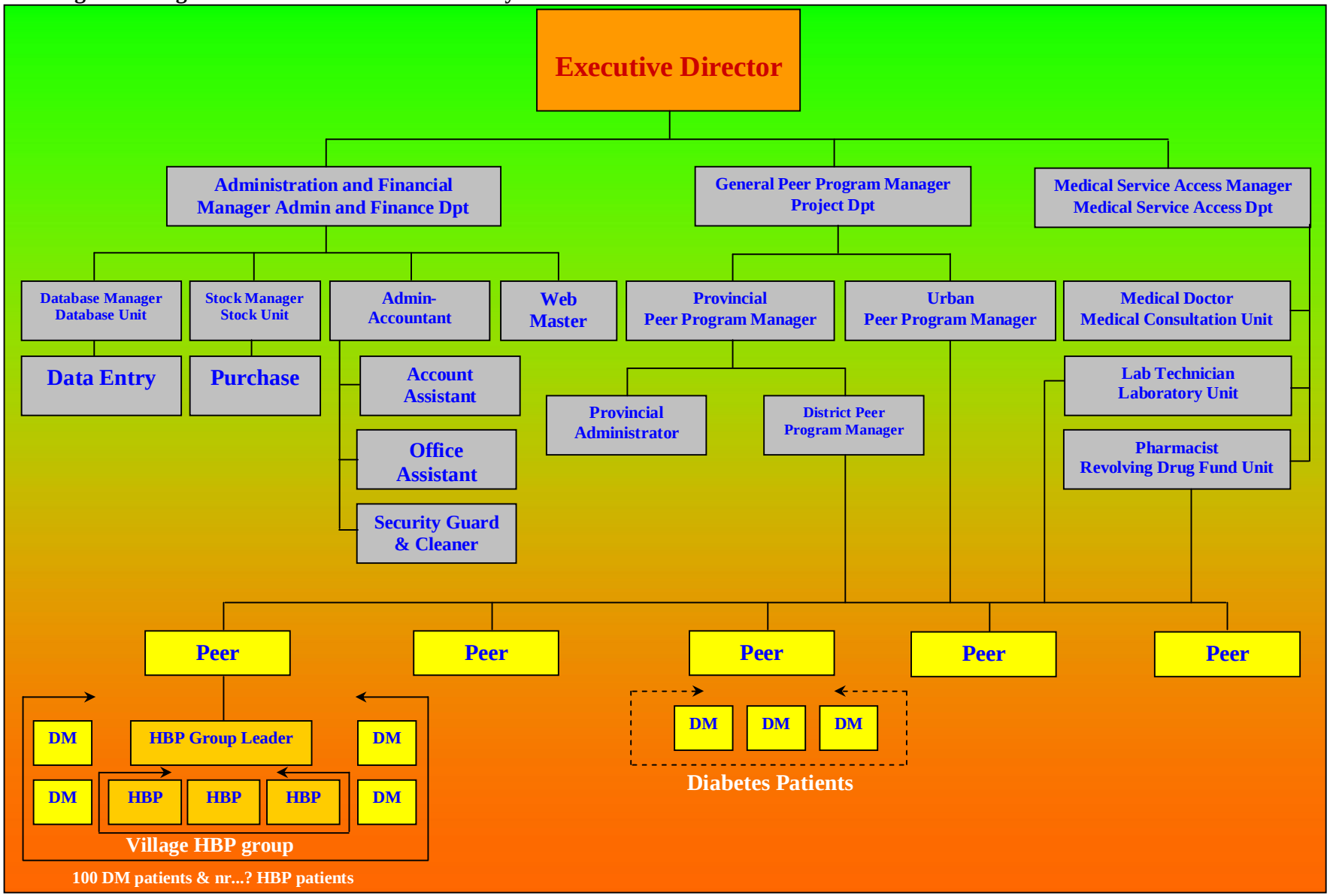
Historically, MoPoTsyo is an “information” provider, not a health service delivery organization like a diabetes clinic. MoPoTsyo has not yet adapted their organizational structure to the fact that they are increasingly being forced to help organize health services that are lacking and to deliver certain health services them-selves. In order for them to be able to continue to advise large numbers of members on what is best for them, MoPoTsyo is

moving into territory for which they are not well equipped, but nor is anyone else. In the coming years MoPoTsyo will have to develop their own capacity to deal with this challenge and not take on responsibilities and tasks where they can decentralize these to their local partners without that this compromises access to medical services for their members.

The MoPoTsyo's structure is shown that MoPoTsyo have put a Peer Program Manager at the head of each of the networks, with a General Peer Program Manager overseeing each salaried PPPM, UPPM, DPPM and PA as they lead their network of peer educators in an area. A part of the administration and finance will be decentralized to each of the networks over time to ensure that MoPoTsyo Headquarters (HQ) does not become a micro manager. This decentralization process started in 2008 by training of local people in the networks to take on administrative tasks. In the structure of MoPoTsyo, the Laboratory Unit has set up the Laboratory Services Program to get the income for the program to participate with Revolving Drug Fund (RDF) program to access the payments of the organization. Moreover, the laboratory services program has been working closely with the peer educators to process the program.

The Laboratory Services Program (LSP) is managed as one of the units within MoPoTsyo Patient Information Centre's department of Medical Services Access, which reports directly to the Executive Director and works actively with peer program manager as well as peer educators of MoPoTsyo to inform the patients for drawing blood on project of MoPoTsyo. (**Figure 1**)

Figure 1: Organizational Structure of MoPoTsyo



2.2.Discussion

2.2.1 Research Question1: What are the factors that influence MoPoTsyo patients to submit themselves for blood testing?

MoPoTsyo is a non-profit organization in Cambodia which working with chronic diseases includes diabetes and hypertension (high blood pressure) in the poor communities. As described above the laboratory services program of MoPoTsyo has set up the low fee of blood testing to create the demand of its patients. Every month many new patients come to join with MoPoTsyo and submit themselves for blood testing with MoPoTsyo's laboratory because MoPoTsyo's laboratory services program is acceptable with the quality control of lab test, the result is similar to Institut Pasteur Du Cambodge as shown in the **Table 3** and **Table 4** but the price of lab tests is very cheap, the fast lab test result, the polite communication of MoPoTsyo's staff and peer educators, and MoPoTsyo has its own doctor who has been working with the public hospital to consult with the patients of MoPoTsyo and the patients have to pay USD 1 in maximum for the consultation with the DM and HBP. This payment is for the hospital not for MoPoTsyo. Moreover, MoPoTsyo has cooperated with the pharmacy to sell the drug for MoPoTsyo in cheap price. Furthermore, the most important point that be able to make the patients decide to join with MoPoTsyo because they all understand about the advantages of blood testing for their diabetes or hypertension and they understand about the disadvantages of diabetes and hypertension because they are called silence killers, the diseases can kill the patients any time when they cannot control the concentration of glucose in their blood or amount of lipids in their blood. In addition, MoPoTsyo has peer educators to educate and encourage the patient and explain to them about the diagnoses as well as the advantages and disadvantages of diabetes and hypertension in order to help them to manage themselves with their DM and HBP. All of the information I have described above are the

factors that influence MoPoTsyo's patient to submit themselves for blood testing at MoPoTsyo's laboratory.

2.2.1 Research Question 2: How does MoPoTsyo assess the current Laboratory Services Program in terms of:

A. Quality Control

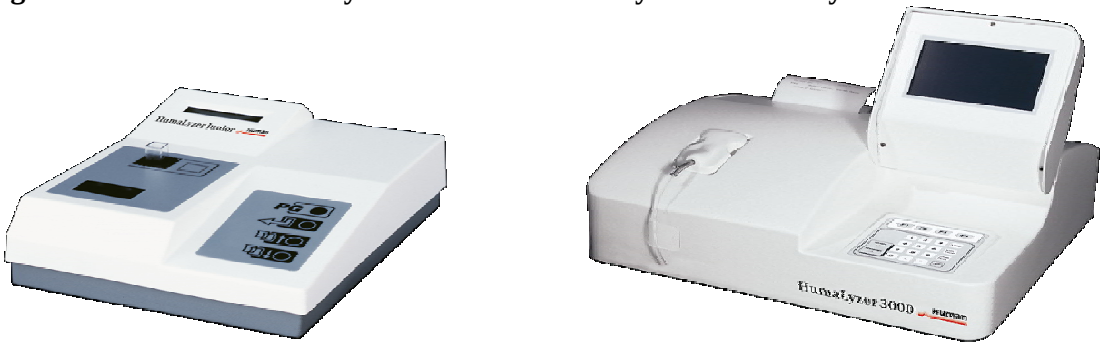
The quality control of the current laboratory Services Program of MoPoTsyo is contained in two levels such as:

A.1. Internal Quality Control (IQC)

A.1.1. Laboratory Machines of MoPoTsyo

In order to ensure the quality control of lab test, MoPoTsyo has been using the two laboratory machines such as ***HumaLyzer 3000*** which is the new compact clinical chemistry analyzer REF: 16700 and it is a semi-automatic, microprocessor-controlled photometer with Large graphic LCD screen, 120 methods programmable and storable (including calibration curves), Lab management by work list and Printing of complete patient reports and the another one is ***HumaLyzer Junior*** which is a microprocessor controlled manual photometer REF: 18050 and it is a manual, microprocessor-controlled photometer with Automatic filter wheel (340, 405, 505, 546 and 578 nm), Temperature controlled at 37^{o}C, Automatic storage of calibration, For endpoint and kinetic methods. (**Figure 2**)

Figure 2: The two laboratory machines of MoPoTsyo's Laboratory unit



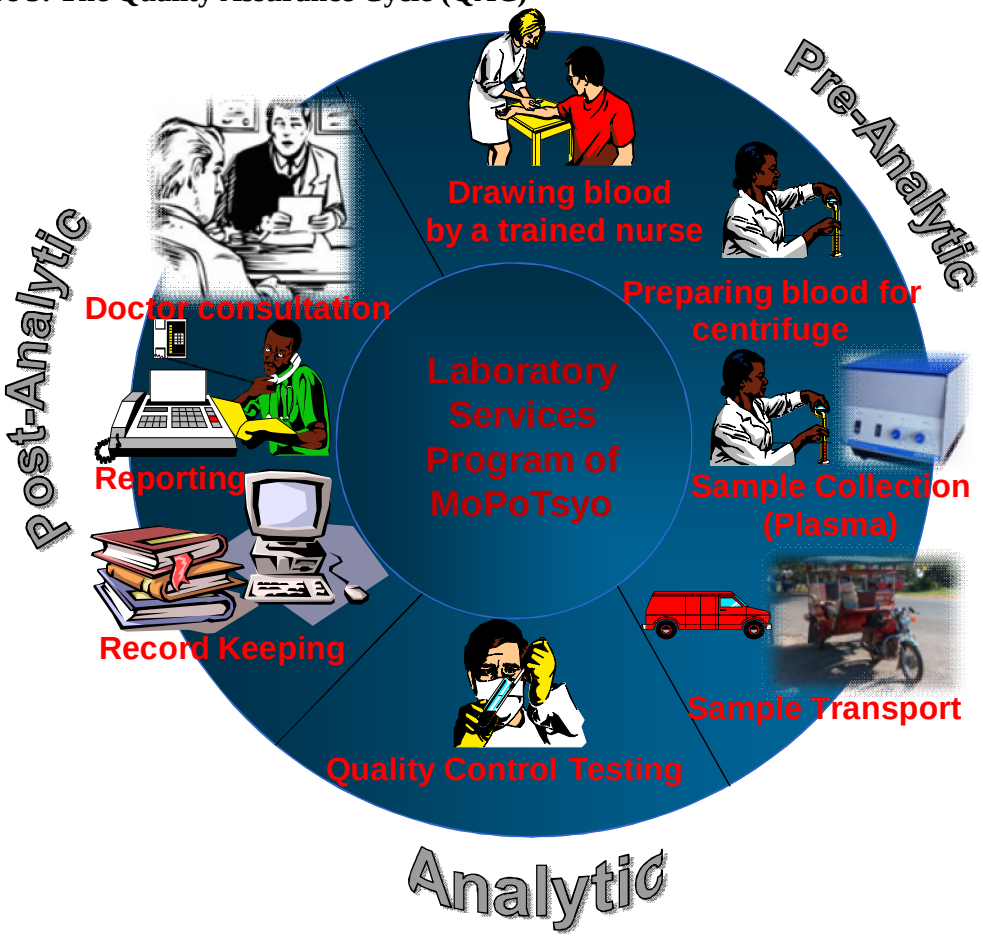
HumaLyzer Junior **HumaLyzer 3000**

These two laboratory machines are very important to provide MoPoTsyo's patients to do the main biochemistry tests with reliable results and high quality with affordable prices. The two laboratory machines of MoPoTsyo have been used to analyze the value of *Blood sugar, Potassium, Creatinine, Total Cholesterol, HDL Cholesterol, Triglyceride, and Transaminase* in the plasma of the venous blood of the patient.

A.1.2. Quality Assurance Cycle (QAC)

The QAC of MoPoTsyo is to ensure the quality control of the lab test as well. In the QAC process, the peer educators have to inform the patients at least three or four days before drawing their fasting venous blood at the health center or peer educators house which close to their village. Then the blood is immediately spun and separates the plasma from the whole blood with a pipette and put the plasma in a labeled tube then the peer educator puts it on ice and sends it by taxi to the laboratory of MoPoTsyo in Phnom Penh. After that the laboratory technicians have to analyze the sample at the same day or the next day. When the laboratory technicians finished their experiment of the lab tests, the lab test results have to be recorded into the database of the organization for keeping and print these result tests for the patients to meet the doctor to do the consultation for diagnosing of their diseases. (**Figure 3**)

Figure 3: The Quality Assurance Cycle (QAC)



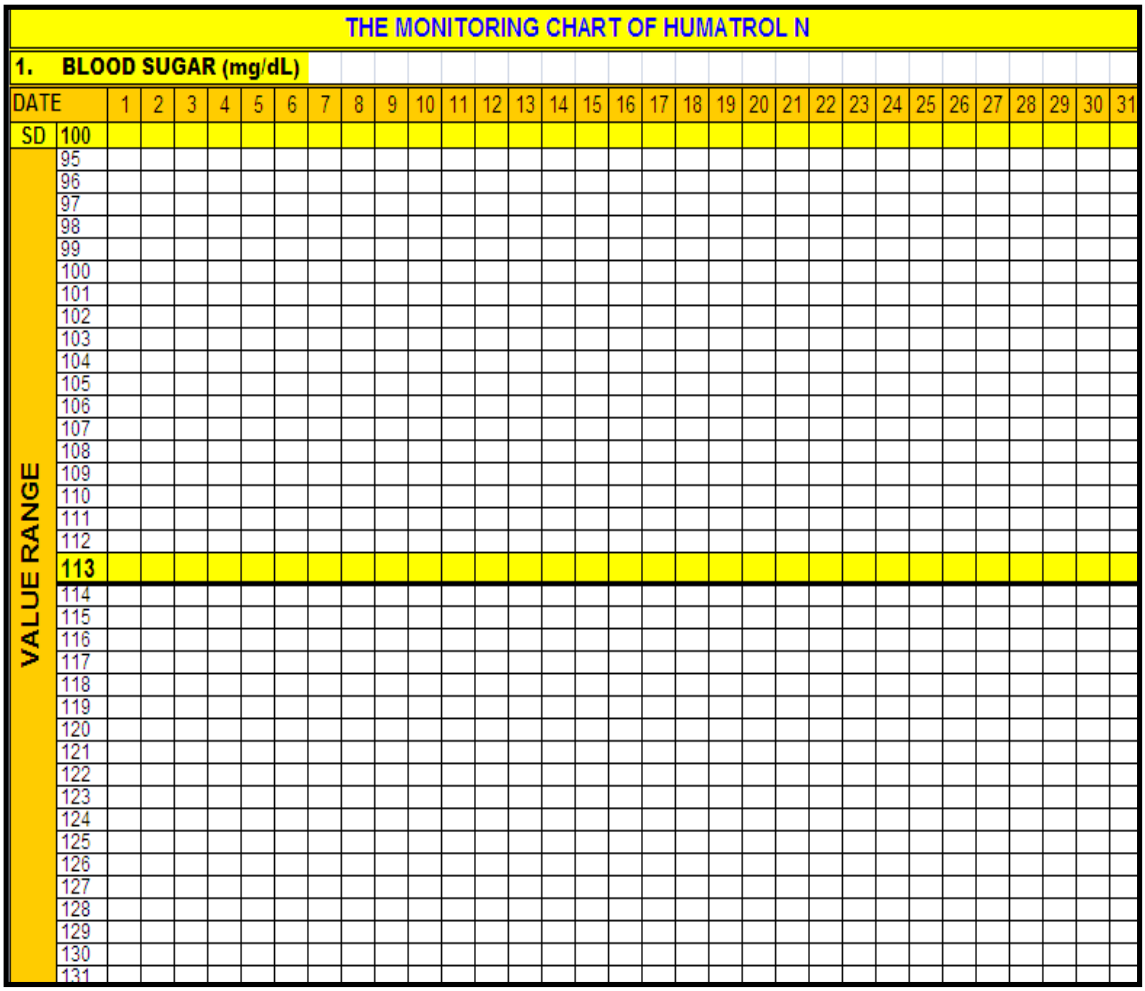
Moreover, MoPoTsyo's laboratory has used other methods to control the quality of its lab tests such as:

A.1.3. HumaTrol N

In the Quality Control process, the laboratory of MoPoTsyo has been using the ***Monitoring Chart of HumaTrol N*** to check every time for blood testing such as checking the machine, it is running well or not, the quality of reagents and checking the technique of the blood testing. So that ***the Monitoring Chart of HumaTrol N*** is very important to monitor the quality of blood testing process and it can be sure that the blood testing process is running well. Every time, before starting the test of blood sample, the laboratory technicians have to

test the sample of HumaTrol N. If the result of HumaTrol N is in the values range in the chart, it means that this process is going well. (**Table 1 and APPENDIX 1**)

Table 1: The HumaTrol N for Blood Sugar (Glucose):



THE MONITORING CHART OF HUMATROL N

1. BLOOD SUGAR (mg/dL)

DATE		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
SD	100																															
VALUE RANGE	95																															
	96																															
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	98																															
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A.1.4. Blood In Plasma (BIP)

The BIP is very important for the quality control of the lab test to control the red blood mixed with the plasma. This problem can destroy the result test of Potassium and Blood sugar for patients. Therefore, all the plasmas come from the province to MoPoTsyo's laboratory are had to spin again. After spinning, at the bottom of the plasma tubes will be seen the red blood if the plasma is not spun and separated well at the province. Moreover, MoPoTsyo's laboratory has a chart for controlling the blood in plasma. (**Table 2**)

Table 2: Controlling Blood in Plasma of MoPoTsyo's Laboratory

CONTROLLING BLOOD IN PLASMA								
2010	**ID**	**Total**	**0**	**+**	**++**	**0**	**+**	**++**
30-Nov	DKL	61	13	48	0	21%	79%	0%
01-Dec	APG	37	5	31	1	14%	84%	3%
02-Dec	APJ	22	6	13	3	27%	59%	14%
03-Dec	APN	32	17	15	0	53%	47%	0%
06-Dec	APM	27	14	13	0	52%	48%	0%
07-Dec	APC	27	13	14	0	48%	52%	0%
14-Dec	ABH	20	14	6	0	70%	30%	0%
15-Dec	ABF	53	36	17	0	68%	32%	0%
16-Dec	ABC	24	17	7	0	71%	29%	0%
20-Dec	DKD	43	22	21	0	51%	49%	0%
21-Dec	ADJ	19	8	11	0	42%	58%	0%
23-Dec	AVL	54	40	14	0	74%	26%	0%
24-Dec	AVG	36	19	17	0	53%	47%	0%
27-Dec	CTC	38	28	8	2	74%	21%	5%
28-Dec	CTD	28	17	11	0	61%	39%	0%
29-Dec	CTA	38	12	26	0	32%	68%	0%
30-Dec	CTF	44	27	17	0	61%	39%	0%
2011	**ID**	**Total**	**0**	**+**	**++**	**0**	**+**	**++**
03-Jan	ARJ	25	17	8	0	68%	32%	0%
05-Jan	ARA	30	23	7	0	77%	23%	0%
10-Jan	ARD	22	19	3	0	86%	14%	0%
12-Jan	ARG	23	13	10	0	57%	43%	0%
17-Jan	DKH+...	55	44	11	0	80%	20%	0%

A.1.5. Advice from Australian expert Robyn Devenish

Figure 4: Explanation from Australian Expert, Robyn Devenish at the laboratory Of National Pediatric Hospital, Phnom Penh

In September 2010, MoPoTsyo found out some problems with the high value of ***Creatinine*** and ***Triglyceride***. (**Table 3)**

Table 3: The Comparison of MoPoTsyo's lab test result with Pasteur before solving the problem

THE COMPARISON OF THE LAB TEST RESULT WITH PASTEUR			
HumaLyzer 3000			
Nr.	**RESULT**	**Creatinine(mg/dL)**	**Triglyceride(mg/dL)**
01	Result 1	1.4	259
INSTITUT PASTEUR DU CAMBODGE			
Nr.	**Patient**	**Creatinine(mg/dL)**	**Triglyceride(mg/dL)**
01	Result	0.72	230

After that MoPoTsyo asked and got free advice from ***Australian expert, Robyn Devenish***. She came over and checked what MoPoTsyo's laboratory has done and then she taught MoPoTsyo's laboratory many things such as how to control the quality of lab tests by making the ***Monitoring Chart of HumaTrol N*** to check the quality of blood testing process. (**Table 1**) Then that the value of Triglyceride became normal and similar to the result from ***Institut Pasteur Du Cambodge***. Furthermore, in order to solve the problem with the high value of **Creatinine**, MoPoTsyo asked an engineer from the **MediGroup** to come to check the machine and reagents. Then he found the solution with the diluting of NaOH (Sodium Hydroxide) of Creatinine. After that the diluting of NaOH was changed from the ratio 1:4 to the ratio 1:7 and in order to confirm the lab test result of ***Creatinine*** and ***Triglyceride*** before MoPoTsyo starts running these tests again with the blood sample of its patients, MoPoTsyo compared the result of ***Creatinine*** and ***Triglyceride*** with ***Institut Pasteur Du Cambodge*** by drawing the blood of *Mr. Thoung Sovanara*, UPPM and a diabetic as well. (**Table 4**)

Table 4: The Comparison of MoPoTsyo's lab test result with Pasteur after finding the solution

THE COMPARISON OF THE LAB TEST RESULT			
HumaLyzer 3000			
Nr.	**RESULT**	**Creatinine(mg/dL)**	**Triglyceride(mg/dL)**
01	Result 01	**1.1**	**181**
INSTITUT PASTEUR DU CAMBODGE			
01	Result	**1.00**	**171**

A.2. External Quality Control (EQC)

A.2.1. External Quality Assurance Services (EQAS) of Bio-Rad

Bio-Rad is renowned worldwide among hospitals, universities, major research institutions, as well as biotechnology and pharmaceutical companies for its commitment to quality and customer service. Founded in 1952, Bio-Rad is headquartered in Hercules, California, and serves more than 85,000 research and industry customers worldwide through its global network of operations.

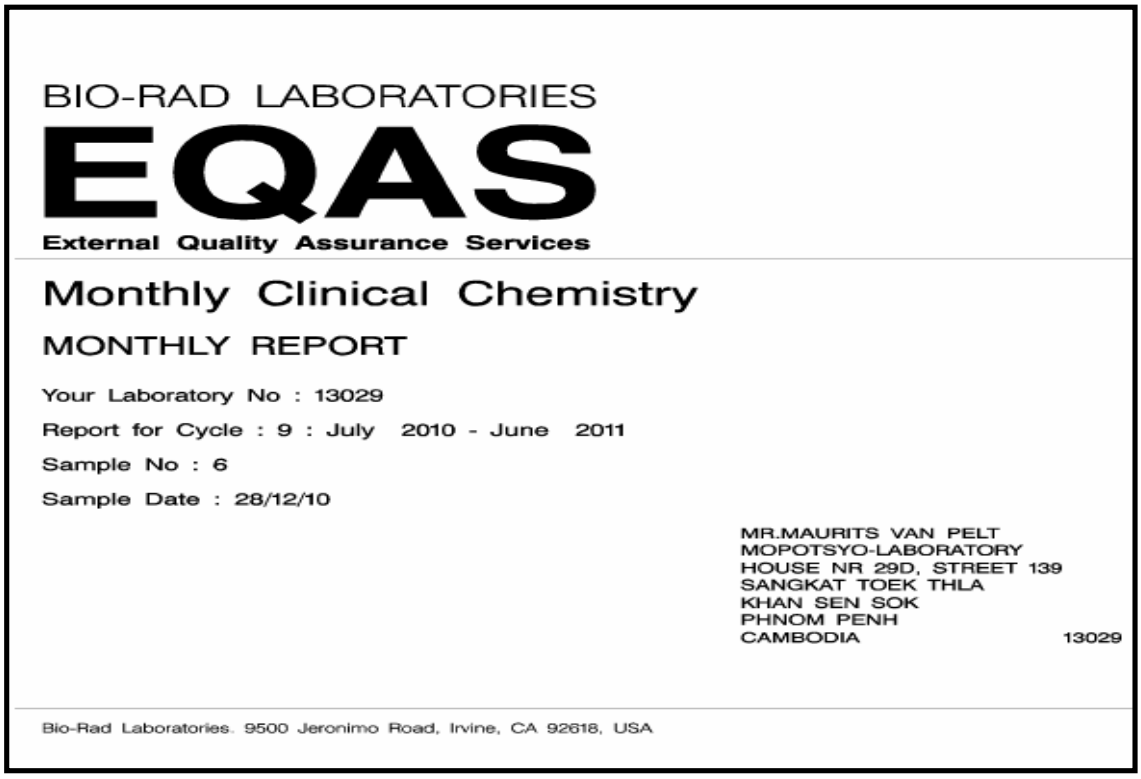
The EQAS of Bio-Rad is accepted around the world as invaluable tools used by laboratories to periodically assess the performance of their test systems. Results are objectively compared to other laboratories using the same methodologies, instruments and reagents. When used in conjunction with daily quality control, these external programs can give laboratories added confidence in their patient test results. Bio-Rad EQAS programs are accredited to help meet the regulatory needs of today's clinical laboratories with large international database with participants from over 90 countries.

MoPoTsyo enrolled in an External Quality Assurance System (EQAS) to help maintain the quality of its laboratory results. In July 2010, MoPoTsyo received for the first time a range of samples on which it performs its biochemistry tests. Before a certain date,

every month, MoPoTsyo sends its results of the lab test by email to Rio-Rad and then they will report the result back to MoPoTsyo.

MoPoTsyo laboratory is the one of 6 Cambodian laboratories enrolled in this system, in which thousands of laboratories worldwide participate. Moreover, each cycle includes 12 high quality samples together in one convenient shipment. In this cycle all the participants have to send their lab test results online early by the following schedule, the sample 1 is on 27 July 2010, the sample 2 is on 31 August 2010, the sample 3 is on 28 September 2010, the sample 4 is on 26 October 2010, the sample 5 is on 30 November 2010, the sample 6 is on 28 December 2010, the sample 7 is on 25 January 2011, the sample 8 is on 22 February 2011, the sample 9 is on 29 March 2011, the sample 10 is on 26 April 2011, the sample 11 is on 31 May 2011, and the sample 12 is on 28 June 2011. MoPoTsyo's laboratory has sent 7 lab test results to EQAS of Bio-Rad and got the results as below. (**Figure 5 and 6 and Appendix 2**)

Figure 5: Result from EQAS for the Quality Control of MoPoTsyo's Laboratory Test



BIO-RAD LABORATORIES

EQAS

External Quality Assurance Services

Monthly Clinical Chemistry

MONTHLY REPORT

Your Laboratory No : 13029

Report for Cycle : 9 : July 2010 - June 2011

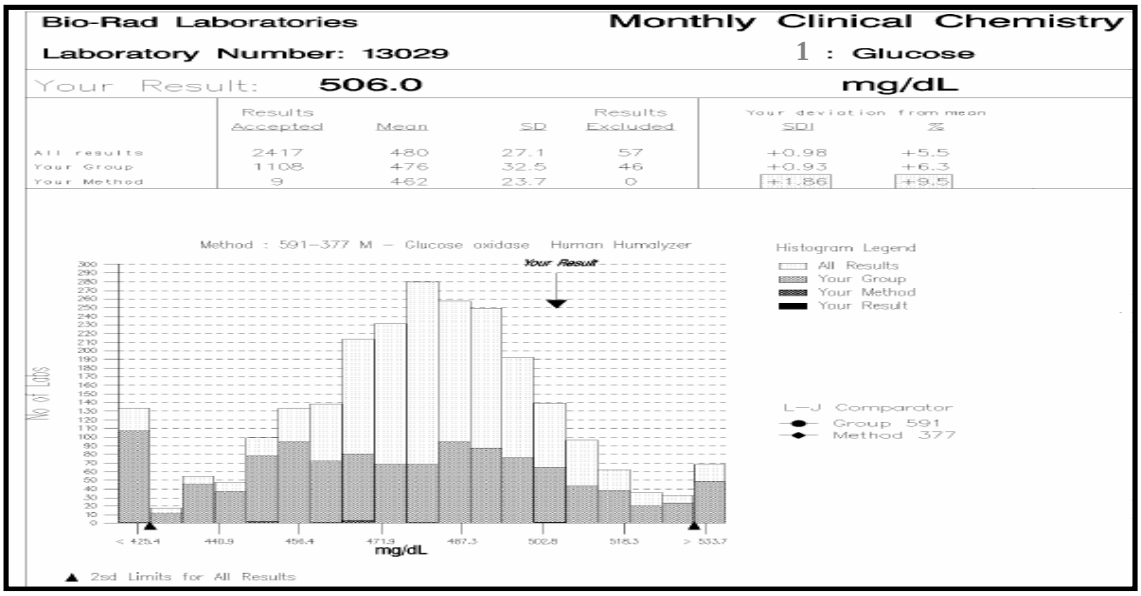
Sample No : 6

Sample Date : 28/12/10

MR.MAURITS VAN PELT
MOPOTSYO-LABORATORY
HOUSE NR 29D, STREET 139
SANGKAT TOEK THLA
KHAN SEN SOK
PHNOM PENH
CAMBODIA 13029

Bio-Rad Laboratories. 9500 Jeronimo Road, Irvine, CA 92618, USA

Figure 6: The Result from EQAS of Glucose or Blood Sugar



B. Logistics

B.1. Material

With the ***HumaLyzer 3000*** and ***HumaLyzer Junior***, MoPoTsyo has to use the reagents for running the blood tests. These reagents include ***Albumin, Cholesterol, HDL Cholesterol, Triglyceride, Glucose, Potassium, Transaminase GOT, Transaminase GPT,*** and ***Creatinine***. (**Table 5**)

Table 5: The Reagents for Blood Testing with HumaLyzer 3000 and HumaLyzer Junior

Nr	Reagent	LAB DESCRIPTION				
		1kit	Value (mL)	Pay ($)	*1Test (µL)*	*Total Test*
1	*ALBUMIN*	4bots	400	19	500	800
2	*CHOLESTROL*	4bots	400	52	500	800
3	*TRIGLYCERIDE*	4bots	400	108	500	800
4	*GLUCOSE*	4bots	400	23	500	800
5	*POTASSIUM(prec)*	3bots	50	76	500	100
6	*CREATININE(pic)*	2bots	100	28	250	400
7	*HDL*	4bots	320	65	200	1600
8	*GPT*	8bots	400	57	500	800
9	*GOT*	8bots	400	57	500	800

Besides the reagents, MoPoTsyo's laboratory has been using the some equipments such as two Centrifuge machines Model 80-2, Pippete-HumaPette (0.5-10µL), Pippete-HumaPette (5-50µL), Pippete-HumaPette (100-1000µL), Glass Tube no cover, Glass Tube has cover, Foot for Tube, Distilled water, Distilled water bottle, Thermometer, Alcohol (97º), Gloves, Syringe (5mL), Stopwatch, Face mask, Printer, Computer, and Calculator.

B.2. Blood Sample Collection

The peer educators of MoPoTsyo are very important for the blood sample collection. They have to tell each patient before they start drawing the blood of the patients. The blood sample is immediately centrifuged on the spot and takes plasma to put in the labeled tube of each patient and then put on the ice and transport to MoPoTsyo's laboratory in Phnom Penh by taxi. Finally, the result of the lab tests has to print on the result form of MoPoTsyo which is very important and easy to understand for the patients and peer. When the patients get their result, the peer educators have to take their patients to meet the doctor but before they go to meet the doctor, the patients and peer educator already know the meaning of each test in the result form. (**Figure 7**)

Figure 7: The result test form of MoPoTsyo

មណ្ឌល ព័ត៌មាន អ្នកជំងឺ
Patient Information Centre
MoPoTsyo

Not-For-Profit Revolving Drug Funds
Laboratory Section

LABORATORY TEST RESULT

Lab Number: 201101998 — Issued Date: 24/01/2011

Reference Test Order Form-Receipt date: 24/01/2011 — Number: 851

Patient's Information:

Name: [illegible] — Sex: ប្រុស — Age: 40

Patient ID: PX0126 — Others: BIP:0

Test's results:

Nr.	Test Name	Test Result	Target Normal
1	Total Cholesterol	192	200
2	HDL Cholesterol	63	40
3	Creatinine	0.9	1.5 … 1.1
4	Blood Sugar	141	126; 110; 65 – 100
5	Potassium	4.4	3.5 – 5.1
6	Triglyceride	141	150
7	Transaminase (SGPT)	33	1 – 50
8	Transaminase (SGOT)	30	8 – 40

Performed by

Office: #29D Street 138, Sangkat Toek Thla, Khan Russei Keo, Phnom Penh, Cambodia. H/P. 012 800 322, 012 272 879.
Tel/Fax: (855) 23 884 483, P.O. Box: 840 Phnom Penh, Cambodia, Email: mopotsyo@gmail.com, http://www.mopotsyo.org

B.3. Comparison of blood testing price

MoPoTsyo has been working with people who living with diabetes and other chronic non-communicable diseases face barriers to access laboratory services because of they don't have money for paying on traveling costs to Phnom Penh and high costs of laboratory tests in both the Cambodian public and private health services and the lost income they forego as a result of waiting times. Therefore, MoPoTsyo has set up a very low price per test for Cambodian people who living with chronic diseases, especially with diabetes and high blood pressure in the poor communities to access the laboratory services. In addition, the patients don't need to go to laboratory of MoPoTsyo in Phnom Penh, they just stay at their village, MoPoTsyo's staffs will go there to draw their blood and send the lab test result back to their village. MoPoTsyo's patients have to pay in the low fee for blood testing. Below there is a table is shown the comparison of lab test price. (**Table 6**)

Table 6: The comparison of lab test price

THE COMPARISON OF BLOOD TESING PRICE					
Nr	**Name of Test**	**MoPoTsyo KHR**	**BioMed KHR**	**Center of Hope KHR**	**Pasteur KHR**
1	***TOTAL CHOLESTROL***	1,500	4,000	6,200	2,880
2	***TRIGLYCERIDE***	3,000	5,000	7,280	5,760
3	***GLUCOSE***	1,000	4,000	8,000	7,680
4	***POTASSIUM***	2,000	10,000	12,000	13,440
5	***CREATININE***	4,000	5,000	7,800	7,680
6	***HDL CHOLESTROL***	2,500	6,000	12,000	20,160
7	**TRANSAMINASE**	4,000	6,000	15,000	19,200

B.4. Peer Educator networks of MoPoTsyo

Since 2005, diabetes peer educator networks provide a cost-effective option to reduce the gap between the existing need for services and healthcare system's capacity to provide these services. Through the distribution of urine glucose strips, trained diabetes peer educators are able to identify other people with diabetes and those at risk for the condition in their own community. Fasting blood glucose tests carried out by diabetes peer educators confirm the status of people found to have high urine glucose. Peer educators then provide information and advice on lifestyle changes. Where necessary, the peer educator helps people with diabetes to make an appointment with an experienced diabetes healthcare professional because the peer educator, having identified the person with diabetes, provides counseling and follow-up, the time spent in consultation with a healthcare professional is optimized: the right people are seen at the right time. There are very significant financial as well as health benefits for people with diabetes, who receive relevant and appropriate information from the peer educator on the medications and supplies they will need to manage their condition effectively.

In order to become a peer educator of MoPoTsyo must be Cambodian who living with diabetes. MoPoTsyo patient information centre has developed a six session course such as the explanation of basic biological mechanisms, how diabetes affect the basic biological mechanisms, how to restore and keep the blood glucose balance, how to buy medicine, nutrition and what is healthy eating for Cambodian diabetics, and how to test, measure and record your progress. Step by step the patients gain practical understanding on how they can improve their own control over the disease, slow down its progress, and they can live with diabetes as other people. All the participants of this course are encouraged to learn about their own disease, set realistic personal objectives and make their disease under control. When they finish this course, they will go back to their homeland with knowledge of diabetes control.

Therefore, they can also explain their villagers who have diabetes about how to control their blood sugar.

MoPoTsyo's peer educators play in the important role of MoPoTsyo to close to the patients to check the patients' blood glucose (PPBG) every week free of charge has made it easy for them to know the status of their disease thus can easily control their disease. Moreover, in order to control their disease, the patients need the peer educators to provide the education to change patient's eating pattern and doing regular physical exercise at least 30 minutes, thus helped them to control their disease as well. As relating to the changing diet of patient, the peer educator educated the patient who living with diabetes to change their habit diet from eating rice to beans because rice converted to glucose faster than bean. The peer educators will change their patient's life style because most Cambodian diabetics do not know that white rice is highly glycemic and contains large quantities of glucose. MoPoTsyo made a food pyramid to give every registered patient and it is easy for the peer educators of MoPoTsyo to explain their patients. (**Figure 8**)

Figure 8: The Food Pyramid of MoPoTsyo

C. Cost recovery

In this evaluation of the LSP of MoPoTsyo, I took one Operational District, Ang Roka OD in Takeo province which is the first rural program of MoPoTsyo started in the mid 2007 to evaluate on the cost recovery. Until December 2010, in this OD, there are 664 patients came to submit themselves to draw their blood for laboratory test of MoPoTsyo. Each patient has to pay in the low fee, **18,000 KHR** for the 8 lab tests of MoPoTsyo such as Blood sugar (Glucose), Total cholesterol, HDL cholesterol, Triglycerides, Potassium, Creatinine, Transaminase SGPT (Serum Glutamic Pyruvic Transaminase) or Alanine transaminase (ALT) or Alanine Aminotransferase (ALAT), and Transaminase SGOT (Serum Glutamic Oxaloacetic Transaminase (SGOT) or Aspartate transaminase (AST) or aspartate aminotransferase (ASAT/AAT/AspAT). So that the revenue of MoPoTsyo from the DM and HBP patients on the LSP residing in Ang Roka has in fact remained stable at 996,000 KHR, which equals USD 249 per month, of which 35.74% equals USD 89 are needed to pay on purchasing new reagents and on the incentive of peer educators for blood collection and the 64.26% which equals USD 160 are needed to pay on the incentive for Peer Networks at Ang Roka OD and on the HQ of MoPoTsyo per month. In order to sustain not just the Peer Educators through the cost recovery from the LSP and the RDF but also the whole organization, MoPoTsyo adds further costs of salaried staff and management costs which it has put at 3% per month per OD, bringing the total of its cost to USD 1,111. In the total expense of USD 1,111 per month on the incentive for peer network in Ang Roka OD, the LSP has to pay 14.38% which equals USD 160 and the RDF has to pay 85.62% which equals USD 951 per month. For the LSP, the payment of the incentives for the 10 Peer Educators are USD 37 per month, the cost includes the telephone cards, the rewards for the peers, 1 PPPM is USD 6, 1 DPPM is USD 5, 1 PA is USD 6, 1 MD is USD 22, the evaluation is USD 47, and

on the management cost is USD 36 and the 85.62% which equals USD 952 is the part of RDF ’s payment but the revenue from the drug sales in RDF program is only USD 447 per month in Ang Roka OD. Therefore, it is not enough for the total payment of RDF. However, currently these extra costs do not have to born by Ang Roka OD as all these extra costs are booked onto projects that are donor financed as they serve as investment into MoPoTsyo to help it increase the membership and its scope of action, and strengthen the organization until it reaches its break even benefiting from economies of scale and gains in efficiency over time. The Hospital Medical Doctor in Ang Roka Referral Hospital never learned from the visiting Specialist MD during the time the project was running how to do consultation, so MoPoTsyo continues to organize the consultations twice per month, which creates some extra cost there. Moreover, by putting the management cost at 3% per OD, MoPoTsyo can become independent from donor financing as soon as it covers 33 out of 77 of Cambodia’s OD. (**Table 7**)

Table 7: The cost *per month* at Ang Roka OD

Items	Incentive	Cell card	Salary	Transportation	Insurance	Evaluation	Reward	HQ	TOTAL	RDF	LSP
	100%	**100%**	**20%**	**20%**	**20%**	**100%**	**100%**	**3%**		**85.62%**	**14.38%**
10 Peer Educators	$150.00	$50.00					$58.33		$258	$221	$37
1 PPPM		$2.00	$19.00	$18.89	$0.60				$40	$35	$5
1 DPPM		$2.00	$19.00	$15.18	$0.60				$37	$31	$6
1 PA		$2.00	$19.00	$18.77	$0.60				$40	$35	$5
1 MD	$64.00	$2.00		$90.00					$156	$134	$22
Evaluation						$328.33			$328	$281	$47
Management Cost								$251.12	$251	$215	$36
TOTAL	***$214.00***	***$58.00***	***$57.00***	***$142.84***	***$1.80***	***$328.33***	***$58.33***	***$251.12***	***$1,111***	**$952**	**$160**

D. Sustainability

D.1. Financial Responsibility

After the LSP started in January 2010, the MoPoTsyo appointed the Admin and Finance Department to responsible for the keeping of proper records required for financial order. This is in addition to pay and ensure the financial health of the LSP and coordinate the implementation of the currency Swap. Moreover, the LSP of MoPoTsyo can join with the RDF to help the finance of MoPoTsyo to expense in each OD.

D.2. Financial Statement

According to the Administration and Financial department of MoPoTsyo directed the LSP to prepare statements of accounts for each month. The accounts are prepared on an accruals basis and must give a true and fair view of the LSP's state of affairs at the end of month.

In preparing the accounts of the LSP is required to:

1. Observe the accounts order direction issued by the Administration and Financial department of MoPoTsyo, including the relevant account and disclosure requirements and apply suitable accounting policies on a consistent basis.
2. Make judgments and estimates on a reasonable basis.
3. Prepare financial statements every month.

D.3. Financial Records

The LSP financial records include:

1. The amounts of patients and revenues by blood testing and type of health facilities. This information is used to assess the impact of the blood test pricing policies and to more accurately predict future laboratory services program requirements for increasing of patients every year.

2. Regular trial balances and income statements provide periodic status reports on reagents stocks and other equipments for lab test and financial reserve. Such reports are vital to assure that the revenues are achieving or at least approaching cost recovery objectives that cash flow is sufficient to procure new stock of reagents for each month, and this stock is sufficient to fill the expected patient demand of lab test for the future.

D.4. Cash Collection

The LSP cash collection is based on the peer educator to explain the patients to understand the blood testing for their health. Since January 2010, the LSP started for the first time and MoPoTsyo authorized revenue collector as peer educator in each OD to receive and sign for reimbursement slip on behalf of MoPoTsyo for the payment in either in Khmer riel or in USD dollars on the process of drawing blood such as the incentive for peer educators, electricity for centrifuge, and the transportation of blood sample to MoPoTsyo's laboratory. This income from blood testing also joined with the RDF to pay on the incentive of pee network in the OD and HQ staffs and this income paid on buying new reagents and the equipments for lab tests as well.

The Revenue Collectors is responsible for all cases of loss of money and all documents related to this collection, and this money according to the Test Request-Payment Slip Form (**Appendix 3**). Immediately after the collection and the payment, the Revenue Collector has to go to deposit the total amounts of the income into MoPoTsyo's LSP bank account of the ACLEDA bank. (**Appendix 3**)

Research Question 3: What does MoPoTsyo suggest to improve its current laboratory services program?

In order to improve its current laboratory services program MoPoTsyo will design a Quality Control Program of the Laboratory including:

1. Establish the lab policies
2. Equipment control and maintenance
3. Train all staff and periodic retraining
4. Periodic Internal audits
5. Improve the knowledge of peer educators.

The peer educators have to be trained more and more about the understanding of lab test result especially the meaning of each lab test (**Table 8**) because it is very important to them to explain to the patients why we have to draw blood for the lab test. When the patients understand about the advantages of the lab tests, they will come to join with MoPoTsyo more. So MoPoTsyo will increase the revenue for the payment back to the OD and then MoPoTsyo will not need the donor any more. Additionally, MoPoTsyo will spread up to cooperate well with many other doctors and private pharmacies to make diagnose and prescribes for the patients of MoPoTsyo. Furthermore, MoPoTsyo will choose more and more peer educators for the new OD in Cambodia to work with patients and find the new patients for blood testing.

Table 8: The meaning of laboratory tests of MoPoTsyo

Name of Test	Why do our members need this test?	How often?	What does it mean?
1. Blood Sugar capillary blood (from your finger)	1) To measure the level of sugar in capillary blood, especially in the morning before we eat or drink anything. 2) To find out if someone has diabetes or not. 3) To measure blood sugar after eating; This is also important and useful.	People with DM and PreDM should check at least once a month, but every week is better and measure both FBG and PPBG. A person with HBP should check once a year to see if the blood sugar is still normal. The urine glucose strip is very useful to measure if blood glucose after eating has risen too high and it is cheaper than blood glucose measurement.	>126 mg/dl before eating: It means DM >110 mg/dl before eating: It means Pre DM >200 mg/dl after eating: It means DM and also that your blood sugar is too high. Talk with your Peer Educator how to bring it down. Use urine strips to check your urine 2 hours after every meal to if there is still a change in color! The blood sugar is too high and you should follow advice from peer educator on how to bring it down to normal level. <100 mg/dl before eating: It means that you have normal blood sugar <180 mg/dl after eating: It means that you have normal blood sugar.
2. Blood Sugar Venous blood (from your arm)	It is more precise than the test above: 1) To measure the level of sugar in venous blood, especially in the morning before we eat or drink anything or 2) To find out if someone has diabetes or not.	People with DM and Pre-DM should check this blood test 2 times per year. People with HBP should check it once per year.	>126 mg/dl before eating: It means DM >110 mg/dl before eating: It means PreDM The blood sugar is too high and you should follow advice from peer educator on how to bring it down to normal level. <100 mg/dl before eating: normal blood sugar
3. Creatinine Venous blood (from your arm)	High blood sugar and High Blood Pressure damage kidneys. To measure if your kidney is functioning well.	DM and HBP should test 2 times per year.	If men have >1.5 or if women have > 1.1 it means the kidneys are damaged. Talk to your peer educator for advice.
4. Total Cholesterol Venous blood (from your arm)	-To find out if you have too much fat in your blood.	DM and HBP should check total cholesterol 2 times per year if : -Total cholesterol is 200 mg/dL or more. You are a man over age 45 or a woman over age 50.	-Too much bad cholesterol can clog blood vessels or arteries in the heart and kidneys

		-HDL (good) cholesterol is less than 40 mg/dL	
5.HDL Cholesterol Venous blood (from your arm)	-To find out if you have enough (>40mg/dl) good Cholesterol (HDL).	-DM and HBP should check HDL cholesterol 2 times per year. -If your Total Cholesterol is less than 250mg/dl and if you are a man over age 45 or a woman over age 50. -If HDL (good) cholesterol has been less than 40 mg/dL.	-HDL helps clear bad fats out of your arteries. -Too low levels of HDL (less than 40 mg/dL) increase the risk of heart disease. Talk to your Peer Educator for advice. Eat more fat fish.
6. Triglyceride Venous blood (from your arm)	-Triglycerides are a type of fat. If TG is very high, especially in combination with high cholesterol, there is risk of heart problems.	-First make sure that you have normal blood glucose. -DM and HBP should check Triglyceride twice a year to monitor it. It is very good if remains under 150 mg/dl	-It is fat in the blood that is created by eating white rice and drinking alcohol. If you have TG above 400mg there is a risk of pancreatitis. -People with high blood triglycerides often also have not enough HDL cholesterol, higher risk of heart disease, stroke because of atherosclerosis. Eat less white rice and drink less alcohol and normalize your blood sugar as the first priority!
7. Potassium Venous blood (from your arm)	-To check if it is not too low or too high.	-Everyone with HBP if you take Hydrochlorothiazide (HCZ) or Furosemide to see if it is not too low (minimum 3.5) should check 2 times per year.	-If it is too low, eat more vegetables, bananas, tomatoes. -If it is higher than 5.1 it can be a sign of kidney failure.
8.Transaminase Venous blood (from your arm)	-To check if the liver is normal. It helps the Doctor to find diagnosis.	-DM and HBP should check this test 2 times per year.	SGPT : if more than 50 SGOT: if more than 40 -If higher, it can be sign of fatty livery, diabetes or many other diseases. If very high it can be a sign of hepatitis A or B, liver injury or other problems.
9. Albumin Venous blood (from your arm)	-If the Doctor suspects that you have liver disease or kidney disease.	-Only if the Doctor prescribes this blood test for you.	-If lower than 3.4 you may have liver disease or a kidney disease. If is more than 5.4 you are maybe dehydrated.

CHAPTER III

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

3.1. Summary

The research study of Evaluation of the Laboratory Services Program of MoPoTsyo patient information centre has attempted to look at the current laboratory services program of MoPoTsyo in term of the quality control. MoPoTsyo patient information centre has been improving the internal quality control such as using the two Laboratory Machines (HumaLyzer 3000 and HumaLyzer Junior) to run the eight blood tests. The laboratory Services Program of MoPoTsyo has absolutely set up the Quality Assurance Cycle to fill the patient's demand of MoPoTsyo in the ODs and in case, MoPoTsyo's laboratory has been using the HumaTrol N to control the process of the blood testing. In order to ensure the internal quality control, MoPoTsyo made the monitoring chart for controlling the blood in plasma (BIP) because it can destroy the sample of the patients. Besides the internal, MoPoTsyo has enrolled with the Bio-Rad Laboratory which located in California, USA for the EQAS to ensure the external quality control by sending the lab test result of each sample to Bio-Rad Laboratory online and then they will send the monthly report to MoPoTsyo back. The logistics of the current laboratory services program of MoPoTsyo, it referred to material, blood sample collection, the comparison of blood test price, the Peer Educator of MoPoTsyo. Moreover, the cost recovery of the current laboratory services program of MoPoTsyo analyzed in the Ang Roka OD in Takeo province which is the first rural program of MoPoTsyo which has 664 members that drown the blood for laboratory test of MoPoTsyo in low fee of 18,000 KHR for the 8 lab tests and the revenue from this program in Ang Roka OD is 996,000 riels, which equals USD 249 per month and USD 89 is needed to pay on

purchasing new reagents and on the incentive of peer educators for blood collection and the USD 160 is needed to pay on the incentive for Peer Networks at Ang Roka OD. In these total expense, USD 160, taken 3% on the HQ of MoPoTsyo per month as well. Therefore, the revenue from the LSP in 2010 is able to pay only 14.38% (USD 160) of the total expense USD 1,111.

In addition, the MoPoTsyo patients decided to join with the NGO to control their health by blood testing at MoPoTsyo because the blood tests at MoPoTsyo is very cheap, 18,000 riel, with high quality, the result of the lab tests are fast with the polite communication of MoPoTsyo's staff and peer educators, and MoPoTsyo has its own doctor and peer educators to help the patients for consultation about their DM and HBP. Furthermore, the patients can go to buy the drug through the prescription in the low cost at any pharmacy which contracted with MoPoTsyo and the peer educators of MoPoTsyo educated and encouraged the patients to organize themselves by controlling their concentration of glucose in their blood and explained about what food they can eat and cannot eat by Pyramid food of MoPoTsyo.

3.2. Conclusion

Based on the research study, the Laboratory Services Program of MoPoTsyo has been achieved such as:

- The LSP structure which attributed to its small and flexible structure. The key factor for success has been financial autonomy and funding from the revenue of blood testing and this research is able to connect the peer educator network with the laboratory unit to assess the success of the LSP process of MoPoTsyo.

- People living with diabetes and hypertension can access to the most affordable of laboratory services program at the place where MoPoTsyo patient information centre located

near their house and there are more and more Cambodian people come to join with MoPoTsyo every month.

- The laboratory has enrolled with the Bio-Rad Laboratory to get the Certificate of EQAS and using the HumaTrol N for controlling the process of blood testing of MoPoTsyo.
- People living with diabetes can access to cost effective for their medical consultation with MoPoTsyo's doctors by using their lab test result.
- The LSP can afford to participate with the RDF to release in apart of the expense of MoPoTsyo at the OD of Ang Roka in Takeo province.

These achievements could be successfully replicated in other Operational District in Cambodia with the similar contexts in Ang Roka Operational District in Takeo province. However, the Laboratory Services Program of MoPoTsyo has fulfilled its financially sustainable of 14.38% equals USD 160 per month to release the payment on the incentive for peer network at Ang Roka OD in Takeo province. Based on the research study during the end of 2010 of the Evaluation of the Laboratory Services Program of MoPoTsyo in Operational District Ang Roka, Takeo Province, and the figure is shown that the cost recovery from blood testing is USD 249 per month in Ang Roka OD and used to pay USD 89 purchasing new reagents for laboratory and on the incentives for the Peer Educators of collection the blood sample and USD 160 is on peer network in Ang Roka.

3.3. Recommendation

Based on the research study finding, some recommendations should be provided for managing of the Laboratory Services Program of MoPoTsyo for improvement as following:

- Monitoring and evaluating on the LSP in each OD for a regular period is essential to determine the success of the program. Particularly, MoPoTsyo should pay attention to train and monitor its peer educators on the understanding of blood testing and the importance of

each test for the patients to consider before they decide to do the blood test with MoPoTsyo and to transfer their knowledge more detail and clear to the patients at other ODs.

- About the blood in plasma (BIP), it is also the very in important point for the quality control of the lab test of MoPoTsyo. So MoPoTsyo should educate the peer educators who work with the spinning blood or blood collection about the disadvantage of BIP to the blood test result. If they are careless with taking the plasma from the whole blood, they will take the plasma with the red blood for blood testing. This point can spoil the values of Blood Sugar and Potassium. Moreover, the trained peer educators have to transport the samples to the laboratory of MoPoTsyo immediately after they finished the blood collection they should not keep the sample for long there because it can also spoil the blood sample.

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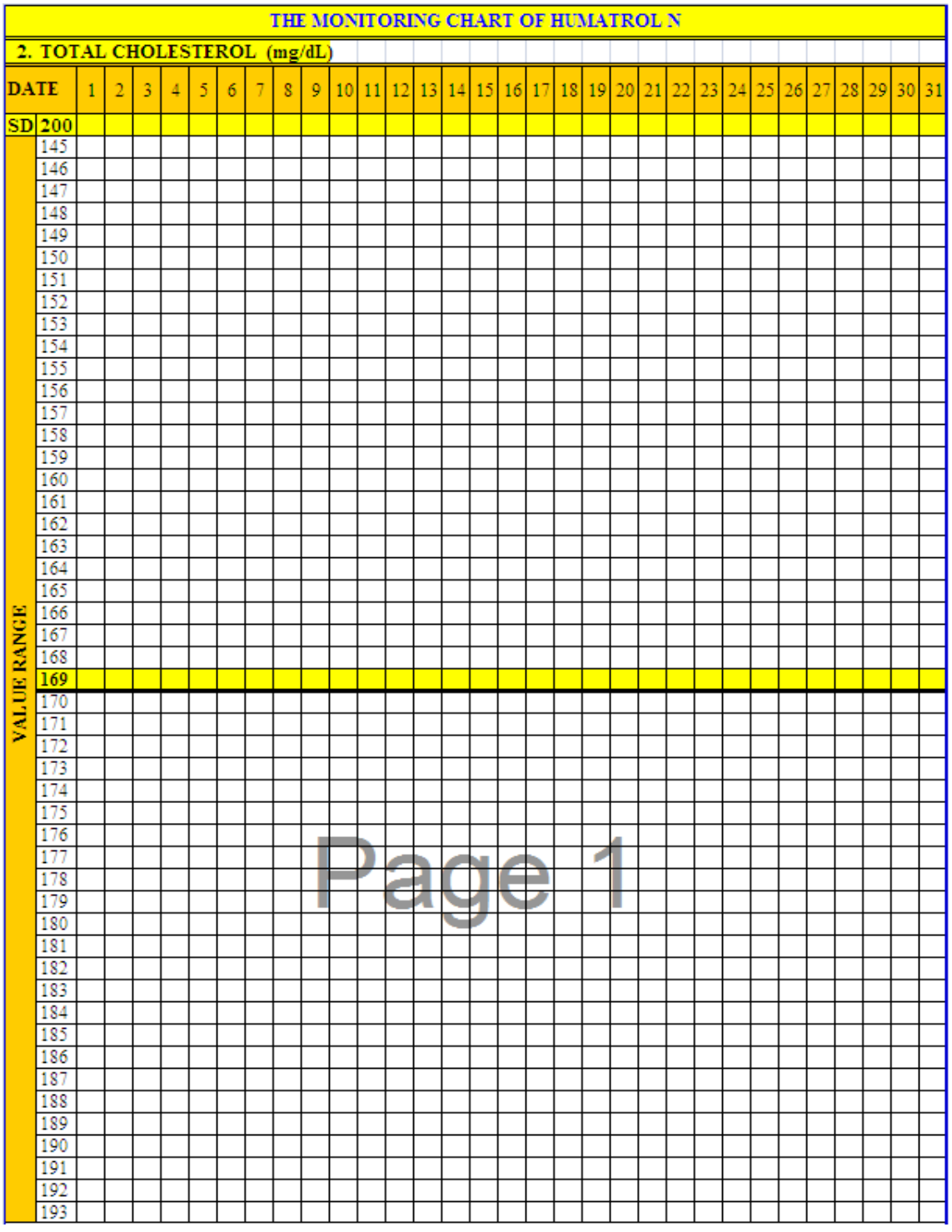
APPENDIX 1

The monitoring chart of HumaTrol N for the tests of **Total Cholesterol, HDL, Triglycerides, Potassium, GOP, GPT, and Creatinine** of MoPoTsyo's Laboratory for the quality control.



THE MONITORING CHART OF HUMATROL N

2. TOTAL CHOLESTEROL (mg/dL)

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THE MONITORING CHART OF HUMATROL N

3. HDL CHOLESTEROL (mg/dL)

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THE MONITORING CHART OF HUMATROL N

4. TRIGLYCERIDE (mg/dL)

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5. POTASSIUM (mmol/L)

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6. TRANSAMINASE SGOT (U/L)

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7. TRANSAMINASE SGPT (U/L)

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THE MONITORING CHART OF HUMATROL N

8. CREATININE (mg/dL)

VALUE RANGE	DATE	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
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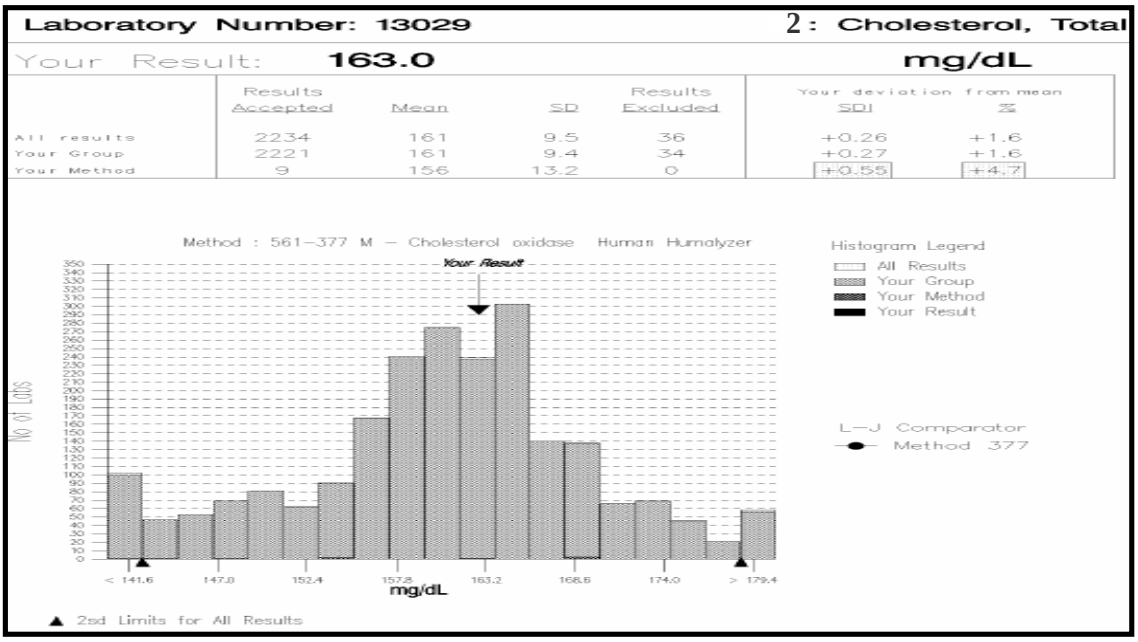
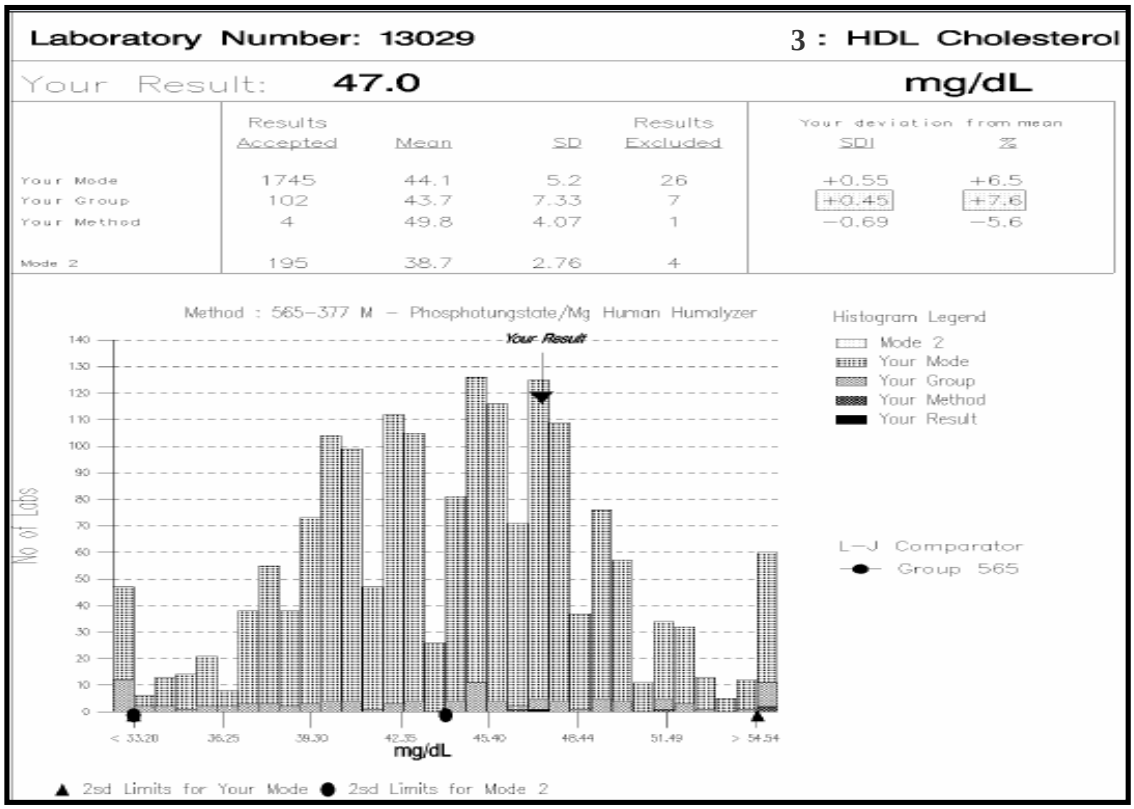
	2.04																															
	2.05																															

APPENDIX 2

The Result from EQAS of Total Cholesterol, HDL, Triglycerides, Potassium, GPT (ALT), GOT (AST), and Creatinine



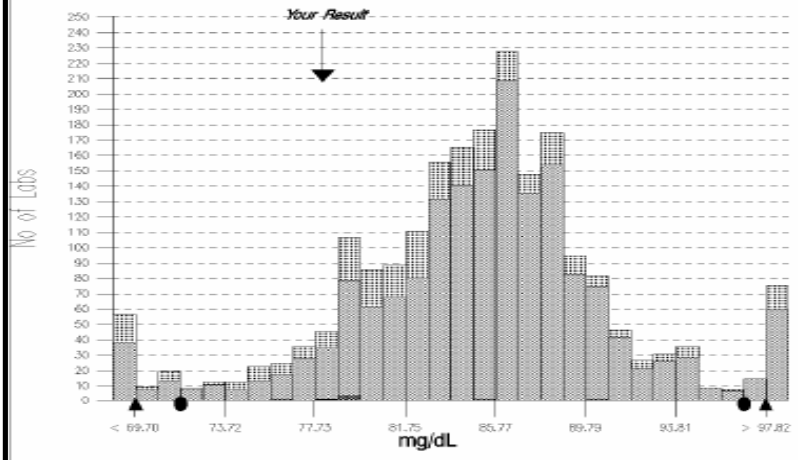


Laboratory Number: 13029 — **4 : Triglycerides**

Your Result: **78.0** **mg/dL**

	Results Accepted	Mean	SD	Results Excluded	Your deviation from mean SDI	Your deviation from mean %
Your Mode	2047	84.7	6.04	44	−1.12	−7.9
Your Group	1701	85.1	5.77	32	−1.23	−8.3
Your Method	7	81.1	4.87	0	−0.63	−3.8
Gly Corr	363	83.8	7.03	9		

Method : 693-377 M – Lip/GK colorimet w/o corr Human Humalyzer



Histogram Legend
- Gly Corr
- Your Mode
- Your Group
- Your Method
- Your Result

L–J Comparator
- Group 693 (L)
- Group 693

▲ 2sd Limits for Gly Corr ● 2sd Limits for Your Mode

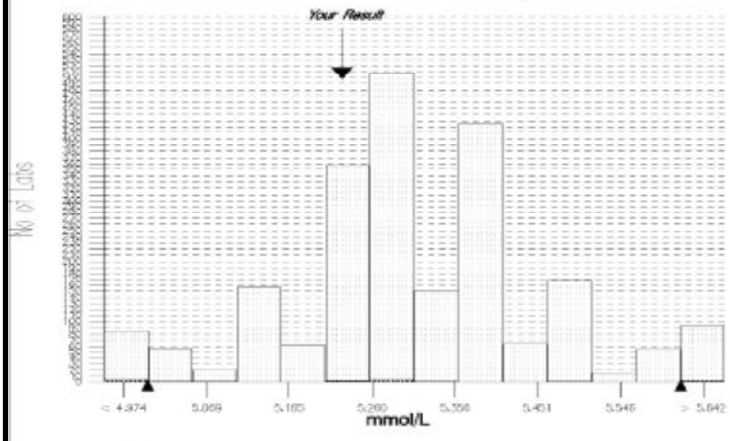
Bio-Rad Laboratories — **Monthly Clinical Chemistry**

Laboratory Number: 13029 — **5 : Potassium**

Your Result: **5.2** **mmol/L**

	Results Accepted	Mean	SD	Results Excluded	Your deviation from mean SDI	Your deviation from mean %
All results	2150	5.308	0.167	54	−0.65	−2.0
Your Group	10	5.214	0.182	4	−0.08	−0.3
Your Method	10	5.214	0.182	4	−0.08	−0.3

Method : 191-999 – Other Methodology HUMALYZER 3000



Histogram Legend
- All Results
- Your Group
- Your Method
- Your Result

L–J Comparator
- Method 999

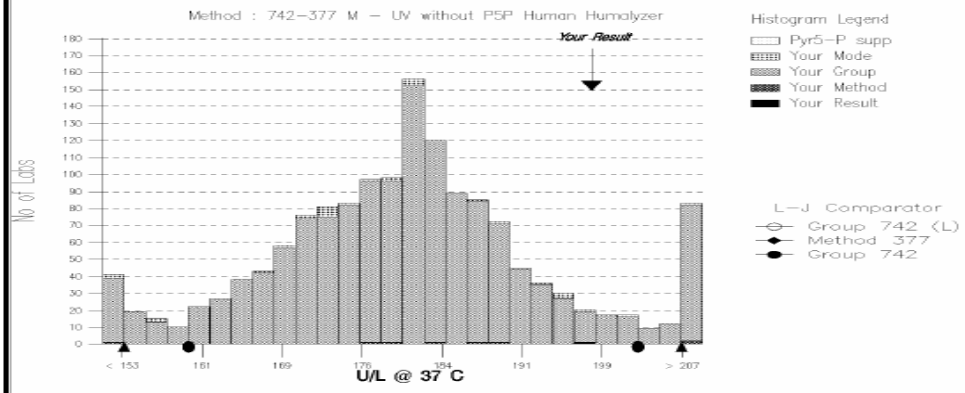
▲ 2sd Limits for All Results

Bio-Rad Laboratories — **Monthly Clinical Chemistry**

Laboratory Number: 13029 — **6 : Alanine Aminotransferase (ALT)**

Your Result: **198.0** **U/L @ 37 C**

	Results Accepted	Mean	SD	Results Excluded	Your deviation from mean SDI	Your deviation from mean %
Your Mode	1459	180	13.3	40	+1.35	+10.0
Your Group	1428	180	13.3	38	+1.35	+10.0
Your Method	8	186	23.6	1	+0.50	+6.3
Pyr5-P supp	892	181	10.9	16		

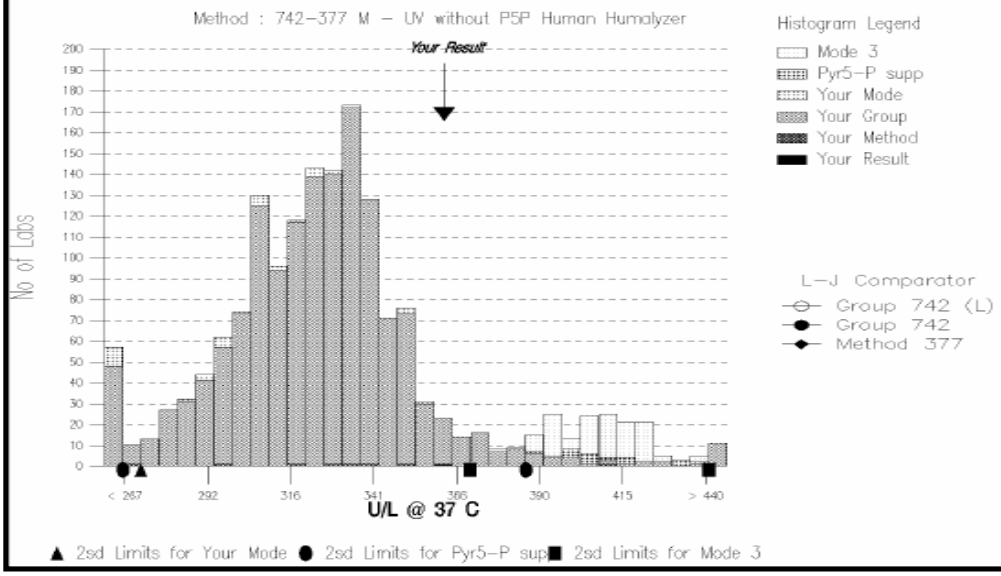


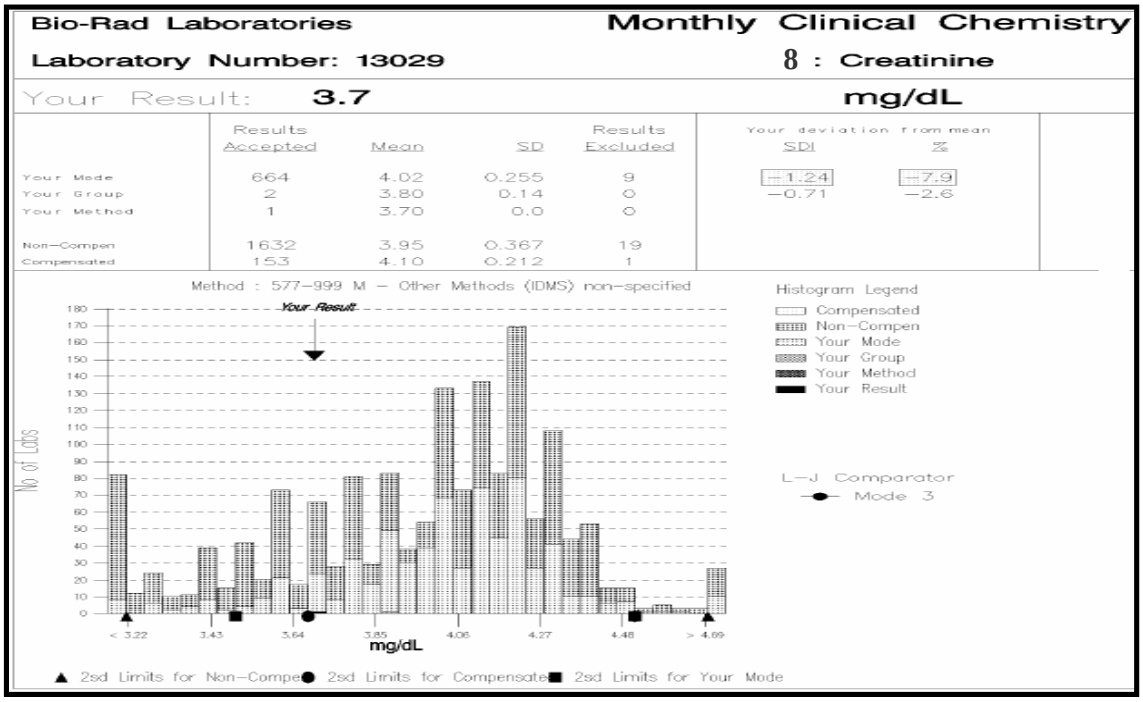
Bio-Rad Laboratories — **Monthly Clinical Chemistry**

Laboratory Number: 13029 — **7 : Aspartate Aminotransferase**

Your Result: **361.0** **U/L @ 37 C**

	Results Accepted	Mean	SD	Results Excluded	Your deviation from mean SDI	Your deviation from mean %
Your Mode	1493	323	25.4	39	+1.48	+11.6
Your Group	1456	324	25.0	34	+1.50	+11.6
Your Method	9	334	39.3	0	+0.68	+8.0
Pyr5-P supp	610	328	30.5	11		
Mode 3	184	405	17.3	1		




Bio-Rad Laboratories
Monthly Clinical Chemistry
Laboratory Number: 13029
8 : Creatinine
Your Result: 3.7
mg/dL
Results Accepted
Mean
SD
Results Excluded
Your deviation from mean
SDI
%
Your Mode 664 4.02 0.255 9 +1.24 +7.9
Your Group 2 3.80 0.14 0 −0.71 −2.6
Your Method 1 3.70 0.0 0
Non−Compen 1632 3.95 0.367 19
Compensated 153 4.10 0.212 1
Method : 577−999 M − Other Methods (IDMS) non−specified
Your Result
No of Labs
mg/dL
< 3.22
3.43
3.64
3.85
4.06
4.27
4.48
> 4.69
Histogram Legend
Compensated
Non−Compen
Your Mode
Your Group
Your Method
Your Result
L−J Comparator
Mode 3
▲ 2sd Limits for Non−Compe
● 2sd Limits for Compensate
■ 2sd Limits for Your Mode

APPENDIX 3

The Test Request-Payment Slip Form

អង្គការ ម.ព.ជ មណ្ឌលពត៌មានជំងឺ

[illegible]

ទូរស័ព្ទ: 023 884 483 / 092 289 197 / 012 926 071

ប័ណ្ណស្នើសុំ - ប័ណ្ណបង់ប្រាក់ / Test Request – Payment Slip Form

កាលបរិច្ឆេទ / Date:	/ / 20.............	លេខប័ណ្ណស្នើ / Request Nr:	

ពត៌មានអំពីសមាជិកស្នើសុំ / Information :

លេខកូដ / Code Nr	- -	ភេទ / Sex:	
ឈ្មោះ / Name:		អាយុ / Age:	
លេខទូរស័ព្ទ		ពត៌មានបន្ថែម:	

មូលនិធិបង្វិលទុនឱសថមិនស្វែងរកប្រាក់ចំណេញ / Not-For-Profit Revolving Drug Funds

ផ្នែកមន្ទីរពិសោធន៍ / Laboratory Unit   តារាងតំលៃតេស្តមន្ទីរពិសោធន៍ / Laboratory test price list

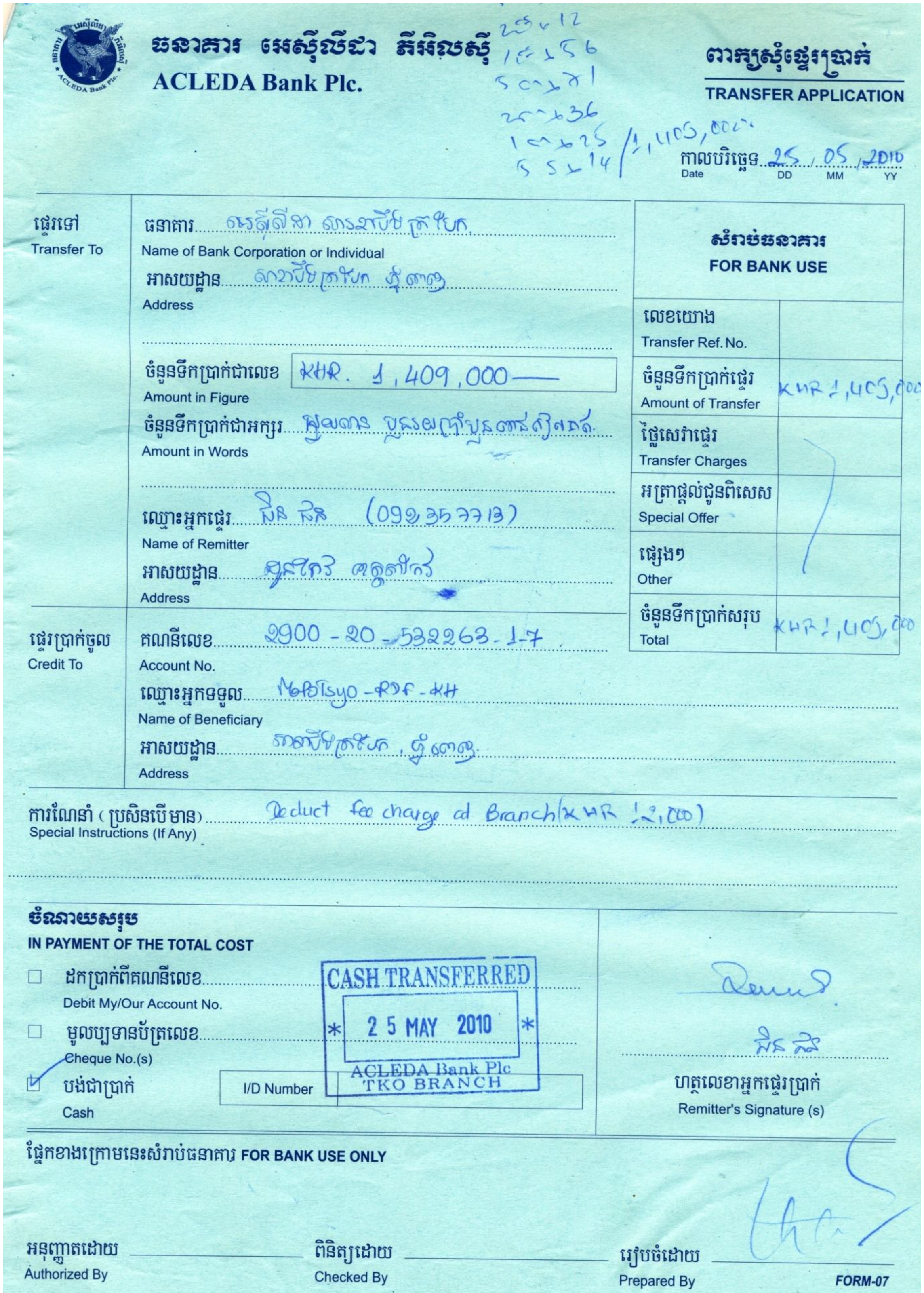
លរ Nr	បរិយាយឈ្មោះតេស្ត Description	តេស្តស្នើសុំ Test Request	តំលៃរាយ Unit Price	តំលៃសរុប Amount
01	កូលេស្តេរ៉ុលសរុប / Total Cholesterol		1,500 រៀល	
02	អេចឌីអិលកូលេស្តេរ៉ុល / HDL Cholesterol		3,000 រៀល	
03	ក្រេអាទីនីន / Creatinine		2,000 រៀល	
04	ស្ករក្នុងឈាម / Blood Sugar		1,000 រៀល	
05	ប៉ូតាស្យូម / Potassium		4,000 រៀល	
06	ទ្រីគ្លីសេរីដ / Triglyceride		2,500 រៀល	
07	ត្រង់សាមីណាស / Transaminase		4,000 រៀល	
08				
			សរុបទាំងអស់ / Grand Total:	

[illegible]

អ្នកស្នើសុំ-បង់ប្រាក់ / Re & Paid by:	ទទួលប្រាក់ដោយ / Received by:	បំពេញប័ណ្ណដោយ / Form filled by:
ឈ្មោះ:....................................	ឈ្មោះ:....................................	ឈ្មោះ:....................................

សំគាល់: [illegible]

The LSP Bank's Transfer Slip


ធនាគារ អេស៊ីលីដា ភីអិលស៊ី
ACLEDA Bank Plc.

ពាក្យសុំផ្ទេរប្រាក់
TRANSFER APPLICATION

កាលបរិច្ឆេទ / Date: 25 / 05 / 2010 (DD MM YY)

ផ្ទេរទៅ / Transfer To
ធនាគារ / Name of Bank Corporation or Individual
អាសយដ្ឋាន / Address
ចំនួនទឹកប្រាក់ជាលេខ / Amount in Figure: KHR. 1,409,000—
ចំនួនទឹកប្រាក់ជាអក្សរ / Amount in Words
ឈ្មោះអ្នកផ្ទេរ / Name of Remitter (092 357713)
អាសយដ្ឋាន / Address

ផ្ទេរប្រាក់ចូល / Credit To
គណនីលេខ / Account No.: 2900 - 20 - 532263 - 1 - 7
ឈ្មោះអ្នកទទួល / Name of Beneficiary: MOTSYO - RDF - KH
អាសយដ្ឋាន / Address

សំរាប់ធនាគារ / FOR BANK USE

លេខយោង Transfer Ref. No.	
ចំនួនទឹកប្រាក់ផ្ទេរ Amount of Transfer	KHR 1,405,000
ថ្លៃសេវាផ្ទេរ Transfer Charges	
អត្រាផ្តល់ជូនពិសេស Special Offer	
ផ្សេងៗ Other	
ចំនួនទឹកប្រាក់សរុប Total	KHR 1,405,000

ការណែនាំ (ប្រសិនបើមាន) / Special Instructions (If Any): Deduct fee charge at Branch (KHR 2,000)

ចំណាយសរុប
IN PAYMENT OF THE TOTAL COST
☐ ដកប្រាក់ពីគណនីលេខ / Debit My/Our Account No.
☐ មូលប្បទានប័ត្រលេខ / Cheque No.(s)
☑ បង់ជាប្រាក់ / Cash — I/D Number

CASH TRANSFERRED
25 MAY 2010
ACLEDA Bank Plc
TKO BRANCH

ហត្ថលេខាអ្នកផ្ទេរប្រាក់ / Remitter's Signature (s)

ផ្នែកខាងក្រោមនេះសំរាប់ធនាគារ FOR BANK USE ONLY

អនុញ្ញាតដោយ / Authorized By
ពិនិត្យដោយ / Checked By
រៀបចំដោយ / Prepared By

FORM-07

Curriculum Vitae

Kem Boreth was born on April 02, 1980 in Kandal Province. He left his hometown to continue his study in Phnom Penh City since 2001. Currently, he is studying at Norton University in Phnom Penh for the **Master in Development Management**. He has already got a **Bachelor Degree of Biochemistry** from Royal University of Phnom Penh since 2005. Further, he has got a lot of experiences in his careers. He has been working as a Laboratory Technician since July 2010 at MoPoTsyo Patient Information Centre based in Phnom Penh City which working with the chronic diseases includes diabetes and high blood pressure in the poor communities. His main responsibility is to analyze the eight blood tests such as Albumin, Total Cholesterol, HDL Cholesterol, Triglyceride, Creatinine, Glucose, Potassium, and Transaminase. He has 4 years experiences in Teaching Chemistry at Peam Chikang high school in Kampong Cham province, 3 years in Teaching English at Hello American School in Phnom Penh and 1 year as Laboratory Specialist at Societé Khmere des Distilleries Company (SKD).


NORTON
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