ความแตกต่างของต้นทุนการรักษาผู้ติดเชื้อเอชไอวีก่อนและหลังการได้รับยาจีพีโอเวียร์ในจังหวัดสระบุรี

นางสาวสิริขวัญ ลุ้งบ้าน

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิทยาศาสตรมหาบัณฑิต
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DISCREPANCY OF HIV-REALATED TREATMENT COST OF HIV PATIENTS BEFORE AND AFTER RECEIVING GPO-VIR IN SARABURI PROVINCE

Miss Siriqhun Loongban

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แม้ว่ายาต้านไวรัสชนิดสามตัวร่วมกันสามารถชะลอความรุนแรงจากการติดเชื้อเอชไอวีและลดอัตราการตายในกลุ่มผู้ป่วยเอชไอวี แต่ต้นทุนการรักษายังสูงมาก ในประเทศไทย ยาจีพีโอเวียร์ซึ่งเป็นยาต้านไวรัสชนิดสามตัวร่วมกันมีต้นทุนเพียง 43 บาทต่อวัน เป็นที่น่าสนใจว่าการใช้ยาจีพีโอเวียร์จะมีผลต่อการลดค่าใช้จ่ายต้นทุนการรักษาที่เกี่ยวข้องกับผู้ป่วยเอชไอวีเท่าใด การศึกษานี้มีจุดประสงค์เพื่อศึกษาต้นทุนค่ารักษาโรคที่เกิดจากโรคติดเชื้อฉวยโอกาสในกลุ่มผู้ป่วยเอชไอวีหลังจากได้รับยาต้านไวรัสจีพีโอเวียร์ว่าจะมีความคุ้มกับต้นทุนค่ายาจีพีโอเวียร์หรือไม่ การศึกษานี้เป็นการศึกษาต้นทุนและผลการรักษาที่เกิดขึ้นในมุมมองของสังคม โดยมีการเก็บข้อมูลทางคลินิกและข้อมูลต้นทุนก่อนและหลังจากผู้ป่วยได้รับยาต้านไวรัสจีพีโอเวียร์ โดยผู้ป่วยที่ทำการศึกษาต้องมีระดับซีดีโฟร์ต่ำกว่า 200 เซลล์/มม^3 เมื่อเริ่มมีการได้รับจีพีโอเวียร์ ผลการศึกษาพบว่า ร้อยละ 52.6 ของผู้ป่วยรวม 78 คน เป็นผู้ป่วยหญิง และ 80.8%ของผู้ป่วยมีระดับซีดีโฟร์ต่ำกว่า 100 เซลล์/มม^3 ก่อนรับยา ต้นทุนของการรักษาผู้ป่วยก่อนได้รับยาจีพีโอเวียร์ เป็นเงิน 4,346.2 บาทต่อคนต่อปี หลังจากได้รับยาต้านไวรัสจีพีโอเวียร์ มีต้นทุนการรักษาเป็นเงิน 22,682.1 บาทต่อคนต่อปี ประกอบไปด้วยต้นทุนยาต้านไวรัส 18,369.2 บาทต่อคนต่อปี และต้นทุนการรักษาอื่น 4,313.0 บาทต่อคนต่อปี ภายหลังจากการได้รับยา ต้นทุนการรักษาผู้ป่วยที่มีการนอนในโรงพยาบาลลดลงจาก 1,978.3 บาทต่อคนต่อปี เป็นเงิน 815.5 บาทต่อคนต่อปี การลดลงของต้นทุนค่ารักษาในผู้ป่วยที่มีการเข้ารักษาโรงพยาบาลมีผลมาจากการเพิ่มขึ้นของระดับซีดีโฟร์ซึ่งมีค่าเฉลี่ยเท่ากับ 179.2±94.0 เซลล์/มม^3 จากก่อนการรับยาจีพีโอเวียร์ซึ่งมีค่าเฉลี่ยเท่ากับ 56.5±52.9เซลล์/มม^3 (P=0.000) ผู้ป่วยร้อยละ 87.2 ยังคงรับยาจีพีโอเวียร์ต่อไป ทั้งนี้โรคติดเชื้อฉวยโอกาสที่เกิดขึ้นในผู้ป่วยนอกลดลงอย่างเห็นได้ชัดหลังจากผู้ป่วยได้รับยา ได้แก่ โรคปอดอักเสบ (พีซีพี), โรคติดชื้อจากไวรัส (ซีเอ็มวี), โรคเยื่อหุ้มสมองอักเสบ และโรคเชื้อราในปาก ในกลุ่มผู้ป่วยในพบว่าหลังการได้ยาจีพีโอเวียร์ไม่มีการเข้ารับการรักษาในโรงพยาบาลด้วยโรคปอดอักเสบ (พีซีพี) และโรคเยื่อหุ้มสมองอักเสบ อย่างไรก็ตาม พบว่ามีผู้ป่วยที่แพ้ยาจีพีโอเวียร์ 4 ราย (ร้อยละ 5.1) ที่ต้องเข้ารักษาภายในโรงพยาบาลประกอบไปด้วยอาการสภาวะเป็นกรดในร่างกาย 2 ราย การทำงานของตับล้มเหลว 1 ราย และการทำงานของไตล้มเหลว 1 ราย ต้นทุนของการรักษาการที่เกิดจาการแพ้ยาสูงถึง ร้อยละ 48.4 ของต้นทุนการเข้ารับการรักษาในโรงพยาบาล แม้ว่าไม่สามารถลดต้นทุนการรักษาโดยรวมจากการได้รับยาจีพีโอเวียร์ แต่มีผลดีในการลดการเกิดโรคติดเชื้อฉวยโอกาสที่รุนแรงและต้นทุนการเข้ารับการรักษาในโรงพยาบาลลดลงมาก ผลดีดังกล่าวจะทำให้ผู้ป่วยเอชไอวีมีความต้องการได้รับยาจีพีโอเวียร์เพิ่มขึ้น และผู้ให้บริการสนับสนุนการใช้ยาจีพีโอเวียร์ทำให้ผู้ป่วยได้เข้าถึงยาและครอบคลุมผู้ป่วยที่มีความจำเป็นต้องได้รับยาโดยครบถ้วนต่อไป

สาขาวิชาเภสัชศาสตร์สังคมและบริหาร ลายมือชื่อนิสิต.....

ปีการศึกษา 2546 ลายมือชื่ออาจารย์ที่ปรึกษา.....

4576854833 : MAJOR SOCIAL AND ADMINISTRATIV PHARMACY

KEY WORD: GPO-VIR/ COST/AIDS/OPPORTUNISTIC INFECTION/CD4 CELL COUNT

MISS SIRIQHUN LOONGBAN: (DISCREPANCY OF TREATMENT COST OF HIV PATIENTS BEFORE AND AFTER RECEIVING TRIPLE ANTIRETROVIRAL THERAPY IN SARABURI PROVINCE). THESIS ADVISOR: ASST.PROF.VITHAYA KULSOMBOON, PH.D. 100 PP.

ISBN: 974-17-5830-8.

Although the triple antiretroviral combination can delay the HIV progression and reduce mortality rate among HIV patients, its cost is relatively high. In Thailand, GPO-VIR®, the triple ARV combination drug, costs only US$ 1 per day. It is important to know if the drug cost could compensate other HIV-related treatment costs. The purpose of this study was to determine whether the reduction of opportunistic infection treatment cost among HIV patients by GPO-VIR offsets their increased cost after providing GPO-VIR. Cost-consequences analysis was employed based upon the societal perspective. Clinical and cost data of the HIV patients before and after receiving GPO-VIR were collected. Only the HIV patients who had CD4 cell count less than 200 cell/mm^3 at the initiation of receiving GPO-VIR treatment were recruited in the study. Of the 78 HIV patients, 52.6% were females and 80.8% had the CD4 cell count level less than 100 cell/mm^3 at the initial treatment. The treatment costs before receiving GPO-VIR were 4,346.2 baht per patient per year (PPPY). After receiving GPO-VIR, the total costs were 22,682.1 baht PPPY including 18,369.2 baht PPPY for the GPO-VIR cost and 4,313.0 baht PPPY for the treatment cost. The hospitalization cost reduced from 1,978.3 baht PPPY to 815.5 baht PPPY after receiving GPO-VIR. The reduction of hospital cost due to the increase of CD4 level and the decrease of severe OI. The mean of the CD4 cell count level (179.2 ± 94.0) after receiving GPO-VIR significantly increased from baseline (56.5 ± 52.9) at the initial treatment (P = 0.000). After receiving the GPO-VIR, 87.2% of the patient remains using the initial regimen. The incidence rate of specific OI at OPD visit substantially decreased including Pneumocystis Carinii Pneumonia (PCP), Cytomegolovirus (CMV), Tuberculosis (TB), Cryptococcal Meningitis, and Oral Cadidiasis. After receiving GPO-VIR, none of the HIV patients was admitted to the hospital due to PCP and Cryptococcal Meningistis. Nevertheless, four HIV patients (5.1%) were admitted with severe ADR including two cases of acidosis, one case of renal failure, and one case of hepatic failure. Treatment of ADR cost from GPO-VIR could be considered as high proportion of hospitalization cost (48.4%). After receiving GPO-VIR, although the overall cost did not outweigh the cost prior to the ARV treatment, it substantially decreased severe OI and hospitalization cost. The positive impact of GPO-VIR will encourage HIV patients to demand for ARV drug and consequently enhance provider to increase universal coverage of GPO-VIR for all eligible HIV patients in Thailand.

Field of study Social and Administrative Pharmacy Student'ssignature……...

Academic year 2003 Adivisor's signature……

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LIST OF ABBREVIATIONS

ABC	Abacavir
ADR	Adverse Drug Reaction
AIDS	Acquired Immuno Deficiency Syndrome
APV	Amprenavir
ART	Anti-Retroviral Treatment
ARV	Anti-Retro Viral
AZT	Zidovudine
BKK	Bangkok
CMV	Cytomegalovirus
CSBMS	Civil Servants' Medical Benefits Scheme
CSW	Commercial Sex Workers
d4T	Stavudine
ddc	Zalcitabine
ddl	Didanosine
DLV	Delavirdine
EFV	Efavirenz
GPO	Government Pharmaceutical Organization
HAART	Highly Active Antiretroviral Therapy
HIV	Human Immune Deficiency Virus
IDU	Injection Drug Use
IDV	Indinavir
IPD	In Patient Department
IRDU	Regional Infectious Disease Unit
IRIS	Immune Reconstitution Inflammatory Syndrome

LIST OF ABBREVIATIONS (CONT.)

MAC	Mycobacterium Avium Disease
MOPH	Ministry Of Public Health
NFV	Nelfinavir
NNRTIs	Non-nucleoside Reverse Transcriptase Inhibitors
NRTIs	Nucleoside Reverse Transcriptase Inhibitors
NVP	Nevirapine
OI	Opportunistic Infections
OPD	Out Patient Department
PCP	Pneumocystis Carinii Pneumonia
PMC	Primary Health Care
PPPY	Per Patient Per Year
RTIs	Reverse Transcriptase Inhibitors
RTV	Ritonavir
SQV	Saquinavir
SSS	Social Security Scheme
TB	Tuberculosis
UC	Universal Coverage
WHO	World Health Organization
3TC	Lamivudine

Chapter 1

Discrepancy of HIV-Related Treatment Cost of HIV Patients before and after Receiving GPO-VIR in Saraburi Province

1.1 Rationale

In 1984, the HIV/AIDS case was first found in Bangkok, Thailand. During the 1990s, in several South and South-East Asian countries including Cambodia, Myanmar and Thailand, heterosexual transmission of HIV continued increase. The rapid spread of HIV within Injection Drug Use (IDU) populations occurred in several provinces in China, North-East India, Malaysia, Myanmar, Pakistan, Thailand, and Vietnam, followed by Indonesia and Nepal at the end of 1990s. In Thailand, number of HIV patients peaked in 1995 among sex workers and had declined since then. The main reason of the decline resulted from the promoting of condom use among commercial sex workers (CSW) and casual sexual interactions.

In Thailand, the HIV/AIDS prevalence varied substantially among 76 provinces. The highest HIV prevalence was in the Northern part of Thailand. More than two-thirds of those infected patients were men. By the end of 1994 about 840,000 Thais had been infected with HIV. In some Northern provinces, the infection rate among pregnant women was more than 10 percent of the population. In Chiangmai, people with AIDS occupied one-third of all hospital beds (WHO, 2001). In 2000, of the 62 million people in Thailand, there were 216,540 AIDS patients; the highest prevalence of HIV was in the Central part of Thailand, followed by Northern, Northern East, and least in South of Thailand.

In 1994, Zidovudine (AZT), monotherapy Antiretroviral (ARV) therapy, was the first drug provided to HIV patients. A short course of AZT was shown to be effective in reducing the mother to child transmission of HIV among non- breast feeding mothers. However, the patients resisted from the medication rapidly. John

(1995) and Scott (1996) suggested that the ARV treatments such as zidovudine plus didanosine, zidovudine plus zalcitabine, or didanosine alone were superior to treatment with zidovudine alone. It was shown that the antiretroviral therapy could improve survival rate in patients with 200 to 500 CD4 cells/ mm^3.

There was evidence that the antiretroviral combination therapy declined the disease progression and mortality rate (Brettle, 1997 and Matthias, 1997). A report from the systematic review supported the evidence from several randomized controlled trials that the use of triple therapy was superior to the others (Rachel, 2002). The effectiveness and tolerability of Nevirapine, stavudine, and lamivudine in clinical practice showed that the regimen was effective in both treatment-experienced and –naïve patients, regardless of baseline viral loads, in a clinical setting (Yozviak, 2001). However, the triple therapy has the treatment cost relatively higher than mono and dual therapy.

Not only chronic HIV/AIDS affected patients on their household assets and income; it also had potential impact on social discrimination. The result of a HIV/AIDS study showed that with the increase of the HIV/AIDS patients, Thai households had to pay more money for the treatment and the government had to increase the budget for HIV/AIDS treatment (Kongsin, 2002). The comparison of MOPH budget reduction indicated that while Non-AIDS budget was 65,084 million in 1997, it was 61,526 million in 1998. The reduction was 5.5%. But for the AIDS budget, the reduction was only 0.6%. AIDS budget was 1,459.9 million in 1997 and 1,099 million in 1998. In 1998, there was a survey for opportunistic infection drug cost in Phayao and Ramathibodi hospitals. Based on the result of the survey, there was the opportunistic drug cost increased in both hospitals. While AIDS budget was limited, OIs drug cost increased substantially. The high drug cost made Thai people who were infected with HIV lacking the accessibility for the ARV treatments.

In Thailand, The Public Health Ministry wants to provide the combination ARV therapy for Thai people but its cost remained the fundamental barrier. A study of

Bumrasnaraddon hospital indicated that cost of ARV drug did not out weight cost saving from hospital admission and OPD costs. It was suggested that only a decrease in ARV costs could improve patients' accessibility (Kulsomboon, 2003). Government Pharmaceutical Organization (GPO) initiated clinical trials of GPO-VIR, the triple combination drugs: Stavudine 30 -40 mg, Lamivudine 150 mg, and Nevirapine 200 mg. The GPO-VIR had its cost less than other ARV triple combination therefore the patients could increase their accessibility to get the ARV drug. At present, there were few published studies on cost aspects of HIV/AIDS especially for the new ARV, GPO-VIR. Data on the total cost of treatment, cost saving of opportunistic infection diseases, and the reduction rate of hospitalization and OPD visit after receiving GPO-VIR will help a decision maker to have cost data to support ARV use.

The purposes of this study were to analyze treatment cost of HIV/AIDS patients, to determine whether the reduction of opportunistic infection could compensate the overall treatment cost, and to measure the reduction of opportunistic infection, hospitalization, and OPD visit, before and after receiving GPO-VIR in Saraburi province. The result of study would demonstrate the benefit of providing triple-antiretroviral treatment in hospital institution in Thailand. Information on cost and consequence of using triple – antiretroviral therapy would enhance hospital institutions to encourage health care providers to use triple antiretroviral therapy for HIV/AIDS patients. Furthermore, the results of the study would support government policy to increase universal coverage of HIV/AIDS patients to access Triple Antiretroviral Therapy.

1.2 Objective

To determine whether the reduction of opportunistic infection treatment cost among HIV patients by GPO-VIR therapy offsets their increased cost after providing GPO-VIR.

1.3 Research Question

Primary Question

1. How much was the difference between the treatment cost of HIV/AIDS patients before receiving GPO-VIR and the treatment cost of HIV/AIDS patients after receiving GPO-VIR?
2. How much was the difference between OIs treatment cost of HIV/ AIDS patients before receiving GPO-VIR and OIs treatment cost of HIV/ AIDS patients after receiving GPO-VIR?

Secondary Question

1. What was the difference of CD4 cell count between before receiving GPO-VIR and after receiving GPO-VIR?
2. What were the differences of opportunistic infection incidence of the OPD visit before HIV patients receiving GPO-VIR and after HIV patients receiving GPO-VIR?
3. What were the differences of opportunistic infection incidence of the hospitalization before HIV patients receiving GPO-VIR and after HIV patients receiving GPO-VIR?
4. What was the adverse drug reaction after receiving GPO-VIR?

1.4 Scope of the Study

1. The data were collected from Saraburi province, consisting of Saraburi hospital, Praputhabaht hospital, and Nong Care hospital
2. The HIV patients in the study had CD4 less than 200 cell/mm^3 at the beginning of the GPO-VIR treatment.
3. Antiretroviral Drug focusing on GPO-VIR; the new cocktail drug, Stavudine 30 - 40 mg, Lamivudine 150 mg, and Nevirapine200 mg.
4. Data of the patients who initiating used GPO-VIR and changed to the other regimen were included in the study.

5. The costs for treatment of HIV patient including drug cost would be calculated using cost from each hospital.

1.5 Operational Definition

1. HIV Patient is the patient who had positive HIV blood testing.
2. GPO-VIR is the combined drug; stavudine (3TC) 30 – 40 mg. lamivudine (d4T) 150 mg, and nevirapine (NVP) 200 mg.
3. Opportunistic Infections (OIs) are related to the person's lack of immune defenses caused by the virus, and the presence of microbes and others. There are viral disease, bacterial disease, fungal disease, protozoal disease, and HIV-associated malignancies.
4. OPD visit is the day that HIV patients came to hospital and got their treatment at the out patient department.
5. Hospitalization is the day that HIV patients came to hospital and got their treatment at the inpatient department.
6. Total cost is the cost of HIV-related treatment of HIV patients when they visited OPD or were admitted to the hospital.
7. OPD visit cost is the cost of drug, laboratory, and medical service when an HIV patient visits the hospital; the OPD visit cost did not include the cost related to the chronic disease such as hypertension, diabetes melitus, heart disease, and accident.
8. Hospitalization cost is the cost of drug, lab, medical service, and the room when the patients were admitted to the hospital; the hospitalization cost did not include the cost related to the chronic disease such as hypertension, diabetes melitus, heart disease, and accident.
9. Drug cost is the cost of drug from price list of each hospital.
10. Laboratory and monitoring cost is the lab cost and the X-ray cost.
11. Medical service cost was the cost of service provided by the hospital staff such as injection, nursing care but not included doctor fee.

12. Room cost was the cost that the hospital set up for the room service.

1.6 The Expected Outcome

1. The result from the study would demonstrate the benefit of using the results for providing triple-antiretroviral treatment in hospital institution in Thailand.
2. The information on the cost and the consequence of using triple – antiretroviral therapy would enhance hospital institutions to encourage health care providers to use triple antiretroviral therapy for HIV/AIDS patients.
3. The results of the study would support government policy to increase universal coverage of HIV/AIDS patients to access Triple Antiretroviral Therapy.

Chapter 2

Literature Review

This chapter consists of the situation of HIV patients in Thailand, the patho-physiology of AIDS, the antiretroviral therapy, the cost and financial aspects of providing ARV therapy, and changing of HIV/AIDS policy and funds in Thailand.

2.1 Situation of AIDS/HIV in Thailand

AIDS has become a major threat among the world populations. About 34 million people are currently infected with HIV world-wide, over 90% of HIV patients who live in the developing world. In some of the poorest countries about one of five adults is infected with HIV. While medical advances have offered hope and life in the industrialized world, these advances remain out of reach for the vast majority of HIV patients.

In 2000, the population of Thailand was estimated to be about 62 million. During 1984 – 2003, the cumulative number of AIDS cases in Bangkok (BKK) was 23,305 and the cumulative number of AIDS cases in Thailand was 216,540 (Table 2.1). The number of new AIDS cases declined during 1999-2003 (Table 2.2).

Table2.1 Number of Cumulative AIDS Cases and Symptomatic HIV in Bangkok Metropolitan, 1984 – 2003

Place	AIDS cases			Symptomatic HIV cases		
	Total	Death	Alive	Total	Death	Alive
Bangkok	23,305	6,745	16,560	7,697	705	95,420
Thailand	216,540	59,616	156,824	79,980	8,370	71,610

The Thai working group on HIV/AIDS Projection, 2001

Table2.2 Number of new AIDS Cases and Symptomatic HIV Patients in Bangkok Metropolitan since 1999 – May 2003

Type	Number of new AIDS Cases and Symptomatic HIV Patients			
	1999	2000	2001	2002
AIDS	3,221	3,176	2,536	2,663
Symptomatic	1,073	895	581	781

The Thai working group on HIV/AIDS Projection, 2001

Thailand had 206,614 AIDS patients, most of AIDS patients were in the Middle part of Thailand (84,264, 41%), the following was in the North (74,956, 36%), the Northern East (74,956, 36%), and in the South (11,106, 5%) (Table 2.3).

Table2.3 Number of AIDS Patients in Thailand by Region, (1984 – 2003)

Region	**No. of the patients**	**Percentage (%)**
Northern	74,956	36
Northern East	36,288	18
Middle	84,264	41
Southern	11,106	5
Total	206,614	100

Source: MOH Thailand

The Middle part of Thailand was divided into 4 Zones, and was shown in the Table 2.4. The majority of AIDS Zone was Zone 3, followed by Zone 4, zone 2, and Zone 1. There are six provinces in Zone 2 (Lopburi, Singburi, Chainat, Saraburi, Nakornayoke, and Supanburi). The number of AIDS patients in Zone 2 was shown in Table 2.5. The highest prevalence of HIV infection was Supanburi, followed by Saraburi, Nakornayoke, Singburi, and least in Chainat.

Table2.4 Number of AIDS Patients in the Middle Part of Thailand

Zone	No. of AIDS Patients	Percentage (%)
1	13,255	22
2	9,140	15
3	20,291	33
4	18,464	30
Total	61,150	100

Source: MOH Thailand

Table2.5 Number of AIDS Patients in Zone 2

Province	No. of AIDS patients	Percentage (%)
Supanburi	2,780	30
Saraburi	2,200	24
Loburi	1,812	20
Nakornayoke	963	11
Singburi	718	8
Chainat	667	7
Total	9,140	100

Source: MOH Thailand, 2003)

2.2 HIV Disease and Its Progression

This topic provides 2 subtopics including pathophysiology of Human Immunodeficiency Virus Infection, and the progression of the disease in HIV/ AIDS Patients.

2.2.1 Pathophysiology of Human Immunodeficiency Virus Infection

HIV attacks and binds to specific cells of the immune system, including monocytes, macrophages, and T-cell lymphocytes (also known as CD4 cells, T-helper cells, and T cells). HIV-infected host cells are destroyed through a direct cytolytic

effect of the virus and eliminate the host's immune response. In addition, HIV infection inhibits the production of new CD4 cells.

Upon infection, HIV invades, use, and eventually destroys key of the immune system, specifically the CD4 lymphocyte. The CD4 cell is responsible for a number of functions; however, its main role is to regulate the host's cell-mediated immunity. Most of these cells, and consequently most infectious HIV virions (approximately 99%), reside inside lymph nodes and other tissues found throughout the body.

Once infected with the virus, patients may not have any symptom. Initially, patients may complain of nonspecific symptoms, such as fever, fatigue, and night sweats. This phase of infection is the acute retroviral syndrome. Within 6 months, the host's immune response is able to control the infection to a point where the number of virus particles produced per day equals the number of particles destroyed per day. This stage is steady, viral load is often referred to as the patient's viral set point. If patients with acute infection should be identified, potent antiretroviral regimens to reduce the set point can be initiated. When the viral set point is established, infection with HIV will result in a constant battle between the virus and immune system. Over time, HIV depleted the body of T cells and places the host at an increased risk for opportunistic infections. Direct measurements of HIV concentrations in plasma can predict the disease progression. Higher viral load measurements represent an inability of the host to control infection and a greater risk for infection and destruction of other tissues and cells.

An HIV-positive person can carry the virus for three to ten years without getting sick. It is impossible to know one's HIV status without laboratory testing. In most of the developing countries, testing is rarely available. As a result, most infected people do not know they are carrying the virus. After a few years, the virus weakens the immune system to the point where the first "opportunistic infections" appear. The HIV virus itself does not kill, opportunistic infections do. The most common infections include tuberculosis, various types of pneumonia, candidiasis, and Cryptococcus meningitis.

Medicines to treat most opportunistic infections are available on the market, but are too expensive for the majority of patients. Furthermore, they are only a temporary solution, since the HIV virus continues to attack the immune system. After one infection is cured, others inevitably follow.

2.2.2 Progression of the Disease and Opportunistic Infections (OIs) in HIV/ AIDS Patients

2.2.2.1 Progression of the Disease

The Centers for Disease Control (CDC) divides HIV infected patients into three laboratory categories and three clinical categories.

Laboratory Categories

m Category 1- A CD4 lymphocyte count of more than 500 cell/mm^3

m Category 2- A CD4 lymphocyte count from 200 through 499 cell/mm^3

■ Category 3- A CD4 lymphocyte count below 200 cell/mm^3

Clinical Categories

mCategory A – One or more of the conditions listed below occurring in an adolescent or adult with documented HIV infection. Conditions listed in categories B and C (below) must not have occurred.

- Asymptomatic HIV infection
- Persistent generalized lymphadenophathy
- Acute (primary) HIV infection with accompanying illness or history acute HIV infection

Category B – Symtomatic conditions occurring in an HIV-infected adolescent or adult which are not included among conditions listed in clinical category C and which meet at least one of the following criteria:

(a) The conditions are attributed to HIV infection and /or are indicative of a defect in cell-mediated immunity; or

(b) The conditions are considered by physicians to have a clinical course or management that is complicated by HIV infection. Examples of conditions in clinical category B infection include.

- Bacterial endocarditis, meningitis, pneumonia, or sepsis
- Candidiasis, vulvovaginal; persisitent (> 1 month duration), or poorly responsive to therapy
- Candidiasis, oropharyngeal (thrush)
- Cervical dysplasia, severe, or carcinoma
- Constitutional symptoms, such as fever (> 38.5 C) or diarrhea lasting > 1 month
- Hairy leukoplakia, oral
- Herpes zoster (shingles), involving at least two distinct episodes or more than one dermatome
- Idiopathic thrombocytopenic purpura
- Mycobacterium tuberculosis, pulmonary
- Nocardiosis
- Pelvic inflammatory disease
- Peripheral neuropathy

Category C – The conditions in clinical category C are strongly associated with severe immunodeficiency, occur frequently in HIV-infected individuals, and cause serious morbidity or mortality. HIV-infected person should be classified based on both the lowest accurate CD4 lymphocyte determination and the most severe clinical condition diagnosed, regardless of the patient's current clinical condition. The classification system is based on the absolute number of CD4 person when the counts cannot be obtained or are outdated in view of the patient's current clinical condition

When the patients get the HIV, they have the highly opportunity to get opportunistic infection from the other pathogenic. OIs and the progression of the disease reflect the severity of infection.

2.2.2.2 Opportunistic Infections (OIs) in HIV/ AIDS Patients

Opportunistic infections in a person with HIV are related to the person's lack of immune defenses caused by the virus, and the presence of microbes and others. There are several types of OIs occurring in the HIV patients

The common opportunistics include:

1. Bacterial disease such as tuberculosis (TB, caused by Mycobacterium Tuberculosis), Mycobacterium avium disease (MAC), Bacterial Pneumonia
2. Protozoal diseases such as Pneumocystis carinii pneumonia (PCP), toxoplasmosis, microsporidiosis, cryptosporidiosis, isosporiasis and leishmaniasis
3. Fungal diseases such as candidiasis, crytococcosis (cryptococcal meningitis (CRM) and penicilliosis
4. Viral diseases such as those caused by cytomegalovirus (CMV), herpes simplex and herpes zoster virus
5. HIV-associated malignancies such as Kaposi sarcoma, lymphoma and squamous cell carcinoma.

In 1984 – 1996 OIs incidence and AIDS deaths rate declined. In 1998, there was a study about HIV-related opportunistic diseases incidence in 4 countries (Table 2.6). In Thailand, the highest prevalence was Pneumoxystis Cartinii Pneumonia, followed by Penicilliosis, Tuberculosis, Bactoraemia Candiasis, Histoplasmosis, Progressive Multifocal Leukoencephalopathy, Atypical Mycobacteriosis, and Toxoplasmosis. In Brazil, the highest prevalence of OIs was Tuberculosis, followed by Toxoplasmosis, Pneumoxystis carinii pneumonia, Bactoraemia Cadiasis, CMV, and cryptosporidiosis. In Mexico, the highest prevalence of OIs was CMV followed by Kaposi Sacroma, Bactoraemia Candiasis, Tuberculosis, and Cryptosporidiosis-Isosporiasis. In USA, the

highest prevalence of OIs was Kaposi Sacroma, followed by Bactoraemia Candiasis, Crytocoxcosis, and Progressive Multifocal Leukoencephalopathy.

Table 2.6 AIDS-Defining Opportunistic Diseases: Prevalence in Four Countries.

Opportunistic Disease	**Country (%)**			
	Thailand	Brazil	Mexico	USA
Pneumoxystis Cartinii Pneumonia	26	22	-	-
Penicilliosis	4-25	16	-	-
Tuberculosis	20	41	28	3
Bactoraemia Candiasis	11	5	30	13
Histoplasmosis	8	-	5-10	-
Progressive Multifocal Leukoencephalopathy	7	11	24	0.6
cytomegalovirus (CMV)	4	5	65-69	5
Toxoplasmosis	2	14-34	17	3
Atypical mycobateriosis	2	-	5-6	4
Cryptosporidiosis –Isosporiasis	-	14	8	6.2
Cryptocoxcosis	-	5	7-11	7
Kaposi Sacroma	-	5	30-43	21
Aspergillasis	-	-	3-7	-

UNAIDS: HIV-related opportunistic disease.1998

CD4 cell count level is associated with type of OIs and severity of HIV disease. If the HIV/AIDS patients had low CD4 level, it increased the risk of OIs (Cohen, 1999). In the study, it was found that the HIV patients who had CD4 cell count 300 - 400 cell/mm^3 had Herpes Zoster, Tuberculosis, and Oral candidiasis. The patients who had CD4 cell count 200 – 300 cell/mm^3 had Pneumocystis Carinii Pneumonia, Esophageal candidiasis, and Mucocutaneous Herpes, and the patients who had CD4 cell count level

0 – 200 cell/mm^3 had Toxoplasmosis, Cryptococcosis, Coccidioidomycosis, Mycobaterium avium complex , Cytomegalovirus, and Cryptosporidiosis, PML.

2.3 The Antiretroviral Treatment Therapy

This topic provides the ARV treatment therapy, goal of therapy, general rules of therapy, criteria to initial therapy, when to change ARV therapy, clinical and Laboratory monitoring, ADR from ART, lab test, and the previous studies concerning efficacy of ARV.

2.3.1 Antiretroviral Drug

Anti-retroviral drugs act by blocking the action of enzymes that are important for replication and functioning of HIV. Two major classes are reverse transcriptase inhibitors (RTIs) and protease inhibitors (PIs). They are currently available. To effectively control HIV replication, Highly Active Anti-retroviral Therapy (HAART) is suggested to be used.

Table2.7 Anti-retroviral Drugs, Licensed and Registered for the Treatment of HIV

Reverse Transcriptase Inhibitors(RTIs)		Protease Inhibitors (PIs)
Nucleoside Reverse Transcriptase Inhibitors (NRTIs)	Non-nucleoside Reverse Transcriptase Inhibitors (NNRTIs)	
Zidovudine (AZT)	Nevirapine (NVP)	Saquinavir (SQV)
Didanosine (ddl)	Evavirenz (EFV)	Ritonavir (RTV)
Zalcitabine (ddc)	Delavirdine (DLV)	Indinavir (IDV)
Stavudine (d4T)		Nelfinavir (NFV)
Lamivudine (3TC)		Amprenavir (APV)
Abacavir (ABC)		

2.3.2 Goal of Therapy

1. Preserve and Strengthen the Immune System and prevent opportunistic infections.
2. Prevent the development of resistance
3. Select a regimen that the patient will take

2.3.3 General Rules of Therapy

1. Monotherapy with any agent should be avoided because clinical trials have shown these regimens to be inferior to combination therapies. The use of dual nucleoside-only-containing regimens should be avoided because initial viral suppression may not be sustained.
2. Avoid regimens with overlapping toxicities.
3. AZT and D4T should not be used together because both in vitro and in vivo studies have shown these agents to be antagonistic
4. No regimen should contain more than two PIs.
5. Avoid the use of two or more NNRTIs. Lack of both in vitro and in vivo data prohibits the use of NNRTIs in a regimen
6. in situation in which high viral load, the actively regimen should use two nucleoside analogs plus two PIs or two nucleoside analog plus an NNRO plus a PI

2.3.4 Criteria to Initial Therapy

1. CD4 count <200 – 350 cell/mm^3 (British HIV Association guidelines recommend CD4 count < 350 cell/mm^3 and US guidelines CD4 count < 500 cell/mm^3)

2. Viral load > 50,000 copies/mm^3 by RT- PCR or > 30,000 copies/ml by bDNA

3. CD4 count > 3850 cell/mm^3 close monitoring of CD4 count at least every month recommended.

2.3.5 When to Change ARV Therapy

1. Treatment failure (the treatment can not elevate the CD4cell or reduce the viral load)
2. Toxicity or inability of the patient to adhere to the treatment
3. Side effect of ARV

2.3.6 Clinical and Laboratory Monitoring of Antiretroviral Therapy

2.3.6.1 Clinical Monitoring

1. Development of a new HIV-related opportunistic illness (OI) and drug side effects.
2. HIV-related disease professions and sign of drug side-effects.
3. Long-term side effects of combination ARV are NRTI-associated lipotrophy and PI-associated lipodystrophy, hepatic and pancreatic toxicity and peripheral neuropathy.

2.3.6.2 Laboratory Monitoring

Routine laboratory testing is useful monitoring progression of HIV-illness and drug side effects. WHO prioritized currently available testing into four categories as shown in the Table 2.8. The lab and monitoring can reduce the risk of ADR and the toxicity from the ARV drug.

Table2.8 Category of Laboratory Testing

Category	Laboratory Test
Absolute minimum	HIV antibody, hemoglobin or hematocrit
Basic	White blood cell count and differental (total lymphocyte count), Serum alanine or aspartate aminotransferase
	Creatinine and/or blood urea nitrogen
	Serum glucose
	Pregnancy test for women
Desirable	Bilirubin, Amylase, Serum lipids, CD4 count
Optional	Viral load

2.3.7 The ADR of the ARV Drug.

The safe use of antiretroviral therapy requires careful clinical and laboratory monitoring. The ADR and toxicity of ARV are the important effects of providing ARV treatment to the HIV patients. If the patients get the ADR and toxicity of the treatment, the patients might stop the treatment and got more severe infection. The severe peripheral neuropathy, hepatotoxicity, pancreatitis, lactic acidaemia, and acute hepatitis are the severe ADR and toxicity of this combined drug (Table 2.9). However, some of the severe ADR and toxicity can be detected from the lab and monitoring results, such as if there were increased SGPT and SGOT. The hepatic function may get worse. For the GPO-VIR, which is the combination of 3TC, d4T and NVP, the drug also has toxicity and ADR as shown in Table 2.9.

Table 2.9 The ADR of the ARV Drugs

Drug Class	Drug	ADR
NRTI	Zidovudine (AZT)	Anaemia, Leucopenia, Neutropenia Myopathy, Lactic Acidaemia
	Didanosine (ddI)	Pancretitis , Lactic Acidaemia
	Lamivudine (3TC)	Severe Peripheral Neuropathy
	Stavudine (d4T)	Hepatotoxicity, Pancreatitis, Lactic Acidaemia, Acute Hepatitis
	Abacavir (ABC)	Hepatotoxicity, Hypersensitivity
	Zalcitabine (ddC)	Pancreatitis, Lactic Acidaemia
	Tenofovir (TNF)	Not recommended in Renal Insufficiency patient
NNRTI	Nevirapine (NVP)	Hepatotoxicity
	Efavirenz (EFV)	Hepatotoxicity, Hyperchlesterolaemia
	Delavirdine (DLV)	Hepatotoxicity

Table 2.9 The ADR of the ARV Drugs (Cont.)

Drug Class	Drug	ADR
PI	Indinavir (IDV)	Renal calculi, Crystalluria, Haematuria, Nephrotoxicity,Hepatotoxicity,Hyperbilirubinaemia, Hyperglycaemia, Diabetes, Hyperlipidaemia
	Saquinavir (SQV), Ritronavir (NLF)	Hepatotoxicity,Hyperglycdmia, Diabetes, Hyperlipidaemia
	Ritonavir (RTV), Amprenavir (AMP)	Hepatotoxicity,Hyperglycdmia, Diabetes, Hyperlipidaemia
	Lopinavir/low dose ritronavir	Hepatotoxicity, Hyperglycdmia, Diabetes, Hyperlipidaemia

Data Source: HIV/AIDS Antiretroviral Newsletter, issue NO.7 (2002)

2.3.8 Monotherapy, Dual and Triple Combination Therapy in HIV Treatment

2.3.8.1 Mono Therapy and Dual Combination

Zidovudine (AZT) as monotherapy ARV therapy was the first drug provided to the HIV patients but the patients resisted to the ARV rapidly. Scott et al (1996) suggested that treatment with zidovudine plus didanosine, zidovudine plus zalcitabine, or didanosine alone slowed the progression of HIV disease. These regimens were superior to the treatment with zidovudine alone. Antiretroviral therapy could improve survival in patients with 200 to 500 CD4 cells per cubic millimeter. Matthias et al. (1997) suggested that the introduction of ARV combination therapies outside the selected patient groups included in clinical trials led to a comparable reduction in disease progression and mortality.

2.3.8.2 Triple Combination ARV Therapy

Brettle et al. (1997) reported the changing trend of the ARV use. The number of HIV patients who used mono and dual therapy declined while the use of the triple

therapy increased. For instance, the dual and triple combination ARV therapy continuously increased in Regional Infectious Disease Unit (RIDU), Western General Hospital, Edinburgh. The result showed that the ARV of treatments changed to the triple combination ARV therapy. They also reported that the rate of the OI events per year significantly decreased in1996-1997 comparing to those in 1995. These reductions occurred in severed OIs such as PCP, candidiasis and CMV.

Table 2.10 Use of ARV Therapy by Patients in RIDU

Regimen	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**
Monotherapy	39	29	19	23	3	0
Dual therapy	2	3	1	17	34	17
Triple therapy	0	0	0	2	22	35
Quadruple therapy	0	0	0	0	5	14
Dual therapy with NRTI's	2	3	1	17	33	16
Dual NRTI's plus PI	0	0	0	1	19	30
Total	43	35	21	60	116	112

Rachel et al. (2002) pointed that evidence from randomized controlled trials supporting the use of triple therapy. Jordan et al. (2002) found that the use of ARV up to three drugs in antiretroviral combination therapies could reduce death rates and slow disease progression in HIV positive patients but there was no evidence to support or challenge the use of quadruple or higher combination ARV therapies.

Neuwelt et al. (2003) reported that the short-term efficacy of EFV-containing regimens and NVP- containing regimens for treatment of ARV in naïve patients was equivalent. Hartmann et al. (2003) and Julian (2003) stated that Nevirapine or Efavirenz should be be used with 2 NRTIs in first line combination of ARV more than PIs because PIs were more easily tolerated. They also recommended that Nevirapine could be applied to children as well as adults.

2.3.8.3 The Efficacy of Combination of Nevirapine, Lamivudine, and Stavudine

Yozviak et al. (2001) suggested that the combination of NVP with 2 NRTIs was effective, and possibly better tolerated than other highly active antiretroviral therapy, which including a protease inhibitor. The NVP+d4T+3TC regimen appeared to be effective in both treatment-experienced and –naïve patients, regardless of baseline viral loads. They reported that 83.6% of 73 patients who were treated with this regimen for 48 weeks, the mean increased CD4 was 170 cell/mm^3. The main adverse effect was rash which could be observed in 20% or more in individuals. Rash occurred with a higher frequency than other ADR.

Javier and Francisco (2003) reported that the combination of Nevirapine with two NRTIs for the HIV patient demonstrated its efficacy in high as well as low baseline viral load patients over a 1-year period. The analysis of the available evidence about the efficacy and tolerability of once-a-day highly active antiretroviral therapy (HAART) was measured at 24 weeks or greater with the 80% of followed-up participants. The overall increased CD4 was at least 114 cell/mm^3. Tolerability was good, with a low discontinuation rate.

2.4. Cost and Financing Aspect of Providing Antiretroviral Therapy

2.4.1 Cost of Providing Antiretroviral Therapy

Available data concerning the costs of providing ARV therapy are presented in two sections. The costs of the ARV drugs were presented in the first section. The second section included the details of the other costs associated the ARV provision.

2.4.1.1 Antiretroviral Drug Costs

A comparison of drug price between Thailand and India appears in Table 2.11. The drug price per patient per year (PPPY) in Thailand was nearly the same as India. Government Pharmaceutical Organization (GPO) (Thailand) produced only NPV, GPO did not produce EFV because it was under the patent. To avoid producing drug under the patent, in 2003, GPO started to produce the combination drug regimen which is the

combination of Stavudine, Lamivudine, and Nevirapine in 2002. The GPO-VIR substantially reduced the cost of ARV treatment for HIV patient in Thailand.

Table 2.11 ARV Price in Developing Countries (US$)

Drug	**EFV**	**NPV**	**3TC+d4T**	**3TC+d4T**	**3TC+d4T+NVP**	**3TC+d4T+NVP**
Strength (mg)	200	200	150+30	150+40	150+30+200	150+40+200
Therapeutic class	NNRTI	NNRTI	2 NRTIS	2 NRTIS	2 NRTIs+ NNRTI	2 NRTIs+ NNRTI
Daily Dose	3	2	2	2	2	2
Aurobindo (India)	438	112	-	-	-	-
Cipla (India)	589	208	162	173	361	361
GPO (Thailand)	-	224	-	-	325	358
Hetero (India)	658	146	141	276	281	286
Ranbaxy (India)	570	166	128	139	287	295

(Source: MSF, June 2002)

2.4.1.2 Opportunistic Infection Drug Cost

When the HIV/AIDS patients had severe disease progression, the patients had more opportunity to get the OIs such as Aspergillasis, Atypical mycobateriosis, Bactoraemia Candiasis, CMV, Cryptocoxcosis, Cryptosporidiosis –Isosporiasis, Histoplasmosis, Kaposi Sacroma, Penicilliosis, Progressive multifocal

Leukoencephalopathy, Pneumoxystis cartinii pneumonia, Toxoplasmosis, and Tuberculosis, etc. To make a patient recovers from severity of illness, a physician has to treat OIs. In Thailand, a study of the cost of OIs treatment in Ramathibodi Teaching Hospital and Prayao Hospital was performed. The data on OI drug price are shown in Table 2.12**.** In Phayao hospital, the price of the OI drugs in 1998 increased about 11 – 50 % of the price in 1997. In Ramathibodi hospital, the price of the OI drugs in 1998 increased 2.7 – 11 % of 1997. An increase of OIs drug cost resulted in the higher cost of the HIV treatment.

Table2.12 Drug Price of Opportunistic Infection Drugs, 1998

Selected Drugs	Phayao Hospital			Ramathibodi Hospital		
	Price		% change	Price		% change
	1997	1998		1997	1998	
Amphotericin B 50mg vial	300	413	37%	300	308	2.7%
Fluconazole 200 mg 50 cap	10,914	12,122	11%	10,368	11,515	11%
Itraconazole 100 mg 100 cap	3,000	3,839	27%	2,850	3,410	20%
Ketoconazole 200 mg 250 tab	1,000	1,500	50%	1,062	1,100	3.5%
Average			31%			10%

Source: Phayao provincial and Ramathibodi Hospital 1998

2.4.2 Other Medical Costs Involved in Providing ARV therapy

Besides the OI treatment drug cost and ARV drug cost, there were the other important costs associated with providing therapy including HIV tests to examine whether a patient who has positive HIV is eligible for ARV therapy, pre- and post-test counseling, regular out-patient visits to monitor side-effects and to receive the ARV drugs, laboratory tests such as CD4 counts, complete blood counts, viral loads and

chemistry panels to monitor patient health status, and out-patient visits/hospitalization associated with adverse drug effects.

2.4.3 The Studies of ARV Treatment Cost

Rely (2002), in his study concerning to the financing of HIV care in Mexico, reported the cost of providing antiretroviral combination therapy. He found that the cost of making combination antiretroviral therapy available in Mexico City substantially increased. The total cost of laboratory test and prophylactic was comparatively less significant than the ARV. The estimated per capita of the implementing combination antiretroviral therapy was US$ 6.56. Masaki and Green (2002) studied about the long term projection of treatment cost and the cost saving of from antiretroviral treatment in countries that lacked health care resources. They found that the potential cost saving from ARV therapy was small. In a resource-constrained setting, the high expense of ARV therapy compared to the saving made government decision on public provision of ARV was an ineffective policy. They suggested that if poor countries hope to maximize the scarce resources available for reducing the impact of AIDS, HIV prevention interventions should be more important than treatment program using ARV therapy. Gilbert (2002) found that in Mexico total cost per patient per year (PPPY) of treatment was US$1,850 in Ministry of Health, US$ 2,464 in Mexican Social Security Institutes, and US$2,278 in National Institutes of Health. In Barcelona, he also found that hospitalization costs decreased but outpatient costs increased. The ARV drug cost occupied 70 – 80% of total cost. In UNAIDS meeting (2003), the results of the meeting showed that the annual cost (PPPY) was US$2,000 in the USA; the annual cost (PPPY) included OI treatment cost, diagnostic HIV testing, OI prophylaxis, and HARRT. Gilbert and Owen (2003) supported that the average OI treatment costs (PPPY) for HIV patients was US$ 25, the total annual cost per-patient cost after proving the ARV was $532 in Zambia and US$ 619 in Uganda. The ARV drug cost was 50% of the total treatment cost in Zambia and 63% in Uganda. Sergio et al. (2003) supported that, the lab costs and outpatient visit costs were the major component of treatment costs. Except

the ARV cost, the overall treatment costs were also higher for patients in advanced stages of illness and were also higher for patients in their last year of life.

In Thailand, Kulsomboon et al (2003) compared the treatment costs for AIDS patient receiving and not receiving triple antiretroviral therapy at Bumrasnaradoon hospital, Thailand. They found that the average annual treatment cost of ARV PPPY were 87,168.1 bath (US$2,027), it was 7.9 times greater than the average cost of non-ARV patient (11,114.8 bath) (US$258). They concluded that the cost of ARV did not out weight cost-saving from hospital admissions and OPD costs. Only a decrease in ARV costs could improve patients' access to ARV. They suggested that a one dollar per day triple ARV, GPO-VIR, produced by GPO (Thai government) could lead to government subsidization of ARV for all AIDS patients in Thailand.

2.5 The Changing of HIV/AIDS Policy and Funds in Thailand

Porapakkham et al (1995) reported that there were many steps and levels involving in the policy formulation process in providing ARV drug in Thailand. The policy environment changed since the first case of HIV/AIDS was reported in 1984. During 1982 – 1987, the government health education program on the HIV was limited to commercial sex workers (CSWs). To protect the patient from receiving HIV infection blood supply, the MOPH added the regulation stating that blood donor had to be tested for HIV before providing blood for a patient. In 1988, the short-term HIV/AIDS program implemented to prevent and control the HIV transmission. The program received technical and financial support from World Health Organization (WHO). The majority of fund came from external sources including international organization such as WHO, UNICEF in 1988 – 1990. The major policy development was to implement a medium-term program and to establish the surveillance system. The other government program included the provision of the testing of blood donated from an individual, behavioral change communication interventions targeting toward CSWs and IDU, in conjunction with condom promotion and distribution. The campaign

targeted at CSWs and their clients because they were the major group of HIV carriers. The prevention program focused on condoms as an effective protection against infection. The MOPH was the central agency responsible for coordinating the national AIDS program. Thai government budget for HIV contributed US$ 0.18 million in 1988. In 1990, Thai government allocated US$ 0.4 million for HIV funds while international donors increased their support to US$ 3.74 million. The government increased financial commitment, and foreign donors still contributed the majority of funds. In 1991 – 1992, HIV epidemic burst into the general population. The primary strategy for the national AIDS campaign emphasized on mass media education, increased concern on human rights of persons with HIV/AIDS, and also increased the budget allocation for HIV budget. The government's budget allocation for the anti-AIDS campaign increased from US$ 2.6 in 1990 to US$ 7.16 million in 1991. In 1992, the budget was more than US$ 25.1 million. During 1992 – 1995, the national AIDS campaign was able to raise awareness and produce behavioral change for HIV reduction. The campaign emphasized on care of HIV –infected persons, and how to live with HIV patients. The priority of the government to alleviate the HIV problem focused on the prevention program to reduce the number of new case of HIV patient.

The Thai Working Group on HIV/AIDS Projection (2001) reported that the condom use became the norm and the percentage of adult men visiting sex workers annually fell to one-quarter of the population. The number of new HIV infections reduced from 143,000 in 1991 to 29,000. However, in 2001 there still were 55,000 Thais who could develop serious AIDS related illness and required essential medical care. At that time, the Thai government had policy to strengthen the risk reduction among commercial sex program, to reduce needle sharing among drug users program, to provide AZT for HIV positive women at antenatal clinics program, to promote HIV counseling and testing, and to encourage condom use in couple. However, there was no policy to increase the access of HIV ARV drugs. Teokul (2002) said that cost of ARV for HIV patient were US$ 2,240 PPPY which was higher than GDP per capita in 2000.

In 2002, HIV/AIDS Fund required US$ 144.93 million to procure ARV for all HIV patients. Within the same year, Thai government implemented a policy on health system reform in conjunction with the government's universal coverage (UC) scheme, a so-called 30 Baht project which a patient would be charged only 30 baht for the registration fee**.** Government subsidized US$ 27.9/person/year for an individual beneficiary. During this time, benefits from this scheme did not cover ARV for HIV patients except for mother-to-child transmission of HIV. The reason for not giving ARV in UC scheme was the high expenditure would affect sustainability of the financial of the UC scheme in long run. Fortunately, GPO could produce GPO-VIR costs only 1,200 baht/month (US$1 per day). The annual cost was only 14,400 baht which was lower than the annual cost for other 8 chronic diseases in the 30-baht health-care program. For this reason, the total number of patients receiving antiretroviral medication has increased from 3,500 to 13,000.

Due to the reduction of the cost of ARV drug, the expansion of the number of patients was made possible by the government annual budget of 250 million baht. The beginning of 2003, the Global Fund for antiretroviral medication from the United Nation could provide ARV to 10,000 patients. The government at present has been trying to scale up as much as possible for HIV patient's accessibility to antiretroviral care. The Anti-Retroviral Therapy (ART) was provided to 3000 patients in fiscal year 2002. In 2003, 10,000 patients were already treated with ART.

The supporting government's on ARV program will increase the number of patients to 50,000 in 2004, increase the ARV treatment site from 110 sites to more than 800 sites by the end of 2003, and increase CD4 count lab test from 19 to 40 sites. For Social Security Scheme (SSS) beneficiaries, "HIV and UC and ARV" SSO newsletter (11 November 2003) reported that SSS allowed ARV drug cost to the SSO patients for 15,000 baht per patient per year, 500 baht for laboratory cost per patients per year, and increase the budget for chronic disease 150 baht per patient to cover the ARV.

Nevertheless, when the patients got ARV, they had to pay for the ADR treatment by themselves.

Based on the review of the treatment with ARV and the cost of the treatment for the HIV patients in Thailand, the result shows that the triple antiretroviral combination declines the HIV progression and reduces mortality rate among HIV patients, however its cost is relatively. Because GPO-VIR, the triple ARV combination drug, costs only US$ 1 per day, it brought into attention if the drug cost could compensate other HIV-related costs.

This study had the conceptual framework of the cost-consequence analysis for the providing GPO-VIR treatment to the HIV patients in Saraburi province in the following.

2.4.4 Conceptual Framework

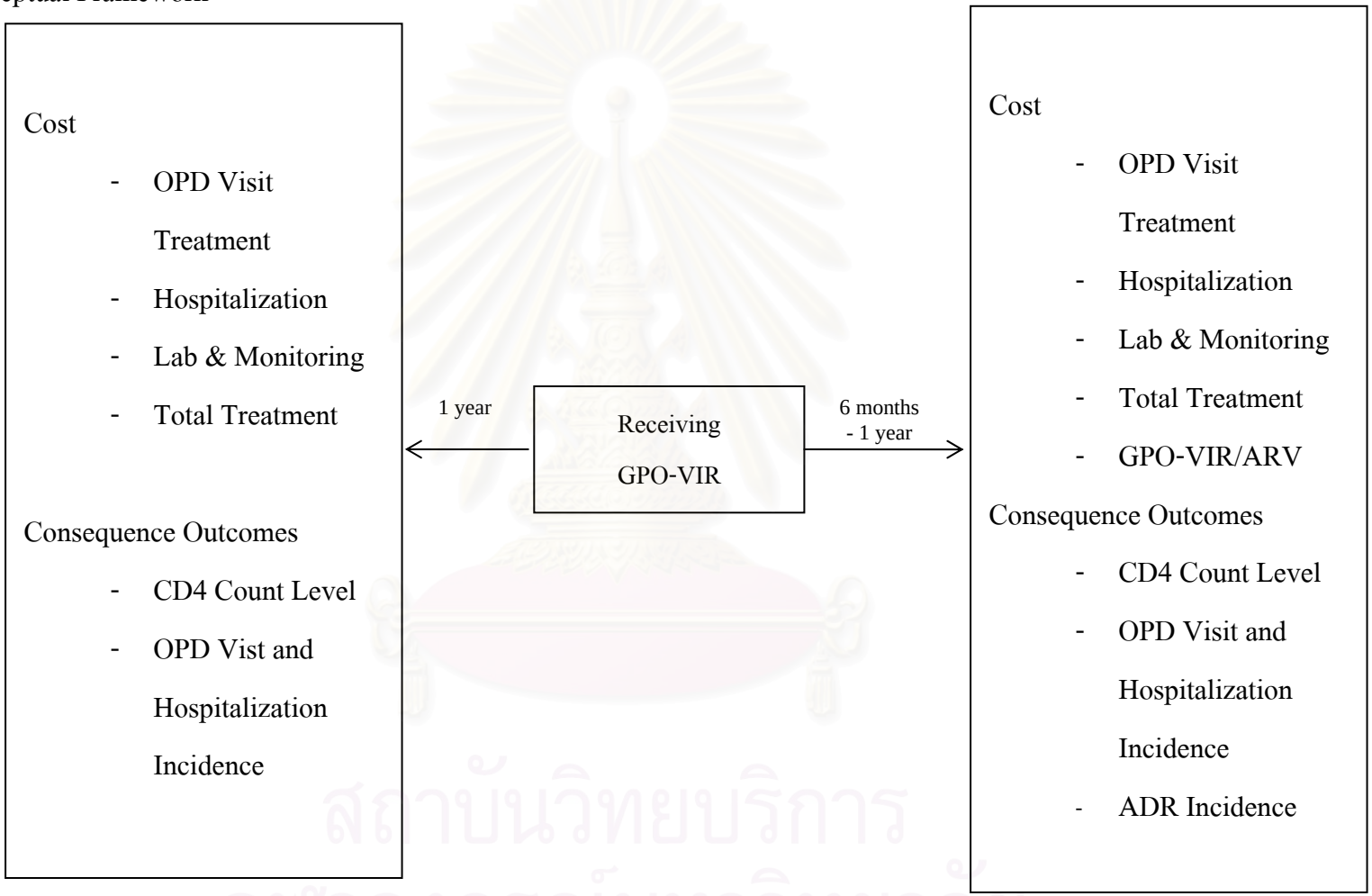

Figure 2.1 Conceptual Framework

Chapter 3

Research Methodology

This chapter provides the description of the methodology including the population and subjects, data collection, data analysis, and time frame. This research was a retrospective descriptive study. Cost-consequence analysis was employed using hospital perspective. The clinical outcome and cost consequences before and after receiving GPO-VIR were analyzed. The data were collected during one year before the patients received GPO-VIR and at least 6 months after receiving the ARV. The data were collected from medical record of the patients from three hospitals in Saraburi province including Saraburi, Praputthabaht, and Nong Care.

Since the study used provider's perspective, it focused on the hospital's treatment cost for the HIV/AIDS patients before and after receiving the GPO-VIR. The costs included the costs of antiretroviral drugs, ADR treatment cost, the OI drug cost, the laboratory cost, the OPD and the monitoring costs. The consequences of the treatment focused on the discrepancy cost of the OIs treatment before and after the HIV/AIDS patients receiving GPO-VIR and the important clinical outcomes including the increase of the CD4 count level, the reduction of the disease incidences, and the ADR incidences.

3.1 Studied Population

3.1.1 Population Characteristics

The population of the study was the HIV/AIDS patients who received GPO-VIR after the provision of this treatment started in 2003 in Saraburi province.

3.1.2 Inclusion Criteria of the Subject under the Study

- Patients who had CD4 cell count less than 200 cell/mm^3
- Patients who had been receiving GPO-VIR treatment

- Patients who had cost and clinical outcome data in medical profile at least one year before receiving GPO-VIR treatment more than 1 year and had the data at least 6 months after receiving GPO-VIR

3.2 Data Collection

Data were collected from OPD card and medical record at Saraburi province. The data collection form used in this study was designed to gather the data on demographic, cost of HIV-related treatment, and clinical outcome in the following.

3.2.1 Demographic Data included

- Gender
- Age
- Marital status
- Leading cause of infection
- Stage of illness

3.2.2 Cost of the Treatment included

- Drug for OIs treatment
- Laboratory and monitoring
- Medical service
- Room
- ARV drug (from GPO-VIR)

In this study, the drug of OIs treatment, laboratory and monitoring, medical service, and room cost were discounted 30% from the medical charge from data that the hospital charges to the patients. This is based on the method to calculate the price charged to the patient in the government hospital recommended by the Ministry of Health. (See Appendix iii)

3.2.3 Outcome of the Treatment included

- Amount of cost saving of treatment from using GPO-VIR
- The increase of CD4 cell count level
- The reduction of OI incidence

- The reduction of hospitalization and OPD visit
- The ADR incidence of GPO-VIR

3.3 Data Analysis

The data were analyzed by calculating the total HIV treatment cost, the cost discrepancy of the OI treatment, the change of the CD4 cell count levels, the relative rate of OI incidence.

3.3.1 Calculating Total OPD Treatment Costs:

Costs of HIV treatment were calculated by these equations:

3.3.1.1 Cost per patient per year in OPD before Receiving GPO-VIR (C_B)

$$C_{OB} = \text{Cost/patient/year} = \frac{\sum_{n=1}^{N} Cb_n}{N}$$

C_{OB} is total cost PPPY of HIV/AIDS treatment in OPD before receiving GPO-VIR

$$Cb_n = \sum_{i=1}^{N} (C_1 + C_2 + C_3)i$$

Cb is total cost of HIV/AIDS treatment in a month before receiving GPO-VIR

C_1 = OI Treatment Cost

C_2 = Laboratory and Monitoring Cost

C_3 = Medical Service Cost

N = number of patients

3.3.1.2 Cost per patient per year in OPD after Receiving GPO-VIR (CA)

$$C_{OA} = \text{Cost/patient/year} = \left[\frac{\sum_{j=1}^{N} \left(\sum_{i=1}^{n} Ca_i \right)_j}{N} \right] \frac{1}{\text{Time}}$$

C_{OA} is total cost PPPY of HIV/AIDS treatment in OPD after receiving GPO-VIR

Ca_n is Total cost of HIV/AIDS treatment in one month after receiving GPO-VIR

$$Ca_n = \sum_{i=1}^{n} (C_1 + C_2 + C_3 + C_4)i$$

C_1 = OI Treatment Cost

C_2 = Laboratory and Monitoring Cost

C_3 = Medical Service Cost

C_4 = ARV Cost

N = number of patient

n = number of month

Time = the average time of ARV drug exposure (per patient per year)

3.3.2.3 Discrepancy Cost of OPD Cost before and after Receiving GPO-VIR

$$DC_O = C_{OA} - C_{OB}$$

3.3.2 Calculating Total IPD HIV Treatment Costs:

Costs of HIV treatment were calculated by these equations:

3.3.2.1 Cost per patient per year in IPD before Receiving GPO-VIR (C_B)

$$C_{IB} = \text{Cost/patient/year} = \frac{\sum_{n=1}^{N} Cb_n}{N}$$

C_{IB} is total cost PPPY of HIV/AIDS treatment in IPD before receiving GPO-VIR

$$Cb_n = \sum_{i=1}^{N} (C_1 + C_2 + C_3 + C_4)i$$

Cb is total cost of HIV/AIDS treatment in a month before receiving GPO-VIR

C_1 = OI Treatment Cost

C_2 = Laboratory and Monitoring Cost

C_3 = Medical Service Cost

C_4 = Room Cost

N = number of patients

3.3.2.2 Cost per patient per year in IPD after receiving GPO-VIR (CA)

$$C_{IA} = \text{Cost/patient/year} = \left[\frac{\sum_{j=1}^{N} \left(\sum_{i=1}^{n} Ca_i \right)_j}{N} \right] * \frac{1}{\text{Time}}$$

C_{IA} is total cost PPPY of HIV/AIDS treatment in IPD after receiving GPO-VIR

Ca_n is Total cost of HIV/AIDS treatment in a month after receiving GPO-VIR

$$Ca_n = \sum_{i=1}^{n} (C_1 + C_2 + C_3 + C_4 =+ C_5)i$$

C_1 = OI Treatment Cost

C_2 = Laboratory and Monitoring Cost

C_3 = Medical Service Cost

C_4 = Room Cost

C_5 = ARV Cost

N = number of patient

n = number of month

Time = the average time of ARV drug exposure (per patient per year)

3.3.2.3 Discrepancy Cost of IPD Cost before and after Receiving GPO-VIR

$$DC_I = C_{IA} - C_{IB}$$

3.3.3 Calculating Discrepancy Cost of OIs Treatment (DC_T PPPY)

$$DC_T == [CA_{OA} + CA_{IA}] - [CB_{OB} + CB_{IB}]$$

3.3.4 Measurement of the Increase of CD4 Cell Level

The measurement of the increase of CD4 cell level including the number of patient who had CD4 increase and the change of CD4 count level

3.3.5 Measurement Number of Disease Incidence in OPD (person-year)

Number of disease incidence due to the concept of Incidence Density

$$ID = \frac{\text{Disease event during a given period of time}}{\text{Total person-time of observation}}$$

$$\text{ID of disease in OPD visit before receiving GPO-VIR} = \frac{\sum \text{OPD Visit}_b}{\sum \text{Time}_b}$$

$$\text{ID of disease in OPD visit after receiving GPO-VIR} = \frac{\sum \text{OPD Visit}_a}{\sum \text{Time}_a}$$

3.3.6 Measurement Number of Disease Incidence in IPD (person-year)

Number of disease incidence due to the concept of incidence density:

$$\text{ID (person-year)} = \frac{\text{disease event during a given period of time}}{\text{Total person-time of observation}}$$

$$\text{IDb of disease in IPD visit before receiving GPO-VIR} = \frac{\sum \text{IPD Visit}_b}{\sum \text{Time}_b}$$

$$\text{IDa of disease in IPD visit after receiving GPO-VIR} = \frac{\sum \text{IPD Visit}_a}{\sum \text{Time}_a}$$

$$\text{IR of OI} = \frac{\text{IDb}}{\text{IDa}}$$

3.3.7 Measurement Number of OI Incidence in OPD and IPD (person-year)

$$\text{IDb of disease before receiving GPO-VIR} = \frac{\sum \text{OPD + IPD Visit}_b}{\sum \text{Time}_b}$$

$$\text{IDa of disease after receiving GPO-VIR} = \frac{\sum \text{OPD + IPD Visit}_a}{\sum \text{Time}_a}$$

$$\text{IR of OI} = \frac{\text{IDb}}{\text{IDa}}$$

3.4 Time Schedule

Table 3.1 Time Schedule of the study

Activity	2003								2004		
	May	June	July	Aug	Sep	Oct	Nov	Dem	Jan	Feb	Mar
Review Literature	←	—	—	—	—	→					
Develop the proposal					←	—	→				
Data Collection							←	—	→		
Data Analysis									←	—	→
Summary										←	— →
Writing & Report											← →

Chapter 4

Results

This chapter provides the results of the study according to the research methodology provided in chapter 3. It consists of the demographic data of the subject and the costs of treatment including the GPO-VIR drug, the OI treatment drug, laboratory and monitoring, the OPD visit, hospitalization, and discrepancy of treatment cost before and after receiving GPO-VIR. Furthermore, the results of CD4 cell count level before and after receiving, the difference of OI incidence, hospitalization, and also OPD visit are reported in this chapter.

4.1 Population and Demographic Data

In spite of the fact that Saraburi province had 2,200 HIV patients who had suffered from the HIV infection, a few patients had received ARV treatment from hospitals. Since November 2002, only 98 HIV patients including 68 patients from Saraburi hospital, 18 HIV patients from Praputhabath hospital, and 12 HIV patients from Nong Care hospital could access to GPO-VIR because the criteria to initial therapy suggests that the HIV patients who receive the ARV treatment should have CD4 cell count level less than 200 cell/mm^3. According to the inclusion criteria in this study, the subjects had to have CD4 cell count less than 200 cell/mm^3 before receiving GPO-VIR, had to have hospital profile treatment more than 1 year before receiving GPO-VIR, and had the data at least 6 months to 1 year after receiving GPO-VIR. Of the 98 patients only 78 patients had the data met the criteria. Therefore, the study included only 78 patients for the analysis. The reason that the study did not include those 20 patients were the 9 patients had OPD and IPD data; before receiving GPO-VIR only 1 – 4 months, and 11 patients had their data after receiving GPO-VIR only 3 - 4 months. The subjects of this study consisted of 59 HIV patients from

Saraburi hospital, 12 HIV patients from Praputthabaht hospital, and 7 HIV patients from Nong Care hospital. (Table 4.1)

Table4.1 Number of AIDS Patients in Saraburi Province Received GPO-VIR

Hospital	**No. of GPO-VIR received patients**	**Percentage (%)**	**No. of enrolled Subjects**	**Percentage (%)**
Saraburi	68	69.4	59	75.6
Phraputhabaht	18	18.4	12	15.4
Nong Care	12	12.2	8	9.0
Total	98	100.00	78	100.00

Situation of HIV Patients who have Received GPO-VIR in the Saraburi province

The characteristics of the patients before and after receiving GPO-VIR are shown in Table 4.2. There were 52.6% females, and 47.4% males. Among different age groups, 76.9% was 21 to 40 years old, and 23.1 % was 41 to 60 years old. For their marital status, 52 (66.7%) were married and 19(24.4%) were single. Of all the 78 patients, 32.1% was in SSS, 32.1% was in 30-baht project patients, 30.7% was in out-of-pocket, and only 5.1% were in the CSMBS. Most of the HIV patients (89.7%) who have been receiving GPO-VIR were in Saraburi Province or lived near the border of Saraburi Province such as Pranakornsriayutthaya Province, Lopburi Province.

Table 4.2 Patients' Characteristics

Demographic Data	No. of Pts.	Percent (%)
Gender		
Female	41	52.6
Male	37	47.4
Age range(years)		
21 – 30	18	23.1
31 – 40	42	53.8
41 – 60	18	23.1
Marital Status		
Married	52	66.7
Single	19	24.3
Widow / Separate / Divorce	7	9.0
Benefit Right		
Social Security	25	32.1
Universal Coverage (30 Baht Project)	25	32.1
Out of pocket	24	30.7
Civil Servants' Medical Benefits Scheme (CSMBS)	4	5.1
Living Place		
Saraburi Province	61	78.2
Pranakornsriayutthaya Province	5	6.4
Lopburi Province	4	5.1
Khon Kaen Province	2	2.6
Supanburi Province	1	1.3
Petchaboon Province	1	1.3
Nakornsawan Province	1	1.3
Pratumthani Province	1	1.3
Nakornrachasrima Province	1	1.3

Leading cause of infection, stage of illness and history of OI were interviewed by nurse before receiving GPO-VIR. The results are shown in Table 4.3. Sexual behavior was the highest of leading cause of infection (93.6%); there was only 6.4% that was not identified. There were 100.0% AIDS. There were 83.3% of the subjects who had OI history before receiving GPO-VIR, 16.7% Pruritus, 14.1% PCP, 11.5% Oral Candidiasis.

Table 4.3 Leading Cause, Stage of Illness and OI History of Infection (N = 78)

Infection History	**No. of Patients**	**Percent (%)**
Leading cause of infection		
Sexual Behavior	73	93.6
Not Identified	5	6.4
Stage of illness		
AIDS	49	62.8
Symptomatic	21	26.9
Asymptomatic	8	10.3
History of opportunistic infection of patients interviewed by the nurse before receiving GPO-VIR		
Did not have Opportunistic Infection	13	16.7
Pruritus	13	16.7
PCP	11	14.1
Oral Candidiasis	9	11.5
Chronic Diarrhoea	7	9.0
Chronic Fever	5	6.4
Cryptomenigitis	4	5.1
CMV	3	3.8
TB	3	3.8
Pruritus with Chronic Diarrhoea	3	3.8
Herpes Zostor	1	1.3

Table 4.3 Leading Cause, Stage of Illness and OI History of Infection (N = 78) (Cont.)

Infection History	**No. of Patients**	**Percent (%)**
History of opportunistic infection of patients interviewed by the nurse before receiving GPO-VIR		
Vaginal Candidiasis	1	1.3
Chronic Fever with oral Candidiasis	1	1.3
Chronic Fever with Chronic Diarrhoea	1	1.3
PCP with CMV	1	1.3
PCP with Cryptomenigitis	1	1.3
Pruritus with PCP	1	1.3

4.2 ARV Treatment Therapy

When the patients received GPO-VIR, they might experience ADR problems or drug resistance. In these cases, doctors have to change to another second ARV regimen. The switching of ARV therapy should take precedence over the potential benefits antiretroviral for the patients. In Saraburi province, the switching of antiretroviral drugs for treatment of HIV patients is shown in Table 4.4. The first regimen is GPO-VIR given to the patients who had less than 200 cell/mm^3 CD4 cell count level. Sixty-five patients received GPO-VIR S30, and 13 received GPO-VIR S40. There were 8 of the 65 patients who started receiving GPO-VIR S30 and were shifted to the other regimen; 5 of the 8 patients shifted to d4T+3TC+EFV, 2 shifted to GPO-VIR S40, and 1 shifted to Combid + NVP. These 8 patients had to change the ARV regimen because of ADR such as hepatic failure, renal failure, lactic acidosis, and rash. Two patients who stopped treatment from antiretroviral drug, one was a patient who received d4T+ 3TC + EFV regimen and one received Combid + NVP. Of the 13 patients who started receiving GPO-VIR S40, 2 shifted to the AZT+3TC+NVP.

Table 4.4 Switching of Antiretroviral Drugs for Treatment of HIV Patients

First Regimen			Second Regimen		
Regimen	Frequency	Percent	Regimen	Frequency	Percent
GPO-VIR S30	65	83.3	GPO-VIR S30	57	73.1
			GPO-VIR S40	2	2.6
			d4T + 3TC + EFV	4+1*	6.4
			Combid + NVP	1*	1.3
GPO-VIR S40	13	16.7	GPO-VIR S40	11	14.1
			AZT + 3TC + NVP	2	2.6
Total	78	100.0	Total	78	100.0

* Two patients who stopped receiving ARV treatment.

The time of switching of ARV drug appears in Table 4.5. There were 8 patients changed the regimen because they had severe ADR after receiving GPO-VIR. The mean of the switching time was 91 days (three months). Two patients who had rash were changed the regimen in 14 days. The patients who had severe ADR changed the regimen in 175 days (six months). The severe ADR were acidosis, renal failure, and hepatic failure. The patient who had ADR changed their regimens during three to six months after receiving GPO-VIR. From Table 4.4, there were two patients who changed the regimen to GPO-VIR S40 after receiving GPOVIR S30 for one year.

Table 4.5 The Time until Switching of Antiretroviral Drugs (days)

No. of the patients	Min.	Max.	Mean
8	14	175	91

The ARV exposure time was shown in Table 4.6. Most of the patients (58.5%) were exposed to the GPO-VIR for 12 months. Only 5 patients who were exposed to the ARV for six months. The average of the ARV exposure time was 10.5 months per patient.

Table 4.6 The ARV Exposure Time

Time Patient Receiving GPO-VIR (Month) (1)	No. of the patients (2)	Total Exposure Time* (Month)
6	5	30
7	4	28
8	5	40
9	7	63
10	8	80
11	9	99
12	40	480
Total	78	820

* (1) x (2) = (Time Patient Receiving GPO-VIR) x (No. of Patients)

Total exposure time = 820 Months

The average of exposure time per patient per year = 820 Months / 78 patients

= 10.5 months per patient

The average of exposure time per patient per year = $\frac{10.5 \text{ months}}{12}$ per patient

= 0.8769 year per patient

4.3 CD4 Cell Count Level and its Related to the Factors

The CD4 cell count level was measured after the patients receiving the GPO-VIR six months. There were statistical tested for the factors related to the changed CD4 after receiving the ARV. The factors tested for its association with CD4 Cell count level were age, gender, the benefit rights, and the severity of HIV infection.

4.3.1 CD4 Cell Count Level before and after Receiving GPO-VIR

A comparison of CD4 count level before and after receiving GPO-VIR is shown in Table 4.7. Before receiving GPO-VIR, 45 patients were in 1 – 50 cell/mm^3 range, 17

patients were in 51 – 100 cell/mm^{3}range, 8 patients were in 101 – 150 cell/mm^3 range, and 8 patients were in 151 – 200 cell/mm^3 range. After receiving GPO-VIR, there were only 76 patients who have the data of CD4 cell count level because 2 patients stopped the treatment who could not be measured CD4 count level. Number of the patients who changed CD4 cell count level after receiving GPO-VIR varied the CD4 cell count range. Based upon the range of CD4 cell count before receiving GPO-VIR, there were 20 patients in 151 – 200 cell/mm^3 range, 19 patients in 101 – 150 cell/mm^3. However, there was only a patient who was still in the 1 – 50 CD4 cells count level range, his CD4 cell count level dropped from 16 cell/mm^3 to 9 cell/mm^3. Most of the patients could increase CD4 count level after receiving GPO-VIR at least 6 months. There were 75 patients (98.7%) who had the increased CD4 cell count level after receiving GPO-VIR (Table 4.8).

Table 4.7 Comparison of CD4 count Level before and after Receiving GPO-VIR

CD4 Count Range	**Before Receiving GPO-VIR**		**After Receiving GPO-VIR**	
cell/mm^3	No. of Pt.	Percent (%)	No. of Pt.	Percent (%)
1 – 50	45	59.0	1*	1.3
51 – 100	17	21.8	13	16.7
101 – 150	8	10.3	19	24.4
151 – 200	8	10.3	20	28.2
201 – 250	-	-	10	12.8
250 - 300	-	-	4	5.1
Higher 301	-	-	9	11.5
Total	78	100	76	10

* The patient is still in the same CD4 cell count range.

Table 4.8 Change of CD4 Count Level after Receiving GPO-VIR

Changing of CD4 Count Level	**No. of Patients.**	**Percent**
Increase	75	98.7
Reduce	1	1.3
Total	76	100.0

Two patients had severe ADR and stopped the treatment. There was no data on CD4 cell count level of those so they were excluded from the CD4 cell count analysis. Only the data of 76 patients were used for the analysis. The mean of CD4 cell count level before receiving was 56.5 cell/mm^3, and the mean of CD4 cell count level after receiving GPO-VIR was 179.2 cell/mm^3. There was a significant difference between the CD4 level before and after getting the drug from Paired T-Test analysis ($P< 0.001$). The ARV significantly affected to the CD4 cell count level for treatment HIV Patients (Table 4.9).

Table 4.9 Comparison of CD4 Count Level before and after Receiving GPO-VIR

Number	No. of Pts.	Min	Max	Mean	SD.	P-value
1st CD4 Count Level	76	4	194	56.5	52.88	0.000*
2nd CD4 Count Level	76	9	447	179.2	94.02	

* $P <.0.01$, $\alpha = 0.05$

4.3.2 Factors Related to CD4 Cell Count Level

4.3.2.1 Gender and CD4 Cell Count Level

Before receiving GPO-VIR, the mean CD4 cell count level of female HIV patients was 60.1 and the mean of CD4 cell count level of male HIV patients was 50.9. There was no difference in CD4 cell count level between male and female patients based on Independent T-test analysis ($P = .443$). After receiving GPO-VIR, the average of CD4 cell count levels of female HIV patients was 186.6 and the average of CD4 cell count levels of

male patients was 170.9. There was no difference between males and female patients from using Independent T-test analysis (P = .473). From this result, the gender of the HIV patient was not associated with the CD4 cell count level before and after receiving GPO-VIR (Table 4.10).

Table 4.10 Gender and CD4 Cell Count before and after Receiving GPO-VIR

Gender	**Before Receiving GPO-VIR**				**After Receiving GPO-VIR**			
	No. of Pts.	Mean of CD4	SD	P-value	No. of Pts.	Mean of CD4	SD	P-value
Female	41	60.1	60.3	.443	40	186.6	170.9	.473
Male	37	50.9	42.3		36	170.9	90.9	

* Not Significant, P > .05, $\alpha = 0.05$

From Table 4.11, the mean of CD4 cell count change of female HIV patients was 125.9 and the mean difference of CD4 cell count change of male HIV patients was 119.1. There was no difference in the mean of CD4 cell count change between male and female patients based on Independent T-test analysis (P = .849).

Table 4.11 Gender and CD4 Cell Count Level Change

Gender	**No. of Pts.**	**Mean of CD4 Change**	**SD**	**P-value**
Female	40	125.9	80.2	.849
Male	36	119.1	77.9	

* Not Significant, P > .05, $\alpha = 0.05$

4.3.2.2 Age and CD4 Cell Count Level

The mean of CD4 cell count level before and after receiving GPO-VIR among the three age groups were tested using ANOVA. Before receiving GPO-VIR, the mean of CD4 cell count level of the 21 - 30 year-old HIV patient group was 66.8, of the 31- 40 year-old HIV patient group was 44.74, and of the 41 – 60 year-old HIV patient group was 70.4. There was no difference in the CD4 cell count level among the three groups (P=0.47). After receiving GPO-VIR, the average of the CD4 cell count level of the 21 – 30 year-old HIV patient was 208.8, of the 31-40 year-old group was 159.6, and of the 41 – 60 year-old group was 193.0. The mean of the CD4 cell count level after receiving GPO-VIR in different age group did not differ (P= 0.473). The CD4 cell count level was not associated with the age group of HIV patients (Table 4.12).

Table 4.12 Ages and CD4 Cell Count Level before and after Receiving GPO-VIR

Age Range	**Before Receiving GPO-VIR**				**After Receiving GPO-VIR**			
(Year-Old)	No. of Pts.	Mean of CD4	SD	P-value	No. of Pts.	Mean of CD4	SD	P-value
21 -30	18	66.8	61.2	.132	18	208.8	105.9	.141
31-40	42	44.7	43.9		40	159.6	88.0	
41-60	18	70.4	58.3		18	193.0	89.4	

* Not Significant, P > .05, $\alpha = 0.05$

From Table 4.13, the mean of CD4 cell count change among the three age groups were tested using ANOVA. the mean of CD4 cell count change of the 21 - 30 year-old HIV patient group was 142.1, of the 31- 40 year-old HIV patient group was 113.9, and of the 41 – 60 year-old HIV patient group was 122.6. There was no difference in the CD4 cell count change among the three groups (P=0.458).

Table 4.13 Ages and CD4 Cell Count Level Change

Age Range (years-old)	No of Pts.	Mean of CD4 Change	SD	P-value
21 - 30	18	142.1	89.2	.458
31 - 40	40	113.9	78.4	
41 - 60	18	122.6	68.5	

* Not Significant, P > .05, $\alpha = 0.05$

4.3.2.3 Difference of Health Insurance Schemes and CD4 Cell Count Level

The mean of CD4 cell count level before and after receiving GPO-VIR among the three health security scheme groups were tested its association with health security scheme using ANOVA. Before receiving GPO-VIR, the average of the CD4 cell count levels of the social security group was 39.3, of enrolled the 30 baht project group was 68.24, and of those paying out-of-pocket and CSMBS was 59.3. There was no difference in the CD4 cell count level before receiving GPO-VIR. After receiving GPO-VIR, the average of the CD4 cell count level of the social security group was 178.4, of those enrolled in the 30 baht project was 178.39, and of those paying out of pocket and CSMBS was 157.9. The CD4 cell count level was not associated with the benefit right group of HIV patients (Table 4.14).

Table 4.14 Health Insurance Scheme and CD4 Cell Count Level before and after Receiving GPO-VIR

Benefit Right	Before Receiving GPO-VIR				After Receiving GPO-VIR			
	No. of Pts.	Mean of CD4	SD	P-value	No. of Pts.	Mean of CD4	SD	P-value
Social Security	25	39.3	39.6	.134	23	178.4	88.9	.209
30 Baht Project	25	68.2	56.2		25	203.8	95.8	
Out of pocket & CSMBS	28	59.3	56.9		28	157.9	94.5	

* Not Significant, P > .05, $\alpha = 0.05$

From Table 4.15, the mean of CD4 cell count change among the three health insurance scheme groups were tested using ANOVA. Before receiving GPO-VIR, the average of the CD4 cell count levels of the social security group was 138.0, of those enrolled in the 30 baht project group was 135.5, and of those paying out-of-pocket and CSMBS was 98.5. There was no difference in the CD4 cell count change before receiving GPO-VIR (P = .124).

Table 4.15 Difference of Health Security Schemes and the Mean of CD4 Cell Count Change

Health Security Scheme	No. of Pts.	Mean of CD4 Change	SD	P-value
Social Security	23	138.0	75.6	.124
UC (30 baht project)	25	135.5	88.1	
Out of pocket & CSMBS	28	98.5	68.5	

* Not Significant, P > .05, $\alpha = 0.05$

4.3.2.4 Severity of HIV Infection and CD4 Cell Count Level Change

It could be assumed that the CD4 cell count level change might be associated with severity of the HIV infection prior to the ARV treatment. In the Table 4.7, the patients were classified into 3 groups of according to CD4 cell count level before receiving GPO-VIR as a proxy of the severity of HIV infection. From Table 4.16, the mean of the CD4 cell count change was 125.5 in the 0 – 50 cell/mm^3 group, 108.4 cell/mm^3 in the 51 – 100 cell/mm^3 group, and 122.7 cell/mm^3 in the 101 – 200 cell/mm^3 group. Of the three groups, the mean of CD4 cell count change did not significantly differ (P <0.01) as tested by ANOVA.

Table 4.16 Severity of HIV Infection and CD4 Cell Count Level Change

CD4 Group (cell/mm^3)	**No. of Pts.**	**Mean of CD4**	**SD**	**P-value**
0 – 50	44	125.5	79.0	.691
51 – 100	17	108.4	84.6	
101 – 200	15	130.3	74.1	
Total	76	122.7	78.7	

* Not Significant, P > .05, $\alpha = 0.05$

4.3.3 CD4 Cell Count Level and Switching of the ARV Regimen

From Table 4.17, there were 4 HIV patients in the 0 – 50 cell/mm^3 group who to changed the ARV regimen and 5 HIV patients in the 101 – 200 cell/mm^3 changed the ARV regimen. There was only one patient in the 51 – 100 cell/mm^3 group changed the ARV regimen.

Table 4.17 Number of the HIV Patients who Switching of the ARV Regimen Classified by CD4 Cell Count Level

CD4 Group(cell/mm^3)	No. of the Pts.	Regimen	No. of the Pts.
0 – 50	46	GPO-VIR S30	36
		GPO-VIR S40	6
		d4T+3TC+EFV	3*
		Combid + NVP	1*
51 – 100	17	GPO-VIR S30	11
		GPO-VIR S40	5
		AZT + 3TC + NVP	1*
101 – 200	15	GPO-VIR S30	10
		GPO-VIR S40	2
		d4T+3TC+EFV	2*
		AZT + 3TC + NVP	1*

* Eight patients who changed the regimen.

4.4 OPD Visit and Hospitalization

4.4.1 OPD Visit

Following the hospital treatment guideline for ARV treatment, the patients were monitored every 1 or 2 months after receiving GPO-VIR. The patients had to come to the hospital more frequent than before receiving GPO-VIR. Averages of OPD visit before and after the patients were 7.6 and 10.4 times. The Mode of OPD visit before receiving GPO-VIR was 6 times. The Mode of OPD visits after receiving GPO-VIR were 8 and 13 times. The maximum of OPD visit before receiving GPO-VIR was 21 times and after receiving GPO-VIR was 22 times (Table 4.18).

Table 4.18 Frequency of OPD Visit before and after Receiving GPO-VIR

Receiving GPO-VIR	**No. of OPD Visit**				
	Average	Mode	Min	Max	SD
Before	7.6	6	0	21	4.86
After	10.4	8 ,13	5	22	3.47

The disease causing OPD visit before and after receiving GPO-VIR are shown in Table 4.19. Before receiving GPO-VIR, the majority cause of patients' visiting to the hospital was URI (16.9%). Pruritus (11.4%), Chronic Diarrheoa (10.9%), Dermatitis (6.5%), Chronic Fever (6.0%), Oral Candidiasis (5.4%), TB (4.9%), and PCP (4.3%). TB, Criptococcal Meningistis, CMV, PCP, Oral Candidiasis were the important cause of visiting the hospital; however, after receiving GPO-VIR, the patients had less OI. The prevalence of Oral Candidiasis reduced from 10 (5.4%), to 2(1.4%); prevalence of TB reduced from 9 (4.9%) to 2 (1.4%). Prevalence of PCP reduced from 8 (4.3%) to 2 (1.4%), prevalence of Criptococcal Meningitis reduced from 5 (2.7%) to 1 (0.7%), and of CMV reduced from 4 (2.2%) to 1 (0.7%). Nevertheless, prevalence of URI increased from 31 (16.9%) to 48 (34.0%), and prevalence of Pruritus increased from 21 (11.4%) to 25 (17.7%). A few diseases were not a concern of OI such as Cervical Adenitis, Thrombophebitis, Giant Condyloma, and Mononucleosis before and after receiving GPO-VIR were not found in the study.

Table 4.19 Diseases Causing of OPD Visit and Number of OPD Visit before and after Receiving GPO-VIR

Disease	Before		After	
	No. of OPD Visit	Percent	No. of OPD Visit	Percent
URI	31	16.9	48	34.0
Pruritus	21	11.4	25	17.7
Chronic Diarrhea	20	10.9	12	8.5
Bronchitis	14	7.6	3	2.1
Dermatitis	12	6.5	12	8.5
Chronic Fever	11	6.0	5	3.5
Oral Candidiasis	10	5.4	2	1.4
TB	9	4.9	2	1.4
PCP	8	4.3	2	1.4
Conjunctivitis	7	3.8	4	2.8
Acute Nasopharyngitis	7	3.8	-	-
Criptococcal Meningitis	5	2.7	1	0.7
Parasitic Disease	5	2.7	3	2.1
CMV	4	2.2	1	0.7
Chronic Sinusitis	3	1.6	4	2.8
Pneumonia	3	1.6	2	1.4
Alepia Eyes	3	1.6	1	0.7
Mycobacterial Infection	2	1.1	-	
Urticaria	2	1.1	1	0.7
Cellulitis	1	0.5	1	0.7
Tinea Corporis	1	0.5	-	-
Blepharitis	1	0.5	-	-

Table 4.19 Diseases Causing of OPD Visit and Number of OPD Visit before and after Receiving GPO-VIR (Cont.)

Disease	Before		After	
	No. of OPD Visit	Percent	No. of OPD Visit	Percent
Cervical Adenitis	1	0.5	-	-
Glossitis	1	0.5	-	-
Granulomateous Disorder of skin	1	0.5	-	-
Thrombophlebitis	1	0.5	-	-
Follicular Disorder	-	-	3	2.1
UTI	-	-	2	1.4
Chronic Gingivitis	-	-	2	1.4
Mononucleosis	-	-	1	0.7
Giant Condyloma	-	-	1	0.7
Acute Iridocyclitis	-	-	1	0.7
Lymphadenitis	-	-	1	0.7
Herpes Simplex Zoster	-	-	1	0.7
Total	184	100.00	141	100.00

4.4.2 Overall OPD Visit Incidence Rate

OPD Visit incidences are shown in Table 4.20. OPD Visit Incidence of after receiving GPO-VIR was slightly less than before receiving GPO-VIR. OPD Visit incidence rate before HIV patients receiving GPO-VIR was 1.1 times of the rate after HIV –patients receiving GPO-VIR treatment (RR = 1.14).

Table 4.20 OPD Visit Incidence Rate before and After Receiving GPO-VIR

Content	Receiving GPO-VIR	
	Before	After
Number of OPD Visit (1)	184	141
Time of Observation(person-year) (2)	78	68.4
Disease Incidence Rate(OPD Visit per person-year)	2.36*	2.06**

*Number of OPD Visit/Time of Observation before receiving GPO-VIR (184/78)

*Number of OPD Visit/Time of Observation after receiving GPO-VIR (141/68.4)

Based on Prevalence in four countries (Table 2.6 AIDS-Defining Opportunistic Diseases). There were 5 OIs were high prevalence in Thailand including Oral Candidiasis, TB, PCP, Criptococcal Meningitis, and CMV. Table 4.21 showed the relative rate of these OIs. The relative rate of Oral Candidiasis of the OPD patients before receiving GPO-VIR was 6.5 times, the relative rate of TB and Criptococcal Meningitis was 6 times, the relative rate of PCP and CMV was 5 times higher than the rate after the HIV patients get receiving GPO-VIR.

Table 4.21 Incidence Rate of Specific OI in OPD Visit

OI Disease	Before Receiving GPO-VIR		After Receiving GPO-VIR		IR*
	No. of Specific OI	ID	No. of Specific OI	ID	
Oral Candidiasis	10	0.13	2	0.02	6.5
TB	9	0.12	2	0.02	6.0
PCP	8	0.10	2	0.02	5.0
Cryptococcal Meningitis	5	0.06	1	0.01	6.0
CMV	4	0.05	1	0.01	5

* Incidence Rate of OI before and after receiving GPO-VIR (Rate before receiving GPO-VIR/Rate after receiving GPO-VIR)

4.4.3 Hospitalization

Frequencies of hospitalization before and after Receiving GPO-VIR are shown in Table 4.22. Among the HIV patients before GPO-VIR, the average of hospitalization was 0.50 and after receiving GPO-VIR was 0.28. As shown in the results, the difference of hospitalization after receiving GPO-VIR was 0.22 less than before receiving GPO-VIR. Most of the patients did not had hospitalization (Mode =1). However, among the patients before receiving GPO-VIR, of the 23 patients who were hospitalized, eighteen inpatients (78.3%) were admitted one time, only one patient was admitted to the hospital seven times. After receiving GPO-VIR, there were 10 HIV patients who were admitted to the hospital. Most inpatients were admitted one time. There was only a patient who was hospitalized with Pneumonia for four times and got reduced CD4 cell count level change.

Table 4.22 Frequency of Hospitalization before and after Receiving GPO-VIR

Receiving GPO-VIR	**No. of Hospitalization**					
	No. of admitted Pts.	Mean	Mode	Min	Max	SD
Before	23	0.50	1	1	7	1.05
After	10	0.28	1	1	4	0.76

Length of stay of the admitted patients shows in Table 4.23. The mean of length of stay (LOS) of twenty three admitted patients was 14.7 days before receiving GPO-VIR. After receiving the drug, there were only ten patients were admitted to the hospital. The mean of the LOS of those was 10.3 days. The LOS of the admitted patients substantially reduced.

Table 4.23 Length of Stay of the Admitted Patients

LOS	No. of the Admitted Patients	No. of Days	Min.	Max.	Mean
Before	23	337	1	40	14.7
After	10	103	1	40	10.3

Length of stay of the patients shows in Table 4.24. Among 78 patients, the mean of LOS was 4.3 days before receiving GPO-VIR and 1.3 days after receiving the ARV.

Table 4.24 Length of Stay of all Patients Receiving GPO-VIR

LOS	No. of the Admitted patients	No. of Days	Min.	Max.	Mean
Before	78	337	1	40	4.3
After	78	103	1	40	1.3

Diseases cause of hospitalization before and after receiving GPO-VIR is shown in Table 4.25. Among the HIV patients before receiving GPO-VIR., the major causes of hospitalization were PCP, Criptococcal Meningitis, Pneumonia, Chronic fever and Chronic Diarrheoa, Bronchitis and Oral Candidiasis. After receiving GPO-VIR, the PCP and Criptococcal Meningitis cases reduced from 6 (16.2%) to 0 (0%), Pneumonia cases reduced from 5 (13.5%) to 2 (14.3%) and Chronic Fever cases reduced from 5 (13.5%) to 2 (14.3%). The incidence of Oral Candidiasis reduced from 3 (8.1%) to 0 (0%), TB cases reduced from 3 (8.1%) to 0 (0%). Nevertheless, the incidence of URI increased from 0 (0%) to 3 (21.4%), and UTI and Skaladenitis case increased from 0 (0%) to 1 (7.1%).

Table 4.25 The Diseases Causing of Hospitalization and Number of Hospitalization before and after Receiving GPO-VIR

Disease	Before		After	
	No. of Hosp.	Percent	No. of Hosp.	Percent
PCP	6	16.2	-	-
Criptococcal Meningitis	6	16.2	-	-
Pneumonia	5	13.5	2	14.3
Chronic Fever	5	13.5	2	14.3
Chronic Diarrhea	4	10.8	1	7.1
Oral Candidiasis	3	8.1	-	-
TB	3	8.1	-	-
Bronchitis	1	2.7	-	-
Anemia	1	2.7	1	7.1
Cellulitis	1	2.7	1	7.1
Chronic Sinusitis	1	2.7	1	7.1
The 2nd Syphillis of skin	1	2.7	-	-
URI	-	-	3	21.4
Skaladenitis	-	-	1	7.1
Dizziness	-	-	1	7.1
UTI			1	7.1
Total	37	100.0	14	100.0

4.4.4 Hospitalization Incidence Rate (Disease per Person-Year)

The hospitalization incidence rate before and after receiving GPO-VIR are shown in Table 4.26. The hospitalization incidence rate before receiving GPO-VIR was 0.5 per person-year and the hospitalization rate after receiving GPO-VIR was 0.2 per Person-year. The relative rate of hospitalization before receiving GPO-VIR was 2.5 times higher than after receiving GPO-VIR. The incidence rate of Pneumonia and Chronic fever hospitalization before receiving GPO-VIR was 2 times higher than after receiving GPO-

VIR. The incidence rate of Chronic Diarrhea hospitalization before receiving GPO-VIR was 5 times higher than after receiving GPO-VIR.

Table 4.26 Hospitalization Incidence Rate before and after Receiving GPO-VIR

Content	Before Receiving GPO-VIR	After Receiving GPO-VIR
Number of Hospitalization	37	14
Time of Observation (person-year)	78	68.4
ID (hospitalization per Person-year)	0.5 *	0.2 **

*Number of hospitalization/ Time of observation before receiving GPO-VIR (37/78)

** Number of hospitalization/ Time of observation after receiving GPO-VIR (14/68.4)

4.4.5 OPD Visit and Hospitalization Incidence before and after receiving GPO-VIR

The OPD Visit and Hospitalization incidences before and after receiving GPO-VIR are shown in Table 4.27. The OPD Visit and Hospitalization incidence rate before after receiving GPO-VIR were 2.8 and 2.3 per Person-year. The OI Incidence rate ratio of OPD visit and hospitalization before receiving GPO-VIR was 1.2 times higher than after receiving GPO-VIR. Hence, OI incidence of OPD visit and Hospitalization was slightly reduced by GPO-VIR

Table 4.27 OPD Visit and Hospitalization Incidence Rate Before and After Receiving GPO-VIR

Content	Before Receiving GPO-VIR	After Receiving GPO-VIR
Number of OPD Visit and Hospitalization	217	155
Time of Observation (person-year)	78	68.4
ID (OPD Visit and Hospitalization per Person-year)	2.8 *	2.3 **

* Number of OPD visit and hospitalization/ Time of observation before receiving GPO-VIR (217/78)

** Number of OPD visit and hospitalization/ Time of observation after receiving GPO-VIR (155/68.4)

4.5 ADR Incidence of GPO-VIR

Among the HIV patients after receiving GPO-VIR, 8 out of 78 patients get ADR from GPO-VIR (Table 4.28). There were 2 out of 8 ADR incidences with rash, one case had symptom of hepatic failure, and one case had abnormal liver function (SGPT and SGOT). Additionally, 4 out of 8 patients were hospitalized with acidosis, hepatic and renal failure. There were 2 cases admitted with acidosis hospitalization. The two patients hospitalized with renal failure and hepatic renal failure stopped GPO-VIR treatment. The treatment regimen was changed for the 8 ADR patients.

Table 4.28 OPD Visit and Hospitalization due to ADR

Disease/ Symptom	Person	Number of Events	Percent (%)
OPD Visit			
Rash	2	2	25.0
Hepatic Failure	1	1	12.5
Abnormal of Liver Function	1	1	12.5
Hospitalization			
Acidosis	2	2	25.0
Hepatic Failure	1	1	12.5
Renal Failure	1	1	12.5
Total	8	8	100.0

Length of stay when patients admitted to the hospital due to ADR is shown in Table 4.29. Of the four patients who had severe ADR including acidosis, renal failure, and hepatic failure, the mean of their LOS was 25.5 days.

Table 4.29 Length of Stay of Hospitalization due to ADR

LOS	No. of the Admitted patients	No. of Days	Min.	Max.	Mean
After	4	102	6	60	25.5

OPD visit and hospitalization due to ADR among HIV groups classified by CD4 cell count level are shown in Table 4.30. The 0 – 50 cell/mm^3 group had 2 cases of hepatic failure, 1 case of renal failure and 1 case of rash, the 51 – 100 cell/mm^3 group had only 1 case of lactic acidosis, the 101 – 200 cell/mm^3 group had 1 case of lactic acidosis and 1 case of rash.

Table 4.30 OPD Visit and Hospitalization due to ADR among HIV Groups Classified by CD4 Cell Count Level

Severity Group (cell/mm^3)	Disease/ Symptom	OPD	Hospitalization	Total
0 – 50	Hepatic Failure	1	1	2
	Renal Failure	-	1	1
	Rash	1	-	1
51 – 100	Lactic Acidosis	-	1	1
101 – 200	Hepatic function test	1	-	1
	Lactic Acidosis	-	1	1
	Rash	1	-	1
Total				8

4.6 Treatment Cost of HIV Patient

The treatment cost before and after receiving GPO-VIR were the treatment cost of the 78 HIV patients who were engaged in this study. The total treatment costs were calculated including the treatment cost from the 76 HIV patients who still received the ARV treatment and the HIV patients who stopped the ARV treatment because they were treated the ADR treatment.

4.6.1 OPD Cost

The OPD treatments costs before and after receiving GPO-VIR are shown in Table 4.31.

Calculation of the average of OPD cost before receiving GPO-VIR (baht PPPY) based on the total exposure time = 78 year

Ex.

Lab and Monitoring = 40,527.8 /78 = 519.6

Calculation of the average of OPD cost after receiving GPO-VIR (baht PPPY) based on the total exposure time = 68.4 year

Ex.

Lab and Monitoring = 43,764.6/68.4 = 639.8

The average OPD treatment cost per patient per year (PPPY) before receiving GPO-VIR was 2,368.0 baht and after receiving GPO-VIR was 21,100.7 baht. The cost discrepancy was 18,732.7 baht. Obviously difference was due to GPO-VIR cost. When excluding GPO-VIR costs, the treatment cost after receiving GPO-VIR was 2,731.5 baht PPPY. The difference of 363.5 baht (2,731.5 baht – 2,368 baht) came from an increase of drug cost 173.6 baht, an increase of lab ad monitoring was 120.2 baht, and an increase of medical services 69.7 baht after patients receiving GPO-VIR. The other reasons of the increasing of OPD treatment cost was related to cost of providing ADR monitoring and patients care.

Table 4.31 OPD Treatment Cost before and after Receiving GPO-VIR

Cost	Total of OPD Cost (Baht)		The Average of OPD Cost (Baht PPPY)	
	Before	After	Before	After
Lab and Monitoring	40,527.8	43,764.6	519.6	639.8
Medical Service	9,781.2	13,345.6	125.4	195.1
Drug	134,392.3	129,725.9	1,723.0	1,896.6
Total Cost	184,701.3	186,836.1	2,368.0	2,731.5
GPO-VIR	-	1,256,450.0	-	18,369.2
Total Cost with GPO-VIR Cost	-	1,443,286.1	-	21,100.7

4.6.2 Hospitalization Cost

4.6.2.1 Hospitalization Cost

The hospitalizations cost before and after receiving GPO-VIR are shown in Table 4.32.

Calculation of the average of hospitalization cost before receiving GPO-VIR (baht PPPY) based on the total exposure time = 78 year

Ex.

Lab and Monitoring = 33,569.2 /78 = 430.4

Calculation of the average of hospitalization cost after receiving GPO-VIR (baht PPPY) based on the total exposure time = 68.4 year

Ex.

Lab and Monitoring = 9,583.6/68.4 = 639.8

The average of the hospitalization cost before receiving GPO-VIR was 1,978.3 baht PPPY and after receiving GPO-VIR was 815.5 baht PPPY. Thus, the average of the hospitalization cost PPPY after receiving GPO-VIR was 1,162.8 baht less than before receiving GPO-VIR. The hospitalization cost before receiving GPO-VIR was 2.4 times greater than after receiving GPO-VIR.

Table 4.32 The hospitalization Treatment Cost before and after Receiving GPO-VIR

Cost	Total of Hospitalization Cost (Baht)		The Average of Hospitalization Cost (Baht PPPY)	
	Before	After	Before	After
Lab and Monitoring	33,569.2	9,583.6	430.4	140.1
Medical Service	22,788.6	13,642.0	292.2	199.4
Drug	74,355.4	25,341.4	953.3	370.5
Room	23,590.0	7,210.0	302.4	105.4
Total Cost	154,303.2	55,777.0	1,978.3	815.5

4.6.2.2 The Hospitalization Cost due to ADR Treatment

Among the 4 HIV patients who got acidosis, hepatic failure, and renal failure after receiving GPO-VIR, the hospitalization cost were 52,395.7baht. The average of ADR treatment cost of hospitalized patients was 13,098.9 baht per patient. However, the average of ADR treatment cost of all HIV patients was 766.0 baht PPPY. The ADR drugs, the lab and monitoring costs and medical service costs were 360.8 baht, 167.8 baht, and 133.1 baht PPPY (Table 4.33).

Table 4.33 The Hospitalization and the ADR Treatment Cost

Cost	Total of ADR Treatment Cost (Baht)	The Average of ADR* Treatment Cost (Baht PPPY)
Lab and Monitoring	11,476.0	167.8
Medical Service	9,101.0	133.1
ADR Treatment Drug	24,678.7	360.8
Room	7,140.0	104.4
Total Cost	52,395.8	766.0

*Calculation of the average of ADR cost after receiving GPO-VIR (baht PPPY) based on the total exposure time = 68.4 year

Total hospitalization cost after receiving GPO-VIR

Total Hospitalization Cost = Hospitalization cost of disease treatment + Hospitalization cost of ADR treatment (baht)

= 55,777.0 + 52,395.8 (baht)

= 108,172.8 (baht)

The annual hospitalization cost per patient = 108,172.8/68.4 (baht PPPY)

= 1,581.5 baht PPPY

From the summation of the total hospitalization cost, the hospitalization cost of ADR treatment was 48.4% of the total hospitalization cost. The annual hospitalization cost was 1,581.5 baht PPPY including disease treatment cost and ADR treatment cost. Included

the ADR treatment cost, the hospitalization cost was 396.8 baht less than the hospitalization cost before receiving GPO-VIR.

4.6.3 Total HIV Treatment Cost

The total treatments cost before and after receiving GPO-VIR are shown in Table 4.34. The total costs included the OPD cost and the hospitalization cost including the ADR treatment cost. Before receiving GPO-VIR, the average OPD visit and hospitalization cost was 4,346.2 baht PPPY. The average OPD visit and hospitalization cost after receiving GPO-VIR was 22,682.1 baht PPPY. Total treatment cost after receiving GPO-VIR was 18,335.9 baht PPPY more than before receiving. The reason of an increasing of the treatment cost was due to GPO-VIR costs, ADR monitoring cost, ADR treatment cost, and clinical monitoring after receiving GPO-VIR.

Table 4.34 Total Treatment Cost before and after Receiving GPO-VIR

Cost	Total of Treatment Cost (Baht)		The Average of Treatment Cost (Baht PPPY)	
	Before	After	Before*	After**
Lab and Monitoring	74,097.0	64,824.2	950.0	947.7
Medical Service	32,568.8	36,088.6	417.5	527.6
Drug	208,747.7	179,746.0	2,676.3	2,627.9
Room	23,590	14,350	302.4	209.8
Total Cost	339,004.5	295,008.8	4,346.2	4,313.0
GPO-VIR	-	1,256,450.0	-	18,369.2
Total cost with GPO-VIR	-	1,551,458.8	-	22,682.1

* Calculation of the average of the total cost before receiving GPO-VIR (baht PPPY) based on the total exposure time = 78 year Ex. Lab and monitoring 74,097.0/78 = 950 baht PPPY

** Calculation of the average of the total cost after receiving GPO-VIR (baht PPPY) based on the total exposure time = 68.4 year Ex. Lab and monitoring 64,824.2/68.4 = 947.7 baht PPPY

4.6.3.1 The Total Treatment Cost among the HIV Groups Classified by CD4 Cell count Level

In the Table 4.7, it could be categorized the CD4 cell count level before receiving GPO-VIR. It could be assumed that the CD4 cell count level change might be related to the severity of the HIV infection prior to the ARV treatment. The patients were classified into 3 groups of according to CD4 cell count level before receiving GPO-VIR as a proxy of the severity of HIV infection.

Calculation of the average of the total treatment cost before receiving GPO-VIR (Baht PPPY)

0 – 50 cell/mm^3 group	= 243,030.0 /46	= 5,283.3
51 – 100 cell/mm^3 group	= 74,296.7/17	= 4,370.4
101 – 200 cell/mm^3 group	= 21,677.8/15	= 1,445.2
Total Cost	= 339,004.5/78	= 4,346.2

Calculation of the average of the total treatment cost excluded GPO-VIR cost after receiving GPO-VIR (Baht PPPY)

0 – 50 cell/mm^3 group	= 214,955.2/39.5	= 5,441.9
51 – 100 cell/mm^3 group	= 48,523.5/15.5	= 3,130.5
101 – 200 cell/mm^3 group	= 31,530.413.4	= 2,353.0
Total Cost	= 295,008.868.4	= 4,313.0

Calculation of the average of the ARV cost after receiving GPO-VIR (Baht PPPY)

0 – 50 cell/mm^3 group	= 703,354.039.5	= 17,806.4
51 – 100 cell/mm^3 group	= 248,719.0/15.5	= 16,046.4
101 – 200 cell/mm^3 group	= 304,377.013.4	= 22,714.7
Total Cost	= 1,256,450/68.4	= 18,369.2

Calculation of the average of the total treatment cost included ARV cost after receiving GPO-VIR (Baht PPPY)

0 – 50 cell/mm^3 group	= 918,319.2/39.5	= 23,248.3
51 – 100 cell/mm^3 group	= 297,242.5/15.5	= 19,176.9
101 – 200 cell/mm^3 group	= 335,907.4/13.4	= 25,067.7
Total Cost	= 1,551,458.8/68.4	= 22,682.1

From Table 4.35, the disease treatment cost before receiving GPO-VIR of the 0 – 50 cell/mm^3 group was 5,283.3 baht PPPY, of the 51 - 100 cell/mm^3 group was 4,370.4 baht PPPY, and of the 101 – 200 cell/mm^3 group was 1,445.2 baht PPPY. The highest disease treatment cost was the cost of 0 – 50 cell/mm^3 group, followed by the 51 – 100 cell/mm^3 group, and the 101 – 200 cell/mm^3 group. After receiving GPO-VIR, the disease treatment cost of the 0 – 50 cell/mm^3 group was 5,441.9 baht PPPY, of the 51 – 100 cell/mm^3 group was 3,130.5 baht PPPY, and of the 101 – 200 cell/mm^3 group was 2,353.0 baht PPPY. The highest disease treatment cost was still the treatment cost of the 0 – 50 cell/mm^3 group, followed by the 51 – 100 cell/mm^3 group, and the 101 – 200 cell/mm^3 group. The treatment cost of the 0 – 50 cell/mm^3 group increased 158.6 baht after receiving GPO-VIR and of the 101 – 200 cell/mm^3 group increased 907.8 baht. The treatment cost of the 51 – 100 cell/mm^3 group reduced 1,239.9 baht after receiving GPO-VIR. The GPO-VIR cost of the 0 – 50 cell/mm^3 group was 17,806.4 baht PPPY, of the 51 - 100 cell/mm^3 group was 16,046.4 baht PPPY, and of the 101 – 200 cell/mm^3 group was 22,714.7 baht PPPY. The highest of GPO-VIR cost was the 101 – 200 cell/mm^3 group, followed by the 0 – 50 cell/mm^3 group, and the 51 - 100 cell/mm^3 group. When including GPO-VIR cost, the total treatment cost of the 0 – 50 cell/mm^3 group was 23,248.3 baht PPPY, of the 51 – 100 cell/mm^3 group was 19,176.9 baht PPPY, and of the 101 – 200 cell/mm^3 group was 25,067.7 baht PPPY. The highest of the total treatment cost was the treatment cost of the 101 – 200 cell/mm^3 group, followed by the 0 – 50 cell/mm^3 group, and the 51 – 100 cell/mm^3 group.

Table 4.35 The Total Treatment Cost among the HIV Groups Classified by CD4 Cell count Level

Severity Group (cell/mm^3)	Total Treatment Cost (Baht)			The Average of Treatment Cost (Baht PPPY)		
	Total Exposure Time (year)	Before	After	Total Exposure Time (year)	Before	After
Total Treatment Cost without ARV						
0 – 50	46	243,030.0	214,955.2	39.5	5,283.3	5,441.9
51 – 100	17	74,296.7	48,523.5	15.5	4,370.4	3,130.5
101 – 200	15	21,677.8	31,530.4	13.4	1,445.2	2,353.0
Total	78	339,004.5	295,008.8	68.4	4,346.2	4,313.0
GPO-VIR						
0 – 50	46	-	703,354.0	39.5	-	17,806.4
51 – 100	17	-	248,719.0	15.5	-	16,046.4
101 – 200	15	-	304,377.0	13.4	-	22,714.7
Total	78	-	1,256,450.0	68.4	-	18,369.2
Total Treatment Cost with ARV						
0 – 50	46	243,030.0	918,309.2	39.5	5,283.3	23,248.3
51 – 100	17	74,296.7	297,242.5	15.5	4,370.4	19,176.9
101 – 200	15	21,677.8	335,907.4	13.4	1,445.2	25,067.7
Total	78	339,004.5	1,551,458.8	68.4	4,346.2	22,682.1

4.6.3.2 The Total Treatment Cost and the ADR Treatment Cost among the HIV Groups Classified by CD4 Cell count Level

Calculation of the average of total treatment cost before receiving GPO-VIR (Baht PPPY)

0 – 50 cell/mm^3 group	= 243,030.0 /46	= 5,283.3
51 – 100 cell/mm^3 group	= 74,296.7/17	= 4,370.4
101 – 200 cell/mm^3 group	= 21,677.8/15	= 1,445.2
Total Cost	= 339,004.5/78	= 4,346.2

Calculation of the average of ADR treatment cost after receiving GPO-VIR (Baht PPPY)

0 – 50 cell/mm^3 group	= 47,822.6/39.5	= 1,210.7
51 – 100 cell/mm^3 group	= 2,286.6/15.5	= 147.5
101 – 200 cell/mm^3 group	= 2,286.6/13.4	= 170.6
Total Cost	= 52,395.8/68.4	= 766.0

Calculation of the average of total treatment cost excluded ADR cost (Baht PPPY)

0 – 50 cell/mm^3 group	= 167,132.6/39.5	= 4,231.2
51 – 100 cell/mm^3 group	= 46,236.9/15.5	= 2,983.0
101 – 200 cell/mm^3 group	= 29,243.8/13.4	= 2,182.4
Total Cost	= 242,613.1/68.4	= 3,547.0

Calculation of the average of total treatment cost included ADR cost (Baht PPPY)

0 – 50 cell/mm^3 group	= 214,955.2/39.5	= 5,441.9
51 – 100 cell/mm^3 group	= 48,523.5/15.5	= 3,130.5
101 – 200 cell/mm^3 group	= 31,530.4/13.4	= 2,353.0
Total Cost	= 295,008.8/68.4	= 4,313.0

The ADR treatment cost of the 0 – 50 cell/mm^3 group was 1,210.7 baht PPPY, of the 51 – 100 cell/mm^3 group was 147.5 baht PPPY, and of the 101 – 200 cell/mm^3 group was 170.6 baht PPPY. The highest disease treatment cost was still the treatment cost of the 0 – 50 cell/mm^3 group, followed by the 101 – 200 cell/mm^3 group, and the 51 – 100 cell/mm^3 group. When excluded the ADR cost, the disease treatment cost of the 0 – 50 cell/mm^3 group was 4,231.2 baht PPPY, of the 51 – 100 cell/mm^3 group was 2,983.0baht PPPY, and of the 101 – 200 cell/mm^3 group was 2,182.4baht PPPY. The disease treatment cost of the 0 – 50 cell/mm^3 group reduced 1,052.1 baht PPPY, of the 51 – 100 cell/mm^3 group reduced 1,387.4 baht PPPY, but of the 101 – 200 cell/mm^3 group increased 737.2 baht PPPY. When included the ADR treatment cost, the disease treatment cost of the 0 – 50 cell/mm^3 group was 5,441.9 baht PPPY, of the 51 – 100 cell/mm^3 group was 3,130.5 baht PPPY, and of the 101 – 200 cell/mm^3 group was 2,353.0 baht PPPY. The highest disease treatment cost was still the treatment cost of the 0 – 50 cell/mm^3 group, followed by the 51 – 100 cell/mm^3 group, and the 101 – 200 cell/mm^3 group. The treatment cost of the 0 – 50 cell/mm^3 group increased 158.6 baht after receiving GPO-VIR and of the 101 – 200 cell/mm^3 group increased 907.8 baht. The treatment cost of the 51 – 100 cell/mm^3 group reduced 1,239.9 baht after receiving GPO-VIR.

Table 4.36 The Total Treatment Cost and the ADR Treatment Cost among the HIV Groups Classified by CD4 Cell count Level

Severity Group (cell/mm^3)	Total Treatment Cost (Baht)			The Average of Treatment Cost (Baht PPPY)		
	Total Exposure Time (year)	Before	After	Total Exposure Time (year)	Before	After
ADR Cost						
0 – 50	46	-	47,822.6	39.5	-	1,210.7
51 – 100	17	-	2,286.6	15.5	-	147.5
101 – 200	15	-	2,286.6	13.4	-	170.6
Total	78	-	52,395.8	68.4	-	766.0
Total Treatment Cost excluded ADR Cost						
0 – 50	46	243,030.0	167,132.6	39.5	5,283.3	4,231.2
51 – 100	17	74,296.7	46,236.9	15.5	4,370.4	2,983.0
101 – 200	15	21,677.8	29,243.8	13.4	1,445.2	2,182.4
Total	78	339,004.5	242,613.1	68.4	4,346.2	3,547.0
Total Treatment Cost included ADR Cost						
0 – 50	46	243,030.0	214,955.2	39.5	5,283.3	5,441.9
51 – 100	17	74,296.7	48,523.5	15.5	4,370.4	3,130.5
101 – 200	15	21,677.8	31,530.4	13.4	1,445.2	2,353.0
Total	78	339,004.5	295,008.8	68.4	4,346.2	4,313.0

Note: Table 4.37 Disease ADR treatment cost with type of ADR

Hospitalization due to ADR and ADR Treatment Cost Classified by CD4 Cell Count Level are shown in Table 4.37. In the 0 – 50 cell/mm^3 group, there were 1 case of hepatic failure and 1 case of renal failure. Therefore, the total ADR treatment cost of the 0 – 50 cell/mm^3 group was 47,822.6 baht. In the 51 – 100 cell/mm^3 group, there was 1 case of lactic acidosis. The total ADR treatment cost of the 51 - 100 cell/mm^3 group was 2,286.6 baht. In the 101 - 200 cell/mm^3 group, there was 1 case of lactic acidosis. The total ADR treatment cost of the 101 - 200 cell/mm^3 group was 2,286.6 baht. Therefore, the ADR treatment cost of the 0 – 50 cell/mm^3 group was the highest cost (91.2%).

Table 4.37 Hospitalization due to ADR and ADR Treatment Cost Classified by CD4 Cell Count Level

Severity Group (cell/mm^3)	Disease/ Symptom	Hospitalization	Total ADR Treatment Cost
0 – 50	Hepatic Failure	1	13,075.2
	Renal Failure	1	34,747.4
51 – 100	Lactic Acidosis	1	2,286.6
101 – 200	Lactic Acidosis	1	2,286.6
Total		4	52,395.8

4.7 Sensitivity Analysis

Table 4.38 shows the values of the variation of discrepancy cost based on the change of drug cost and ADR prevalence. The multiple sensitivity analysis described the effect of ADR prevalence and cost including the drug switching of ARV treatment on the cost of HIV patients receiving GPO-VIR. Data on overall treatment cost 18,335.9 baht PPPY with 5% ADR were used as the base case scenario. A scenario of the analysis changed due to the reduction and the increase of ARV drug cost and ADR prevalence of the HIV patients after receiving GPO-VIR. For instance, at the 5% ADR, when drug cost

reduced 30%, the cost discrepancy was 10,093.7 baht. When drug cost increased 30%, the cost discrepancy was 21,115.2 baht.

Table 4.38 Sensitivity Analysis of Treatment Cost

Scenario	Discrepancy Cost (Baht PPPY)				
	1%ADR	3% ADR	5%ADR	7%ADR	10%ADR
Normal Drug Cost(base case)	17,794.5	17,975.0	18,335.9	18,696.9	19,507.9
Drug Cost Reduced 10%	13,226.1	13,406.5	13,767.5	14,128.5	14,489.4
Drug Cost Reduced 20%	11,389.1	11,569.6	11,930.6	12,291.6	12,652.5
Drug Cost Reduced 30%	9,552.2	9,732.7	10,093.7	10,454.7	10,815.6
Drug Cost Increased 10%	16,899.9	17,080.4	17,441.3	17,802.3	18,163.3
Drug Cost Increased 20%	18,736.8	18,917.3	19,278.3	19,639.2	20,000.2
Drug Cost Increased 30%	20,573.7	20,754.2	21,115.2	21,476.1	21,837.1

Data from table 4.36 were used for sensitivity analysis plot which the discrepancy cost varied by the change of ARV cost and the change of ADR prevalence. When the drug cost reduced 30% from base case with 10 % ADR, the discrepancy cost was only 10,093.7 baht PPPY (Figure 4.1). It could be consider that if the ARV cost is not lower than at the present, strategy to prevent the ADR from ARV should be implemented. Based on our observation, providing ARV at the CD4 count level less than 50 cell/mm^3 might increase chance of getting the ADR. Therefore, the policy to provide ARV at CD4 200 – 250 cell/mm^3 may lower the chance of ADR and will consequently prevent ADR treatment cost.

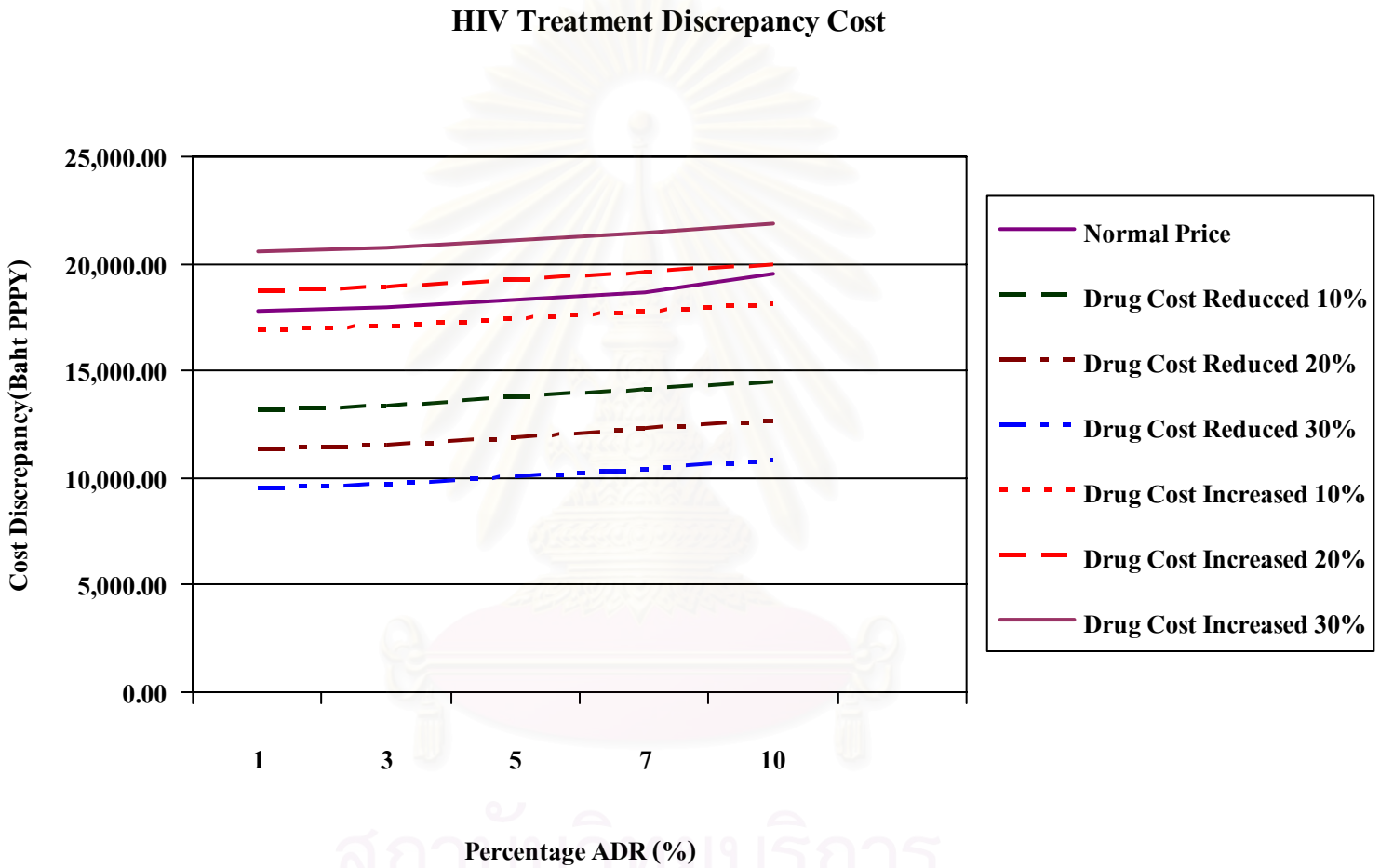

Figure 4.1 Sensitivity Analysis of Cost Discrepancy

Chapter 5

Discussion and Conclusion

This chapter provides discussion, conclusion, limitation of the study, and recommendation. There were two parts of discussion concerning cost and clinical consequence of GPO-VIR treatment. The results on cost of ARV treatment are discussed related to the hospital perspective. The clinical consequences including the CD4 cell count level, OI incidence, and the CD4 cell count level related to OI incidence are discussed. The limitations of the study include the number of subjects, the drug exposure time study, the study's perspective, the comparator, and the study focusing only on direct cost. The recommendations include the policy, the provider, and the further study.

5.1 Discussion

5.1.1 Cost Analysis

Before receiving GPO-VIR, the total treatment cost was 4,346.2 baht PPPY (US$ 101). After providing the GPO-VIR to HIV patients, the annual treatment cost was 22,682.1 baht PPPY (US$527.5). The HIV treatment cost after receiving GPO-VIR was higher than the treatment cost before receiving GPO-VIR. Although the total treatment cost increased but the annual hospitalization cost PPPY substantially reduced. When GPO-VIR cost was excluded, the treatment cost after receiving GPO-VIR was 4,313.0 baht PPPY (US$100.3) including disease treatment (3,547.0 baht PPPY)and ADR treatment cost(766.0 baht PPPY). The annual treatment cost was almost the same before and after receiving the ARV.

In the study of Kulsomboon and others (2003), the treatment cost of the HIV patients who did not receive the ARV drug was 11,114.8 baht PPPY. If we compared the data of the treatment cost of the HIV patients who did not get the ARV drug with the present study, the benefit of ARV treatment might be greater. In this study, providing the

ARV resulted in the treatment cost of 22,682.1 baht PPPY. The treatment cost of the HIV patients before receiving GPO-VIR was only 4,346.2 baht PPPY. The discrepancy of the treatment cost between after (22,682.1 baht PPPY) and before (4,346.2 baht PPPY) receiving GPO-VIR was 18,335.9 baht PPPY. The discrepancy of the treatment cost between after receiving GPO-VIR (22,682.2 baht PPPY) and the treatment of the HIV patients who did not receive the ARV drugs (11,114.8 baht PPPY) was 11,567.3 baht PPPY. The discrepancy of the treatment cost between providing the ARV drug and not providing the ARV drug (11,567.3 baht PPPY) was lower than the discrepancy in this study (18,335.9 baht PPPY).

5.1.2 CD4 Cell Count and OI Incidences in OPD Visit and Hospitalization

The CD4 cell count level is associated with the immune status of the patients. If the patients had high immune status, the patients had less opportunity to get OI. Therefore, when the CD4 cell count level was high, the patients might have less opportunity to get OI. In this study, after six months that the patients received the GPO-VIR treatment, the average of the CD4 cell count level increased to 179.2 cell/mm^3 from the base line at 56.5 cell/mm^3.

It should be noticed that providing ARV at higher CD4 cell count level will reduce the severity of the HIV infection. For instance, the HIV patients who had the CD4 cell count level less than 100 cell/mm^3 increased the average CD4 cell count level to 176.7 cell/mm^3. The patients who started taking the drug when their CD4 cell count level more than 100 cell/mm^3 increased the CD4 cell count level to 278.5 cell/mm^3. If HIV patients could get ARV at higher CD4 cell count level, the reduction of OI should be greater and this will result in the reduction of the cost of treatment.

In this study, the 78 HIV patients were classified into 3 groups according to CD4 cell count level before receiving GPO-VIR including the 0 -50 cell/mm^3 group, the 51 – 100 cell/mm^3 group, and the 101 – 200 cell/mm^3 group. The 0 – 50 cell/mm^3 group had the highest treatment cost (5,283.3 baht PPPY), followed by the 51- 100 cell/mm^3 group (4,370.4 baht PPPY), and the 101 – 200 cell/mm^3 group (1,445.2 baht PPPY). After

receiving GPO-VIR, the treatment cost of the 0 – 50 cell/mm^3 group was still the highest treatment cost (5,441.9 baht PPPY), followed by the 51 – 100 cell/mm^3 group (3,130.5 baht PPPY), and 101 – 200 cell/mm^3 group (2,353.0 baht PPPY). Therefore, the HIV patients who had less CD4 cell count level had higher treatment cost. When GPO-VIR cost was included, the treatment cost in the 0 – 50 cell/mm^3 group was 23,248.3 baht PPPY. In the 101 – 200 cell/mm^3 group, the treatment cost was 25,067.7 baht PPPY which was a little higher than in the 51 – 100 cell/mm^3 group (19,176.9 baht PPPY).

5.1.3 ADR Incidence

From the study, there were 2 types of ADR including mild and severe ADR. Both mild and severe ADR could affect the total treatment cost when HIV patient had to change the ARV. The hospital had to provide ADR treatment in case of severe ADR such as hepatic failure, renal failure, and lactic acidosis. In this study, the total cost of severe ADR treatment was 48.4% of the hospitalization cost. In the sensitivity analysis, it showed the variation of the total cost based on several percentage of ADR 1, 3, 5, 7, 10% and the change of total cost that may occur (Figure 4.1). If the provider could prevent the ADR incidence, the total cost of treatment should be less than in our study. Two cases of ADR occurred in the HIV patients who had CD4 cell count level at initial treatment less than 50 cell/mm^3 and had impact on hospitalization cost. It should be further explored whether providing the ARV at CD4 cell count level less than 50 cell/mm^3 at the initial may lead to the higher occurrence of the severe ADR.

5.2 Conclusion

This study was undertaken to determine whether the reduction of opportunistic infection treatment cost among HIV patients by GPO-VIR offsets their increased cost after providing GPO-VIR. GPO-VIR cost was still the major cost of the treatment of HIV patients. In this study there was obviously difference between treatment cost PPPY before and after receiving GPO-VIR 4,346.2 baht and 22,682.1 baht. The treatment cost with GPO-VIR was 5.2 times greater than before the patients got the treatment. The medical service cost, lab and monitoring costs and OI treatment cost in OPD visit increased but the hospitalization cost PPPY reduced from 1,978.3 baht to 815.5 baht (58.8%). Furthermore, at six months of GPO-VIR treatment, the average of CD4 cell count level was 179.2 cell/mm^3. There was significantly different of the mean of CD4 cell count level before and after receiving GPO-VIR (P=0.000). The relative rate of incidences of OPD visit and hospitalization before receiving GPO-VIR was reduced after receiving GPO-VIR (IR=1.1). The patients had a chance to have PCP when did not receive GPO-VIR 5 times greater than when received GPO-VIR (IR = 5), 5 times for CMV (IR= 5), 6 times for TB (IR=6), 6 times for Cryptococcal Meningitis (IR = 6), 6.5 for Oral Candidiasis (IR=6.5) in OPD. Nevertheless, after receiving GPO-VIR, 5% of the patients had severe ADR were admitted to the hospital with acidosis, renal failure and hepatic failure. In addition, the cost of ADR treatment was high (48.4% of the total hospitalization cost). The ADR treatment cost had significantly impact on the total treatment cost. Therefore, if the health care provider could prevent the ADR occurrence, the total treatment cost should be lower. Though the GPO-VIR cost was relatively high but it could decrease the treatment cost in OPD and hospitalization. The reduction of the severe OI incidence rate and the increase of CD4 cell count level among the HIV patients who received GPO-VIR will have greater benefit to the patients. The positive impact of GPO-VIR will encourage HIV patients to demand for ARV drug and consequently enhance provider to increase GPO-VIR for all eligible HIV patients.

5.3 Limitations of the Study

5.3.1 Limitation of the subjects.

Although there were many HIV patients in Saraburi province, there were 98 the HIV patients received the ARV drug at the initial time. According to the inclusion criteria, the patients must have CD4 cell count less than 200 cell/mm3, must have hospital profile treatment of more than 1 year before receiving GPO-VIR, and must have the data at least 6 months to 1 year after receiving GPO-VIR. Though there was some more of patients who received the GPO-VIR drug at the end of 2003, but they had the hospital profile with GPO-VIR exposure time less than 6 months. The study tried to prolong the period of the collecting data time of the patients but the patients who got later engaged into the study did not have the data of CD4 cell count level. Only 78 patients met to the inclusion criteria. Thus, the results of the study are limited by the number of the subject in the study.

5.3.2 Limitation of the drug exposure time under the study

The data was collected from HIV patient had the data at least 6 months to 1 year after receiving GPO-VIR. The drug exposure time of each patient should be 1 year. There were 41.5% of the patient had the GPO-VIR exposure time less than 12 months. The average of the GPO-VIR exposure time was 10 months. The long term study of this cohort HIV patient will assure our study results

5.3.3 Limitation of the Comparator

The cost discrepancy of the total treatment cost when compared among the HIV patients before and after receiving GPO-VIR was real cost discrepancy because the stage of illness of the HIV patient was not the same. However, the provider had to provide the ARV drug to the HIV patients who had CD4 cell count level less than 200 cell/mm^3, therefore the study could not compared to the HIV in the same level in this study.

5.3.4 Focused on only on direct cost

In this study, only the data of OPD and hospitalization cost including the ARV cost, OI treatment cost, lab and monitoring cost, medical service cost, and room cost which were only medical direct cost were collected. The study also did not include the doctor fee

in the study. There were other costs based on patient perspective which the study did not include the cost of the patients, the waiting time of the patients who had to visit to the hospital, and the opportunity cost.

5.4 Recommendations

5.4.1 The hospitals that are the site of ARV treatment should increase the coverage of HIV patients to receive GPO-VIR because the hospital spent the budget at the same amount either providing or do not providing the ARV drug to the HIV patients. The ARV drugs are subsidized by the government so the hospitals do not have to carry the ARV drug cost. In addition, the HIV patients who received the ARV treatment will have the benefit from the ARV treatment because they are not admitted to the hospital with the severe OI.

5.4.2 The hospital should concern on ADR prevention after providing the GPO-VIR to the HIV patients because the patients may get the severe ADR from the ARV drug and will result in substantial amount of treatment cost. It should be further explored whether providing the ARV at CD4 less than 50 cell/mm3 at the initial may lead to the higher occurrence of severe ADR.

5.4.3 Further study should be conducted to observe the CD4 cell count level change among the HIV patients with continuously repeated measurement. Long term follow up of CD4 level monitoring will provide more fruitful results. In the further study, not only provider perspective, but also patients and societal perspective should be added in the study. The pharmacoeconomics evaluation of the provision of the ARV should include the quality of life of the HIV patients in the further study.

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APPENDIX

APPENDEIX I

Collecting Form QN ID…….

Date……Month……..year……

Hospital .....

Part I: Demographic Data

Gender ☐ male ☐ female Birthday Date…….. Place .....Known HIV Results .....

Marrital Statua ☐ single ☐ married ☐ separated ☐ widoed ☐ divorced ☐ unknown

Benefit Right ☐ out of pocket ☐ CSMBS ☐ SSC ☐ 30 baht Project ☐ private insurance ☐ etc.....

Leading cause of infection ☐ sexual behavior ☐ IDU ☐ Blood donor ☐ unknown ☐ etc.....

Stage of illness ☐ Asymptomatic ☐ Symptomatic HIV ☐ AIDS

The first regimen (Date start.....)

☐ AZT……..…… ☐ ddI…….. ☐ NVP……... ☐ d4T…….. ☐ 3TC…….. ☐ EFV……

☐ GPO-vir…… ☐ Comvir……..…… ☐ SQV/RTV ……..… ☐ IDV/RTV…… ☐ etc……..

Cause of changing ☐ ADR ☐ Drug resistant ☐ etc.....

The new regimen (Date Start.....)

☐ AZT …… ☐ ddI……..…….. . ☐ NVP……

☐ d4T……. ☐ 3TC…… ☐ EFV…….……..…

☐ GPO-vir…….....……... ☐ Comvir……..…… ☐ SQV/RTV ……..……

☐ IDV/RTV……. ☐ etc……..……..

Summary of the treatment in six months

☐ On treatment ☐ Refer out ☐ Loss to FU ☐ Dead related to HIV ☐ Dead not related to HIV

APPENDEIX I

Collecting Form QN ID…….

Date……Month……..year……

Hospital .....

Part II: OPD Treatment (Date Start.....)

Period of colleting data..... 1st CD4 ..... cell/mm3 2nd CD4 …….. cell/mm3

No.	date	Diagnosis	Drug and Treatment	Lab	Duration	Cost(Baht)
1		W...……kg BP……mm/Hg				DF……... D/S……..... Lab……..... X-Ray…….. Drug…….
2		W...……kg BP……mm/Hg				DF……... D/S……..... Lab……..... X-Ray…….. Drug…….
3		W...……kg BP……mm/Hg				DF……... D/S……..... Lab……..... X-Ray…….. Drug…….

APPENDEIX I

Collecting Form QN ID…….

Date……Month……..year……

Hospital .....

No.	date	Diagnosis	Drug and Treatment	Lab	Duration	Cost(Baht)
4		W...……kg BP……mm/Hg				DF……... D/S……..... Lab……..... X-Ray…….. Drug…….
5		W...……kg BP……mm/Hg				DF……... D/S……..... Lab……..... X-Ray…….. Drug…….
6		W...……kg BP……mm/Hg				DF……... D/S……..... Lab……..... X-Ray…….. Drug…….

APPENDEIX I

Collecting Form QN ID……

Date……Month……..year……

Hospital .....

No.	date	Diagnosis	Drug and Treatment	Lab	Duration	Cost(Baht)
7		W...……kg BP……mm/Hg				DF……... D/S……..... Lab……..... X-Ray…….. Drug…….
8		W...……kg BP……mm/Hg				DF……... D/S……..... Lab……..... X-Ray…….. Drug…….
9		W...……kg BP……mm/Hg				DF……... D/S……..... Lab……..... X-Ray…….. Drug…….
10		W...……kg BP……mm/Hg				DF……... D/S……..... Lab……..... X-Ray……..

APPENDEIX I

Collecting Form QN ID…….

Date……Month……..year……

Hospital .....

No.	date	Diagnosis	Drug and Treatment	Lab	Duration	Cost(Baht)
11		W...……kg BP……mm/Hg				DF……... D/S……..... Lab……..... X-Ray…….. Drug…….
12		W...……kg BP……mm/Hg				DF……... D/S……..... Lab……..... X-Ray…….. Drug…….
13		W...……kg BP……mm/Hg				DF……... D/S……..... Lab……..... X-Ray…….. Drug…….

APPENDEIX I

Collecting Form QN ID…….

Date……Month……..year……

Hospital .....

No.	date	Diagnosis	Drug and Treatment	Lab	Duration	Cost(Baht)
14		W...……kg BP……mm/Hg				DF……... D/S……..... Lab……..... X-Ray…….. Drug…….
15		W...……kg BP……mm/Hg				DF……... D/S……..... Lab……..... X-Ray…….. Drug…….
16		W...……kg BP……mm/Hg				DF……... D/S……..... Lab……..... X-Ray…….. Drug…….

APPENDEIX I

Collecting Form QN ID…….

Date……Month……..year……

Hospital .....

No.	date	Diagnosis	Drug and Treatment	Lab	Duration	Cost(Baht)
17		W...……kg BP……mm/Hg				DF……... D/S……..... Lab……..... X-Ray…….. Drug…….
18		W...……kg BP……mm/Hg				DF……... D/S……..... Lab……..... X-Ray…….. Drug…….
19		W...……kg BP……mm/Hg				DF……... D/S……..... Lab……..... X-Ray…….. Drug…….

APPENDEIX I

Collecting Form QN ID…….

Date……Month……..year……

Hospital .....

No.	date	Diagnosis	Drug and Treatment	Lab	Duration	Cost(Baht)
20		W...……kg BP……mm/Hg				DF……... D/S……..... Lab……..... X-Ray…….. Drug…….
21		W...……kg BP……mm/Hg				DF……... D/S……..... Lab……..... X-Ray…….. Drug…….

รวมจำนวนครั้งที่มาตรวจรักษาแบบผู้ป่วยนอกก่อนรับยา ARV .....ครั้ง รวมจำนวนครั้งที่มาตรวจรักษาแบบผู้ป่วยนอกหลังรับยา ARV .....ครั้ง

APPENDEIX I

Collecting Form QN ID…….

Date……Month……..year……

Hospital .....

การเข้ารับการรักษา ผู้ป่วยใน (เริ่มรับยา ARV วันที่.....)

ระยะเวลาในการเก็บข้อมูล.....

ครั้งที่	ว/ด/ป	Final Diagnosis	ยาและขนาดการใช้ยา	รายการ lab	Length of Stay	ค่าใช่จ่ายรวม (บาท)
1		W...……kg BP……mm/Hg				DF……... D/S……..... Lab……..... X-Ray…….. Drug……. Room ……...
2		W...……kg BP……mm/Hg				DF……... D/S……..... Lab……..... X-Ray…….. Drug……. Room ……...

APPENDEIX I

Collecting Form QN ID…….

Date……Month……..year……

Hospital .....

การเข้ารับการรักษา ผู้ป่วยใน (เริ่มรับยา ARV วันที่.....)

ระยะเวลาในการเก็บข้อมูล.....

ครั้งที่	ว/ด/ป	Final Diagnosis	ยาและขนาดการใช้ยา	รายการ lab	Length of Stay	ค่าใช่จ่ายรวม (บาท)
3		W...……kg BP……mm/Hg				DF……... D/S……..... Lab……..... X-Ray…….. Drug……. Room ……..
4		W...……kg BP……mm/Hg				DF……... D/S……..... Lab……..... X-Ray…….. Drug……. Room ……..

APPENDIX II

รายการ	คำอธิบาย	
ลำดับที่	28	
ชื่อตัวชี้วัด	ต้นทุนต่อหน่วยบริการของโรงพยาบาล - OPD - IPD	
ความหมายของตัวชี้วัด	ต้นทุนต้อหน่วยบริการของโรงพยาบาลแยกเป็นผู้ป่วยนอกและผู้ป่วยใน	
วัตถุประสงค์ของตัวชี้วัด		
ประเภทตัวชี้วัด	ผลลัพธ์	
(	IPD = ต้นทุนเฉลี่ยค่าบริการผู้ป่วยนอก x Factor (OPD visit) + (IPD Case x Factor)	
ความถี่การเก็บข้อมูลและรายงาน	ทุก 3 เดือน	
แหล่งข้อมูล	รายงานทางบัญชี/เวชสถิติ	
ผู้เก็บข้อมูลและรายงาน	ฝ่ายบัญชี	
ผู้กำหนดเป้าหมาย	คณะกรรมการ QST	
ผู้รับผิดชอบในการบรรลุเป้าหมาย	PCT/กลุ่ม/ฝ่าย/หน่วยงาน	
ผู้สนับสนุน	คณะกรรมการ QST	
ข้อมูลปี 44	-OPD 436 (/ ครั้ง)	- IPD 7,856 /คน
เป้าหมายปี 45 / ข้อมูลปี 45	- /540	- / 9,723
เป้าหมายปี 46 / ข้อมูลปี 46	ไม่เกินค่าเฉลี่ย รพศ./479	ไม่เกินค่าเฉลี่ย รพศ./ 8,630
เป้าหมายปี 47 / ข้อมูลปี 47	ไม่เกินค่าเฉลี่ย รพศ./	ไม่เกินค่าเฉลี่ย รพศ./
บรรลุตามเป้าหมาย (เขียว)	≤ 429	$\leq 7,724$
ยังไม่บรรลุตามเป้าหมาย(เหลือง)	> 429 - 500	> 7,724 – 9,000
ต้องแก้ไข(แดง)	> 500	> 9,000

APPENDIX III

หมวดที่ 1
บททั่วไป

1. นิยามศัพท์

1.1 การบริการ หมายความว่า กิจกรรมต่างๆที่สถานบริการสาธารณสุขจัดให้มีผู้มารับบริการรวมถึงเทคนิควิชาการ วัสดุอุปกรณ์ และเวชภัณฑ์

1.2 ค่าบริการหมายความว่า เงินที่สถานบริการสาธารณสุขเรียกเก็บในการให้บริการรักษาพยาบาล รวม 11 หมวด ดังนี้

1.2.1 ค่ายาที่ผลิตในสถานบริการและยาสำเร็จรูป

1.2.2 ค่าตรวจวินิจฉัยทางพยาธิวิทยา

1.2.3 ค่าตรวจรักษาทางรังสีวิทยา

1.2.4 ค่าบริการตรวจรักษาทั่วไป

1.2.5 ค่าตรวจรักษาโดยวิธีการพิเศษต่างๆ

1.2.6 ค่าทันตกรรม

1.2.7 ค่าบริการด้านวิสัญญี

1.2.8 ค่าบริการศัลยกรรม

1.2.9 ค่าห้องและค่าอาหารคนไข้ใน

1.2.10 ค่าบริการผู้ป่วยทั่วไปนอกเวลาราชการ

1.2.11 อื่นๆ ที่สถานบริการเห็นสมควร

1.3 ยา หมายความว่า

1.3.1 วัตถุที่รองรับไว้ในตำรายาที่รัฐมนตรีประกาศ

1.3.2 วัตถุที่มุ่งหมายสำหรับใช้ในการวินิจฉัย บำบัด บรรเทา รักษา หรือป้องกันโรค หรือ ความเจ็บป่วยของมนุษย์หรือสัตว์

1.3.3 วัตถุที่เป็นเภสัชเคมีภัณฑ์หรือเภสัชเคมีภัณฑ์สำเร็จรูป หรือ

1.3.4 วัตถุที่มุ่งหมายสำหรับให้เกิดผลแก่สุขภาพ โครงสร้าง หรือการกระทำหน้าที่ใดๆของร่างกายของมนุษย์ หรือ สัตว์

วัตถุตาม 1.3.1ม 1.3.2ม หรือ 1.3.4 ไม่หมายความรวมถึง

(ก) วัตถุที่มุ่งหมายสำหรับใช้ในการเกษตร หรือการอุตสาหกรรม ตามที่รัฐมนตรีประกาศ

หมวดที่2

ยาที่ผลิตในสถานบริการและยาสำเร็จรูป

ประเภทยา	รายการยา	ราคา	หมายเหตุ
1.1 ประเภทยาสามัญและยาผสมที่ผลิตในสถานบริการ	1.1.1 ยาน้ำผสมตำรับสามัญ (Mixture)	ไม่เกิน3.00 บาท/30ซีซี หรือ / 1fl.oz.	1. ราคาที่กำหนดเป็นแนวทางนี้ ไม่รวมค่าอุปกรณ์ เช่นขวด ฉลาก จุก กล่อง เป็นต้น
	1.1.2 ยาน้ำผสมโซลูชั่น (Solution/Lotion)	ไม่เกิน 2.00 บาท/30ซีซี หรือ / 1fl.oz.	2. ยาอื่นๆ นอกเหนือจากที่กำหนด เช่นยาที่ต้องผสม ปรับปรุงให้เมาะสมอีกครั้งหนึ่งให้คิดราคายาโดยคิดราคาเพิ่ม 30% ของราคาที่กำหนดไว้
	1.1.3 ยาน้ำแขวนตะกอน/อิมัลชั่น (Suspension/Emulsion)	ไม่เกิน 5.00 บาท/30ซีซี หรือ / 1fl.oz.	
	1.1.4 ยาน้ำเชื่อม/อิลิกเซอร์ (Syrup/Elixir)	ไม่เกิน3.00 บาท/30ซีซี หรือ / 1fl.oz.	
	1.1.5 ยาขี้ผึ้ง/ครีมตำรับสามัญ (Ointment/Cream)	ไม่เกิน 4.00 บาท/15 กรัม	
	1.1.6 ยาทิงเจอร์ (Tincture for external use)	ไม่เกิน 4.00 บาท/30ซีซี หรือ / 1fl.oz.	3. การคิดราคาทุกชนิดให้อยู่ในดุลยพินิจของหัวหน้าสถนบริการซึ่งปกติทำตามมติของคณะกรรมการ
1.2 ประเภทยาตำรับพิเศษในโรคเฉพาะที่ผลิตในสถานบริการ	1.2.1 ยาผสมตำรับพิเศษสำหรับโรคเฉพาะทาง	ไม่เกิน 1.00 บาท/30ซีซี	
	1.2.2 ยาขี้ผึ้ง/ครีม ตำรับพิเศษสำหรับโรคเฉพาะทาง	ไม่เกิน 4.00 บาท/1 กรัม	
1.3 ประเภทเภสัชผลิตภัณฑ์ปราศจากเชื้อที่ผลิตในสถานบริการ (ปัจจุบันมี 6 ประเภท)	1.3.1 สารละลายที่ใช่ทดแทนสารอาหาร (Replacement Solution) หรือ Parenteral Nutrition		
	1.3.2 ยาฉีด (Injection) ขนาดบรรจุ:- ปริมาณน้อย		
	1.3.3 น้ำนาสวนล้าง (Peritoneal Dialysis)		

ยาที่ผลิตในสถานบริการและยาสำเร็จรูป (ต่อ)

ประเภทยา	รายการยา	ราคา	หมายเหตุ
	1.3.4 สารละลายป้องกันการแข็งตัวของโลหิต (A.C.D./C.P.D.) 1.3.5 ยาเตรียมสำหรับ ตา หู คอ จมูก (E.E.E.N.T Prepararation) 1.3.6 น้ำเกลือล้างแผล (0.9% Normal Saline)		
1.4 ประเภทยาสำเร็จรูป	1.4.1 ยาสำเร็จรูปทุกชนิด	1. ให้คิราคาเพิ่มตั้งแต่ 15% และไม่เกิน 30 % ของราคาซื้อหรือไม่เกินราคาตามฉลาก ถ้าราคาต่ำมากหรือสูงมากให้อยู่ในดุลยพินิจของหัวหน้าสถานบริการสาธารณสุขนั้น	

BIOGRAPHY

Miss Siriqhun Loongban was born May 8, 1975 at Trang Province, Thailand. I congratulated from Bachelor of Sciences in Pharmaceutical Science, Chulalongkorn University in 1999. I was a graduate student in Master of Sciences in Social and Administrative Pharmacy at Chulalongkorn University in 2002. I worked in Saraburi Province in 2000 to present.