CHAPTER II

ESSAY ON

Improvement of Laboratory Services in Baaray-Santuk Referral Hospital

2.1. Introduction

Baaray-Santuk Referral Hospital (BSRH) is situated along the main road (national road No. 6) in Baaray District in Kampong Thom Province which is in the central region of The Kingdom of Cambodia. Baaray-Santuk Referral Hospital is the former Baaray District Hospital and has been upgraded to one of the three-Referral Hospitals in Kampong Thom Province, according to the 1995 national health coverage plan for implementing health care system reform. It has to provide health care to the population in the catchment area, which consists of two districts with a population of 200,000 in Baaray, and Satuk districts in the southern region of Kampong Thom Province.

Besides providing health care services in the Referral Hospital, Baaray-Santuk Referral Hospital is responsible for referred cases from the 19 health centers in this catchment area, according to the role of a Referral Hospital as Complete Package Activities (CPA) defined by the Ministry of Health.

The present bed capacity of the Referral Hospital is 75 and there are 54 health staff who are working in the Baaray-Santuk Referral Hospital. Of the staff of 54, five are medical doctors, nine are medical assistants, eleven are

secondary nurses, two are secondary laboratory technicians, six are primary nurses, three are primary midwives, two are drivers and the others are administrative staff. There is no pharmacist, dentist, pharmacist assistants, dental assistant, secondary midwife, physiotherapist, primary laboratory technician, X-ray technician, preparatory pharmacist, and secondary accountant, working in Baaray-Santuk Referral Hospital.

The present infrastructure of the Referral Hospital is not a permanent structure. It is the single and old building due to unavailability of budget from the government to renovate and/or construct new buildings. It had been constructed long time ago in the 1960s, before the civil war in Cambodia. However, the Ministry of Health in collaboration with other non-government organization, especially the GTZ Health Project, planned to construct some new buildings by considering the role of the Referral Hospital based on Complete Package Activities (CPA) and the policy of the Ministry of Health.

In this essay, I'm going to give a brief overview of country profile, the development of health care services in Cambodia, the definition of laboratory services, the quality of laboratory service support in the Referral Hospital, quality assurance in laboratory services, organization of laboratory services at the Referral Hospital or intermediate level, further I will address providers and consumers of laboratory services, problem identification and analysis, and ways to improve laboratory services in Baaray-Santuk Referral Hospital.

2.2. Country Profile

The Kingdom of Cambodia is located in the South East Asia region with a land area about 181,035 square kilometers, and about 560 km from the west to the east and 440 km from the south to the north. It is bordered by Thailand in the north-western region, Viet Nam in the south-eastern region, Laos in the north-eastern region, and the sea in the west-southern region. Cambodia has been divided in to three regions: Coastal region, Mekong delta region, and Mountain and Highland region.

The population of Cambodia is estimated to be about 11.4 millions (National Census in 1998). Most of Cambodian people are women and children. 80% of population are living in rural areas and the main occupation is farming. Cambodia has been classified as one of the poorest countries in the world and the income per capita (GNP) is about USD 300 because they suffered for a long time, from 1970s till early 1990s, from civil war.

2.3. Development of Health Care Services

2.3.1. Health Care System Reform

The health care system in Cambodia was changed many times according to political events as changes in the regimes occurred. In the last decade after the first general election in Cambodia in 1993 brokered by The United Nations Transitional Authority in Cambodia (UNTAC), a new government was formed, and the Ministry of Health initiated the health care system reform in Cambodia.

The former health care system was based on administration regions rather than population coverage and accessibility criteria. There were four levels in the old health care system: the central level (Ministry of Health, national programs, central hospitals and institutions), the provincial level (provincial health department and provincial hospital), district level (district health office and district hospital), and commune level (commune health center).

After implementing health care system reform, the Ministry of Health has been trying to improve the capacity of health care staff at the national level as well as at the operational district level through several measures (MoH, 1999). Firstly, a number of physicians have been trained within and/outside the country as specialists so that they can carry out their jobs in hospitals as surgeons, anesthesiologists, pediatricians, gynecologists and obstetricians, ophthalmologists, general practitioners, and clinical biologists. Secondly, the Ministry of Health is providing a training program for physicians working in Referral Hospitals. They have been trained and have practiced in national institutions or hospitals to improve the capacity of staff in terms of surgery, emergency care, anesthesiology etc in order to improve the quality of care in Referral Hospitals regarding to its role to provide a Complete Package of Activities (CPA).

2.3.2. Present Laboratory Services

Laboratory services in Cambodia have been integrated into health care services at all levels of the health care system, especially in Referral Hospitals of the operational district level. But there are no laboratory services at the most peripheral level being the health centers. The laboratory service system has only been divided into two levels: (1) central level or national level, and (2) intermediate level which is established in Referral Hospitals to support health care deliveries.

In addition, the present laboratory services in Referral Hospitals are independent laboratory services. This is because there is no referral system for specimens that can not be done in one Referral Hospital to another Referral Hospital or laboratory services at the national level. Although there is the National Reference Laboratory (NRL) but it is only responsible for in-service training and research, development of laboratory standards, and quality control in terms of external quality assessment scheme (EQA) to help laboratory services within Referral Hospitals for developing internal quality control program (IQC), as defined by the Ministry of Health.

There are only very few laboratory tests that can be provided by laboratory services in Referral Hospitals. Most of laboratory services in Referral Hospitals have only microscope and they can provide only stool, mycobacterium tuberculosis, malaria examination, and blood cell count (MoH/ADB Survey, 1995). Further, besides services mentioned above laboratory services in Referral

Hospitals which were former provincial hospitals can provide more services such as HIV screening test, hepatitis B and C, syphilis test, and ABO blood group test/Rhesus factors. This is because the role of Provincial Hospitals and District Hospitals were different before implementing the health care system reform in 1995. Equipment and facilities have not been upgraded yet, including laboratory services, in Referral Hospitals that were former District Hospitals to provide the quality health care.

2.4. Definition of Laboratory Services

Two types of laboratory services are defined according to the role of the laboratory, namely public health laboratory and clinical laboratory services. Even though, they have some differences in terms of its functions at intermediate level, laboratory services usually have been established in regional or district hospitals (WHO, 1994).

Roemer (1993) said that laboratory services contribute to the operation of national health system in many ways. Broadly speaking, they have developed along two pathways: laboratories for examination of specimens in public health programs and laboratories for services to individual patients receiving medical care. These are often defined as "clinical laboratory services" and "public health laboratory services".

Therefore, according to the policy of the Ministry of Health of Cambodia that defines the function of laboratory services as one component of the

Complete Package Activities (CPA) within Referral Hospitals and responsible for laboratory diagnosis, this study will focus on clinical laboratory services.

2.5. The Quality of Laboratory Services Support

Laboratory services are an essential part in health care services which support diagnosis and treatment services in a hospital. In general practices in health care, there are three steps for patients who come to see doctor or visit the hospital with health problems before there is an accurate diagnosis and appropriate treatment.

Firstly, it is the history of patients, in which they describe health problems based on their perceptions. Secondly, the physical examination of doctors or physicians. In this step, sometimes doctors can not arrive at a diagnosis to provide appropriate treatment. Therefore, they need the support from other services, especially laboratory services to come up with an accurate diagnosis of disease in order to provide appropriate treatment for individual patients. Finally, for follow up of treatment they need service support all the time, particularly for chronic diseases e.g. diabetes, tuberculosis, and other condition e.g. emergency care and surgery. Laboratory services can ensure safe blood products for transfusions in hospitals through screening tests for HIV and other infectious disease agents.

In addition, unavailability of blood transfusion in Referral Hospitals that are former district hospitals before implementing health care system reform in

1995 is a common problem. It is due to lack of laboratory service support within Referral Hospitals and also because Blood Bank Centers have only been established in the provincial town.

Blood transfusions can be made available only in Referral Hospital in provincial towns because laboratory services in those hospitals are better than in Referral Hospitals that are former District Hospitals even though blood safe product is not available from blood bank center. Because in the context of Cambodia, there are three categories of blood donors either in urban areas or in rural areas which have been reported by the National Blood Transfusion Center (MoH, 1997). The first blood donors who devoted their blood product to National Blood Transfusion Center or blood bank center in provincial towns by themselves through blood donation campaigns. The second blood donors, blood products come from relative of patients when they are sick. The third donors, blood products come from people who sell their blood because they are poor. Therefore, laboratory services in the Referral Hospital should be able to provide safe blood products for transfusions.

There is no specific definition for the terms "quality of laboratory services" and "quality improvement of laboratory services" at intermediate level or district hospital (Heuck, 1999). However, Alexandria (1995) defined the term " quality" in the publication of WHO regional office for the eastern Mediterranean "Quality Systems for Medical Laboratories". He said that "quality" is the totality of features and characteristics of a product or service that influence its ability to satisfy stated or implied needs.

Tarimo, E., and Webster, E.G. (1996) also stated that the availability of efficient and reliable laboratory services is essential for diagnosis and treatment. The use of laboratory services to test blood to be used for transfusion is especially important, in view of the prevalence of hepatitis A and B, and HIV/AIDS.

Based on the above mentioned concepts, the quality of laboratory services support in the Referral Hospital can be described as follow: "The availability of laboratory tests that can response to the need of doctors and medical assistants, and patients in order to support diagnosis and treatment services for individual patients in the Referral Hospital with quality assurance of laboratory services. Furthermore, laboratory services should be able to provide safe blood products for transfusion in the Referral Hospital through screening tests for providing safe blood product".

2.6. Laboratory Quality Assurance

Laboratory quality assurance (QA) is concerned with sampling, specifications and testing as well as with organization and release procedures that ensure that the necessary and relevant steps have been taken to ensure satisfactory quality (WHO, 1998).

There are two important independent variables in terms of quality assurance in laboratory services at all levels either in the central level or the

intermediate level of laboratory service system. The two variables are internal quality control (IQC) and external quality assessment scheme (EQA).

Figure 2.1: Two important variables of laboratory quality assurance

	Internal		External
Quality Assurance (QA) =	Quality (IQC)	+	Quality (EQA)
	Control		Assessment

In Cambodia, we don't have quality control programs for laboratory services, even though there is a National Reference Laboratory (NRL) which is responsible for those programs. It is because there are no laboratory standards yet to provide rules and guidelines for common use in laboratory services within the country (MoH, 1999). All laboratory services either at central level or at intermediate level, have no standard operating procedure manual that laboratory technicians should follow in order to perform laboratory tests correctly.

According to the WHO's recommendation, all laboratories should take part in quality control programs in terms of internal quality control (IQC) and external quality assessment scheme (EQA). WHO (1996) stated that "IQC and EQA are complementary. Every laboratory must establish and maintain a IQC program and participate in an EQA scheme. Furthermore, IQC plays a central role in underpinning laboratory quality".

2.6.1. Internal Quality Control (IQC)

Internal quality control refers to the set of procedures employed by laboratory staff for continuous and immediate monitoring of laboratory work in order to decide whether their test results are reliable enough to be released. The process involves a work culture in which all the possible variables that can influence the results have been checked against standards or their appropriateness has been verified (WHO 1996).

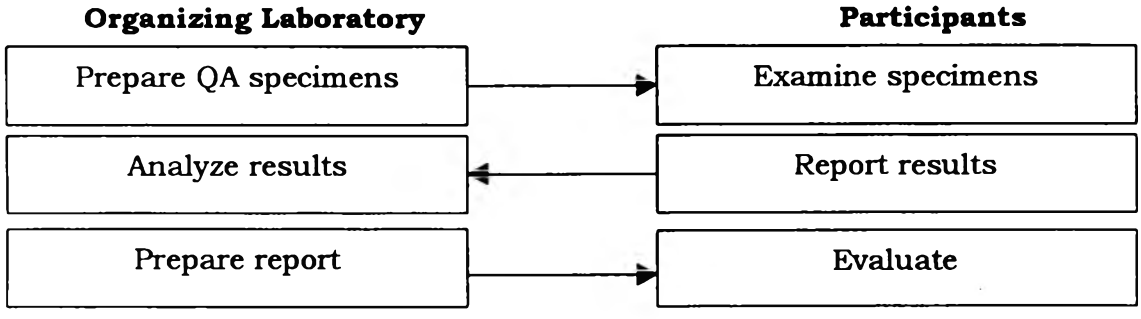
2.6.2. External Quality Assessment (EQA)

External quality assessment scheme is a check on the performance of laboratories. This mechanism involves a periodic and retrospective evaluation of a laboratory, which undertaken by an independent and external laboratory by incorporating proficiency panels as the means of evaluation.

The objective of external quality assessment scheme is to establish inter-laboratory comparison, make participating laboratories conscious of their shortcomings, and suggest measures for improvement so as to ensure reliability of future testing.

A good external quality assessment scheme is a tool for assessing the internal quality control, but is never a substitute for internal quality control (WHO, 1996).

Figure 2.2. The process of external quality assessment



2.6.3. Alternative Strategies of Quality Control

2.6.3.1. On-the-Spot Control

This method is advocated for laboratories with little or no central supervision or where the medical or non-medical scientific staff is inadequate to maintain supervision of the technical staff.

The procedure consists of forming a group of qualified laboratory technicians with teaching experience in the various laboratory disciplines, directed whenever possible by a team leader appointed by the central laboratory.

This team, possibly provided with a mobile unit and selected specimens, visits peripheral and intermediate laboratories and asks technical staff there to perform certain analyses. The results are evaluated and compared with the

standards and at the same time the techniques and equipment used are assessed.

A very useful additional member of the team is a specialist in laboratory instrument maintenance and repair, who would check all the equipment. The strict control of laboratory methodology, which is greatly helped by an up-to-date manual accredited at national level, increase laboratory efficiency.

A regular dialogue between the laboratory's scientific staff and the various users of the laboratory will provide valuable information about the true value of the laboratory's reports and lead to a readjustment of the range of tests supplied by local health laboratory service (WHO, 1972).

2.6.3.2. Simple Methods of Quality Control

Simple methods have been devised as a preliminary measure until more elaborate external or internal procedures using unknown controls can be applied. These techniques may be of particular value in certain developing countries (WHO, 1972).

2.7. The Organization of Laboratory Services in the Referral Hospital

In order to organize laboratory services within a Referral Hospital, we should consider how important laboratory services are and its components in a

Referral Hospital including laboratory sections and tests, equipment and supplies, laboratory staff and laboratory infrastructure.

During the 49th session of the WHO regional committee for the South East Asia region in Chiang Mai, Thailand, 9-14 September 1996, it was stated that clinical laboratory services are an important component of health care system for supporting the diagnosis and treatment of individual patients.

The meeting also stated that "quality of laboratory services lead to the establishment of an accurate diagnosis in a patient, the institution of appropriate treatment, assessment of prognosis, confirmation of successful treatment, detection of the source of infection (environment analysis), early diagnosis of an outbreak or epidemic, selection of appropriate chemoprophylaxis for individual patients and community, tracing of the spread of infection to control it, and identification of the role of environment factors".

The WHO 's regional publication in Western Pacific Series No. 4 in 1996, they indicated that modern medicine is increasingly dependent on laboratory services for the prevention, diagnosis, and control of diseases. Therefore, laboratory services play a central role in the hospital and in the community health services, and each hospital must have an adequate laboratory service under the direction of a medically qualified pathologist.

Carter (1996) stated that, laboratory investigations are essential part of health care, especially in tropical countries. They should be able to provide a

set of core tests to help in the treatment of sick children. Other tests can then be added, according to the funding and facilities available, and the level of trained staff. Clinical staff need to be able to order tests appropriately and interpret results correctly, and laboratory staff should be able to perform tests to an acceptable standard.

WHO (1996) indicates that a comprehensive laboratory in a district hospital should have the following sections such as hematology, clinical pathology, and microbiology.

How laboratory services at a district level or intermediate laboratory should be established, was described by another WHO publication (WHO, 1996). Stating that laboratory services should be very well equipped, adequately funded and staffed and carefully planned to provide proficient testing. They also highlighted the main points of establishing laboratory services at the intermediate level such as laboratory sections and tests, laboratory staff, and equipment.

2.7.1. Laboratory Sections and Tests

WHO (1996) provided a suggested list for a full range of laboratory tests (see Appendix E) and sections at the intermediate level or referral hospitals such as: Microbiology and Parasitology, Serology, Clinical Biochemistry, Hematology, Blood Transfusion, Cytology, and Histopathology (if possible). They

also described the functions of each laboratory section at the intermediate level as follow:

Microbiology and Parasitology: This section should provide facilities for

- Basic microscopical work for evidence of inflammation, exudate, bacteria, fungi, protozoa, and helminthes.
- Darkfield microscopy for T.pallidum.
- Culture and antibiotic sensitivity testing of clinical specimens such as faeces, urine, blood, pus, cerebrospinal fluid (CSF), throat swabs, aspirated fluids, and urethral discarge.
- Samples should be dispatched to state or central laboratories for virus detection (eg, rotavirus, encephalitis) and serology.

Serology: This section should provide facilities for the VDRL test, agglutination tests, antistreptolysin O test, immunological techniques for pregnancy, and screening for human immunodeficiency virus (HIV) and hepatitis B surface antigen (HBsAg). The screening tests selected should be rapid, simple, sensitive, reliable and cheap.

Clinical Biochemistry: Facilities provided in this section should allow

- Urine examination (glucose, protein, ketones, bile salts/pigments, urobilinogen, pregnancy testing and microscopic examination of deposits)
- Blood examination (glucose, urea, bilirubin, protein, alkaline phosphatase, and serum glutamic oxalo-acetic transaminase SGOT).
- CSF examination (glucose, protein).

- Faeces examination (occult blood).

Haematology: Facilities in this section should provide for haemoglobin estimation, total and differential leucocyte counts, peripheral blood smears, erythrocyte sedimentation rate determination (ESR), eosinophil, platelete and reticulocyte counts, bone marrow examination, bleeding and clotting time estimation, prothrombin time estimation, lupus erythematosus (LE) cell preparation, and blood grouping ABO/Rh (D).

Blood transfusion: This section should provide facilities for storage of blood products, blood pressure and weight determinations, hemoglobin estimations and screening for HIV-1 (HIV-2 also if considered to be prevalent), HBsAg and syphilis (Rapid plasma reagin RPR) as well as other infections as decided by the national policy. Compatibility testing for ABO blood groups and Rhesus factor D (RhD) cell grouping with cross matching at room temperature (saline tube test) followed by immediate centrifugation and anti-human globulin test.

Cytology: Cytology facilities should provide for early detection of cancer, cervical specimen examination, and fine needle aspiration cytology.

Histopathology: Histopathology facilities should provide for examination of biopsy and organ material removed during operations, and post-mortem examinations.

However, in the context of Cambodia we could not provide all of those tests or sections because our resources are limited in terms of human resources, health infrastructure, and availability of government budget to provide all of the equipment and supplies. There are only secondary laboratory technicians and primary laboratory technicians who have been working in the operational district level or Referral Hospitals. Also the poor health infrastructure regarding to availability of electricity, water supplies, and space for establishing laboratory services in hospitals and limitations in government budgets (about 1.8 USD per head) spent on health care within the country. This contributes to limited availability of laboratory sections and tests in the hospitals (MoH, 1998).

2.7.2. Laboratory Equipment

WHO (1996) provided a list of equipment that was necessary for the laboratory services in intermediate level or referral hospitals. The following laboratory equipment and its quantity should be available: Binocular Microscope with in built light (02), Dark Field Microscope (01), Inoculating Chamber (02), Centrifuge (02), Autoclave "downward displacement type"(02), Incubator (02), Hot Air Oven (01), Water Bath (02), VDRL Shaker (01), Colorimeter (01), Haemoglobinometer (several), Haemocytometer (several), Westergren tube and stand (several), Refrigerator (01), Balances (02), pH meter (01), Inspissator (01), Deionizer/distilled water apparatus (01), Microtome (01), and Histokinette (01).

In fact, equipment and supplies will be provided for tests or laboratory sections in the hospitals based on a priority setting steered by the limitation mentioned above. Selection and purchase of equipment must be done carefully because laboratory equipment is expensive. Especially because laboratory equipment and supplies in Cambodia are imported from foreign countries due to lack of equipment and supply production in the country.

Therefore, we need to make sure that equipment and supplies should be chosen carefully. We need laboratory experts and/or experienced persons to make decisions on this issue.

Carter (1996) suggested that buying laboratory equipment is expensive for a small hospital, so equipment should be carefully chosen. The best approach is to first decide what tests the laboratory will do, then choose equipment based on advice from local professional sources rather than from commercial agents or manufacturers. In addition, it was advisable to choose good quality equipment which can bought easily within the country or region and which is backed up by qualified service engineers and a supply of spare parts. Laboratory staff should be trained in basic care and maintenance of all equipment. For laboratories without electricity supply, equipment that operate on 12 volt power sources should be available. New or second handed equipment from generous donors can cause a problem, unless they are supplied with an operator or service manual in a locally understandable language. Recipients of equipment should ask donors to provide manuals, spare parts and where

possible, training in the use of the equipment they donate. Without this, correct use and repair are almost impossible.

2.7.3. Laboratory Staff

WHO (1994) suggested that the following staff should be included in laboratory services at the intermediate level or Referral Hospital such as one qualified pathologist/microbiologist (Doctor of Medicine/diploma in clinical pathology), three technicians (diploma in medical laboratory technology), two laboratory assistants, two laboratory attendants, one cleaner, and one clerk-cum-storekeeper.

Regarding to the human resources for laboratory services in Referral Hospitals, we can provide mostly laboratory staff that are recommended by WHO, especially for secondary laboratory technician and primary laboratory technician because they are available in the operational district level except microbiologist or laboratory specialist for complicated laboratory tests or examinations. However, the Ministry of Health in Cambodia can not provide cytology and histopathology services in the Referral Hospital due to unavailability of human resources.

2.7.4. Laboratory Infrastructure

The space for establishing laboratory services at the intermediate level or Referral Hospitals should be provided appropriately for staff working in each

section of laboratory services, equipment installations and the storage of supplies.

The following space is suggested by WHO (1994):

- Microbiology/serology laboratory (30' × 16')
- Clinical biochemistry, hematology, cytology, histopathology (30' × 16')
- Sterilization, media preparation laboratory (20' × 16')
- Store room (10' × 16')
- Office (10' × 16')

As a whole, health infrastructures in Cambodia are poor especially in the Referral Hospitals that were former District Hospitals before implementing health care system reform in 1995. This results in poor laboratory infrastructure in terms of space for establishing properly laboratory services contributing to poor quality and to limited availability of laboratory tests and services in the Referral Hospital.

2.8. Providers and Consumers of Laboratory Services

In order to address the issue of poor quality of laboratory services in Baaray-Santuk Referral Hospital, it is important that we consider both sides laboratory service consumers and providers. The consumers of laboratory services in the Referral Hospital are medical doctors, medical assistants, and patients. However, patients do use laboratory services indirectly through

medical doctors and medical assistants who provide diagnosis and treatment. Laboratory service providers are usually laboratory technicians.

Therefore, medical doctors, medical assistants, and laboratory technicians are the target population for determination of common health problems for which laboratory tests are needed. And to determine the deficiencies and shortcomings relating to the present laboratory services. The information gathered from both laboratory services users and providers will be useful to improve laboratory services in Baaray-Santuk Referral Hospital.

2.9. Problem Identification and Analysis

2.9.1. Present Status

Laboratory services in Baaray-Santuk Referral Hospital are provided by two secondary laboratory technicians. Only blood cell count, stool, malaria, and mycobacterium tuberculosis examinations are available in the Referral Hospital (MoH, 1997). These laboratory tests currently provide the only support to diagnosis, treatment and follow up of some diseases.

2.9.2. Present Laboratory Service Problems

Current laboratory services in Baaray-Santuk Referral Hospital can not sufficiently respond to the needs of medical doctors and medical assistants in order to support diagnosis and treatment services. One factor is the number of patients in outpatient consultation and in patient services of the Referral

Hospital, the main health problems in outpatient consultation and in-patient services, and amount of laboratory tests that can be provided by the section of laboratory services. Furthermore, from a technical survey report conducted by the Ministry of Health in collaboration with Asian Development Bank (ADB) in 1995 it was found that laboratory services were limited to support diagnosis and treatment services because only a microscope is mainly available in hospitals in rural area.

The out-patient consultation in Baaray-Santuk Referral Hospital sees about 20 to 40 outpatients per day and since the upgrading of the hospital to a Referral Hospital status, in patient services has seen a increase of the admission rate of about 5 to 15 patients per day. These patients can be divided into two categories: the patients who come by themselves to the hospital and patients who are referred from three Health Centers in the catchment area (other sixteen Health Centers in this catchment area are not functioning yet).

According to the report of Kampong Thom Provincial Health Department in 1997, the main health problems among out patients are fever (26.99%), acute respiratory infections (15%), diarrhea (14%), and malaria (4.11%). The main health problems among in-patients are acute respiratory infections (11.92%), malaria (11.88%), tuberculosis (9.43%), gynecology diseases (8.35%), and diarrhea (4%) (see table 2.1 & 2.2). All of these health problems are infection diseases that usually needs laboratory tests or examination to support diagnosis and treatment for individual patients.

Cambodia is located in the tropical region and there is the high prevalence of infection diseases. Based on personal communications with laboratory staff and also physicians, there are indications that the existing laboratory tests may not be adequate to support diagnosis and treatment services in the Referral Hospital. A number of additional laboratory tests should be available in the Referral Hospital to support diagnosis and treatment services such as complete blood cell counts, platelets, hematocrit, hemoglobin estimation, Widal test, gram stain, culture and antibiotic sensitivity, and urine analysis.

As Carter (1996) stated, laboratory investigations are an essential part of health care, especially in tropical countries. They should be able to provide a set of core tests to help in diagnosis and treatment of patients such as blood slides for malaria, hemoglobin estimation or hematocrit, blood glucose examination (bedside test), urine microscopy and chemistry, cerebrospinal fluid (CSF) microscopy and gram stain, syphilis screening, and direct wet preparations (stool and genital specimens).

Due to poor quality of laboratory services support, medical doctors and medical assistants have no choice and they have to provide diagnosis and treatment for individual patients in the Referral Hospital without accurate diagnosis protocol and therefore, risking inappropriate treatment.

Table 2.1: Main Health Problems in Out Patient Consultation at Kampong Thom

Main Health Problems	0-4 years (%)	5-14 years (%)	≥ 15 years (%)	Total (%)
Malaria	1.35	2.74	6.30	4.11
Other fever	39.17	32.37	17.67	26.99
Diarrhea	20.21	17.53	10.21	14.67
Acute respiratory infections	16.16	15.54	15.45	15.76
Cough > 21 days	0.47	0.59	1.32	0.91
Measles	0.08	0.22	0.03	0.09
Skin infection	3.85	4.66	3.02	3.66
Gynecology infection	0.00	0.12	5.26	2.57
STD for women	0.00	0.00	0.20	0.10
STD for men	0.00	0.01	0.21	0.10
Others	18.72	25.53	40.34	31.04
Total	100.00	100.00	100.00	100.00

Adapted from Kampong Thom Provincial Health Department Report in 1997

Table 2.2: Main Health Problems for In Patient Services at Kampong Thom

Main Health Problems	0-4 years (%)	5-14 years (%)	≥ 15 years (%)	Total (%)
Malaria	10.77	14.05	11.56	11.88
Acute respiratory infections	24.97	15.61	9.55	11.92
Diarrhea	18.63	8.21	1.35	4.03
Typhoid fever	0.38	1.18	1.18	1.11
Dengue	9.89	12.35	0.02	2.87
Non TB meningitis	1.14	1.04	0.02	0.28
Tuberculosis (TB)	1.52	1.04	12.16	9.43
Gynecology diseases	0.00	0.00	11.14	8.35
Road accident	0.51	2.22	5.65	4.64
Mine accident	0.00	0.59	1.59	1.28
Others	32.19	43.71	45.79	44.21
Total	100.00	100.00	100.00	100.00

Adapted from Kampong Thom Provincial Health Department Report in 1997

2.9.3. Expected Problems

Besides the old building of the Baaray-Santuk Referral Hospital, a complementary building has been constructed in 1999. Two health staffs were sent to practice in surgery and anesthesiology at the national hospital. Because

the Referral Hospital Committee plans to provide surgery service so that the Referral Hospital undertakes to its role in this catchment area through the financial support from GTZ Health Project by the end of year 2000.

Therefore, diagnosis and treatment services in the Referral Hospital will need more laboratory tests than the existing tests provided by the section of laboratory services.

2.9.4. Why Poor Quality of Laboratory Services Support?

The mission of Baaray-Santuk Referral Hospital is to provide the quality of care that is responsive to the health needs of people living in its catchment area in Baaray and Santuk district of Kampong Thom Province. Moreover, It is important when we are attempting to analyze the problems of laboratory services, because those services are involved in other health care services of Complete Package Activities (CPA) in the Referral Hospital such as: infectious diseases, chronic diseases, medical and surgical emergencies, simple surgery cases, and obstetric care.

There are many factors that lead to the poor quality of laboratory services support in Baaray-Santuk Referral Hospital. The factors affecting the quality of laboratory services can be described:

(i). Lack of Adequate Equipment and Supplies:

The main problem affecting the poor quality of laboratory service support in the Referral Hospital is unavailability of laboratory equipment and supplies. Although the Ministry of Health has reformed the health care system in Cambodia since 1995, laboratory equipment and facilities have not been upgraded yet in Baaray-Santuk Referral Hospital.

Laboratory staffs are working with limited laboratory equipment and supplies, such as microscope, micropipette, and some chemical products to provide a few laboratory tests and examinations to support the quality of care for individual patients. Moreover, when equipment is not working properly or out of order, technical supports are difficult to find in the country.

(ii). Lack of Knowledge and Skills

In service training for laboratory staff is an essential component so as to maintain and improve the quality of laboratory services (WHO, 1972).

Laboratory staff either working in Baaray-Santuk Referral Hospital or other Referral Hospitals have not been trained. This is because the National Reference Laboratory under the National Institute of Public Health who is officially responsible for in-service training for laboratory staff all over the country has not provided training yet. It is due to lack of laboratory training curriculum and coordination between National Reference Laboratory and

laboratory services in the operational district level. Furthermore, the lack of in-service training and coordination also leads to lack of information for laboratory staff between the central level and the operational district level in terms of new laboratory techniques.

(iii). Lack of Manpower

There is lack of manpower because laboratory staffs are not distributed properly within Baaray-Santuk Operational District. There are five secondary laboratory technicians and six primary laboratory technicians in Baaray-Santuk Operational District but most of them are working in Operational District Health Office in the administrative jobs, and in health centers when there is no laboratory services in Health Centers. There are only two secondary laboratory technicians who are working in the Referral Hospital.

Another problem related to manpower is unavailability of qualified staff or laboratory specialist either in the health operational district level or at the national level of health care system to perform complicated laboratory tests or specimen examinations. This means that we can not provide cytology and histopathology services in the Referral Hospital and the procedures for a referral system of specimens between the operational district level and the national level is not in place.

(iv). Standard Operating Procedures Manual

The standard operating procedures manual (SOPM) is the most important document in a laboratory. It describes in detail the complete technique for performing the tests (WHO, 1998).

Laboratory services in the Referral Hospital have no standard operating procedures manual (SOPM) so that laboratory staff can follow it in order to perform laboratory tests correctly. This due to lack of an internal quality control program for laboratory services in the operational district level.

(v). Lack of External Quality Assessment Scheme and Internal Quality Control

In Cambodia, External Quality Assessment Scheme (EQA) and Internal Quality Control (IQC) have not been established in laboratory services at all levels of the health care system even though there is a National Reference Laboratory.

Due to lack of internal quality control (IQC) and external quality assessment scheme (EQA) in laboratory services, especially at the operational district level, laboratory services in Baaray-Santuk Referral Hospital function without quality assurance.

(vi). Poor Infrastructure

As a whole, the health infrastructure in Cambodia is poor, especially in the Referral Hospitals in rural areas. The infrastructure of Baaray-Santuk Referral Hospital is the old and single building that had constructed long time ago in 1960s. It was never renovated due to the limited budget from the government and also lack of policy and planning. The mains of water supply and electricity are not available in Baaray-Santuk Referral Hospital.

2.9.5. The Consequences of Poor Quality of Laboratory Services Support in the Referral Hospital

The consequences of poor quality of laboratory services in Baaray-Santuk Referral Hospital are contributing to poor quality of diagnosis and treatment services in the Referral Hospital. Due to lack of laboratory services support, medical doctors and medical assistants as clinicians have to provide health care without accurate diagnosis and appropriate treatment for individual patients even though they are trained well to do diagnosis and treatment. It also leads to lack of blood transfusion in the Referral Hospital because of lacking HIV screening test and other infectious disease agents.

WHO (1996) emphasized that the quality of laboratory services will lead to improve diagnosis and treatment service, an accurate diagnosis in a patient, institution of appropriate treatment, assessment of prognosis, confirmation of

successful treatment, early diagnosis of an outbreak or epidemic, selection of appropriate chemoprophylaxis for individual patient and community.

Sidemen and D. BenDak (1997) also indicated that medical technology plays a crucial role in maintaining a high level, modern health care system. Even highly qualified physicians are seriously hampered by the lack of supportive technology for better diagnosis and effective therapeutics.

Furthermore, the lack of accurate diagnosis and appropriate treatment leads to ineffective treatment, increased costs and lost time for patients and health care services. Sometimes, this issue leads to the death for patients due to late diagnosis because doctors and medical assistants can not provide treatment on time and or inappropriate treatment, and lack of blood transfusion in the Referral Hospital.

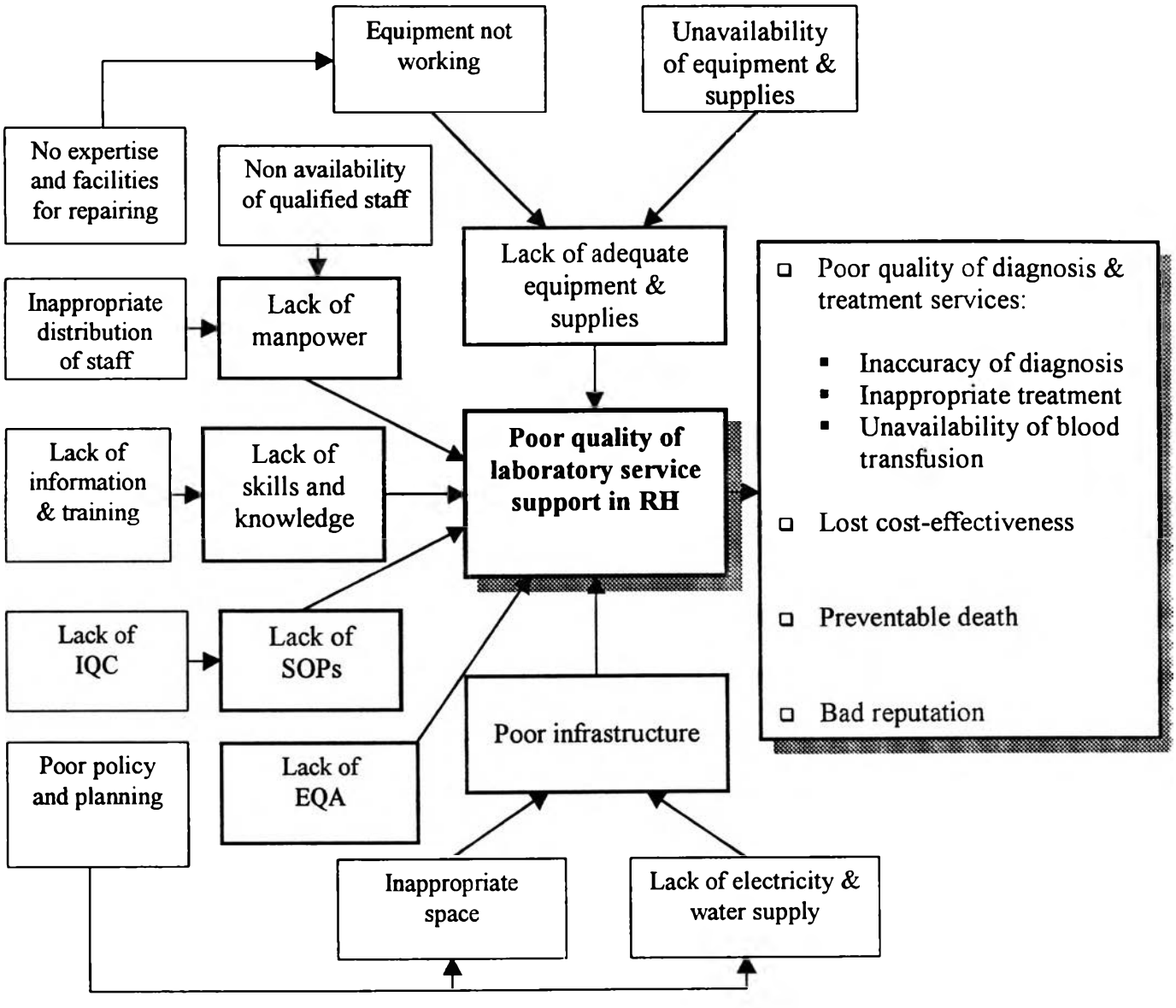
Martha (1998) mentioned that the cost-effectiveness of the health services is highly dependent on the quality of diagnosis of diseases and monitoring of treatment. Correctly and timely diagnosis and treatment are utmost importance to health services budgets as well as to the economic situation of individual and families.

The poor diagnosis and treatment services in terms of inaccurate diagnosis and appropriate treatment, lack of blood transfusion, lost of cost effectiveness for patients, and death in the Referral Hospital may be

contributing to poor reputation and low utilization of Baaray-Santuk Referral Hospital in its catchement area.

(See Figure 2.3)

Figure 2.3: CONCEPTUAL FRAMEWORK: *Causes and Consequences of Laboratory Service Problems*



* IQC = internal quality control
* EQA = external quality assessment
* SOPs = standard operating procedures
* RH = referral hospital

2.10. How Laboratory Services Support in Baaray-Santuk Referral Hospital, Can Be Improved?

In order to address the poor quality of laboratory services in Baaray-Santuk Referral Hospital, equipment and supplies, and laboratory training program should be provided so as to upgrade laboratory services and also to upgrade knowledge and skills of laboratory staff in the Referral Hospital.

However, laboratory equipment and supplies, and the development of training curriculum will be provided according to the needed laboratory tests in the Referral Hospital. Equipment and supplies are expensive and in the context of Cambodia we could not be provided for all laboratory tests suggested by World Health Organization (see Appendix E). This is because of limited resources in terms of human resources and budget.

Therefore, an action research study on improvement of laboratory services in Baaray-Santuk Referral Hospital need to be done. The main concept of the proposed study is to bring medical doctors, medical assistants, laboratory staff in the Referral Hospital "insider" and researcher "outsider", together to identify the common health problems so as to prioritize laboratory test needs to support diagnosis and treatment services in the Referral Hospital. Further to identify the deficiencies and shortcomings and their underlying causes to provide corrective measures for upgrading laboratory services in the Referral Hospital.

2.10.1. Laboratory Technical Committee

A Laboratory Technical Committee (LTC) will be established to address the needs for upgrding. In order to upgrade laboratory facilities in the Hospital, as Carter mentioned (1996), the best approach is to first focus on laboratory test needs in the Hospital. The equipment to choose will be based on advice from local professional sources rather than from commercial agents or companies.

The committee members will consist out of four experienced people in medical laboratory services. There will be two people from the National Reference Laboratory, selected by Director Committee of the National Institute of Public Health (NIPH), and chief of the National Reference Laboratory. One person will come from the National Blood Transfusion Center and one person will come from laboratory section of the National Pediatric Hospital (NPH).

The role of Laboratory Technical Committee (LTC) is to be responsible for decision making on the selection of laboratory equipment so as to upgrade laboratory services in Baaray-Santuk Referral Hospital.

In order to choose laboratory equipment, following considerations should be taken into account by the committee members:

(i). The availability of spare parts

(ii). Laboratory staff should be trained by provider or company in the basic care and maintenance of all equipment.

(iii). Due to unavailability of electricity at all times in the Referral Hospital, some equipment should be chosen which can operate using 12 volt power sources, e.g. microscopes, haemoglobinometers, colorimeters, small microhaematocrit centrifuges and electric centrifuges.

(iv). Second hand equipment can cause a problem, unless they are supplies with an operator or an original service manual in a locally understandable language.

(v). Recipients of equipment should ask donors to provide manuals, spare parts and where possible, training in the use of the equipment they donate. Without this, correct use and repair are almost impossible.

2.10.2. Laboratory Training Program

The National Reference Laboratory in collaboration with the National Blood Transfusion Center and laboratory section of the National Pediatric Hospital will carry laboratory-training program.

The laboratory training program is an essential component to maintain and improve the quality of laboratory services in the Referral Hospital. Currently, the laboratory staff has not been trained and they are working with

few equipment. Therefore, in order to upgrade laboratory services in the Referral Hospital, laboratory in-service training plays a very important role to upgrade knowledge and skills, and to acquaint laboratory staff with new advances in terms of laboratory techniques.

A. Practical Course of the Training

The curriculum of laboratory training program has to cover all the needed laboratory tests in the Referral Hospital required by medical doctors and medical assistants, and patients. The basics of maintenance of laboratory equipment and quality controls also have to be included in the curriculum of the training program.

Training in the laboratory testing needs should be divided into specialties, such as hematology, serology and blood transfusion, microbiology and parasitology, and clinical chemistry; because it may not be practical to attempt comprehensive training in all specialties at the same time.

Therefore, the training program should be started with one of the specialties of medical laboratory and proceeded to the others such as hematology, serology and blood transfusion, clinical biochemistry, and microbiology and parasitology.

B. Training of Trainers

The members of the Laboratory Technical Committee should also be used as resource persons to develop a curriculum for the laboratory training program and provide training for laboratory staff working in the Referral Hospital.

During the training process, all these resource persons should start to develop a standard operating procedures manual so that laboratory staff can perform laboratory tests correctly in the Referral Hospital after the training program. The selection of resource persons will be based on their experience and qualification in the medical laboratory field.

C. Assessment

Before the laboratory-training program begins in each specialty of medical laboratory, the participants will have to complete a test that will provide a baseline score and indicate areas where special learning efforts will be needed.

At the end of the course another test will be set and practical skills will be assessed by means of laboratory examination that will be prepared by the trainers of laboratory training program.

2.11. Conclusion

Patients visiting the Referral Hospital expect quality health care services in the Baaray-Santuk Referral Hospital. Without laboratory service support or poor quality of laboratory services there will be poor diagnosis and treatment services, and leading to poor quality of health care services in the Referral Hospital.

Based on the role of the Referral Hospital defined by the Ministry of Health as a Complete Package Activities (CPA), the importance and cost-effectiveness of laboratory services, and the present available laboratory service activities, laboratory services in Baaray-Santuk Referral Hospital need to be improved. Otherwise, there will be no support to health care services in order to provide the quality of care for individual patients either for in in-patients services or out patient consultation.

In order to improve laboratory services in Baaray-Santuk Referral Hospital, the laboratory test needs assessment should take into account common health problems in out patient consultation and in-patient services of the Referral Hospital. Because equipment and supplies are expensive and in the context of Cambodia, it is not feasible to provide all laboratory tests suggested by World Health Organization due to limited resources in terms of human resources and budget.

Equipment and supplies will be provided according to the needed laboratory tests in the Referral Hospital. Then we have to organize laboratory team work in the Referral Hospital and at the same time provide laboratory training for them in order to upgrade their knowledge and skills.

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