ASSESSMENT OF DATA QUALITY IN THE OI-ART DATABASE SYSTEM FOR HIV HEALTH CARE IN TBONG KHMUM REFERRAL HOSPITAL, KAMPONG CHAM PROVINCE, CAMBODIA

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Thematic Paper
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ASTRACT

Objective: To assess data quality of the OI-ART Database System in terms of completeness, accuracy and consistency.

Methods: This study used secondary data of adult antiretroviral treatment (ART) patient medical records in the opportunistic infection-antiretroviral treatment (OI-ART) service during 2010-2012 to assess completeness, accuracy, and consistency of data quality. The data collection process was based on two sources of data: paper-based medical records and electronic medical records.

Results: Electronic medical records showed on overall completeness of data in several variables, 98%-100% in the adult initial form (A); 53% -100% in the adult patient visit form (B). However, based on the paper-based medical records, the completeness of data in several variables was 97%-100% in the adult initial visit form (A), 54%-100% in the adult patient visit form (B) except 7% of the Patient ID's were at variance, while 69%-92% of data were accurate. Additionally, consistency of data between paper-based and electronic medical records was 97%-100% in the adult initial form (A) and 69%-100% in the adult patient visit form (B)

Conclusions: Staff commitment, provision incentives, and training to OI-ART staffs could be another main point to improve quality of data and quality of care service in hospitals.

KEY WORDS: HIV/AIDS / DATA QAULITY / ELECTRONIC MEDICAL RECORDS / CAMBODIA

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AIDS	Acquired Immune Deficiency Syndrome
OI	Opportunistic Infection
ART	Antiretroviral Treatment
STD	Sexually Transmitted Disease
STI	Sexually Transmitted Infection
HIV	Human Immunodeficiency Virus
VCCT	Voluntary Confidential Counseling and Testing
PMTCT	Preventing Mother-to-Child Transmission
PLHIV	People Living with HIV
TB	Tuberculosis
WHO	World Health Organization
WPR	Western Pacific Regional
HIT	Health Information Technology
EWI	Early Warning Indicator
ANC	Antenatal Clinic
HIS	Health Information System
M&E	Monitoring and Evaluation
IDU	Injecting Drug User
ICF	Intensive Case Finding
IPT	Isoniazid Preventive Therapy
MSM	Men who have Sex with Men
PWID	People Who Inject Drugs
NCHADS	National Center for HIV/AIDS, Dermatology and STDs
NMCHC	National Mother and Child Health Center
CENAT	National Center for Tuberculosis and Leprosy Control
DMU	Data Management Unit
UPS	Uninterruptible Power Supply

CHAPTER I
INTRODUCTION

1.1 Background and rational:

Cambodia is one of a number of countries in the world that the spread of Human Immunodeficiency Virus (HIV) has been reversed. At its height, HIV prevalence was estimated at 1.7% (among adults aged 15-49) in 1998, compared to 0.6% in 2012 among the general population. An estimated 92% of eligible adult patients received Antiretroviral Treatment (ART), which is considered to be relatively high or a country that has successful expanded the coverage of ART. After scaling up the program for many years, there are 61 sites for adult patients and 35 sites for children in 20 provinces. However, HIV case reporting relies on routine data collected from the programs on Opportunistic Infection (OI), Antiretroviral treatment (ART), Voluntary confidential counseling and testing (VCCT), preventing mother-to-child transmission (PMTCT), and provider initiated testing and counseling for tuberculosis patients and pregnant women. Challenges still remain for these data to be used effectively (1).

For the past decades, data quality is very important in business, organizations and public health, but it stills is a major problem as of now. There are many reasons for data quality issues such as: errors in manual data entry, system upgrades, initial data conversion, poor database design, problems in data collection, and data processing errors (2). Additionally, there are several types of data quality issues, e.g., inaccuracy, incompleteness, inconsistency and duplicates, and these issues may be the consequence of several problems, such as misspelling, integration from heterogeneous sources, and software bugs. Moreover, every organization faces data quality problems. which can significantly impact efficiency and effectiveness (3). Data quality experts estimate that erroneous data can cost a business as much as 10 - 20% of its total system implementation budget” (4). Common causes of poor data quality in healthcare include poorly designed data collection forms, poor interview data and

errors in recording details caused by lack of training, inexperienced staff, lack of time due to pressures in work productivity. Insufficient staffs, as well as lack of understanding of the needs for accurate and high quality data are also reasons for poor data quality. It is important for related staffs from medical officers, to nurses and other health personnel to understand the needs to collect data and be familiar with data collection tools (5).

Data quality is judged based on completeness, accuracy and consistency. It is very important in key clinical, laboratory and psychosocial assessments data (6).

Data quality means that the information collected is the adequate representation of the program activities (7). There are many components of data quality standards such as: policy governance and leadership, systems and processes, skills, and the use of data and reports (8).

Health information technology (HIT) describes hardware, software, users, implementation, adoption, input, data, and outputs of computerized systems in the health care delivery environment (9). Nowadays, there are many types of health information technology systems including: Electronic health records computerized provider order entry, decision support system, electronic results reporting, electronic prescribing, consumer health informatics/patient decision support, mobile computing, telemedicine (data interchange based), electronic health communication, administration, data exchange networks, knowledge retrieval systems, and other HIT (10). Moreover, HIT has the ability to provide the increase in effectiveness and safety of the health care delivery. There are many benefits that some organizations have realized from implementing interoperable and multifunctional HIV systems around EHRs. However, the development and implementation of a health IT system requires better knowledge and understanding of interventions, policies and organizational structures in different organizations it is implemented. (11)

A health information system is “a system that integrates data collection, processing, reporting, and use of the information necessary for improving health service effectiveness and efficiency through better management at all levels of health services” (12) . Moreover, a health information system can also refer to “any system that captures, stores, manages or transmits information related to the health of individuals or the activities of organizations that work within the health sector”. These

definitions incorporate systems such as district-level routine information systems, disease surveillance systems, a hospital's patient administration systems and human resource management information systems, as well as laboratory information systems. Staff needs to understand the data collection process, the importance of data, and data quality for improve the quality of care and people's health. Capacity building provides knowledge of health data to policy makers at all levels. It is important for policy makers to be able to interpret the data, regardless of how they are collected. Also, it is important that other health system personnel understand the local data from local programs to be able to run statistical analyses and use these findings to improve health statistical analysis. Data quality can be improved by obtaining and including data from the lower levels of the health care system (13).

There are clear values in defining what constitutes health information and understanding how its components interact to produce better health. In addition, there are six modules of a health information system including: input, process, data sources, data management, information products and dissemination and use (14).

Healthcare information systems provide many benefits when used to improve access, collaboration and data sharing among healthcare providers, researchers, and patients. Given the very personal nature of medical data, this comes with significant risks to the integrity, confidentiality and availability of such information, currently. Currently, most healthcare information systems implement basic security features: data transmission may be encrypted, and passwords, as well as public and private keys are used to provide protections from adversaries (15).

The HIV Health Management System is among the most important tools to improve the quality of care for HIV patients. With this system, ART services are quickly made available and accessible and are linked with accelerated prevention interventions. These interventions are intimately linked to other existing services including: antenatal, obstetrical and sexually transmitted infection (STI) care, PMTCT, family, testing and counseling, HIV surveillance, and tuberculosis (TB) and HIV drug resistance surveillance and monitoring(16).

1.2 Research question:

What is the state of data quality in the OI-ART Database System used in managing HIV infected cases in referral hospitals in the Kampong Cham Province in Cambodia?

1.3 Main objective:

To assess data quality in the OI-ART Database System in terms of completeness, accuracy, and consistency

1.4 Specific objectives:

1) To determine completeness and accuracy of HIV patients in registration books

2) To determine completeness and accuracy of patient data in medical record forms

3) To compare consistency of data between those from the medical record forms against those in the OI-ART Database

1.5 Hypothesis:

There is no difference between the completeness and accuracy of the HIV patient records data in the system and the patient's paper-based medical records.

1.6 Significance of the study:

• It helps improve understanding of weaknesses or shortcomings in data entry by clinicians and data entry clerks

• It helps develop approaches to encourage facility staff to improve data recording.

• Currently, there is no evaluation of the OI-ART database system so the result of this study will help understand the weakness of data so it could be used to improve data quality in the future

1.7 Operational definitions:

Table 1.1: Variables of data collection

No	Varaiable	Description
1	Patient ID	Number assigned by OI-ART site
2	Sex	“M” for male, “F” for female
3	Age	Patient’s age
4	Address	HIV patient’s full address
5	Date first visit	Date the patient first came to visit for treatment
6	Date HIV positive	Date HIV positive
7	VCCT site	Name of VCCT site
8	Marital status	Single, married, divoice
9	First ART regimen	Patient received ART regiment first time
10	ART Number	Number assigned by OI-ART site for ART patient
11	CD4 count	CD4 count
12	Start ARV	Start ARV regiment
13	Reason start ARV	Reason for starting ARV
14	Continue ARV	Continue ARV regiment
15	Date next appointment	Date for next visit

1.8 Conceptual framework:

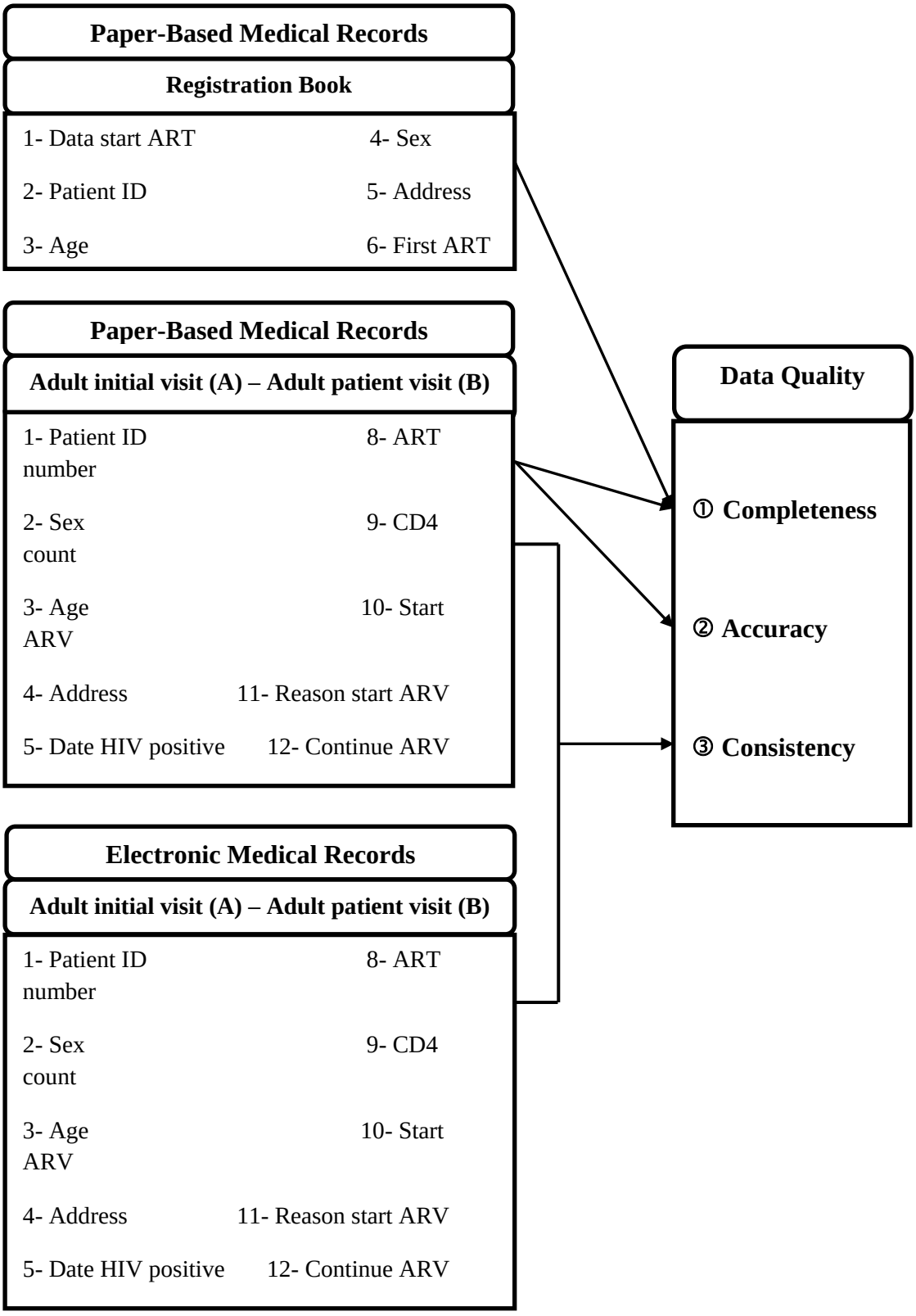

Figure 1.1: Conceptual framework in this study

CHAPTER II
LITERATURE REVIEW

2.1 The epidemiological situation of HIV/AIDS:

2.1.1 HIV/AIDS Epidemics in the western pacific region:

For the Western Pacific Region (WPR), one of the six regions of the World Health Organization (WHO), the HIV prevalence rate for adults and children living with HIV in the region was 0.1% in 2010. As the epidemic matured, the number of annual AIDS-related deaths rose from 33,000 in 2001 to 80,000 in 2010, but it has been stable over the past five years (2007-2011) (17). Across the region, national HIV prevalence levels among adults aged 15-49 years range from less than 0.1% in Mongolia to 0.9% in Papua New Guinea. Among lower and middle income countries in the Region, more than 90% of PLHIV are from five countries: China, Malaysia, Viet Nam, Cambodia and Papua New Guinea.

Table 2.1: Estimated burden of disease among countries in the WPR in 2009

College	Estimated number of PLHIV (all ages)	Estimated HIV prevalence among, adults 15-49 years (%)	Estimated range of newly infected adults and children	Estimated number of AIDS-related deaths (all ages)
Low and middle-income countries				
Cambodia	63 000	0.5	<1000-4200	3100
China	740 000	0.1	47 000-140 000	26 000
Lao PDR	8500	0.2	<1000-3400	<200
Malaysia	100 000	0.5	8400-13 000	5800
Philippines	8 700	<0.1	1200-4900	<200
Viet Nam	***280 000***	**0.4**	**16 000-38 000**	**20 000**

Table 2.2: Estimated burden of disease among countries in the WPR in 2009(cont.)

College	Estimated number of PLHIV (all ages)	Estimated HIV prevalence among, adults 15-49 years (%)	Estimated range of newly infected adults and children	Estimated number of AIDS-related deaths (all ages)
High-income countries				
Australia	20 000	0.1	<1000-<1500	<100
Japan	8100	<0.1	<200-<500	<100
Korea	9500	<0.1	<500-<1000	<500
Singapore	3400	0.1	<100-<500	<100

Source: **UNAIDS/WHO, AIDS epidemic update, 2010**

2.1.1.1 Status of epidemic in the five high priority countries:

In 2009, HIV prevalence in China stood at only 0.1%, while other countries in the WPR group, such as Malaysia and Viet Nam has estimated that 100,000 people were living with HIV. In the beginning, Malaysia and Viet Nam worried about an increase in HIV prevalence, but the actual figures did not seem to be as they expected (17).

In Viet Nam, an epidemic projection suggests that, over the years, the number of people living with HIV would likely decrease, but in reality HIV prevalence has increased among the general population. New HIV infections have increased more than mortality rate among people living with HIV.

2.1.1.2Status of the epidemic in low prevalence countries:

Among countries in Western Pacific Region, Philippines, Lao People's Democratic Republic, Mongolia and Fiji, the HIV prevalence levels have been consistently low. The Philippines is one of seven low prevalence countries in the world where the estimated HIV incidence has risen more than 25% since 2001 (18). Data from surveillance of Lao People's Democratic Republic, Fiji and Mongolia still show decreases in prevalence of people living with HIV.

2.1.1.3 HIV/AIDS treatment and care:

In WPR, there has been a more than tenfold increase in the number of PLHIV on ART, from 17,000 patients on ART in 2004 to 203,000 at the end of 2010 (19). The ART coverage in WPR, based on the WHO guidelines in 2010, was estimated at 43% for adult and child patients who are in need of ART (20), which was lower than the global average of 47% (21). According to the WHO guidelines in 2010, all HIV patients eligible for ART if they have a CD4 count of <350 cells/mm^3. Among the high priority countries, only Cambodia has achieved the coverage target for universal access to ART treatment.

Table 2.3: Number of adults and children on ART in WPR countries, 2004-2010 Enrollment in local colleges, 2005

Country	2004	2006	2007	2008	2009	2010
Cambodia	4527	20 131	27 000	31 999	37 315	42 799
China	8219	31 140	35 000	48 254	65 481	86 122
Fiji	-	-	<100	39	52	58
Lao PDR	104	479	700	1 009	1 345	1 690
Malaysia	2700	4 999	6 800	8 197	9 962	13 918
Mongolia		2	<100	5	9	28
Papua New Guinea	60, <200	1 098	2300	5 195	6 751	7 555
Philippines	71, <200	170	<500	532	750	1 274
Viet Nam	300, <500	8 310	17 000	27 059	37 995	49 492
WPR	**17 000**	**61 130**	**89 000**	**122 000**	**160 000**	**203 000**

Source: WPRO, compiled from Universal access reports, 2007-2011. Data before 2007 are estimates.

2.1.1.4 TB/HIV services:

In WPR, there are estimated 35,000 PLHIV with an active TB disease. Only 4.8% compared to 9.5% in the WHO South East Asia Region and 23% globally of TB patients are HIV positive (22). The mortality rate of TB among people living with HIV is higher than TB among the general population.

Reducing the burden of co-infection with TB and HIV begins with the three I's: intensive case finding (ICF) by screening newly diagnosed HIV

patients for TB, provision of isoniazid preventive therapy (IPT), and infection control (IC). IPT is conducted among PLHIV who have positive tuberculin skin test results to reduce development of the TB disease.

2.1.1.5 Early warning indicators for HIV drug resistance:

Among WPR countries, Cambodia, China, Papua New Guinea and Viet Nam are implementing assessment of HIV drug resistance. Early Warning Indicator (EWIs), to monitor ART prescribing practices, ART site quality assurance activities, data quality assurance programs, by evaluating ART medical records, have been collected annually in Cambodia and Viet Nam since 2008. In Cambodia, 48 sites among 51 ART sites were surveyed in 2011. (23)

2.1.1.6 Prevention of HIV transmission from mother to child:

In 2010, there were approximately 14,600 pregnant women infected with HIV in need of ARV prophylaxis, and 23,400 HIV infected children in need of ART in WPR (20). The comprehensive approach recommended by the United Nations to reduce PMTCT of HIV consists of four prongs:

- Primary prevention of HIV infection among women of childbearing age
- Preventing unintended pregnancies among women living with HIV
- Preventing HIV transmission from pregnant women living with HIV to their infants
- Providing appropriate treatment, care and support to mothers living with HIV and their children and families.

In WPR countries, PMTCT services with low and concentrated HIV epidemics must be integrated and synergized with other national programs to improve maternal and child (MCH) outcomes. In 2011, the Asia Pacific region launched a combined campaign to eliminate congenital syphilis and expand PMTCT services. Currently, Lao Peoples Democratic Republic, the Philippines and Viet Nam are piloting the integration of antenatal HIV and syphilis screening in some geographical sites.

2.1.1.7 Antiretroviral drugs to prevent mother to child transmission of HIV:

The WHO guidelines on the use of ARV drugs for treating pregnant women and preventing HIV infection in infants are based on two key approaches: ①- lifelong ART for pregnant women who need treatment for their own health, which is also safe and highly effective in reducing PMTCT, and ②- new options for ARV prophylaxis to prevent PMTCT during pregnancy, delivery and breastfeeding for those who do not require treatment. (Option B provides a triple combination of ARV to mother until one week after the end of breast feeding. In Papua New Guinea and Cambodia, nearly 50% of pregnant women with HIV are eligible for and receive ART, obviating the need for a prophylaxis dose. The triple ARV combination prophylaxis regimen is widely used in Papua New Guinea and China.(24)

2.1.1.8 Integration and decentralization of services provided by the health sector:

In WPR countries, HIV/AIDS services have to be provided linked and integrated with other health sectors such as MCHC and TB, and others (25).

Linkages can take many forms.

- Offering patients options to seek sexual and reproductive health (SRH) services, HIV prevention, HIV testing and referral, and/or ANC services at a single health facility

- Developing referral systems linking clinic populations at TB, ANC, HTC and ANC sites, facilitated by joint patient information system with a common patient identification number

- Creating referrals from community based outreach services to services provided in health facilities, and instead for treatment, prevention and care.

- Joint planning, coordination, monitoring, and evaluation that occurs between an MCHC and the national HIV program around PMTCT and elimination of congenital syphilis

2.1.2 HIV/AIDS in Cambodia:

2.1.2.1 Geography:

Kingdom of Cambodia, formerly Kampuchea, is a country in Southeastern Asia, bordering with Thailand, Viet Nam, Laos, and the Gulf of Thailand. Phnom Penh is capital city. Cambodia covers 181,035 square kilometers in a part of the Indochina peninsula. Cambodia population is approximately 14 million(26).

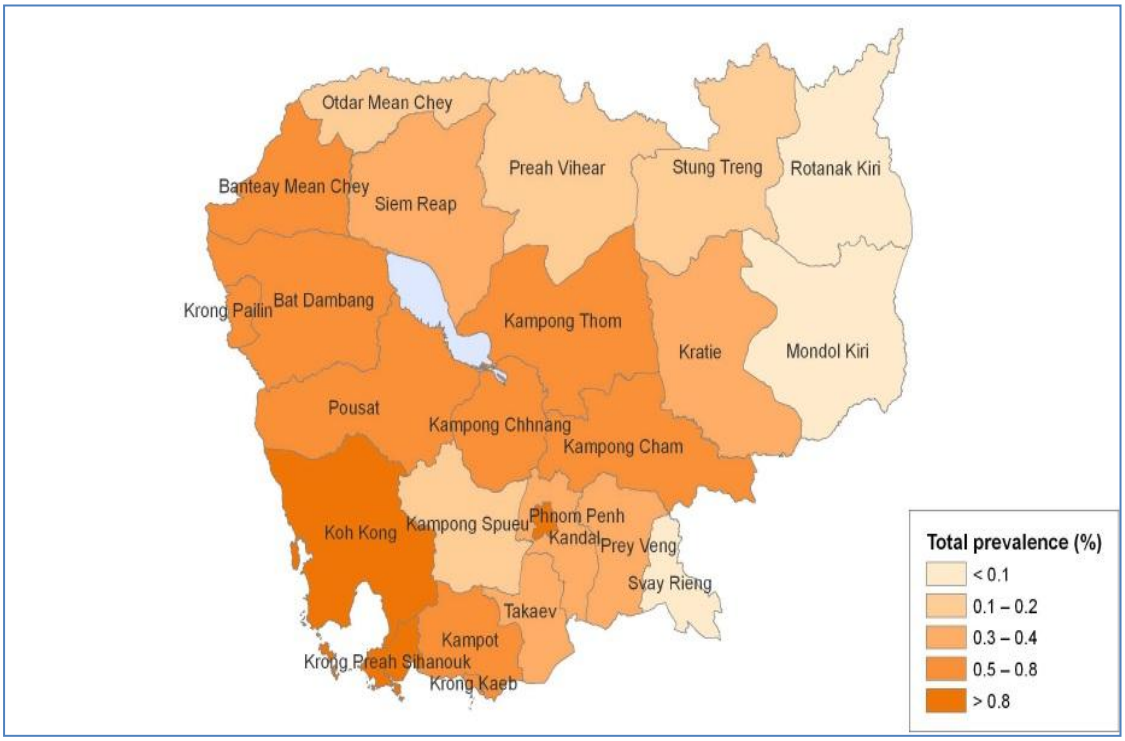

Figure 2.1: Cambodia administration map

2.1.2.2 History of HIV/AIDS in Cambodia:

The HIV/AIDS epidemic in Cambodia has been relatively well documented. The first HIV case was detected in 1991 and the first AIDS case was diagnosed at a national hospital in 1993. After taking into consideration the fact that it takes on average about 8 years for HIV to progress to AIDS, it is commonly believed that the HIV infection has been in Cambodia since the mid-1980s.

The HIV/AIDS epidemic in Cambodia is believed to have originated among commercial sex workers, since the HIV prevalence among female

sex workers (FSW) at the start of the epidemic was very high (27). The main mode of HIV transmission in Cambodia is still "unprotected heterosexual contact", although the rate of HIV infection among men who have sex with men (MSM) was estimated as being 5.1% in 2005 (28). The rate among injecting drug users (IDU) was predicted as being even higher again with a prevalence of 25%, as documented in 2007 (29).

2.1.2.3 HIV prevalence in the general population:

According to the NCHADS report on Estimations and Projections of HIV/AIDS in Cambodia 2006-2012, the HIV prevalence among the general population in 2001, aged 15-49 years, was calculated at 0.6 percent down from 0.9 percent in 2006 (30).

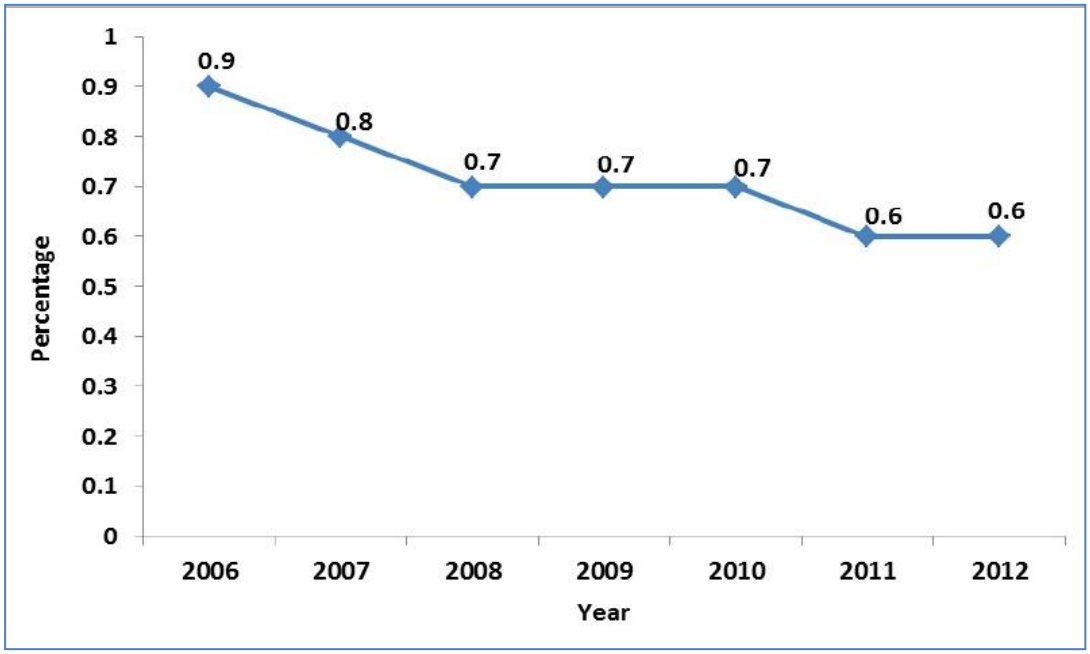

Figure 2.2: The trend of HIV prevalence among the general population aged 15-49, 2006-2012

Source: *Estimation and Projection of HIV/AIDS in Cambodia 2006-2012, Ministry of Health, National Center for HIV/AIDS, Dermatology and STD, June 2007*

The continued decline in the number of PLHIV can be ascribed to the decreasing number of new infections, in conjunction with increased ART

coverage, which reduces the infectiousness of individuals infected with HIV, and the success of targeted HIV prevention activities. Increased ART coverage has resulted in lowering the mortality rate of HIV infected individuals and as a result the rate of decline is slowing down. In numerical terms it was estimated that there were 53,100 people (age 15+) living with HIV in 2011. Fifty two percent, or 27,800, of these individuals are estimated to be female; this rate has not changed significantly since 2006. (31)

2.1.2.4 HIV incidence in the general population:

The falling HIV prevalence in the population is due in part to the decreasing number of new HIV infections. It can be taken from figure 3 above that until 2007 the number of women newly infected was surpassing the number of newly infected men. This has since turned around. In 2011, 43 percent of new infections were women and this rate is expected to continue to decrease gradually. In numerical terms, of the 530 new infections expected in the general population (aged 15-49) in 2011, 230 of these were estimated to be female. (31)

2.1.2.5 HIV/AIDS relation mortality in the general population:

The number of AIDS related deaths in the general population (aged 15+), in 2011, with ART available, was estimated at 2,400 and down from 9,950 in 2006, a drop of almost 75 percent. This dramatic decline can be attributed to the continuing decline in the number of new infections each year and increasing numbers of people who are in need of ART service access. As the graph shows, the availability of ART has a significant impact on the number of AIDS related deaths over a period of time. It was estimated that in 2010 and 2011 alone, 9,520 fewer people would die because of the widespread availability of ART. (31)

2.1.2.6 Prevention of mother to child transmission

HIV positive pregnant women received antiretroviral therapy to reduce the risk of transmitting the virus to their child. Since last reporting, routine monitoring data from 2010 and 2011 has become available from the National Mother

and Child Health Center (NMCHC). In 2010, just under half (49.5 percent) of eligible women received antiretroviral (ARV) prophylaxis for prevention of mother to child transmission (PMTCT) and coverage increased to 63.5 percent in 2011, the peak of a nine year trend in increasing coverage.(32)

2.1.2.7 Co-management of tuberculosis and HIV treatment:

The numbers of people co-infected with advanced HIV and tuberculosis (TB) who are receive treatment for both conditions is another important indicator. Routine monitoring data provided by the National Center for Tuberculosis and Leprosy Control (CENAT) is available from 2011 and 2009. New data show that nearly one third (32.7%) of co-infected patients is receiving treatment for both HIV and TB, a strong rise from 4.8% in 2009. Stratified data on gender and age group are not available.(32)

2.1.2.8 HIV treatment: Antiretroviral Therapy (ART):

Data from the National Center for HIV/AIDS, Dermatology and STD (NCHADS) quarterly report show that 46,473 people (42,034 adults and 4,439 children under the age of 15) 89.5 % of the total eligible population ART, suggesting adequate ART receiving ART coverage. Children under the age of 15 were more likely than adults and adolescents aged 15 and older to receive adequate coverage (94.4% vs. 89%). Further population data stratified by gender and age are not available.(33)

2.1.2.9 Challenges in HIV/AIDS:

The lack of individual and institutional capacity was an important challenge that was identified in the last report. Capacity in both government and non-government sectors has steadily grown over time and so has the national ownership of the national response to the epidemic. The highest risks of new infections among key populations include EW, MSM, TG and PWID. Another major challenge outlined in Cambodia during 2010-2011 was the cessation of salary supplementation for civil servants. Meanwhile, this has been reintroduced though it is being phased out again 2013. The suppression of salary supplements and incentives

has had negative consequences, some key government staff have moved to the private sector, or have undertaken better paid free-lance consultancy work. (32)

2.2 Data management in OI-ART service:

Cambodia has the elements of a HIV case reporting system to detect new infections, but only the aggregate number of new infections is reported. Data collected at the facility level are aggregated by sex, age and when applicable, risk group, and sent to the NCHADS Data Management Unit.

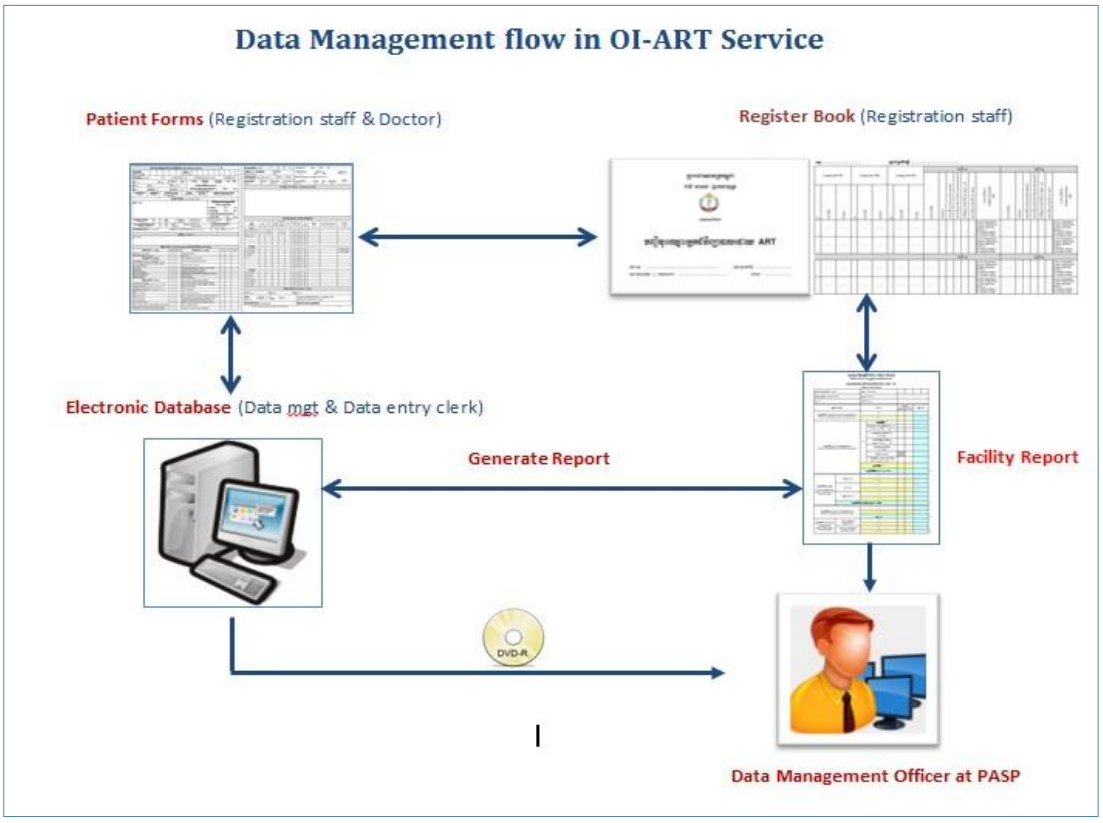

Figure 2.3: Data management floor in OI-ART service

The current case reporting system presents a number of challenges, including no mechanism to estimate duplication of cases recorded and inability to analyze new HIV infections. NCHADS is piloting a unique identifier system which could help de-duplicate records and create linkages across the cascade of HIV

services. Reporting sociodemographic information and risk behaviors would enhance the usefulness of the case reporting system. Routine program data are collected on an ongoing basis from HIV services, providing readily available information that can supplement HIV surveillance data. Routine program data provide information on who is using services, how often services are accessed and whether target populations are being reached, which is key for implementation of Cambodia 3.0 strategies. Current parallel efforts of continuous quality improvement (CQI), HIV drug resistance early warning indicator (HIV-DR EWI) monitoring-and ART cohort analysis should be consolidated and simplified procedures should be established to promote data use. Also, a mechanism should be developed to regularly assess loss to follow-up across HTC, pre-ART/ART, PMTCT and TB/HIV and to identify reasons of loss to follow-up. (34)

2.2.1 The national OI-ART paper-based tools:

The National center for HIV/AIDS, Dermatology and STD (NCHADS) developed data collection tools following the World Health Organization (WHO) guidelines including patient register books, patient forms, appointment book, summary patient forms, prescriptions, and lab registers which are completed by doctors, pharmacists, nurses, and social workers (16). All data collection tools are used in district and provincial sites to ensure all data collected are complete, accurate, consistent, and confidential and improve quality of care. Additionally, data entry clerk verified data from paper-based record before entry into OI-ART Database to make sure there are no missing fields especially all fields related to the reporting. NCHADS provides training courses for health workers on how to complete patient forms, and register books, and how to check missing data.

2.2.1.1 Registration book for ART patients:

This book is used to fill in patient information such as: (Date register ART, Patient ID, Patient name, Sex, Address, Date follow up, …,etc.) and all information are filled in by registration staffs. (*Appendix 1*)

2.2.1.2 Adult initial visit form (A):

Adult initial visit form (A): used for filling in patient information for patients registering for the first time in OI-ART services and has many fields such as: patient address, marital status, education, family history, TB past medical history, ARV treatment history, etc. (*Appendix 2*)

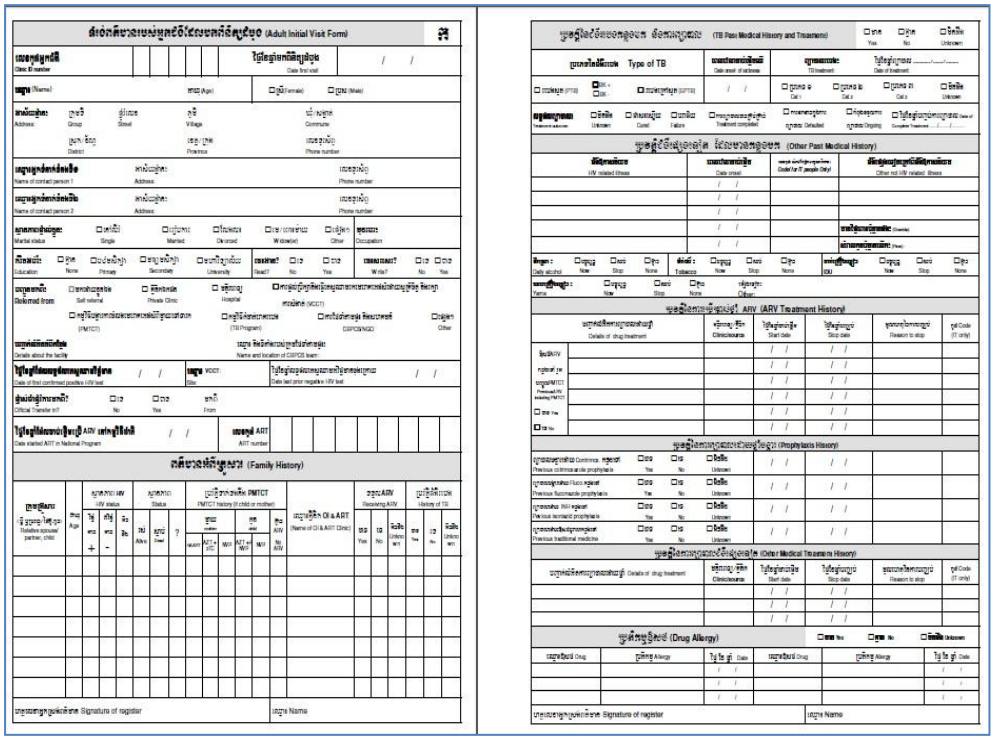

Figure 2.4: Adult initial visit form (A) tools

2.2.1.3 Adult visit form (B):

Adult visit form (B): used for filling in HIV patient information for patients who come to follow-up OI-ART services, to collect information such as: weight, temperature, pulse, blood pressure, current medical history, drug regimen, appointment date,…etc. (*Appendix 3*)

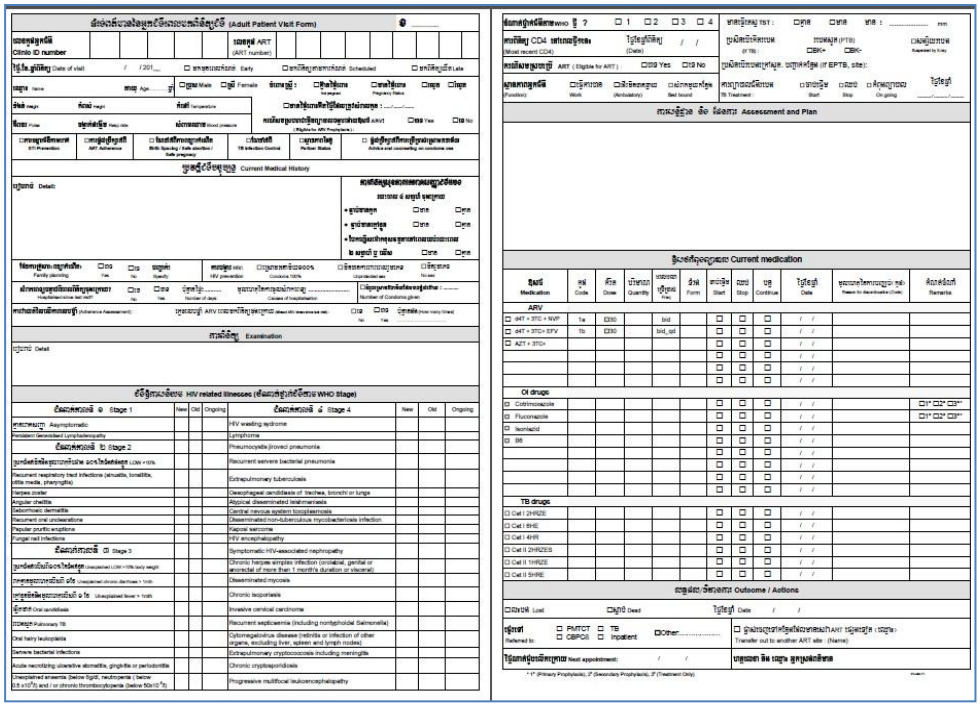

Figure 2.5: Adult patient visit form (B) tools

2.2.1.4 Patient pre-ART and ART summary form:

Patient pre-ART and ART summary Form: used for filling in the summary of information of HIV patient, to collect information such as: (Patient name, ART number, WHO stage, drug regiment, CD4 count…etc.). (*Appendix 4*)

2.2.1.5 Patient transfer-out form:

Used for HIV patients who wish to change the OI-ART service from one hospital to another hospital (*Appendix 5*)

2.2.1.6 OI-ART reporting form:

Used for total HIV patients in the hospital to record some data such as: (Total new patients, total new patient start ARV, patient dead, patient lost, patient transfer out, active patient, and total all patients). (*Appendix 6*)

[illegible]

[illegible] ARV

(Facility ART report)

[illegible] (Facility) [illegible]	[illegible] (Facility Code) 0201
[illegible] (Operational District) [illegible]	[illegible] (Province) Battambang
[illegible] (year) 2013	[illegible] (Quarter) 2

[illegible] (Category)		[illegible] Age	[illegible] (male)	[illegible] (female)	[illegible] (total)	
[illegible] ART [illegible] Number of Active Patients on ART at the end of Preceding quarter		>14	270	312	582	
		0-14	17	21	38	a
[illegible] ART [illegible] Number of New Patients started in ART Care at this facility during this quarter	>14	[illegible] >14	9	7	16	
	>14	[illegible] Diagnosed TB (BK+/-,EP)	3	1	4	
	>14	[illegible] (TB Tx Started)	3	1	4	
	>14	[illegible] (Pregnant)		2	2	
	>14	[illegible] Positive Prevention (at least 3 *)	9	7	16	
		[illegible] ART [illegible] 0-14	0	1	1	
		[illegible] total all new art patients	9	8	17	b
[illegible] (Number of Patients transferred in during this quarter)		>14	1	1	2	
		0-14	1	0	1	
		[illegible] total	2	1	3	c
[illegible] ART [illegible] (Number of Patients Who Left ART Care during this quarter)	[illegible] (Transferred Out)	>14	2	3	5	
		0-14	0	2	2	
	[illegible] (Lost)	>14	0	1	1	
		0-14	0	0	0	
	[illegible] (Died)	>14	1	2	3	
		0-14	0	0	0	
	[illegible] total		3	8	11	d
[illegible] ART [illegible] (Number of Active Patients at end of quarter)		>14	277	314	591	
		0-14	18	20	38	
		[illegible] total	295	334	629	e

Figure 2.6: Facility ART report tools:

2.2.2 National OI-ART database system tools:

In the past many NGOs built database for the management of HIV patients but they used different tools. In 2005, the National Center for HIV/AIDS, Dermatology (NCHADS) created and designed a new OI-ART Database System for monitoring of HIV patients through the recording and reporting of OI-ART patients' information. This system is implemented and used for all OI-ART sites in Cambodia.

The OI-ART Database System interface is designed following the paper based tools Adult forms include:

- Adult Initial Visit Form
- Adult Visit Form
- Backup
- Restore

- Patient Test Form
- Reporting Forms (Facility OI Report, Facility ART Report, CD4 Reminder, Daily Report, Patient Status, OI-ART Regimen, Exposed Infant Report)
- Patient Summary Form
- Appointment Form

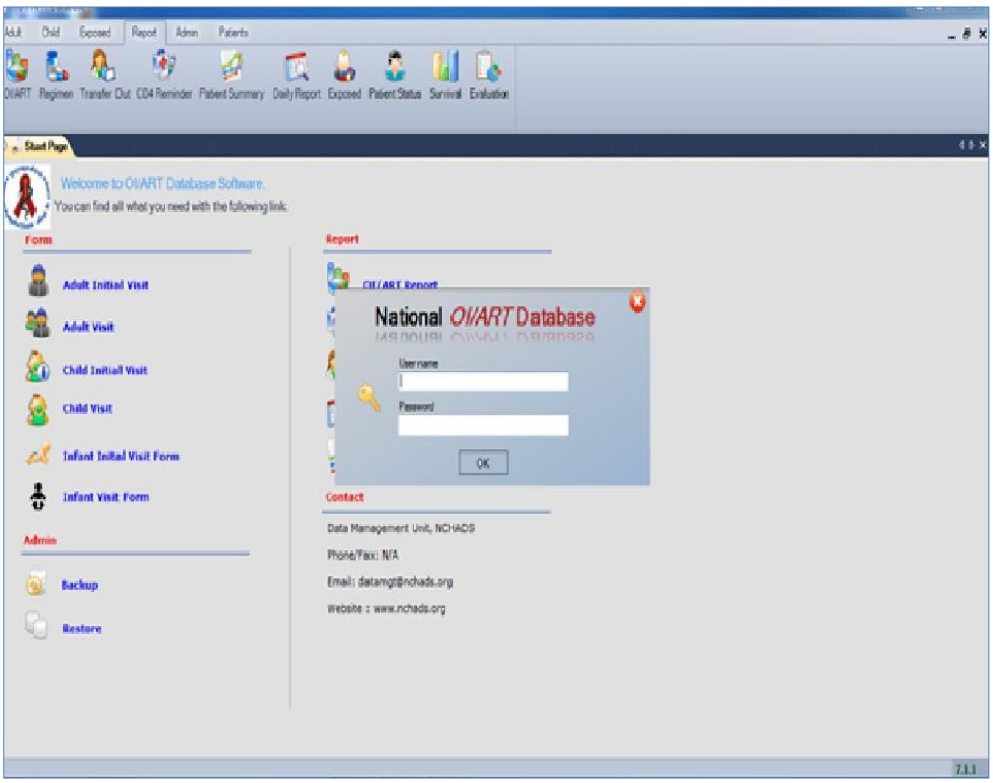

Figure 2.7: National OI-ART Database interface screen:

2.2.2.1 Adult initial visit form (A) on database:

Adult initial visit form (A): use to input patient information for patients who registered for the first time in the OI-ART service. The form has many fields such as: patient address, marital status, education, family history, TB past medical history, ARV treatment history, etc.)

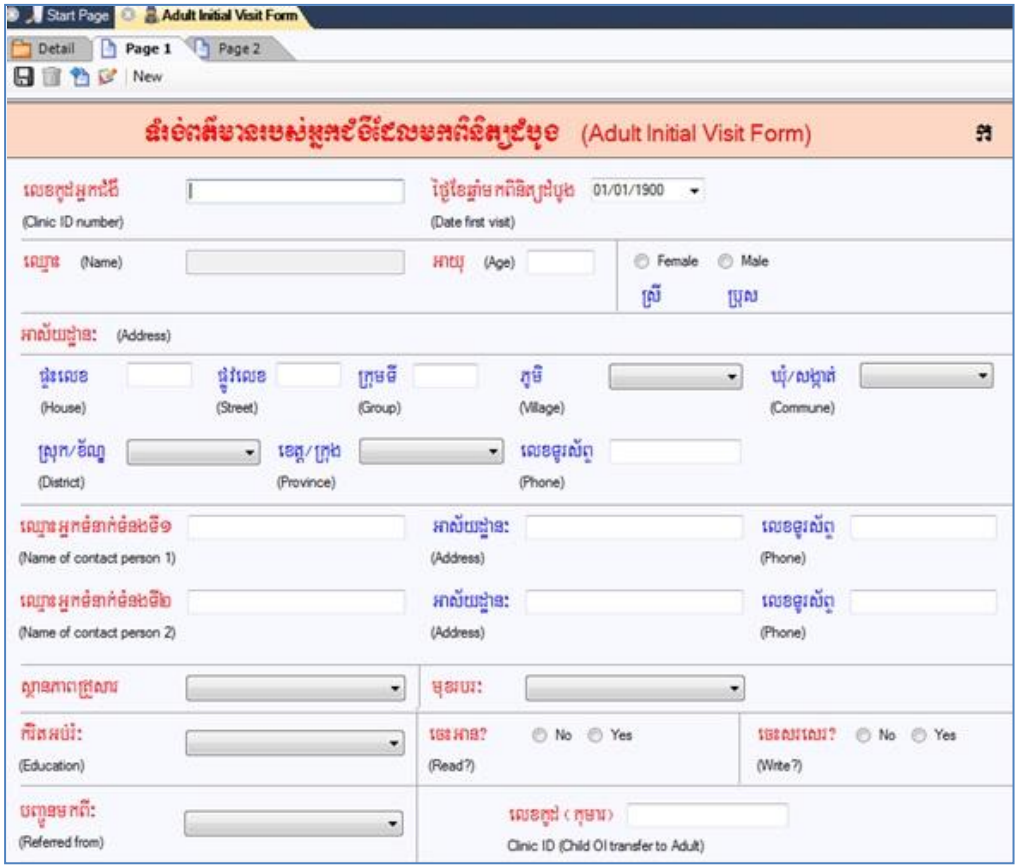

Figure 2.8: Data Entry Screen for Adult initial visit form (A) on OI-ART Database

2.2.2.2 Adult patient visit form (B) on database:

Adult visit form (B): used to input information of HIV patients who come to follow up OI-ART services, including information such as: weight, temperature, pulse, blood pressure, current medical history, drug regimen, appointment date …etc.

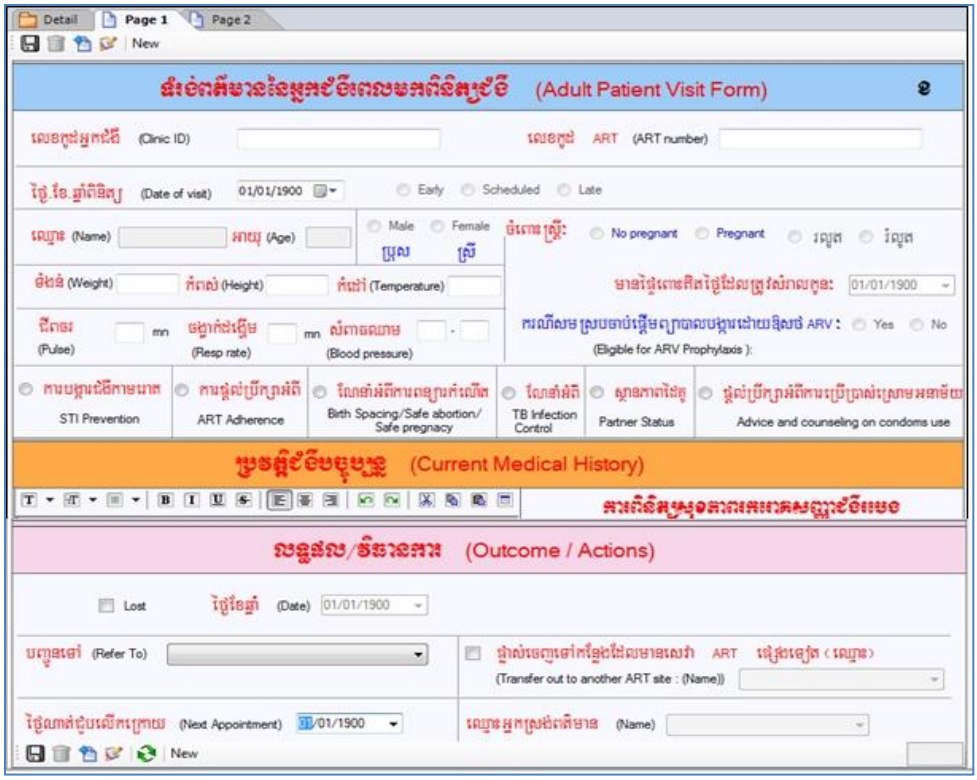

Figure 2.9: Data Entry Screen for Adult patient visit form (B) on OI-ART Database

2.2.2.3 Patient test form:

This form is used to input the laboratory results and collect information such as: CD4 count, HBs-Ag, white blood cells count, createnine, GOT/ASAT, GPT/ALAT etc.

2.2.2.4 Security:

Data management officer and data entry clerks have permission to access computers and databases through username and password authentication. The data management officers and data entry clerks must inform the Data management Unit at NCHADS of all problems related to use of the system.

2.2.2.5 Data backup:

Hard drives are the most likely component of computers to fail. Unfortunately, it is also the most critical component as it contains the operating

system and software to run the computers as well as the data (35). Data entry clerks need to back up data for their daily works at the end of working hours. Data can be saved into secret folders, flash drives, or external hard disks and send the backed up data to the Data Management Unit at NCHADS at the end of the month.

2.2.2.6 Restoring data:

When there are computer or database errors we can restore data from the backup files that are backed up every day. The data recovered will have all the information saved at the last backup.

2.2.2.7 Patient appointment form on database:

This form use for input the appointment date for next visit of HIV patients.

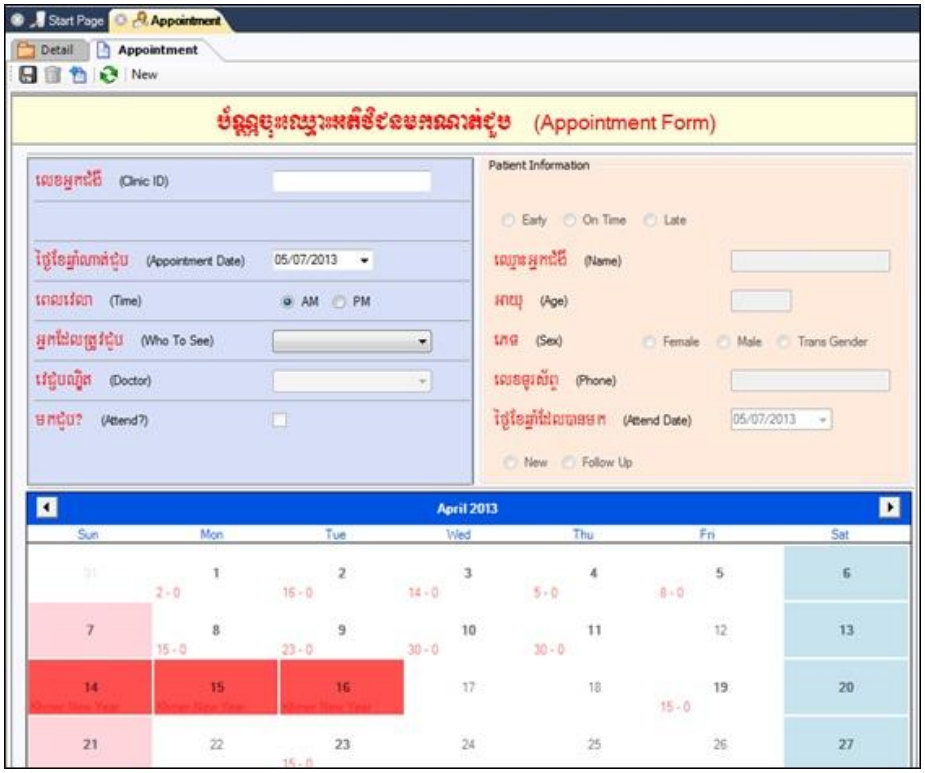

Figure 2.10: Data entry screen for patient appointment form

2.2.2.8 Reporting form on database:

The OI-ART database system can generate many reports such as: OI-ART report, daily report, patient summary, patients dead, patients lost, patients transferred out, CD4 reminders, appointment reports, etc.

2.3 Data quality in HIV health care:

Based on the conceptual framework, there are several factors for improvement of data quality in HIV health care such as: human factors (register staff, data entry clerk, data management officer) and technology factor (hardware and software).

2.3.1 Data quality dimensions:

Data quality in HIV health care is maintained for the present and future care of the patient regardless of the level of services provided. The data quality is very important for patient care as well as monitoring and evaluation of the health services. Data collected and presented should be complete, accurate and consistent (36).

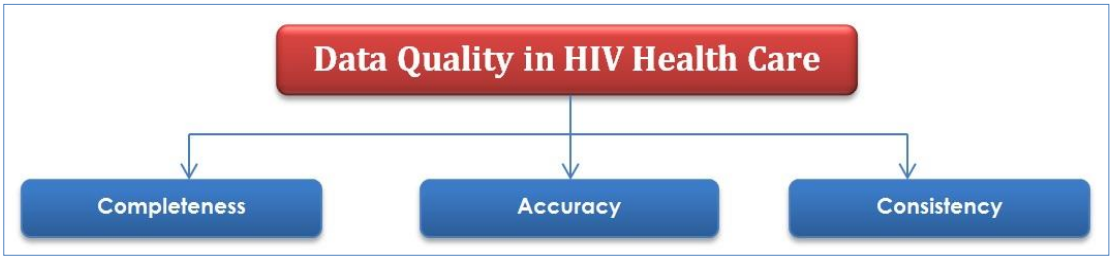

Figure 2.11: Data quality dimensions in HIV Health care

2.3.1.1 Data completeness:

Complete data do not have missing elements, and include all of the clients that are served, and the services delivered. Complete data improve the accuracy of the information used for reporting and for program decision-making. Complete data provide a full picture of the work done. If some of the data are missing,

the services provided or the number of clients served may be underreported. In some cases, incomplete data can make it seems like some of the services that your clients need are not provided, even though those services are actually provided (37).

2.3.1.2 Data accuracy:

Accuracy of data quality in information systems is defined as the ratio of data fields in the information system with a given characteristic that truly have this attribute. The single record will often contain several data fields in addition to the field by which the person is identified, for example, the results of patient test, age, sex and demographic data. (38)

2.3.1.3 Data consistency:

Data consistency is promoted by complying with protocols, definitions and standards. Standard definitions and symbols are also emphasized. Data consistency edits can be developed to compare fields. For example a male patient cannot receive a pregnancy test. The quality of data entry must be observed. Usually some errors made during data entry were found during later edits. However, some are very difficult to detect except by comparison to the completed data collection forms. Furthermore, the time required to find and correct key entry errors may be a significant module of the workload in some locations. It should be noted that such checks are needed regardless of whether 100% double data entry with comparison or data entry and verification is employed routinely. To determine rates of data entry errors, a random sample of data fields is selected for checking.(36, 39)

A study was conducted in Center Mozambique about assessment of accuracy and availability of data in electronic patient tracking systems for HIV patients. This study compared data in the electronic database with data abstracted from patient's charts. The study found completeness of height data to be at 81.4% and that of weight at 88.5% in electronic patient tracking. Finally, electronic patient tracking system is used for monitoring and evaluation. Particularly, data are, reported to Ministry of Health and use to improve quality of data in reporting and research. (40)

Moreover, there was a study assessing the quality of data aggregated by antiretroviral treatment clinics in routine settings in Malawi. The study compared own quarterly data from site reports with supervision reports by the Ministry of Health supervision team in case registration and outcome. The study found 29% of complete data for six fields in registration and data accuracy were unacceptable because data missing >5% different compared with supervision report. Ministry of health should improve capacity building for monitoring and evaluation of data accuracy in sites (41).

Another, study was done in Mozambique, for medical record completeness and accuracy at an HIV clinic, in 2005-2006. This study was done in a public sector HIV clinic to monitor data completeness, accuracy and reliability based on paper based medical record of HIV patient follow-up. The study found that 72% of data elements were completed and data accuracy was 95% for enrollment visit. A number of recommendations were offered. First, improve data quality of paper based medical records. Second, provide training to health workers to use routine data collection tools. Finally, there are no “gold standards” for checking true values of data elements but multi elements should be consistent and data should be shared among data entry clerks, registration staffs, physicians, and stakeholders.(6)

However, Measure the completeness and accuracy of the drug treatment reporting system in Ireland. The study use client’s clinical record system as the gold standard, to identify completeness and accuracy of variables (compared between clients information report in National drug system with clinical record information). The study found 61.1% of data completed. Data accuracy of some key variables needs to identify because of problems. Urgent actions have been taken to improve the completeness and accuracy of the reporting system.(42)

Even though, completeness and consistency in recording information in the tuberculosis case register Cambodia, China and Viet Nam. To assess completeness and accuracy of TB quarterly case reporting and treatment outcome and data collected from paper record of registers. Errors, missing data and no record result are main points of this study, over and under reported cases were individually of treatment. The result of this study found completeness of diagnostic microscopy result in Cambodia (82.9%), Viet Nam (85.0%), and China (96.4%).

Completeness of register information forms and improves capacity building staffs TB treatment outcome are essentially. (43)

In addition, Completeness of data entry in three cancer surgery databases, this study was conducted to evaluation what is the impact of completeness of data in cancer treatment database system. Two variables such as: (breast 80.4%, colorectal 67.3%) cancers were analysis to find the overall data completeness 78.1%. After data analysis found data in cancer surgery database incomplete so the main impact of incomplete data because of lack of completeness data fields, lack of training staff to entry data and database not satisfaction for data entry clerk. Totally, should improve completeness of fields, re-design database and improve accuracy of data.(44)

One more study, the survey of provider based electronic medical records and implement of the quality of data in large HIV program in Sub Saharan Africa. This survey compared information of patient's files in electronic medical record before and after conducted EMR in different year to find the rate of errors, missing, correct, and incorrect of information. The survey found the total of incompleteness, errors, inaccuracy of data is decreased for ART toxicity (51.9% to 3.5%), reason ART interruption (82.8% to 12.5%), reason ART switch (94.1% to 0.9%). Implement of electronic medical record can be improving the quality of data and reduce incompleteness and inaccuracy of data in clinical care. (45)

Still, Data quality evaluation in childbirth records in two district hospitals in Kenya. The study is compared data quality in childbirth register to find number of completeness and accuracy of data among two sites. 80% completeness data of Bondo more than Siaya site. Accuracy data of childbirth register very low because of lack of fill in form and small free space for writing, lack of staff commitment, and lack of coordinator. Finally, staffs commitment very important for improve quality of data is requisite of this study. (46)

the order hand, study of data quality in malaria system in Mozambique, mortality and morbidity is the main issue of malaria need to improve activities with communities. However, data reporting case still poor quality. This study was to evaluate three keys point of data quality (completeness, accuracy and consistency) reporting in different locations. There were many problems of data reporting because of limited coordination, lack of data reporting case because exist

reporting system not update on time as malaria strategies plan, another big problem because of markup data in reporting. Finally, should create a standard data collection form and implement malaria database system to all health facilities to improve quality of malaria data. (47)

In conclusion, all health workers to make sure all data are completeness and accuracy and consistency. If health workers fill in patient forms are invalid so data entry clerk entry data into database, it will be errors information. For example, HIV patient over 99 years old of age, or male HIV patient, but got pregnant. Moreover, for accuracy data we can compare CD4 cell count record between patient visit form and CD4 cell count on lab report. Totally, capacity building, staffs commitment, good database system, good data flow, provides training, and good leadership is very important to improve quality of data.

2.3.2 Data quality factors:

After scaling up many years of antiretroviral therapy (ART) program in Cambodia, the National OI-ART database system have been adopted for monitoring HIV patients, evaluation treatment, and reporting to the National Center for HIV/AIDS, Dermatology and STD (NCHADS), report to Ministry of Health, and donors. To make sure accurate reporting and good quality for research, and completeness of data systems need to be assessed and reported.(40)

Figure 2.12: Data quality factors in HIV health care

In Cambodia, according to the real practice in HIV health care, OI-ART service has many factors for improvement data quality in HIV health care such as: Human factor (Registration staff, Data Entry Clerk, and Data Management Officer) and Technology factor (Hardware and Software).

2.3.2.1 Human factors:

2.3.2.1.1 Registration staff:

Register staff is a component of Data quality factor which record all HIV patients' information that comes to register or follow up. So, register should understand the guideline, meaning of fields in the registration book and parts of paper based data collection tools.

2.3.2.1.2 Physician:

Physicians should to know about the usefulness of data, guideline of treatment, and understand clearly about fields on paper based data collection form. Some parts of paper based tools physician have to write clearly, avoiding error when enter the data into the database system by data entry clerk.

2.3.2.1.3 Data entry clerk:

Data entry clerk needs to understand the guidelines of OI-ART treatment, data entry floor, and all fields in Database to make sure that all the data entered into database are complete, correct and consistent. All data on paper based need to modify before enter into database. If some fields are incomplete or missing, the Data entry clerk need to ask or give feedback to physicians for correction. All data should be entered into database on time by Data entry clerk.

2.3.2.1.4 Data management officer:

Data management officer is the major point to improve quality of data. Using tools for control, protect, compile all reports, and check data errors, data missing, data cleaning, fix errors and some data analysis to improve data quality.

2.3.2.2 Technology factors:

2.3.2.2.1 Hardware:

This includes: computer, printer, uninterruptible power supply (UPS), and external hard disk. All of hardware should have high capacity, availability and importantly decrease error of data.

2.3.2.2.2 Software:

Database system can be controlled and prevent data errors, data missing, back up data, restore data, and generate report. Database system, was developed after paper based record form, provides user friendly environment for Data entry clerk to entry data easily into database and reduce errors.

CHAPTER III
MATERIALS AND METHODS

3.1 Research design:

- Record review study
- Use retrospective data

3.2 Study area:

Tbong Khmum Referral Hospital is a hospital among 12 Referral hospitals in Kampong Cham Province. There are many services such as: Emergency medicine, Tuberculosis, Malaria, HIV/ADIS treatment, Laboratory service, delivery service, etc.

There are around 60 beds provides for inpatient and outpatient comes to hospital.

Organization of Tbong khmum Referral Hospital:

- Director: 01
- Deputy directors: 03
- Doctors: 18
- Nurses: 31
- Other: 16
- Total staffs: 69

In 2006, National Center for HIV/AIDS, Dermatology and STD is launched at Tbong Khmum RH, provides HIV treatment for adult patients and children. Until now, there are active ART patients = 957 and OI = 92. In OI-ART services have two doctors, one nurse, one pharmacist, one counselor, one registration, and one data entry clerk provides service from Monday to Friday. The Tbong khmum RH were selected in this study because HIV program was implanted since 2006, HIV is still high if we compare with another site in Kampong Cham Province.

Table 3.1: Number of active HIV patient in Cambodia: Q2-2013

No	Name of OI-ART sites	Number of Active ART	Number of Active Pre-ART	Total Active Patient
BANTEAY MEAN CHEY				
1	Serei Sophorn RH	1016	68	1084
2	Mongkul Borey PH	731	53	784
3	Poipet 1 HC	1051	133	1184
4	Thmor Pouk RH	188	14	202
BATTAMBANG				
5	Mong Russey RH	591	31	622
6	Battambang PH	2125	228	2353
7	R5 Military Hospital	176	19	195
8	Thmor Kol RH	592	42	634
9	Sampov Loun RH	360	39	399
KAMPONG CHAM				
10	Kampong Cham PH	1561	90	1651
11	Memut RH	251	26	277
12	***Tboung Khmum RH***	***957***	***92***	***1049***
13	Choeung Prey RH	447	35	482
14	Chamkar Loeu RH	125	14	139
15	Srey Santhor RH	148	16	164
KAMPONG CHHNANG				
16	Kampong Chhnang PH	573	54	627
KAMPONG SPEU				
17	Kampong Speu PH	656	96	752
18	Oudong RH	194	95	289
19	Kong Pisey RH	220	76	296
KAMPONG THOM				
20	Kampong Thom PH	578	85	663
21	Baray Santhuk RH	208	30	238

Table 3.1: Number of active HIV patient in Cambodia: Q2-2013 (cont.)

No	Name of OI-ART sites	Number of Active ART	Number of Active Pre-ART	Total Active Patient
KAMPOT				
22	Kampot PH	688	137	825
23	Kampong Trach RH	1034	111	1145
KANDAL				
24	Chey Chum Neash PH	2132	271	2,403
25	Koh Thom RH	357	92	449
26	Kean Svay RH	132	21	153
KOH KONG				
27	Smach Meanchey PH	553	49	602
28	Sre Ambil RH	213	89	302
KRATIE				
29	Kratie PH	396	31	427
PHNOM PENH				
30	Khmer Soviet Hospital	3234	146	3,380
31	Calmette Hospital	1418	127	1545
32	Preah Kossamak	2395	74	2,469
33	NPH	HIV Pediatric		
34	Center of Hope	3084	142	3,226
35	Preah Ketomealea	1205	96	1301
36	Social Health Clinic	1965	119	2084
37	Chhouk Sar I Clinic	517	99	616
38	Chhouk Sar II Clinic	139	37	176
39	Samdach Ov RH	321	112	433
40	Meanchey RH	340	72	412
41	Chamkar Doung HC	163	42	205
42	Pochinton RH	179	56	235

Table 3.1: Number of active HIV patient in Cambodia: Q2-2013 (cont.)

No	Name of OI-ART sites	Number of Active ART	Number of Active Pre-ART	Total Active Patient
PREY VENG				
43	Neak Loeung RH	1242	132	1374
44	Kampong Leav PH	790	77	867
45	Pearaing	141	116	257
PURSAT				
46	Sampov Meas PH	942	154	1096
SIEM REAP				
47	Siem Reap PH	2519	171	2690
48	Komar Angkor Hospital	HIV Pediatric		
49	Sothnikum RH	501	66	567
50	Kralanh RH	163	55	218
SIHANOUK VILLE				
51	Sihanouk PH	1503	131	1634
STUNG TRENG				
52	Stung Treng PH	293	39	332
SVAY RIENG				
53	Svay Rieng Hospital	969	100	1069
54	Romeas Hek RH	149	18	167
TAKEO				
55	Takeo Hospital	1149	50	1199
56	Ang Roka RH	361	33	394
57	Kirivong RH *	451	28	479
58	Prey Kabas RH	177	18	195
ODDOR MEANCHEY				
59	Samrong PH	250	35	285
PAILIN				
60	Pailin PH	283	36	319

Table 3.1: Number of active HIV patient in Cambodia: Q2-2013 (cont.)

No	Name of OI-ART sites	Number of Active ART	Number of Active Pre-ART	Total Active Patient
PREAH VIHEAR				
61	16 Makara PH	156	25	181
TOTAL		**45252**	**4543**	**49795**

However, OI-ART Database system is implemented in 2007 improves HIV patient's management and data quality of HIV reporting case. In this site using both of Paper based tools and Electronic medical record. OI-ART facility reporting is generated from OI-ART database every quarter for submit to Provincial Health Department and send back up data to Data management officer every the end of month.

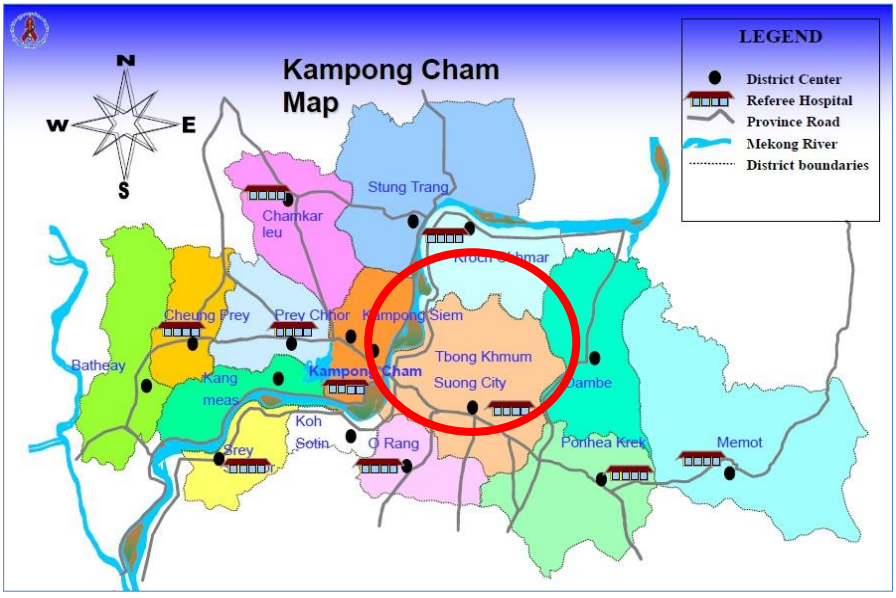

Figure 3.1: Study area of Tbong Khmum RH, Kamong cham Province Map

Source: Kampong cham provincial Health department, 2012

3.3 Population and sample:

Use with adult HIV patients (>14 years of age) medical records that eligible with ART in Tbong Khmum Referral Hospital from 2010 to 2012.

3.4 Data collection:

3.4.1 Data collection method:

This study is used secondary data of adult ART patient medical records in OI-ART service to assess completeness, accuracy and consistency of data quality. However, data collection process was separated to two main points:

(1). Collect data from paper based patient medical record,

(2). Collect data from OI-ART Database system

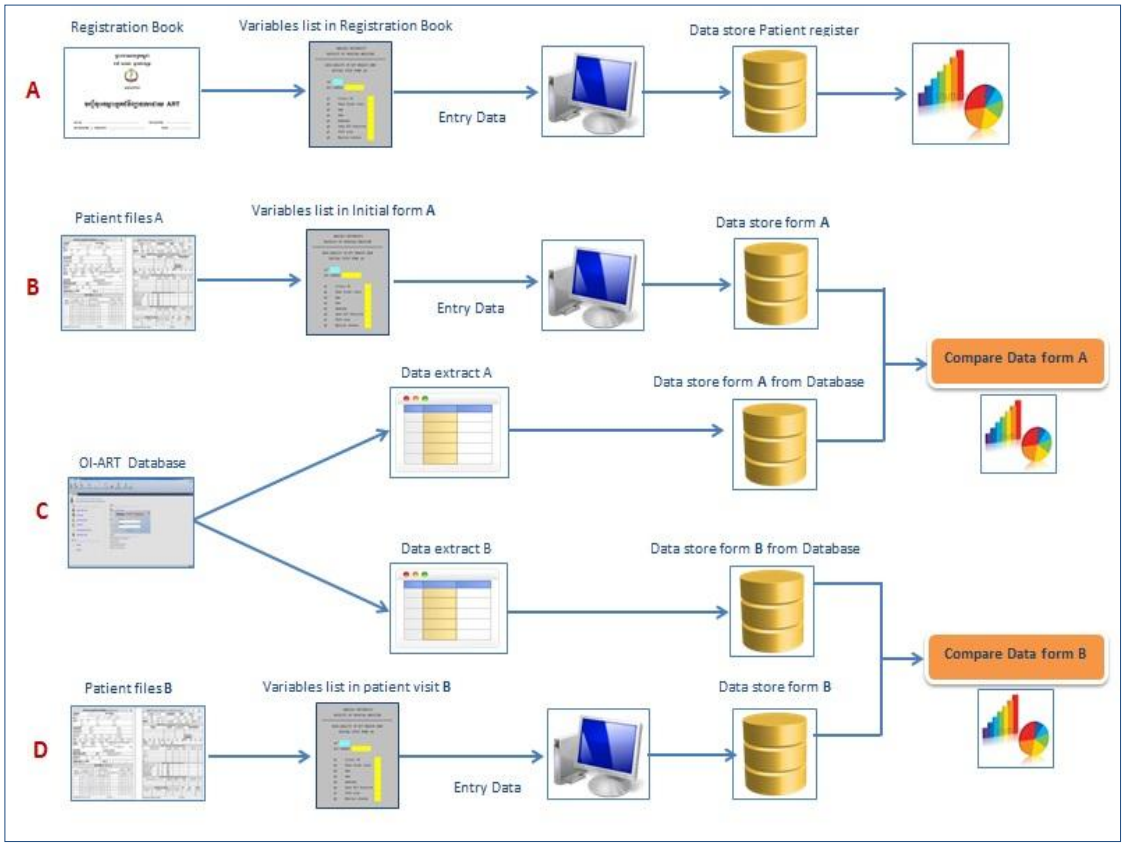

Figure 3.2: Data collection process in OI-ART service

Data is entries from patient medical records into computer directly as we set some variables in database for key in using Epi data software.

(A). ART Registration Book:

Data is entered into computer directly from Registration Book as we set variables in this study after that analysis data to find completeness and accuracy.

(B). ART patient files (Adult initial visit form A):

Data is entered into computer directly from Adult initial visit form (A) follow by variables as we set in this study after that analysis data to find completeness and accuracy.

(C). Extract data from OI-ART database system:

Data is extracted from OI-ART database system of adult initial visit form (A) and adult patient visit (B) the same what we set variables in adult initial form (A) and adult patient visit (B).

(D). ART patient files (Adult patient visit B):

Data is entered into computer directly from adult visit form (B) as we set variables after that analysis data to find completeness and accuracy.

Finally, we can compare and analysis data between adult initial visit form (A) and adult visit form (B) that we key in from patient medical records form with data in electronic patient medical records.

All data in OI-ART Database system is extracted by Data Management Officer Team in Data Management Unit, NCHADS. In addition, all data unlinked with HIV patients

3.4.2 Variables of the study:

The completeness and accuracy of the HIV patients in Registration Book:

- Date start ART
- Patient ID
- Age

- Sex
- Address
- First ART regiment

The completeness and accuracy in HIV patients Initial visit form(A) :

- Patient ID
- Date first visit
- Age
- Sex
- Address
- Marital status
- Date HIV positive
- VCCT site

The completeness and accuracy in HIV patients visit form(B):

- Patient ID
- Date visit
- ART Number
- Age
- Sex
- CD4 count
- Start ART
- Reason start ART
- Continue ART
- Date next appointment

Table 3.2: Measure of data quality dimensions

Variables Name	Measure		
	Completeness	**Accuracy**	**Consistency**
Patient ID	✓		✓
ART Number	✓	✓	✓
Sex	✓	✓	✓
Age	✓		✓
Address	✓		✓
Date HIV positive	✓		✓
VCCT site	✓		✓
Marital status	✓		✓
CD4 Count	✓	✓	✓
First ARV regiment	✓		✓
Start ART	✓		✓
Reason start ART	✓		✓
Continue ART	✓		✓
Date next appointment	✓		✓

3.4.3 Measurement of data dimensions:

- **Data completeness:** no missing data in fields

$$\textbf{\%Completeness} = \frac{\text{Number of fields completes x 100}}{\text{Total of fields reviewed}}$$

- **Data accuracy:** the extent to which the data are free of identifiable errors.

Sex: must the same sex in initial patient form (A)

ART number: must the same first visit ART number

CD4 count: Range from 01 – 1200 cells/mm^3

- **Data consistency:** the extent to which the healthcare data are reliable and the same across applications. Compare paper ART patient medical records against ART patient electronic medical records

-

$$\text{\% of Consistency} = \frac{\text{Number of field data consistency between papers based records and electronic records x 100}}{\text{Total of field records both paper based and electronic medical records}}$$

3.5 Sampling:

3.5.1 The sample size and distribution:

From literature review with the completeness varies from 72% to 82%. (6, 40, 46) The sample size for this study was calculated based on expected completeness rate of 80%, with 95% Confidence Interval, and precision of 8% (10% of 80%).

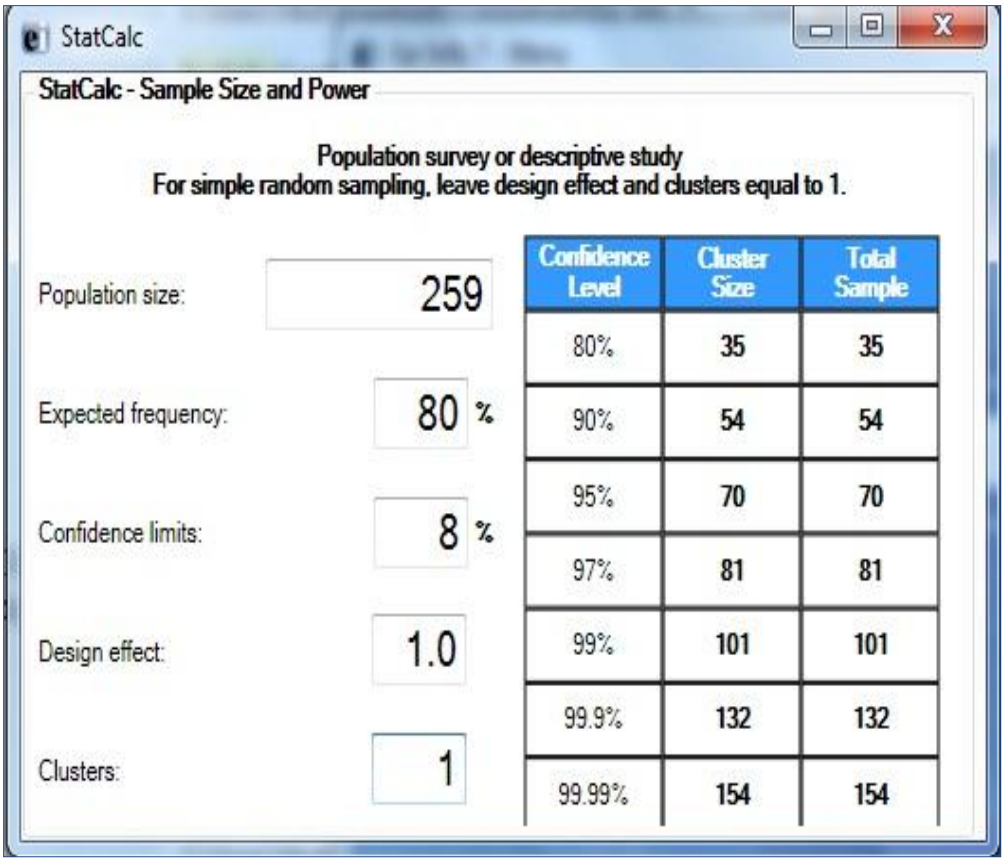

Figure 3.3: Calculate sample size with Epi info

Calculated sample size by Epi Info selected 259 HIV patients' medical records that eligibility with an ART among adult patients (>14 years of age). The sample size was the 70 cases with round up to 80 cases.

The stratified sampling ensures that at least one observation is picked from each of the strata and being the most representative of population so we use stratified systematic sampling technique of 259 cases among active ART patient records during 2010 to 2012.

Table 3.3: Number of sample size selected by year

	Total number of cases	Sample
2010	96	30
2011	84	26
2012	79	24
	259	**80**

The records will be systematically from 2010 to 2012 and calculated interval size k:

k=N/n;

In 2010: We suppose sample in n=30 patient files from 96 samples.

Interval k= 96/30 = **3**, so every 3th patient file is selected after initial random number from 1- 3.

In 2011: We suppose sample in n=26 patient files from 84 samples.

Interval k= 84/26 = **3**, so every 3th patient file is selected after initial random number selected 1- 3.

In 2012: We suppose sample in n= 24 patient files from 79 samples.

Interval k= 79/24 = **3**, so we should take 3rd patient file is selected after initial random number selected 1- 3.

3.6 Data management and statistical analysis:

3.6.1 Software for the study:

Using the Epi Data program for double data entry from paper based patient medical records into computer directly.

3.6.2 Analysis:

The data were analysis using STATA version 12

- Descriptive statistic (Mean, Median, Std. deviation, Minimum, Maximum)

3.7 Ethical consideration:

This study is approved by the Ethics Committee of the Faculty of Tropical Medicine, Mahidol University (Appendix 3.7). The investigator was requested letter approval from Director of National Center for HIV/AIDS, Dermatology and STD, and inform to the Director of Tbong Khmum Referral Hospital to access patient registration books, HIV patient files, reporting, and Patient medical records were used in this study, the permission on accessing to record was obtained from the official administrator. All data were kept confidential, security only Data Management Officer and Data entry clerk could access to the data. All data is collected from patient medical records and electronic medical records were backup and set password in computer, CD, and flash drive.

CHAPTER IV
RESULTS

The study was conducted in Tbong khmum Referral Hospital, Kampong Cham province, Cambodia. Records of 80 HIV patients who started with ARV drugs in OI-ART service during 2010-2012 were reviewed.

Results of this study are shown in 12 parts, as the followings

1) Summary of records reviewed

2) Completeness of data in ART registration book

3) Completeness of data in adult initial form (A) in 2010-2012:

4) Completeness of data in adult initial form (A) by year in electronic medical records:

5) Completeness of data in adult initial form (A) by year in paper based medical records:

6) Completeness of data in adult patient visit form (B) in 2010-2012:

7) Completeness of data in adult patient visit form (B) by year in electronic medical records:

8) Completeness of data in adult patient visit form (B) by year in paper based medical records:

9) Accuracy of data in 2010-2012:

10) Accuracy of data by year:

11) Consistency of data in adult initial form (A) in 2010-2012:

12) Consistency of data in adult initial form (A) by year:

13) Consistency of data in adult patient visit form (B) in 2010-2012:

14) Consistency of data in adult patient visit form (B) by year:

4.1 Summary of records reviewed

This study used secondary data of adult ART patient medical records in OI-ART service to assess completeness, accuracy and consistency of data quality. Data were reviewed from ART registration book, Adult initial visit form (A), and Adult patient visit form (B).

Table 4.1: Summary of records review in the OI-ART services by years

	Overall	Year 2010	Year 2011	Year 2012
Number of patients in OI-ART service	259	96	84	79
Number of randomly selected patients	80	30	26	24
Number of ART registration book (records)	80	30	26	24
Number of Initial patient visit form (A) (records)	80	30	26	24
Number of Adult patient visit form (B) (records)	1220	600	388	232

- ART registration book: 80 records of ART patients who register at OI ART services in 2010, 2011, and 2012 were randomly selected and reviewed. For every new patient, the registration staffs must record information of ART patients into the ART registration book (Table 7) including variables Patient ID, date start ART, ART number, age, sex, address, and first ART regimen.

- Initial patient visit form (A): 30 ART patients in 2010, 26 ART patients in 2011, and 24 ART patients in 2012 were randomly selected for the review (Table 7) including variables Patient ID, date start ART, ART number, age, sex, address, and first ART regimen. For initial patient visit form (A) is used only one time at the first registration attached with adult patient visit form (B).

- Adult patient visit form (B): 600 records of 30 ART patients in 2010, 388 records of 26 ART patients in 2011, and 232 records of 24 ART patients in 2012 were reviewed (Table 7) including variables Patient ID, date visit, ART number, age, sex, CD4count, start ART, reason start ART, continue ART, and date next appointment. For adult patient visit form (B) is used any times when patient come to follow up visit, usually every months.

4.2 Completeness of data in ART registration book 2010-2012:

A total of 80 registration books (paper-based) of 80 ART patients who were enrolled in OI-ART service during 2010-2012 were reviewed. For every new patient, the registration staffs must record information of ART patients into the ART registration book. As in Table8, we found (100%) completeness of all selected variables, including patient ID, date start ART, ART number, age, sex, address, and first ART regimen.

Table 4.2: Completeness of data in ART registration book 2010-2012**:**

Variables	ART registration book	
	n	No. Completeness (%)
Patient ID	80	80 (100)
Date start ART	80	80 (100)
ART number	80	80 (100)
Age	80	80 (100)
Sex	80	80 (100)
Address	80	80 (100)
First ART regimen	80	80 (100)

4.3 Completeness of data in adult initial form (A) in 2010-2012:

Eighty records of adult initial form of 80 ART patients who were enrolled in the OI-ART services during 2010-2012 were reviewed for completeness of data, in both paper-based and electronic medical record (computer-based). In general, doctors, nurses are responsible for completing the paper-based form, and data entry clerks are responsible for entering information from paper-based to electronic medical record. As show in Table9, the overall completeness was very high (97%-100%). The completeness of data in adult initial visit form (A) both in electronic medical records and paper-based medical records were 100% complete in variables patient ID, date first visit, age, sex, date HIV positive and 98.75% in variables of address and marital status. For VCCT site, there were missing values in both electronic and paper-based medical records, but data entry clerk could find data in other sources to complete in

the electronic database. However the completeness was still at high level (97.50% and 98.75%) for paper-based and electronic-based, respectively.

Table 4.3: Completeness of data in adult initial form (A) in 2010-2012**:**

Variables	Electronic record		Paper based	
	n	No. Completeness (%)	n	No. Completeness (%)
Patient ID	80	80 (100)	80	80 (100)
Date first visit	80	80 (100)	80	80 (100)
Age	80	80 (100)	80	80 (100)
Sex	80	80 (100)	80	80 (100)
Address	80	79 (98.75)	80	79 (98.75)
Marital status	80	79 (98.75)	80	79 (98.75)
Date HIV positive	80	80 (100)	80	80 (100)
VCCT site	80	79 (98.75)	80	78 (97.50)

4.4 Completeness of data in adult initial form (A) by years in electronic medical records:

Table10 showed the completeness of data of adult initial form (A) in electronic medical records by years. In 2010 and 2011, among all of recorded reviewed were 100% complete in variables: patient ID, date first visit, age, sex, address, marital status, date HIV positive, and VCCT site. In 2012, among 24 records of ART patients, the completeness was found to be 100% in almost all variables, except variables of Address, Marital status, and VCCT site that one record was missing (95.83% completeness).

Table 4.4: Completeness of data in adult initial form (A) by years in electronic medical records:

Variables	Adult initial in 2010		Adult initial in 2011		Adult initial in 2012	
	n	No. completeness (%)	n	No. completeness (%)	n	No. completeness (%)
Patient ID	30	30 (100)	26	26 (100)	24	24 (100)
Date first visit	30	30 (100)	26	26 (100)	24	24 (100)
Age	30	30 (100)	26	26 (100)	24	24 (100)
Sex	30	30 (100)	26	26 (100)	24	24 (100)
Address	30	30 (100)	26	26 (100)	24	23 (95.83)
Marital status	30	30 (100)	26	26 (100)	24	23 (95.83)
Date HIV positive	30	30 (100)	26	26 (100)	24	24 (100)
VCCT site	30	30 (100)	26	26 (100)	24	23 (95.83)

4.5 Completeness of data in adult initial form (A) by years in paper based medical records:

Table11 showed the completeness of data of adult initial form (A) in paper based medical records by years. All 30 records reviewed in 2010 were 100% complete in all variables. In 2011, 26 records were reviewed and almost all variables had 100% completeness of data, except variable VCCT site was missing in one record in 2011. In 2012, among 24 records were reviewed of ART patients, 100% of patient ID, date first visit, age, sex, date HIV positive were completed, but some records registration was missed fill in on the patient form so (95.83%) of address, marital status, and VCCT site.

Table 4.5: Completeness of data in adult initial form (A) by years in paper based medical records**:**

Variables	Adult initial in 2010		Adult initial in 2011		Adult initial in 2012	
	N	No. completeness (%)	n	No. completeness (%)	n	No. completeness (%)
Patient ID	30	30 (100)	26	26 (100)	24	24 (100)
Date first visit	30	30 (100)	26	26 (100)	24	24 (100)
Age	30	30 (100)	26	26 (100)	24	24 (100)
Sex	30	30 (100)	26	26 (100)	24	24 (100)
Address	30	30 (100)	26	26 (100)	24	23 (95.83)
Marital status	30	30 (100)	26	26 (100)	24	23 (95.83)
Date HIV positive	30	30 (100)	26	26 (100)	24	24 (100)
VCCT site	30	30 (100)	26	25 (96.15)	24	23 (95.83)

4.6 Completeness of data in adult patient visit form (B) in 2010-2012:

Table12 showed the completeness for data of ART patients during follow up visits in OI-ART services. A total of 1220 records of 80 ART patients were reviewed to evaluate the completeness of patient follow up visit in electronic medical records and paper-based medical records. The majority of data follow-up visits in electronic medical records had greater completeness than those in paper-based medical records. In electronic medical records, 100% of variables patient ID, date visit, ART number, age, sex, date next appointment, and 97.45% of CD4count were completed. However, in paper based medical records, among 1220 records of 80 ART patients reviewed, only 80 records had complete patient ID variable (7% completeness). The completeness of data were found to be higher than 90% in variables such as date visit (98.68%), ART number (94.67%), age (94.83%), sex (91.31%), CD4count (68.91%), and date next appointment (97.29%). Additionally, 80 records of patients who start ART were reviewed for completeness of variables Start ART and Reason start ART. All 80 records in both electronic and paper-based had 100% completeness in Start ART data. Only 53.75% of 80 records had complete data. Moreover, data on continue ART were reviewed in 1140 records of 80 ART patients, but only 86.49% of the

record had complete data on continue ART variable in electronic, while 80.17% of continue ART variable had complete data in paper-based record.

Table 4.6: Completeness of data in adult patient visit form (B) in 2010-2012:

Variables	Computer		Paper based	
	n	No. Completeness (%)	n	No. Completeness (%)
Patient ID	1220	1220 (100)	1220	80 (7.00)
Date visit	1220	1220 (100)	1220	1204 (98.68)
ART number	1220	1220 (100)	1220	1155 (94.67)
Age	1220	1220 (100)	1220	1157 (94.83)
Sex	1220	1220 (100)	1220	1114 (91.31)
CD4 count	1220	1189 (97.45)	1220	841 (68.93)
Start ART *	80	80 (100)	80	80 (100)
Reason start ART *	80	43 (53.75)	80	43 (53.75)
Continue ART **	1140	986 (86.49)	1140	914 (80.17)
Date next appointment	1220	1220 (100)	1220	1187 (97.29)

***** Denominators were based on number of cases

****** Denominators were based on subsequent records of each case

4.7 Completeness of data in adult patient visit form (B) by years in electronic medical records:

Table13 showed the completeness for data in adult patient visit form (B) of ART patients during follow up visits in electronic medical record of OI-ART services by years. Overall, the completeness of data in many variables remained at high level over 3-years. The completeness was observed to be 100% in variables, including patient ID, date visit, ART number, age, sex, and date next appointment in all 3 years data. Data on CD4 count were completed in all records in 2010 and 2011, but there were missing data in 31 of 232 records in 2012 (86.63% completeness). Additionally, 30 records of ART patients who start ART (number of case) were reviewed, 100% of start ART was completed in all 3 years data, but only 66.66%, 53.84%, and 37.50% of reason start ART variable were completed in 2010, 2011, and 2012 databases,

respectively. Among 570 records of continue ART (subsequent records of each cases), 89.12%, 88.12%, and 76.44% of records in 2010, 2011, and 2012, respectively, were completed.

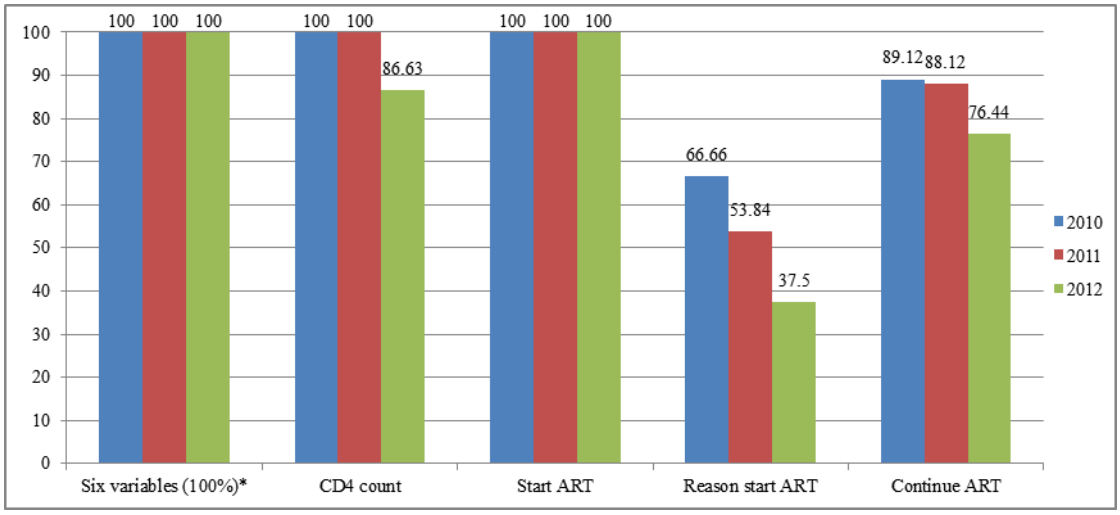

Figure 4.1: Percentage of data completeness in adult patient visit form (B) by years in electronic medical records

Table 4.7: Completeness of data in adult patient visit form (B) by years in electronic medical records:

Variables	Adult patient visit in 2010		Adult patient visit in 2011		Adult patient visit in 2012	
	n	No. completeness (%)	n	No. completeness (%)	n	No. completeness (%)
Patient ID	600	600 (100)	388	388 (100)	232	232 (100)
Date visit	600	600 (100)	388	388 (100)	232	232 (100)
ART number	600	600 (100)	388	388 (100)	232	232 (100)
Age	600	600 (100)	388	388 (100)	232	232 (100)
Sex	600	600 (100)	388	388 (100)	232	232 (100)
CD4 count	**600**	**600 (100)**	**388**	**388 (100)**	**232**	**201 (86.63)**
Start ART *	30	30 (100)	26	26 (100)	24	24 (100)
Reason start ART *	30	20 (66.66)	26	14 (53.84)	24	9 (37.50)
Continue ART **	570	508 (89.12)	362	319 (88.12)	208	159 (76.44)
Date next appointment	600	600 (100)	388	388 (100)	232	232 (100)

4.8 Completeness of data in adult patient visit form (B) by years in paper based medical records:

Table14 showed the completeness for data of ART patients during follow up visits in paper-based medical records of OI-ART services. Among 3-year period in 2010, 2011, and 2012, the completeness were found to be very low in patient ID variable (5%, 6.70%, and 10.34% completeness), and low in CD4count variable (75.00%, 69.58%, and 52.15% completeness). However, overall, the completeness of data in many variables remained at high level over 3-years. The completeness was observed to be more than 85% in variables, including date visit (98.33%, 99.22%, and 98.70%), ART number (94.00%, 94.32%, and 96.98), age (94.50%, 93.81%, and 97.41%), sex (92.00%, 89.94%, and 91.81%), and date next appointment (96.50%, 97.68%, and 98.70) in all 3 years data.

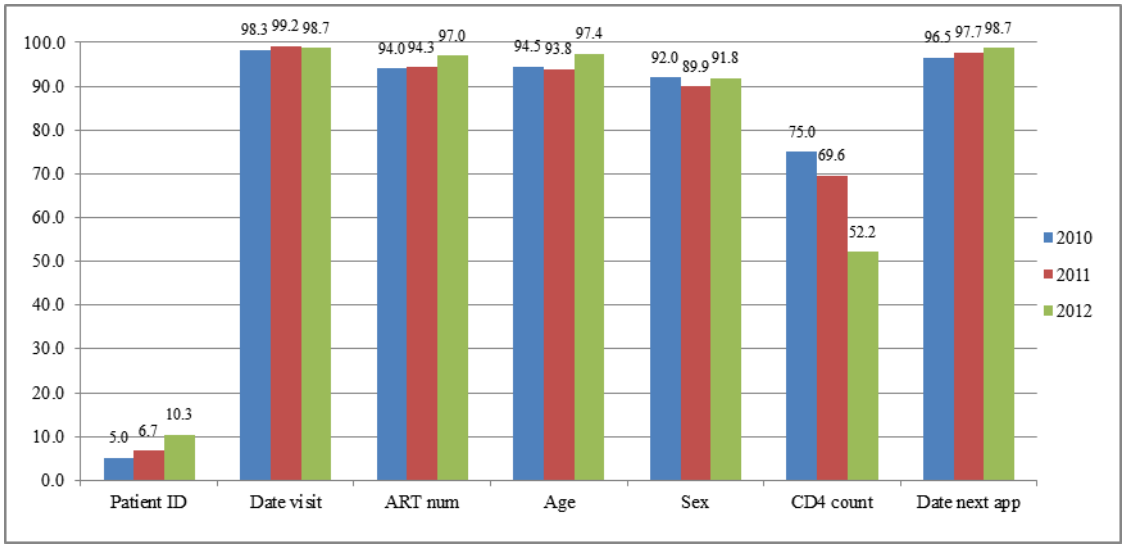

Figure 4.2: Percentage of completeness data in adult patient visit form (B)

Additionally, 30 records in 2010, 26 records in 2011, and 24 records in 2012 of ART patients who start ART (number of case) were reviewed, 100% of start ART variable was completed in all 3 years data, but only 66.66%, 53.84%, and 37.50% of reason start ART variable were completed in 2010, 2011, and 2012 databases, respectively. Among 570 records in 2010, 362 records in 2011, and 208

records in 2012 of continue ART (subsequent records of each cases), 84.38%, 78.45%, and 71.63% of records were completed.

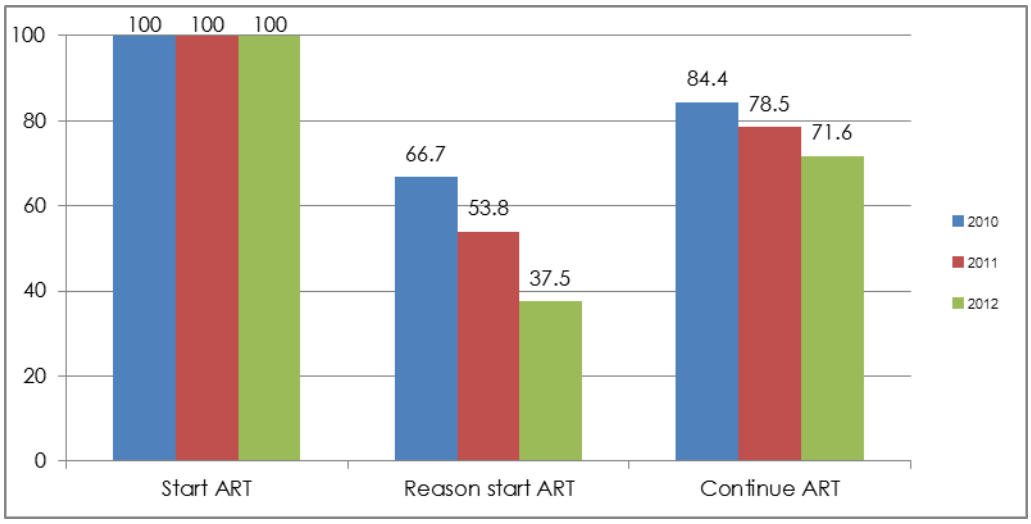

Figure 4.3: Percentage of data completeness in adult patient visit form (B)

Table 4.8: Completeness of data in adult patient visit form (B) by years in paper based medical records:

Variables	Adult patient visit in 2010		Adult patient visit in 2011		Adult patient visit in 2012	
	n	No. completeness (%)	n	No. completeness (%)	n	No. completeness (%)
Patient ID	600	30 (5.0)	388	26 (6.70)	232	24 (10.34)
Date visit	600	590 (98.33)	388	385 (99.22)	232	229 (98.70)
ART number	600	564 (94.00)	388	366 (94.32)	232	225 (96.98)
Age	600	567 (94.50)	388	364 (93.81)	232	226 (97.41)
Sex	600	552 (92.00)	388	349 (89.94)	232	213 (91.81)
CD4 count	600	450 (75.00)	388	270 (69.58)	232	121 (52.15)
Start ART *	30	30 (100)	26	26 (100)	24	24 (100)
Reason start ART *	30	20 (66.66)	26	14 (53.84)	24	9 (37.50)
Continue ART **	570	481 (84.38)	362	284 (78.45)	208	149 (71.63)
Date next appoint	600	579 (96.50)	388	379 (97.68)	232	229 98.70)

4.9 Accuracy of data in 2010-2012:

Table15 showed the accuracy of data in adult patient visit form (B) on paper-based medical records. Among 1220 records of 80 ART patients enrolled in OI-ART service during 2010-2012. The accuracy of data in variables of Sex (88.85%) was consistent with those on variable of sex in electronic medical records, while accuracy of ART number with (92.13%) of value consistent with ART number in electronic medical records, and accuracy of CD4 count (69.42%) was consistent with CD4 count result in patient test records.

Table 4.9: Accuracy of data in 2010-2012:

Variables	Accuracy of data in 2010-2012	
	N	No. (%)
Sex	1220	1084 (88.85)
ART number	1220	1124 (92.13)
CD4 count	1220	847 (69.42)

4.10 Accuracy of data by years:

Table16 showed the accuracy of data in adult patient visit form (B) on paper-based medical records. Among 3-years in 2010, 2011, and 2012 the accuracy of data in variable of Sex (90.66%, 88.14%, and 89.22%) were consistent with those on variable of sex in electronic medical records, while accuracy of ART number with (92.13%, 91.66%, 91.75%, and 93.96%) of values were consistent with ART number in electronic medical records, and accuracy of CD4 count (73.50%, 65.46%, and 65.51%) of values were consistent with CD4 count data result in Patient test records.

Table 4.10: Accuracy of data by years:

Variables	2010(n=600)		2011(n=388)		2012(n=232)	
	Accuracy	%	Accuracy	%	Accuracy	%
Sex	544	90.66	342	88.14	207	89.22
ART number	550	91.66	356	91.75	218	93.96
CD4 count	441	73.50	254	65.46	152	65.51

4.11 Consistency of data in adult initial form (A) in 2010-2012:

The data were highly consistent in adult initial form (A) between electronic medical records and paper-based medical records (as show in Table17). Among 80 ART patients enrolled in OI-ART service during 2010-2012, 100% of patient ID, date first visit, age, sex, address, marital status were consistent between two databases. For data on date HIV positive, the data entry clerk key in incorrect one record in the electronic medical record, so there was inconsistent in one record (98.75% consistency). For VCCT site variable, there was inconsistent in one record where there was missed fill in on paper (98.75% consistency).

Table 4.11: Consistency of data in adult initial form (A) in 2010-2012:

Variables	Number of fields review	No. Consistency (%)
	Computer & Paper based	
Patient ID	80	80 (100)
Date first visit	80	80 (100)
Age	80	80 (100)
Sex	80	80 (100)
Address	80	80 (100)
Marital status	80	80 (100)
Date HIV positive	80	79 (98.75)
VCCT site	80	79 (98.75)

4.12 Consistency of data in adult initial form (A) by years:

Table18 showed the consistency of data in adult initial visit form (A) between electronic medical records and paper based medical records by years. There were 100% consistency between the two databases in almost all variables over 3-years, except data in 2010 on date HIV positive was inconsistent in one record (96.66% consistency) and data on VCCT site that had missing data on one record in year 2011 (96% consistency).

Table 4.12: Consistency of data in adult initial form (A) by years:

Variables	No. fields review 2010	No. Consistency (%)	No. fields review 2011	No. Consistency (%)	No. fields review 2012	No. Consistency (%)
	Computer & Paper		Computer & Paper		Computer & Paper	
Patient ID	30	30 (100)	26	26 (100)	24	24 (100)
Date first visit	30	30 (100)	26	26 (100)	24	24 (100)
Age	30	30 (100)	26	26 (100)	24	24 (100)
Sex	30	30 (100)	26	26 (100)	24	24 (100)
Address	30	30 (100)	26	26 (100)	24	24 (100)
Marital status	30	30 (100)	26	26 (100)	24	24 (100)
Date HIV positive	30	29 (96.66)	26	26 (100)	24	24 (100)
VCCT site	30	30 (100)	26	25 (96.15)	24	24 100)

4.13 Consistency of data in adult patient visit form (B) in 2010-2012:

As show in Table19 the consistencies of data in adult follow up visit form (B) between electronic medical records and paper based medical records in 2010-2012 were varied across different variables. The consistency was high in variables of date visit (98.19%), ART number (92.13%), sex (88.85%), start ART (100%), reason start ART (100%), continue ART (92.54%), and date next appointment (96.72%).

However, the consistency was found to be very low in patient ID variable (only 6.55% consistent), and low in age variable (47.29%). Most of the inconsistency in patient ID variable was due to missing data in paper-based record, but not in electronic medical record. For data on age, the inconsistency was due to both missing data in paper-based record and inconsistent of data appeared in both paper-based record and electronic record.

Table 4.13: Consistency of data in adult patient visit form (B) in 2010-2012:

Variables	Number of fields review	No. Consistency (%)
	Computer & Paper based	
Patient ID	1220	80 (6.55)
Date visit	1220	1198 (98.19)
ART number	1220	1124 (92.13)
Age	1220	577 (47.29)
Sex	1220	1084 (88.85)
CD4 count	1220	847 (69.42)
Start ART *	80	80 (100)
Reason start ART *	80	80 (100)
Continue ART **	1140	1055 (92.54)
Date next appointment	1220	1180 (96.72)

***** Denominators were based on number of cases

****** Denominators were based on subsequent records of each case

4.14 Consistency of data in adult patient visit form (B) by years:

Table20 showed the consistencies for data of ART patients between paper-based medical record and electronic medical record by year during follow up visits in OI-ART services. Among 3-years in 2010, 2011, and 2012 were reviewed across different variables. The consistency was found to be very low in patient ID variable (5%, 6.70%, and 10.34% consistency), on Age variable (36.00%, 47.16%, and 76.72% consistency), and low in CD4count variable (73.50%, 65.46%, and 65.61% consistency). Most of the inconsistency in patient ID, Age, and CD4count variables

was due to missing data in paper-based record, but not in electronic medical record. However, the consistency of data in many variables remained at high level in 3-years. The consistency was observed to be more than 85% in variables of date visit (97.66%, 98.96%, and 98.27% consistency), ART number (91.66%, 91.75%, and 93.96% consistency), sex (89.16%, 88.14%, and 89.22% consistency), and date next appointment (95.66%, 97.68%, and 97.84% consistency) in 3-years data. Additionally, 30 records in 2010, 26 records in 2011, and 24 records in 2012 of ART patients who start ART (number of case) were reviewed, 100% of start ART and reason start ART were consistent in all 3-years data. Moreover, 570 records in 2010, 362 records in 2011, and 208 records in 2012 of continue ART (subsequent records of each case), 94.56%, 88.67%, and 93.75% were consistent.

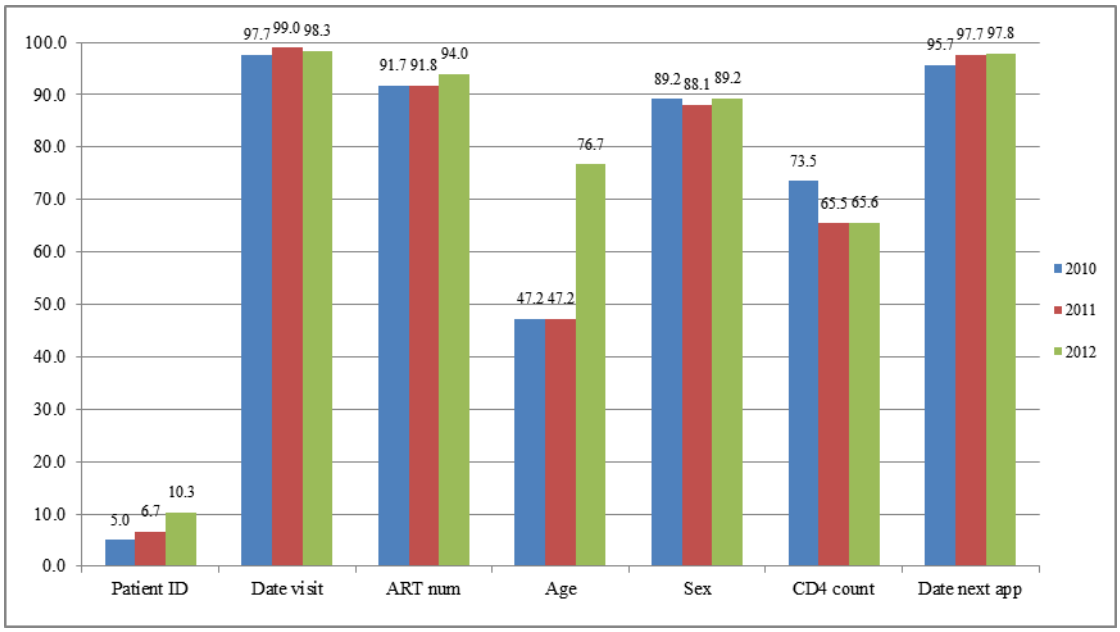

Figure 4.4: Percentage of data consistency between paper-based and electronic based data in adult patient visit form (B) by years

Table 4.14: Consistency of data in adult patient visit form (B) by years:

Variables	No. fields review 2010	No. Consistency (%)	No. fields review 2011	No. Consistency (%)	No. fields review 2012	No. Consistency (%)
	Computer & Paper		Computer & Paper		Computer & Paper	
Patient ID	600	30 (5.00)	388	26 (6.70)	232	24 (10.34)
Date visit	600	586 (97.66)	388	384 (98.96)	232	228 (98.27)
ART number	600	550 (91.66)	388	356 (91.75)	232	218 (93.96)
Age	600	216 (36.00)	388	183 (47.16)	232	178 (76.72)
Sex	600	535 (89.16)	388	342 (88.14)	232	207 (89.22)
CD4 count	600	441 (73.50)	388	254 (65.46)	232	152 (65.61)
Start ART *	30	30 (100)	26	26 (100)	24	24 (100)
Reason start ART *	30	30 (100)	26	26 (100)	24	24 (100)
Continue ART **	570	539 (94.56)	362	321 (88.67)	208	195 (93.75)
Date next appoint	600	574 (95.66)	388	379 (97.68)	232	227 (97.84)

***** Denominators were based on number of cases

****** Denominators were based on subsequent records of each case

CHAPTER V
DISCUSSIONS

In this study, the completeness, accuracy and consistency of data were reviewed among 80 of ART patients (approximately 30% of total number of cases in 2010-2012) that were randomly selected from the total patients in the OI-ART service. Several important variables in paper medical record and electronic medical record were reviewed. The OI-ART database system was implemented in 2007, and since then there has been no studies that evaluate the data quality of the system. The study was conducted at Tbong khmum Referral Hospital, one of 61 hospitals in the OI-ART service. The Tbong khmum Referral Hospital is considered as a middle to large hospital size (about 1,000 active HIV patients in the service) as compared with other hospitals. The quality of service and database management in this hospital was considered to be ranked in the middle among other hospital. The discussion of the result found in the study was arranged as followings:

5.1 The completeness of data

5.2 The accuracy of data

5.3 The consistency of data

5.4 Significance of study

5.5 Limitations of study

Overall, the completeness, accuracy, and consistency of data very high recorded in 3-years.

5.1 The completeness of data:

Overall, the study showed very high levels (95% - 100%) of completeness of data in adult initial visit form (A), both in electronic medical record and paper-based medical record in variables of Patient ID, Date first visit, Age, Sex, Address, Marital status, and VCCT site. However, in adult patient visit form (B), the

completeness of data was high in many variables, except the variable Patient ID which 93% of record was incomplete in this variable. In practice, the registration staffs usually record patient ID only the first time when a patient starts ART and for the next follow-up visits they do not record again because another number, called (ART number), is assigned and used for the patient. However, according to the guideline, the registration staffs should record patient ID in all patient follow up visit. Additionally, the variable of reason start ART had missing in about 50% of records in both of electronic medical record and paper-based medical record. This variable should be completed by doctors. Missing record in reason start ART could be explained by several reasons. Firstly, doctors may not have time for filling in patient paper form (doctor usually spend time around 15 minutes for management and fill in the form of one patient) because of workload due to a large number of patients come to follow up visit per day. Secondly, in the same form, there is another section called WHO stage checklist, if the doctor checked on stage 3 or 4, this means that the patient is eligible for the ART treatment. Therefore, doctors may not want to repeat starting reason for starting ART again, but based on instruction of fill out in patient form, doctors should fill in reason start ART when patient start ART. Moreover, too small free spaces to write down the reason start ART might be another issue that made doctors did not want to fill in the form. However, result showed decreased trend in data completeness in variable reason start ART over the 3-year period. This could be explained by reduction in compensation for doctors to fill in the patient form. From 2010 until mid of 2011, the project received support from the Family Health International Organization to provide incentive for doctors fill in patient paper form (0.25$ per case). After the support was finished, doctors did not receive incentive to complete the form. This might explain why we found data on reason start ART in 2010 and 2011 higher than data in 2012. Generally, the adult patient visit form (B) should be completed by different persons, including registration staff (for patient characteristics), nurses (for CD4 count), and doctors (for ART details). Our results also showed that the completeness of data also depended on the role of staff. The variables that have to be completed by doctors had more incompleteness than other staffs. The study of implementation of electronic medical records to improve the quality of data in Africa, this survey compared data in electronic medical record before and after conducted

EMR in 2007 and 2011 to find the completeness of data in some variables. The total of data completeness was increased from 45.4% in 2007 to 98.1% in 2011 of new opportunistic infections, 51.4% to 96.5% of ART toxicity, 48.6% to 93.8% of Reason for ART interruption, and 54.9% to 99.6% of Reason for ART switch. Before implementation of EMR, the most of errors, three of the four variables were observed that due to incompleteness. Improving the quality of data in EMR is meaning improves the quality of care. (45)

According to a study conducted in Mozambique during 2005-2006, this study applied in public sector HIV clinic to monitoring completeness based on paper based medical record of HIV patient follow up. The study found 72% of data elements for patient register and 66% of patient follow up visit were completed. Incomplete CD4 count data in patient follow up visit and missing WHO stage in initial visits were concerning to decide patient eligible ART early. Data completeness was higher for patient registration than patient follow-up visit. (6)

5.2 The accuracy of data:

Overall, in this study, the accuracy of data was found in 69% - 89% of paper medical record adult patient visit form (B) with most variables including Sex, ART number, and CD4count were highly accurate. However, our findings were consistent with a study that reviewed data quality in large HIV program in Sub Saharan Africa which compared information of patient's files in electronic medical record before and after conducted EMR in different years to find the rate of correct and incorrect of information. The study found incorrect of data was decreased from 26.2% in 2007 to 2.1% in 2011 of New opportunistic infections, 6.7% to 0% of ART toxicity, 64.7 to 6.7% of Reason for ART interruption, and 25% to 0.4% of Reason for ART switch. (45)

Another study was done in Mozambique 6 month twice time periods in 2005 and 2006. The study found 95% of data accuracy for patient register and 84% for patient follow-up visit. Accuracy of CD4 count 96% on patient follow up visit was consistent with CD4 count data in Laboratory and accuracy of age was good, with

78% of age variable consistent with age calculate from patient date of birth. However, accuracy of data in patient registers better than data in patient follow-up visit.(6) Accuracy of data in Patient database system was also assessed in central Mozambique. This study was compared between data in electronic database with data abstracted from a stratified random sample of 520 patients. The accuracy of data was observed with 97.69% of gender variable, 98.40% of CD4 count, and 95.91% of ART initiation Date. The patient database system has involved monitoring patient management and HIV reporting. A high level of data accuracy in this study could be a result of using standardized of data recording.(40)

5.3 The consistency of data:

Overall, the data were highly consistent in both of electronic medical record and paper-based medical record. Almost variables in adult initial form (A) including patient ID, date first visit, age, sex, address, marital status, date HIV positive, and VCCT site were about 97% - 100% consistent. However, in adult patient visit form (B) we found that 90% - 95% of patient ID, 24% - 63% of Age, and 27% - 35% of CD4count variables were inconsistent, whereas other variables in this form were highly consistent. Regarding the result, the issue of patient ID variable, the registration staff are usually not recording patient ID on patient paper form (B), but rather record ART number, since patient ID was recorded at the first time on cover patient file. However, the registration staff should record both of patient ID and ART number in every patient follow up visits. For Age variable, the registration staff has to ask patient in every visit, patients may give inconsistent answers, as seen in the inconsistency of data that was due to wrong entering value during data collection rather than missing values. To avoid this issue, the system should provide automatically calculation of age according to date of birth and then Age variable may not be a required to fill out in the patient form (B). In addition, for CD4 count variable the registration staff should record on patient paper form (B) in every patient follow up visits based on the CD4 count paper result from laboratory; for this process, registration staff may not be aware of the date of laboratory results, sometimes they

just copy the CD4 results from the previous visit to fill in the form. The CD4 count records were inconsistent due to both missing value and wrong entering value during data collection. However, the CD4 count result on electronic patient visit form (B) was captured directly from Patient Test form, which is more accurate than in the paper-based record

In a study conducted in Mozambique during 2005-2006, this study assessed consistency of data in based on paper-based medical record of HIV patient. The study compared across different data sources (patient follow up vs laboratory test, patient register vs paper patient register). Result showed that 96% of CD4 count on patient follow up visit was consistent with CD4 count data in Laboratory, 95% of date HIV diagnosis was consistent with test report and 78% of age variable consistent with age calculate from patient date of birth on patient register. This study recommended that the quality of data in electronic medical record depended on data on paper-based medical record. (6)

Data quality is an issue not only in HIV case management, but also in system of other diseases. A study that reviewed malaria reporting system in Mozambique also found that data quality consistency of reporting case system was still poor. There were many problems of data reporting such as incomplete data, errors with handwriting, recorded with wrong items, most of malaria cases do not record in register book, workload, existing reporting system not update on time as malaria strategies plan. To improve quality of malaria data this study suggested that the reporting system should create a standard data collection form and implement malaria database system to all health facilities. (47)

5.4 Significance of study:

This is the first study that assessed data quality in HIV database system in Cambodia. Firstly, the study provides information about the impact of data quality in term of completeness, accuracy, and consistency in both paper-based medical records and electronic medical records. Results from this study offer to help develop approaches to encourage facility staffs to improve recording information and improve

understanding of weaknesses or shortcomings in data entry by clinicians and data entry clerk. Secondly, results of this study could be as a feedback to help health workers understand what the real problem of paper-based and electronic medical records. In addition, understanding data quality in HIV service is important for management of patients, logistic management for drugs and other supplies, and also help policy makers to make decision based on the report generated from database system. Finally, there is no evaluation of the OI-ART database system so the result of this study will help to understand the weakness of data so it could be help to improve the quality of data in the future.

5.5 Limitations of study:

This study also has some limitations. First, the study reviewed data quality of only selected variables that are potential to the use of data in generating reports and other useful analysis. Secondly, the study was collected data from middle level of quality of service and database management if compare to another hospital so it may not be representative of all the hospitals in the OI-ART services.

CHAPTER VI
CONCLUSIONS

6.1 Conclusions:

The study was conducted in OI-ART service at Tbong Khmum Referral Hospital, Kampong Cham Province, Cambodia. According to the results of study found high levels of completeness, accuracy, and consistency of data in both electronic medical record and paper-based medical record. However, in some variables such as patient ID, sex, age the completeness was found more in electronic medical record than in paper-based medical record. An electronic medical record is used more generally to monitoring, support researchers, HIV treatment and evaluate program. This study provides full picture of completeness and consistency of data in that site. Moreover, level of data completeness, accuracy, and consistency of systems can confirm that high data quality is being used for these reports and research, and especially the reports to the National center for HIV/AIDs, Ministry of Health and funder.

6.2 Recommendations:

This is the first study in quality of data in HIV health care in Cambodia. An evaluation quality of data in OI-ART service at Tbong khmum Referral Hospital is very important to improving the quality of data in paper-based record and electronic medical record.

First, in electronic medical record, on age variable may not be need for adult patient visit form (B), should be make the system to calculate age automatically from date of birth in initial visit form (A) and develop edit checks list for certain variables to improve quality of data entry. Moreover, provide larger space or check list for “reason start ART”. However, on paper-based medical record, the age variable

should be change to date of birth in initial patient form (A) and should provide a larger free space of reason start ART or make a check list for common reasons to assist doctors to reduce unnecessary variables on patient forms.

Second, OI-ART staffs should understand clearly about the benefit of data quality and quality of care to improving the completeness, accuracy, and consistency of data. It would be best if doctors recorded more about the OI-ART that are experienced by patients and then data entry clerk should record these more accurately. Data entry clerk should review fields on paper patient form before key in into database system to make sure that value in database system and values in paper patient form are matched. Moreover, should be random check for consistency in the database system and develop edit checks for certain variables to avoid errors in data entry. In addition, capacity building among OI-ART staffs should be done by providing training course of standardization of data collection tools and data collection routine works to OI-ART staffs. Future study should focus on other diagnosis such as: data quality in HIV pregnant women and baby follow up sheet, data quality in HIV Exposed Infant database, and data quality in VCCT registration database system which was not included in this study. Moreover, further study is recommended to cross check other variables and to assess data quality to all hospitals that provides OI-ART services.

Finally, staffs commitment and providing incentive to OI-ART staffs could be another main point to improve quality of data and quality of care services in hospital. But this hospital is at least represent typical mid-level hospital, which accounted for most hospitals in the OI-ART service.

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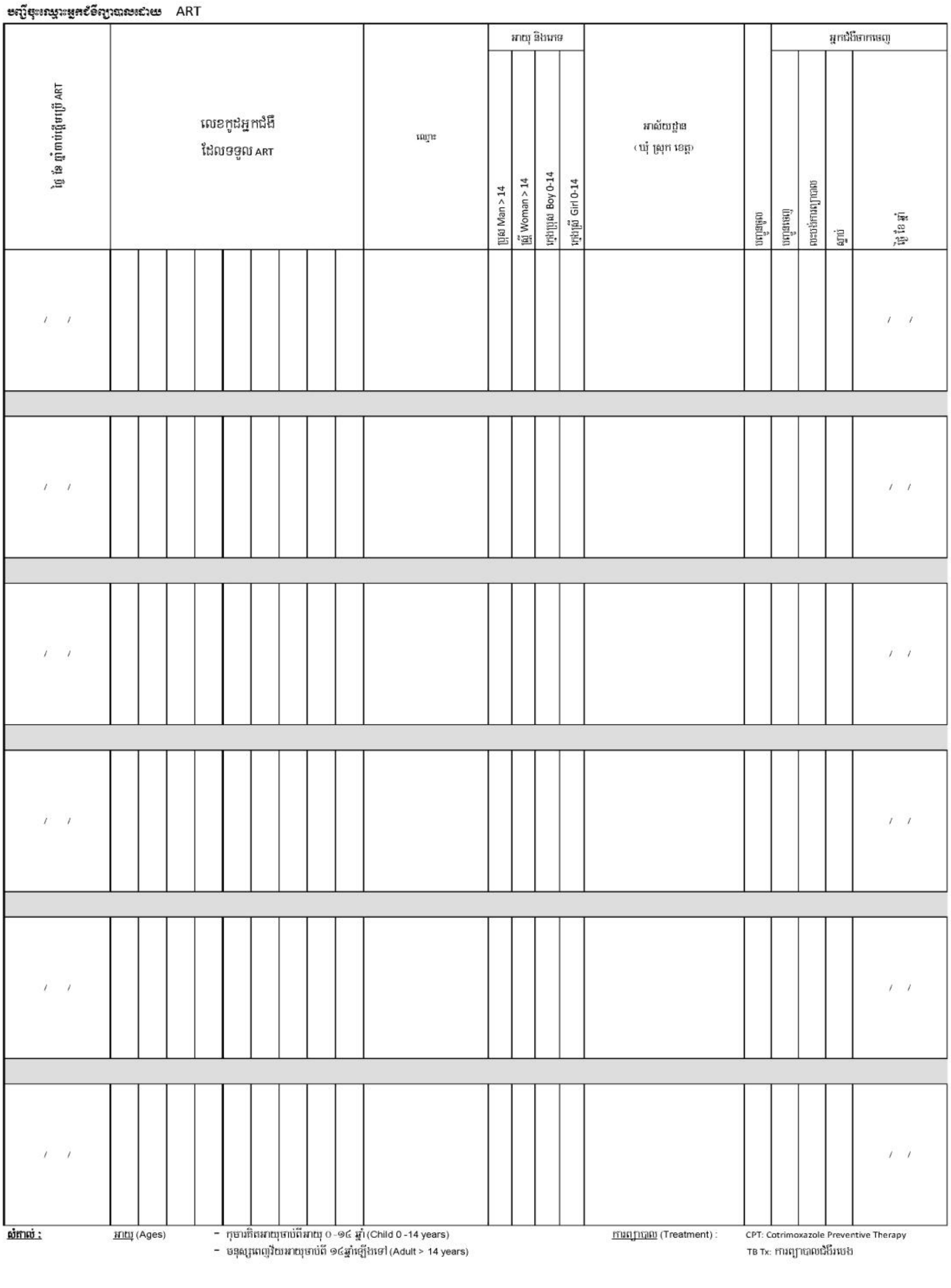
APPENDIX

1. ART Patient Registration Book:



បញ្ជីចុះឈ្មោះអ្នកជំងឺព្យាបាលដោយ ART

ថ្ងៃ ខែ ឆ្នាំចាប់ផ្តើមប្រើ ART	លេខកូដអ្នកជំងឺ ដែលទទួល ART	ឈ្មោះ	អាយុ និងភេទ				អាស័យដ្ឋាន (ឃុំ ស្រុក ខេត្ត)		អ្នកជំងឺចាកចេញ			
			ប្រុស Man > 14	ស្រី Woman > 14	ក្មេងប្រុស Boy 0-14	ក្មេងស្រី Girl 0-14		[illegible]	[illegible]	[illegible]	ស្លាប់	ថ្ងៃ ខែ ឆ្នាំ
/ /												/ /
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សំគាល់ : អាយុ (Ages)
- កុមារគឺអាយុចាប់ពីអាយុ ០ -១៤ ឆ្នាំ (Child 0 -14 years)
- មនុស្សពេញវ័យអាយុចាប់ពី ១៤ឆ្នាំឡើងទៅ (Adult > 14 years)

ការព្យាបាល (Treatment) : CPT: Cotrimoxazole Preventive Therapy
TB Tx: ការព្យាបាលជំងឺរបេង

2. Patient Initial Visit A:

(Adult Initial Visit Form) ក

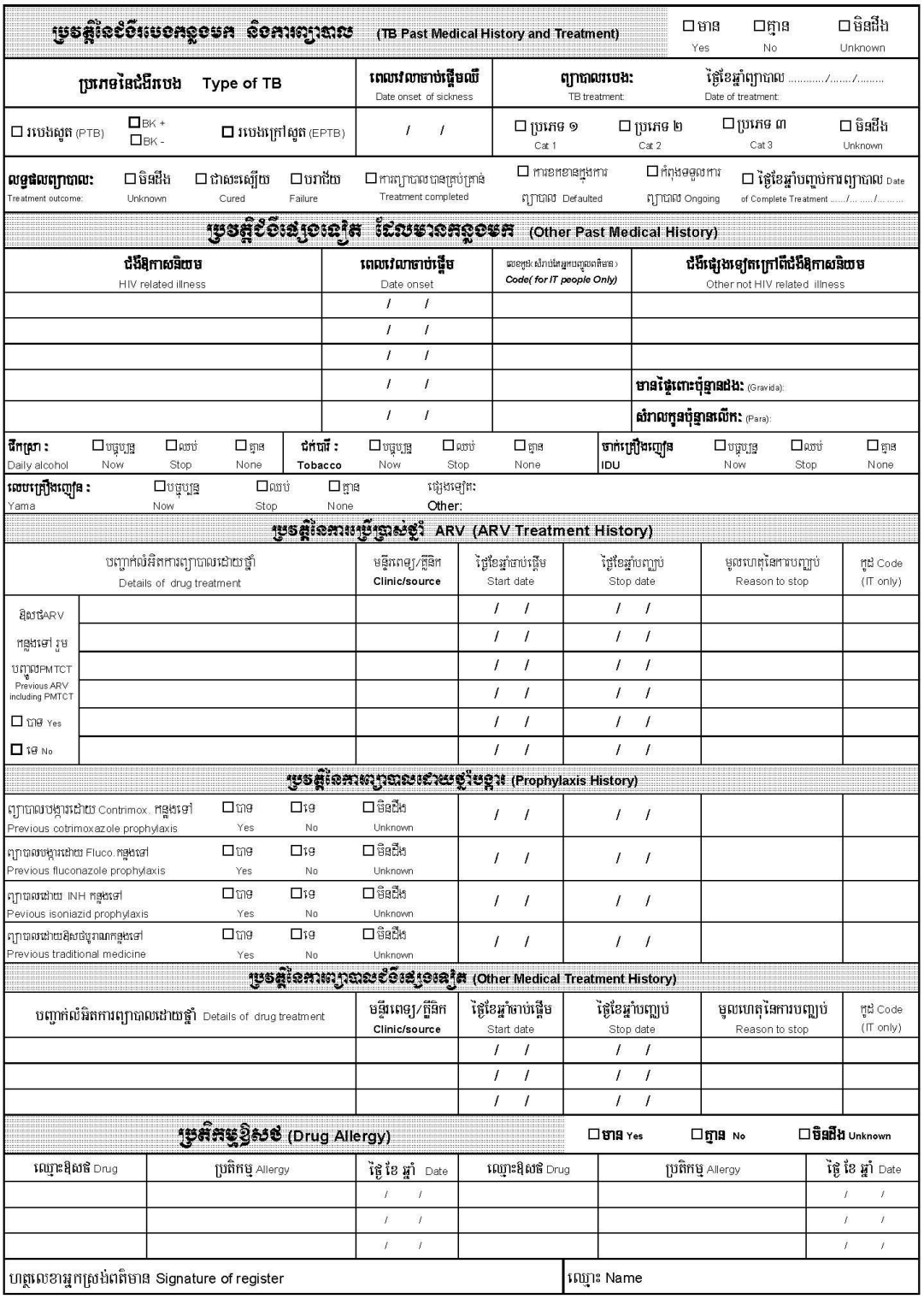
Clinic ID number	Date first visit: / /
Name	Age	ស្រី (Female) / ប្រុស (Male)
Address:	Group / Street / Village / Commune / District / Province / Phone number
Name of contact person 1	Address: / Phone number
Name of contact person 2	Address: / Phone number
Marital status	☐ Single ☐ Married ☐ Divorced ☐ Widow(er) ☐ Other — Occupation
Education	☐ None ☐ Primary ☐ Secondary ☐ University — Read? ☐ No ☐ Yes — Write? ☐ No ☐ Yes
Referred from	☐ Self referral ☐ Private Clinic ☐ Hospital ☐ (VCCT) ☐ (PMTCT) ☐ (TB Program) ☐ CBPCS/NGO ☐ Other
Details about the facility	Name and location of CBPCS team:
Date of first confirmed positive HIV test: / /	VCCT Site:	Date last prior negative HIV test: / /
Official Transfer in?	☐ No ☐ Yes — From
Date started ART in National Program: / /	ART number

(Family History)

Relative: spouse/ partner, child	Age	HIV status +	HIV status −	HIV status ?	Status Alive	Status Dead	Status ?	PMTCT history (if child or mother): mother HAART	mother AZT + 3TC	mother NVP	child AZT +/- NVP	child NVP	No ARV	(Name of OI & ART Clinic)	Receiving ARV Yes	Receiving ARV No	Receiving ARV Unknown	History of TB Yes	History of TB No	History of TB Unknown

Signature of register	Name

2. Patient Initial Visit A: (cont.)



ប្រវត្តិនៃជំងឺរបេងកន្លងមក និងការព្យាបាល (TB Past Medical History and Treatment) ☐មាន Yes ☐គ្មាន No ☐មិនដឹង Unknown

ប្រភេទនៃជំងឺរបេង Type of TB | ពេលវេលាចាប់ផ្តើមឈឺ Date onset of sickness | ព្យាបាលរបេង: TB treatment: | ថ្ងៃខែឆ្នាំព្យាបាល Date of treatment: .....//...../.....

☐ របេងសួត (PTB) ☐BK + ☐BK - ☐ របេងក្រៅសួត (EPTB) | / / | ☐ ប្រភេទ ១ Cat 1 ☐ ប្រភេទ ២ Cat 2 ☐ ប្រភេទ ៣ Cat 3 ☐ មិនដឹង Unknown

លទ្ធផលព្យាបាល: Treatment outcome: ☐ មិនដឹង Unknown ☐ ជាសះស្បើយ Cured ☐ បរាជ័យ Failure ☐ ការព្យាបាលបានគ្រប់គ្រាន់ Treatment completed ☐ ការខកខានក្នុងការព្យាបាល Defaulted ☐ កំពុងទទួលការព្យាបាល Ongoing ☐ ថ្ងៃខែឆ្នាំបញ្ចប់ការព្យាបាល Date of Complete Treatment ...../... ...../.....

ប្រវត្តិជំងឺផ្សេងទៀត ដែលមានកន្លងមក (Other Past Medical History)

ជំងឺឱកាសនិយម HIV related illness	ពេលវេលាចាប់ផ្តើម Date onset	(លេខកូដ: សំរាប់អ្នកបច្ចេកទេសតែប៉ុណ្ណោះ) Code(for IT people Only)	ជំងឺផ្សេងទៀតក្រៅពីជំងឺឱកាសនិយម Other not HIV related illness
	/ /		
	/ /		
	/ /		
	/ /		មានផ្ទៃពោះប៉ុន្មានដង: (Gravida):
	/ /		សំរាលកូនប៉ុន្មានលើក: (Para):

ទឹកស្រា: Daily alcohol ☐បច្ចុប្បន្ន Now ☐ឈប់ Stop ☐គ្មាន None | ជក់ឃ្មុំ: Tobacco ☐បច្ចុប្បន្ន Now ☐ឈប់ Stop ☐គ្មាន None | ចាក់គ្រឿងញៀន IDU ☐បច្ចុប្បន្ន Now ☐ឈប់ Stop ☐គ្មាន None

ចេបគ្រឿងញៀន: Yama ☐បច្ចុប្បន្ន Now ☐ឈប់ Stop ☐គ្មាន None ផ្សេងទៀត: Other:

ប្រវត្តិនៃការប្រើប្រាស់ថ្នាំ ARV (ARV Treatment History)

	បញ្ជាក់លំអិតការព្យាបាលដោយថ្នាំ Details of drug treatment	មន្ទីរពេទ្យ/គ្លីនិក Clinic/source	ថ្ងៃខែឆ្នាំចាប់ផ្តើម Start date	ថ្ងៃខែឆ្នាំបញ្ចប់ Stop date	មូលហេតុនៃការបញ្ឈប់ Reason to stop	កូដ Code (IT only)
ឱសថARV			/ /	/ /		
កន្លងទៅ រួម			/ /	/ /		
បញ្ចូលPMTCT Previous ARV including PMTCT			/ /	/ /		
			/ /	/ /		
☐ បាទ Yes			/ /	/ /		
☐ ទេ No			/ /	/ /		

ប្រវត្តិនៃការព្យាបាលដោយថ្នាំបង្ការ (Prophylaxis History)

ព្យាបាលបង្ការដោយ Contrimox. កន្លងទៅ Previous cotrimoxazole prophylaxis ☐បាទ Yes ☐ទេ No ☐មិនដឹង Unknown	/ /	/ /		
ព្យាបាលបង្ការដោយ Fluco. កន្លងទៅ Previous fluconazole prophylaxis ☐បាទ Yes ☐ទេ No ☐មិនដឹង Unknown	/ /	/ /		
ព្យាបាលដោយ INH កន្លងទៅ Pevious isoniazid prophylaxis ☐បាទ Yes ☐ទេ No ☐មិនដឹង Unknown	/ /	/ /		
ព្យាបាលដោយឱសថបុរាណកន្លងទៅ Previous traditional medicine ☐បាទ Yes ☐ទេ No ☐មិនដឹង Unknown	/ /	/ /		

ប្រវត្តិនៃការព្យាបាលជំងឺផ្សេងទៀត (Other Medical Treatment History)

បញ្ជាក់លំអិតការព្យាបាលដោយថ្នាំ Details of drug treatment	មន្ទីរពេទ្យ/គ្លីនិក Clinic/source	ថ្ងៃខែឆ្នាំចាប់ផ្តើម Start date	ថ្ងៃខែឆ្នាំបញ្ចប់ Stop date	មូលហេតុនៃការបញ្ឈប់ Reason to stop	កូដ Code (IT only)
		/ /	/ /		
		/ /	/ /		
		/ /	/ /		

ប្រតិកម្មឱសថ (Drug Allergy) ☐មាន Yes ☐គ្មាន No ☐មិនដឹង Unknown

ឈ្មោះឱសថ Drug	ប្រតិកម្ម Allergy	ថ្ងៃ ខែ ឆ្នាំ Date	ឈ្មោះឱសថ Drug	ប្រតិកម្ម Allergy	ថ្ងៃ ខែ ឆ្នាំ Date
		/ /			/ /
		/ /			/ /
		/ /			/ /

ហត្ថលេខាអ្នកស្រង់ពត៌មាន Signature of register	ឈ្មោះ Name

3. Patient Visit Form B:

ទំរង់ព័ត៌មាននៃអ្នកជំងឺពេលមកពិនិត្យជំងឺ (Adult Patient Visit Form) ខ ....

លេខកូដអ្នកជំងឺ Clinic ID number | | | | | | លេខកូដ ART (ART number) | | | | | | | | |

ថ្ងៃ.ខែ.ឆ្នាំពិនិត្យ Date of visit / / 201__ ☐ មកមុនពេលកំណត់ Early ☐ មកពិនិត្យតាមការកំណត់ Scheduled ☐ មកពិនិត្យយឺត Late

ឈ្មោះ Name អាយុ Age..........ឆ្នាំ ☐ ប្រុស Male ☐ ស្រី Female ចំពោះស្ត្រី : ☐ គ្មានផ្ទៃពោះ Not pregnant ☐ មានផ្ទៃពោះ Pregnancy Status: ☐ រលូត ☐ រំលូត

ទំងន់ Weight កំពស់ Height កំដៅ Temperature ☐ មានផ្ទៃពោះគិតថ្ងៃដែលត្រូវសំរាលកូន : ...../....../.......

ជីពចរ Pulse ចង្វាក់ដង្ហើម Resp rate សំពាធឈាម Blood pressure ករណីសមស្របចាប់ផ្តើមព្យាបាលបង្ការដោយឱសថ ARV: (Eligible for ARV Prophylaxis) : ☐ បាទ Yes ☐ ទេ No

☐ ការបង្ការជំងឺកាមរោគ STI Prevention	☐ ការផ្តល់ប្រឹក្សាអំពី ART Adherence	☐ ណែនាំអំពីការពន្យារកំណើត Birth Spacing / Safe abortion / Safe pregnacy	☐ ណែនាំអំពី TB Infection Control	☐ ស្ថានភាពដៃគូ Partner Status	☐ ផ្តល់ប្រឹក្សាអំពីការប្រើប្រាស់ស្រោមអនាម័យ Advice and counseling on condoms use

ប្រវត្តិជំងឺបច្ចុប្បន្ន Current Medical History

រៀបរាប់ Detail:

ការពិនិត្យស្រាវជ្រាវរោគសញ្ញាជំងឺរបេង

រយៈពេល ៤ សប្តាហ៍ ចុងក្រោយ

* ធ្លាប់មានក្អក ☐ មាន ☐ គ្មាន
* ធ្លាប់មានក្តៅខ្លួន ☐ មាន ☐ គ្មាន
* បែកញើសជោកខុសធម្មតានៅពេលយប់រយៈពេល ២ សប្តាហ៍ ឬ លើស ☐ មាន ☐ គ្មាន

ផែនការគ្រួសារ(ពន្យាកំណើត) Family planning ☐ បាទ Yes ☐ ទេ No បញ្ជាក់: Specify

ការបង្ការ HIV: HIV prevention ☐ ស្រោមអនាម័យ១០០% Condoms 100% ☐ មិនបានការពារពេលរួមភេទ Unprotected sex ☐ មិនរួមភេទ No sex

សំរាកពេទ្យបន្ទាប់ពីពេលពិនិត្យចុងក្រោយ? Hospitalised since last visit? ☐ ទេ No ☐ បាទ Yes ប៉ុន្មានថ្ងៃ.......... Number of days: មូលហេតុនៃការចូលសំរាកពេទ្យ .... Causes of hospitalisation ☐ ចំនួនស្រោមអនាម័យដែលបានផ្តល់អោយ : .... Number of Condoms given

ការវាយតំលៃលើការលេបថ្នាំ (Adherence Assessement) : ភ្លេចលេបថ្នាំ ARV ពេលមកពិនិត្យចុងក្រោយ (Missed ARV doses since last visit) : ☐ ទេ No ☐ បាទ Yes ប៉ុន្មានដង (How many times) ....

ការពិនិត្យ Examination

រៀបរាប់ Detail

ជំងឺឱកាសនិយម HIV related illnesses (ចំណាត់ថ្នាក់ជំងឺតាម WHO Stage)

ដំណាក់កាលទី ១ Stage 1	New	Old	Ongoing	ដំណាក់កាលទី ៤ Stage 4	New	Old	Ongoing
គ្មានរោគសញ្ញា Asymptomatic				HIV wasting sydrome			
Persistent Generalised Lymphadenopathy				Lymphoma			
ដំណាក់កាលទី ២ Stage 2				Pneumocystis jiroveci pneumonia			
ស្រកទំងន់មិនដឹងមូលហេតុតិចជាង ១០%នៃទំងន់ដងខ្លួន LOW <10%				Recurrent servere bacterial pneumonia			
Recurrent respiratory tract infections (sinusitis, tonsillitis, otitis media, pharyngitis)				Extrapulmonary tuberculosis			
Herpes zoster				Oesophageal candidiasis of trachea, bronchi or lungs			
Angular cheilitis				Atypical disseminated leishmaniasis			
Seborrhoeic dermatitis				Central nevous system toxoplasmosis			
Recurrent oral unclearations				Disseminated non-tuberculous mycobacteriosis infection			
Papular pruritic eruptions				Kaposi sarcoma			
Fungal nail infections				HIV encephalopathy			
ដំណាក់កាលទី ៣ Stage 3				Symptomatic HIV-associated nephropathy			
ស្រកទំងន់លើសពី១០%នៃទំងន់ខ្លួន Unexplained LOW >10% body weight				Chronic herpes simplex infection (orolabial, genital or anorectal of more than 1 month's duration or visceral)			
រាកគ្មានមូលហេតុលើសពី ១ខែ Unexplained chronic diarrhoea > 1mth				Disseminated mycosis			
ក្តៅខ្លួនមិនដឹងមូលហេតុលើសពី ១ ខែ Unexplained fever > 1mth				Chronic isoporiasis			
ផ្សិតមាត់ Oral candidiasis				Invasive cervical carcinoma			
របេងសួត Pulmonary TB				Recurrent septicaemia (including nontyphoidal Salmonella)			
Oral hairy leukoplakia				Cytomegalovirus disease (retinitis or infection of other organs, excluding liver, spleen and lymph nodes)			
Servere bacterial infections				Extrapulmonary cryptococcosis including meningitis			
Acute necrotizing ulcerative stomatitis, gingivitis or periodontitis				Chronic cryptosporidiosis			
Unexplained anaemia (below 8g/dl, neutropenia (below $0.5 \times 10^9/l$) and / or chronic thrombocytopenia (below $50 \times 10^9/l$)				Progressive mulitfocal leukoencephalopathy			

3. Patient Visit Form B: (cont.)

ចំណាត់ថ្នាក់ជំងឺតាម WHO ថ្មី ?	☐ 1 ☐ 2 ☐ 3 ☐ 4	មានធ្វើតេស្ត TST : ☐គ្មាន ☐មាន មាន : .... mm
ការពិនិត្យ CD4 នៅពេលថ្មីៗនេះ (Most recent CD4)	ថ្ងៃខែឆ្នាំពិនិត្យ (Date) / /	ប្រសិនបើកើតរបេង (If TB) : របេងសួត (PTB) ☐BK+ ☐BK- ☐សង្ស័យរបេង Suspected by X-ray
ករណីសមស្របប្រើ ART (Eligible for ART) :	☐បាទYes ☐ទេNo	ប្រសិនបើរបេងក្រៅសួត, បញ្ជាក់កន្លែង (If EPTB, site):
ស្ថានភាពអ្នកជំងឺ (Function):	☐ធ្វើការបាន Work ☐ដើរមិនបានឆ្ងាយ (Ambulatory) ☐សំរាកមួយកន្លែង Bed bound	ការព្យាបាលជំងឺរបេង TB Treatment : ☐ចាប់ផ្តើម Start ☐ឈប់ Stop ☐កំពុងព្យាបាល On going ថ្ងៃខែឆ្នាំ ..../......../........

ការសន្និដ្ឋាន និង ផែនការ Assessment and Plan

ឱសថកំពុងព្យាបាល Current medication

ឱសថ Medication	កូដ Code	កំរិត Dose	បរិមាណ Quantity	ពេលវេលាប្រើប្រាស់ Freq	ទំរង់ Form	ចាប់ផ្តើម Start	ឈប់ Stop	បន្ត Continue	ថ្ងៃខែឆ្នាំ Date	មូលហេតុនៃការបញ្ឈប់(កូដ) Reason for discontinuation (Code)	កំណត់ចំណាំ Remarks
ARV											
☐ d4T + 3TC + NVP	1a	☐30		bid		☐	☐	☐	/ /		
☐ d4T + 3TC+ EFV	1b	☐30		bid_qd		☐	☐	☐	/ /		
☐ AZT + 3TC+						☐	☐	☐	/ /		
						☐	☐	☐	/ /		
						☐	☐	☐	/ /		
						☐	☐	☐	/ /		
OI drugs											
☐ Cotrimoxazole						☐	☐	☐	/ /		☐1° ☐2° ☐3°*
☐ Fluconazole						☐	☐	☐	/ /		☐1° ☐2° ☐3°*
☐ Isoniazid						☐	☐	☐	/ /		
☐ B6						☐	☐	☐	/ /		
						☐	☐	☐	/ /		
						☐	☐	☐	/ /		
						☐	☐	☐	/ /		
						☐	☐	☐	/ /		
TB drugs											
☐ Cat I 2HRZE						☐	☐	☐	/ /		
☐ Cat I 6HE						☐	☐	☐	/ /		
☐ Cat I 4HR						☐	☐	☐	/ /		
☐ Cat II 2HRZES						☐	☐	☐	/ /		
☐ Cat II 1HRZE						☐	☐	☐	/ /		
☐ Cat II 5HRE						☐	☐	☐	/ /		

លទ្ធផល/វិធានការ Outcome / Actions

☐លះបង់ Lost ☐ស្លាប់ Dead	ថ្ងៃខែឆ្នាំ Date / /
បញ្ជូនទៅ Referred to: ☐ PMTCT ☐ TB ☐ CBPCS ☐ Inpatient ☐Other:..................	☐ ផ្លាស់ចេញទៅកន្លែងដែលមានសេវាART ផ្សេងទៀត (ឈ្មោះ) Transfer out to another ART site : (Name)
ថ្ងៃណាត់ជួបលើកក្រោយ Next appointment: / /	ហត្ថលេខា និង ឈ្មោះ អ្នកស្រង់ពត៌មាន

* 1° (Primary Prophylaxis), 2° (Secondary Prophylaxis), 3° (Treatment Only)

1-Feb-12

4. Patient ART care Summary Form:

ARV (Patient ART care summary form)

ឈ្មោះ Name		ART number	-	-	
Baseline (all patients)	Date started ART care	/ /	WHO Stage ☐1 ☐2 ☐3 ☐4	CD4	ARV
Baseline (if start ART care at this clinic)	Pregnant ☐ទេ No ☐បាទ Yes	Previous ART use ☐ទេ No ☐បាទ Yes	On TB treatment ☐ទេ No ☐បាទ Yes		
If transferred in	Date started ART care at this clinic	/ /	WHO Stage ☐1 ☐2 ☐3 ☐4	CD4	ARV
Date exit ART care	/ /	Reason for exit ART care	☐ Transfer out	☐ Lost	☐ Dead
Hep B sAg: / /		Hep C Ab: / /		TPHA: / /	

Date of visit	ART care month	Weight	Laboratory CD4	Hb	SGPT	(Other)	New HIV related illness	Treatment	Prophylaxis Cotrim	Flucon	Isoniazid	ARV regimen	ARV side effect	Date next visit
/ /														/ /
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* CD4 - (Number if adult) - (Percentage if child)

1-Feb-12

5. Patient Transfer Form:

សំណុំលិខិតបញ្ជូនអ្នកជំងឺ (National HIV care Adult transfer form)

លេខកូដអ្នកជំងឺ Clinic ID number							លេខកូដ ART number			–			–					

ឈ្មោះ Name | អាយុ Age | ☐ ភេទស្រី Female | ☐ ភេទប្រុស Male

អាស័យដ្ឋាន: Address: | ក្រុមទី Group | ផ្លូវលេខ Street | ភូមិ Village | ឃុំ/សង្កាត់ Commune

ស្រុក/ខ័ណ្ឌ District | ខេត្ត/ក្រុង Province | លេខទូរស័ព្ទ Phone number

ឈ្មោះនិងទីតាំងរបស់ក្រុមថែទាំតាមផ្ទះ: Name/location of HBC team: | លេខទូរស័ព្ទ Phone number | មូលហេតុនៃការបញ្ជូន: Reason for transfer:

ប្រវត្តិជំងឺ Medical History

ថ្ងៃខែឆ្នាំដែលលទ្ធផលតេស្តឈាមវិជ្ជមាន Date of first confirmed positive HIV test / / | ឈ្មោះ VCCT: Site: | ថ្ងៃខែឆ្នាំលទ្ធផលតេស្តឈាមអវិជ្ជមានចុងក្រោយ Date last prior negative HIV test / /

ជំងឺឱកាសនិយម HIV related illnesses	ពេលវេលាចាប់ផ្តើម Date onset	
TB: ☐ PTB ☐ EPTB ☐ NoTB ☐ ?	/ /	
	/ /	
	/ /	
	/ /	
	/ /	
	/ /	
	/ /	
	/ /	

ប្រសិនបើកើតរបេង If TB: ☐BK+ ☐BK- | ប្រសិនបើរបេងក្រៅសួត, បញ្ជាក់កន្លែង If EPTB, site:

ជំងឺផ្សេងទៀត ក្រៅពីជំងឺអេដស៍: Other not HIV related illness:

ទំងន់ Weights	កត់ត្រាលើកដំបូង First recorded	ចាប់ផ្តើម ART At start of ART	លើកចុងក្រោយ Most recent
កាលបរិច្ឆេទ:	Date / /	Date / /	Date / /

ចំណាត់ថ្នាក់ជំងឺតាម WHO ថ្មី ? New WHO stage | ☐ 1 ☐ 2 ☐ 3 ☐ 4 | ថ្ងៃខែឆ្នាំពិគ្រោះលើកដំបូងនៅគ្លីនិកបញ្ជូន Date of first consultation at referring clinic / /

ចាប់ផ្តើមប្រើ ART នៅកម្មវិធីជាតិ? Started ART in national program? | ☐ បាទYes ☐ ទេ No

បើព្យាបាលហើយ, សូមបញ្ជាក់ថ្ងៃខែឆ្នាំដែលចាប់ផ្តើម ART នៅកម្មវិធីជាតិ If yes, date started ART in National Program / /

បើទេ, តើសមស្របនឹងចាប់ផ្តើម ART ពីពេលនេះឬទេ? If no, eligible for ART now? ☐ បាទ Yes ☐ ទេ No

ពត៌មានអំពីគ្រួសារ Family History

ទំនាក់ទំនងក្រុមគ្រួសារ (ប្តី ឬ ប្រពន្ធ/ដៃគូ,កូន) Relative:spouse/ partner, child	អាយុ Age	ស្ថានភាព HIV HIV status				ស្ថានភាព Status			ឈ្មោះគ្លីនិក OI និង ART Name of OI & ART Clinic)	ទទួល ARV Receiving ARV			ប្រវត្តិជំងឺរបេង History of TB			ការបញ្ជូន Transferring?		
		វិជ្ជ. +	អវិជ្ជ. −		?	រស់ Alive	ស្លាប់ Dead	?		បាទ Yes	ទេ No	?	បាទ Yes	ទេ No	?	បាទ Yes	ទេ No	?

5. Patient Transfer Form: (cont.)

ប្រវត្តិនៃការព្យាបាល Treatment History

	បញ្ជាក់លំអិតការព្យាបាលដោយថ្នាំ Details of drug treatment	មន្ទីរពេទ្យ/គ្លីនិក Clinic/source	ថ្ងៃខែឆ្នាំចាប់ផ្តើម Start date	ថ្ងៃខែឆ្នាំបញ្ឈប់ Stop date	មូលហេតុនៃការបញ្ឈប់ Reason to stop
ឱសថARV			/ /	/ /	
កន្លង ទៅរួម			/ /	/ /	
បញ្ចូល PMTCT			/ /	/ /	
Previous ARV including PMTCT			/ /	/ /	
☐ បាទ Yes			/ /	/ /	
☐ ទេ No			/ /	/ /	
ព្យាបាលបង្ការដោយ Contrimox. កន្លងទៅ Previous cotrimoxazole prophylaxis	☐ បាទ Yes ☐ ទេ No ☐ ?		/ /	/ /	
ព្យាបាលបង្ការដោយ Fluco. កន្លងទៅ Previous fluconazole prophylaxis	☐ បាទ Yes ☐ ទេ No ☐ ?		/ /	/ /	
ព្យាបាលបង្ការដោយ INH កន្លងទៅ Pevious isoniazid prophylaxis	☐ បាទ Yes ☐ ទេ No ☐ ?		/ /	/ /	
ព្យាបាលដោយឱសថបុរាណកន្លងទៅ Previous traditional medicine	☐ បាទ Yes ☐ ទេ No ☐ ?		/ /	/ /	
ព្យាបាលរបេង: TB treatment:	☐ សព្វគ្រប់ Complete ☐ មិនគ្រប់ Incomplete ☐ កំពុងព្យាបាល Ongoing	☐ គ្មានព្យាបាល None ☐ ?	☐ Cat 1	☐ Cat 2 ☐ Cat 3	

ផលប៉ះពាល់បន្ទាប់បន្សំ Drug Reaction

ឱសថកំពុងព្យាបាល Current medication

ឱសថ Medication		កូដ Code	កំរិត Dose	ពេលវេលាប្រើប្រាស់ Freq	ទំរង់ Form	ចាប់ផ្តើម Start	ឈប់ Stop	បន្ត Continue	ថ្ងៃខែឆ្នាំ Date	មូលហេតុនៃការបញ្ឈប់ (កូដ) Reason for discontinuation (Code)	កំណត់ចំណាំ Remarks
ARV											
☐	d4T+3TC+NVP	1a	☐30☐40	bid		☐	☐	☐	/ /		
☐	d4T + 3TC_ EFV	1b	☐30☐40	bid_qd		☐	☐	☐	/ /		
						☐	☐	☐	/ /		
						☐	☐	☐	/ /		
						☐	☐	☐	/ /		
						☐	☐	☐	/ /		
						☐	☐	☐	/ /		
						☐	☐	☐	/ /		
OI drugs											
☐	Cotrimoxazole					☐	☐	☐	/ /		☐1° ☐2° ☐3°
☐	Fluconazole					☐	☐	☐	/ /		☐1° ☐2° ☐3°
☐	Isoniazid		300mg			☐	☐	☐	/ /		
						☐	☐	☐	/ /		
						☐	☐	☐	/ /		
						☐	☐	☐	/ /		
						☐	☐	☐	/ /		
TB drugs											
☐	Cat I 2HRZE					☐	☐	☐	/ /		
☐	Cat I 6HE					☐	☐	☐	/ /		
☐	Cat I 4HR					☐	☐	☐	/ /		
☐	Cat II 2HRZES					☐	☐	☐	/ /		
☐	Cat II 1HRZE					☐	☐	☐	/ /		
☐	Cat II 5HRE					☐	☐	☐	/ /		

កំណត់ចំណាំបន្ថែម **Additional notes:**

ថ្ងៃខែឆ្នាំពិនិត្យចុងក្រោយ Date last visit / /	ឈ្មោះមន្ទីរពេទ្យបង្អែក: **Referral Hospital name:**	សូមភ្ជាប់មកជាមួយនូវលិខិតថតចំលងអំពីលទ្ធផលតេស្ត ។ លទ្ធផលមន្ទីរពិសោធន៍ និងលទ្ធផលវិទ្យុសាស្ត្រ (ឬ បំពេញតារាង) លិខិតថតចំលងអំពីការពិគ្រោះជំងឺ និងហ្វីលថតសួត (បើចាំបាច់) ។ Please attach copies of HIV test result forms, significant laboratory and radiology results (or complete table), copies of significant consultations (optional) and X-Ray films (optional).

ឈ្មោះគ្រូពេទ្យដែលបញ្ជូន: Referring Doctor Name:	ហត្ថលេខាគ្រូពេទ្យ Signature	ហត្ថលេខាអ្នកជំងឺ **Patient' Signature**	លេខទូរស័ព្ទទំនាក់ទំនង: **Contact phone number:**	សូមទូរស័ព្ទទៅបញ្ជាក់អ្នកជំងឺ ដើម្បីមកពិនិត្យជំងឺជាលើកដំបូង (Please call to confirm patient has attended for first visit)

6. Facility ART Report Form:

មជ្ឈមណ្ឌលជាតិរោគស្បែក និងកាមរោគ

National Center for HIV/AIDS Dermatology and STD

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របាយការណ៍ត្រួតពិនិត្យសង្ខេបអំពីការព្យាបាលដោយ ARV

Facility ART report

ឈ្មោះមន្ទីរពេទ្យបង្អែក/ក្លីនីក (Facility)	លេខកូដ (Facility Code)				
ឈ្មោះស្រុកប្រតិបត្តិ (Operational District)	ខេត្ត-ក្រុង (Province)				
ឆ្នាំ (Year) :	ត្រីមាសទី (Quarter)				

ប្រភេទ (Category)			អាយុ Age	ភេទ (Sex)		សរុប Total	
				ប្រុសMale	ស្រី Female		
ចំនួនអ្នកជំងឺដែលសកម្ម ទទួលបានការព្យាបាលដោយ ART នៅចុងត្រីមាសមុន (Number of Active Patients on ART at the end of preceding quarter)			> 14			0	
			0 - 14			0	A
ចំនួនអ្នកជំងឺថ្មីចាប់ផ្តើមព្យាបាលដោយ ART នៅក្នុងមន្ទីរពេទ្យបង្អែក/ក្លីនីក នៅក្នុងត្រីមាស (Number of new patients started on ART Care at this facility during this quarter)	>14		**សរុបអ្នកជំងឺថ្មី > 14**			0	
			បានធ្វើរោគវិនិច្ឆ័យថាមានជំងឺរបេង Diagnosed TB (BK+ / - , EP)			0	
			បានចាប់ផ្តើមព្យាបាលជំងឺរបេង (TB Tx Started)			0	
			មានផ្ទៃពោះ (Pregnant)			0	
			ការបង្ការជាវិជ្ជមាន (ផ្តល់សេវាពេញលេញ) Positve Prevention (at least 3 *)			0	
		សរុបអ្នកជំងឺ ART ថ្មី 0 - 14				0	
		សរុបអ្នកជំងឺថ្មីទាំងអស់ Total all new ART patients		0	0	0	B
ចំនួនអ្នកជំងឺដែលបានបញ្ជូនចូល នៅក្នុងរយៈពេលត្រីមាស (Number of Patients transferred in during this quarter)			> 14			0	
			0 - 14			0	
			សរុប Total	0	0	0	C
ចំនួនអ្នកជំងឺដែលចាកចេញពីការ ព្យាបាលដោយ ART ក្នុងត្រីមាស (Number of patients who left ART Care during this quarter)	បញ្ជូនចេញ (Transferred Out)		> 14			0	
			0 - 14			0	
	លះបង់ការព្យាបាល (Lost) [1]		> 14			0	
			0 - 14			0	
	ស្លាប់ (Died)		> 14			0	
			0 - 14			0	
		សរុបអ្នកជំងឺដែលចាកចេញពីការព្យាបាល ART ទាំងអស់		0	0	0	D
ចំនួនអ្នកជំងឺដែលសកម្ម ទទួលព្យាបាលដោយ ART រហូតដល់ចុងត្រីមាស (Number of active patients at end of quarter)			> 14			0	
			0 - 14	0	0	0	
			សរុប Total	0	0	0	E

6. Facility ART Report Form: (cont.)

ចំនួនអ្នកជំងឺកំពុងទទួល ART បានធ្វើរោគវិនិច្ឆ័យថាមានកើតរបេង ក្នុងត្រីមាសនេះ (Number of patients active on ART diagnosed TB (BK+/-, EP) during this quarter.)	> 14			0	
ចំនួនអ្នកជំងឺកំពុងទទួល ARTបានចាប់ផ្តើមព្យាបាលជំងឺរបេង នៅក្នុងត្រីមាសនេះ (Number of patient active on ART Started TB Treatment during this quarter)	> 14			0	F
ចំនួនអ្នកជំងឺរបេង-អេដស៍កំពុងព្យាបាល ART បានចាប់ផ្តើមព្យាបាលបង្ការដោយ Cotrimoxazole (CPT) នៅក្នុងត្រីមាសនេះ (Number of TB-HIV patients on ART Started Cotrimoxazole during this quarter)	> 14			0	G
ចំនួនស្ត្រីបានព្យាបាល ART មានផ្ទៃពោះ ក្នុងត្រីមាសនេះ (Number of woman on ART got pregnant during this quarter)				0	H
ចំនួនស្ត្រីមានផ្ទៃពោះដែលបានរាយការណ៍ថា (Number of pregnan women reported)		រលូត (Spontaneous abortion)		0	
		រំលូត (Induced abortion)		0	I
ថ្ងៃ ខែ ឆ្នាំធ្វើរបាយការណ៍ (Date Reported):					
ឈ្មោះ និងហត្ថលេខាអ្នកធ្វើរបាយការណ៍ (Report completed by)					
ឈ្មោះ និងហត្ថលេខាអ្នកអនុម័តអោយធ្វើរបាយការណ៍ (Report Approved by)					

E = A+B+C-D ***A = E from Previous Quarter*** ***A = E*** នៅក្នុងរបាយការណ៍កាលពីត្រីមាសមុន

[1] **ជាប់មួយ Lost**: រាប់បញ្ចូលទាំងអ្នកមិនបានមើលមុខកាន់តិចតែរយៈពេល >/=3 [1] **Lost**: included lost (not seen in the clinic >/=3 months)

* **ការបម្រុងជំងឺផ្តាច់ :** ១-ការបង្ការជំងឺកាមរោគ, ២-ការផ្តល់ប្រឹក្សាអំពី ART Adherence, ៣-ឈានទាំងអំពីការពន្យាកំណើត, ៤-ឈានទាំងអំពី TB Infection Control, ៥-ស្ថានភាពដៃគូ, ៦-ផ្តល់ប្រឹក្សាអំពីការប្រើប្រាស់ស្រោមអនាម័យ, ៧-ចំនួនស្រោមអនាម័យដែលបានផ្តល់ជូន

(* **PP services include** : 1-STI prevention, 2-ART Adherence, 3-Birth spacing / safe abortion/ safe pregnancy, 4-TB Infection control, 5-Partner status, 6-Advice and counselling on condoms use, 7-Number of condoms given)

Last update: 12-Dec-2010

7. Ethical approval:

MUTM 2013-066-01

CERTIFICATE OF ETHICAL APPROVAL
Ethics Committee of the Faculty of Tropical Medicine, Mahidol University
420/6 Ratchawithi Rd., Ratchatheewee, Bangkok 10400, Thailand

This Certificate of Ethical Approval (MUTM 2013-066-01) applies to the

Project entitled: Assessment of data quality in the OI-ART database system for HIV health care in Tbong Khmum Refeeral hospital, Kampong Cham province, Cambodia

EC Submission No.: TMEC 13-057
with the following relevant document:

1. Research Proposal (FTM ECF-019-02); English version 2 date 29 October 2013

Principal Investigator: Mr. Sun Sok Leng

Advisor: Dr. Saranath Lawpoolsri Niyom

Affiliation: Department of Tropical Hygiene,
Faculty of Tropical Medicine, Mahidol University

This project has been approved for the period
from 5 November 2013 to 4 November 2014

The Ethics Committee of Faculty of Tropical Medicine certify that we are in compliance with Declaration of Helsinki, ICH Guidelines for Good Clinical Practice and other International Guidelines for Human Research Protection.

Signature .....
(Prof. Dr. Srisin Khusmith)
Chairperson (Panel 2)
Ethics Committee of the
Faculty of Tropical Medicine
Date ..... 6 NOV 2013

Signature .....
(Mrs. Pornpimon Adams)
Member and Secretary
Ethics Committee of the
Faculty of Tropical Medicine
Date ..... 6 NOV 2013

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BIOGRAPHY

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