COST-EFFECTIVENESS ANALYSIS OF CHRONIC DISEASE MANAGEMENT: COMPARISON BETWEEN KING CHULALONGKORN MEMORIAL HOSPITAL AND PUBLIC HEALTH CENTER 16 LUMPINI

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ต้นทุน-ประสิทธิผลของการดูแลผู้ป่วยโรคเรื้อรัง เปรียบเทียบโรงพยาบาลจุฬาลงกรณ์และศูนย์บริการสาธารณสุข 16 ลุมพินี

นภัสนันท์ ลิ้มสันติธรรม

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิทยาศาสตรมหาบัณฑิต
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Field of study	:	Health Economics
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นภัสนันท์ ลิ้มสันติธรรม: ต้นทุน–ประสิทธิผลของการดูแลผู้ป่วยโรคเรื้อรังเปรียบเทียบโรงพยาบาลจุฬาลงกรณ์และศูนย์บริการสาธารณสุข 16 ลุมพินี (Cost-Effectiveness Analysis of Chronic Disease Management: Comparison between King Chulalongkorn Memorial Hospital and Public Health Center 16 Lumpini) อาจารย์ที่ปรึกษา: รศ.มณิศรี พันธุลาภ, อาจารย์ที่ปรึกษาร่วม: ศ.นพ. ภิรมย์ กมลรัตนกุล, 98 หน้า ISBN 974-53-1839-6

วัตถุประสงค์ของงานวิจัยนี้คือ ศึกษาต้นทุน – ประสิทธิผลของการดูแลผู้ป่วยโรคเรื้อรังเปรียบเทียบโรงพยาบาลจุฬาลงกรณ์และศูนย์บริการสาธารณสุข 16 ลุมพินี ระหว่าง 1 ตุลาคม 2546 – 30 กันยายน 2547 โดยศึกษาจากมุมมองของผู้ให้บริการ

การศึกษานี้เป็นการศึกษาข้อมูลย้อนหลังโดยใช้รูปแบบการวิจัยเชิงพรรณนา ซึ่งต้นทุนในการศึกษาครั้งนี้คิดเฉพาะต้นทุนทางตรง(Direct cost) เท่านั้น และประสิทธิผลของการดูแลผู้ป่วยวัดในเชิงการควบคุมโรคได้ของผู้ป่วย

ผลการศึกษาพบว่า (1) ต้นทุนรวมของการดูแลผู้ป่วยโรคเบาหวาน ชนิดไม่มีโรคแทรกซ้อน ณ โรงพยาบาลจุฬาลงกรณ์และศูนย์บริการสาธารณสุข 16 ลุมพินี เท่ากับ 1,170,917.21 และ 738,679.67 บาท/ปี ตามลำดับ และต้นทุนรวมของการดูแลผู้ป่วยโรคความดันโลหิตสูง ชนิดไม่มีโรคแทรกซ้อน เท่ากับ 840,797.66 และ 946,625.30 บาท/ปี ตามลำดับ ต้นทุนต่อหน่วยของการดูแลผู้ป่วยโรคเบาหวาน ณ โรงพยาบาลจุฬาลงกรณ์และศูนย์บริการสาธารณสุข 16 ลุมพินี เท่ากับ 1,885.53 และ 370.08 บาท/ครั้ง ตามลำดับ ต้นทุนต่อหน่วยของการดูแลผู้ป่วยโรคความดันโลหิตสูง เท่ากับ 1,054.95 และ 370.08 บาท/ครั้ง ตามลำดับ (2) ประสิทธิผลในการควบคุมโรคได้ของผู้ป่วยโรคเบาหวาน ณ โรงพยาบาลจุฬาลงกรณ์และศูนย์บริการสาธารณสุข 16 ลุมพินี เท่ากับ 34.79% และ 22.58% และประสิทธิผลในการควบคุมโรคได้ของผู้ป่วยโรคความดันโลหิตสูง เท่ากับ 86.20% และ 81.26% ตามลำดับ (3) ต้นทุน – ประสิทธิผล ในการดูแลผู้ป่วยโรคเบาหวานที่ศูนย์บริการสาธารณสุข 16 ลุมพินี มีต้นทุน-ประสิทธิผลที่สูงกว่าโรงพยาบาลจุฬาลงกรณ์ โดยมีต้นทุนเท่ากับ 10,655.99 และ 20,522.39 บาท/รายที่ควบคุมได้ และต้นทุน – ประสิทธิผล ในการดูแลผู้ป่วยโรคความดันโลหิตสูงที่ศูนย์บริการสาธารณสุข 16 ลุมพินี มีต้นทุนประสิทธิผลที่สูงกว่าโรงพยาบาลจุฬาลงกรณ์ซึ่งเหมือนกับการดูแลผู้ป่วยโรคเบาหวาน โดยต้นทุน-ประสิทธิผลเท่ากับ 3,255.23 และ 5,301.11 บาท/รายที่ควบคุมได้

ดังนั้นการให้ผู้ป่วยโรคเรื้อรังที่ไม่มีโรคแทรกซ้อนไปรับการรักษาที่สถานพยาบาลปฐมภูมิที่ศูนย์บริการสาธารณสุขแทนการเข้ารับการรักษาที่สถานพยาบาลปฐมภูมิที่โรงเรียนแพทย์หรือสถานพยาบาลตติยภูมิน่าจะเป็นนโยบายที่ควรจัดการเพื่อให้การดูแลผู้ป่วยโรคเรื้อรังเป็นไปอย่างมีประสิทธิผล

สาขาวิชา .....เศรษฐศาสตร์สาธารณสุข..... ลายมือชื่อนิสิต.....

ปีการศึกษา.....2547..... ลายมือชื่ออาจารย์ที่ปรึกษา.....

ลายมือชื่ออาจารย์ที่ปรึกษาร่วม.....

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Napassanun Limsantithum : Cost-Effectiveness Analysis of Chronic Disease Management : Comparison between King Chulalongkorn Memorial Hospital and Public Health Center 16 Lumpini . THESIS ADVISOR : Assoc. Prof. Manisri Puntularp , THESIS CO-ADVISOR : Prof. Pirom Kamol-Rattanakol, M.D. , 98 pp. ISBN : 974-53-1839-6

The objectives of this study was to analyze the cost-effectiveness of chronic disease management: comparison between King Chulalongkorn Memorial Hospital and Public Health Center 16 Lumpini during 1 Oct, 2003 – 30 Sep, 2004 focusing on the provider perspective.

This was a descriptive retrospective study. The cost in this study focuses on the direct cost. The effectiveness was measured in terms of disease controllability.

The results from the study revealed that :(1) The total management cost of diabetes mellitus with non-complicated patients at King Chulalongkorn Memorial Hospital and Public Health Center 16 Lumpini was 1,170,917.21 and 738,679.67 baht/year, respectively. The total cost of management of hypertension was also 840,797.66 and 946,625.30 baht/year, respectively. The unit cost of diabetes mellitus management at King Chulalongkorn Memorial Hospital and Public Health Center 16 Lumpini was 1,885.53 and 370.08 baht/visited, respectively. The unit cost of hypertension management was 1,054.95 and 370.08 baht/visited, respectively. (2) The effectiveness of diabetes mellitus management at King Chulalongkorn Memorial Hospital and Public Health Center 16 Lumpini was 34.79% and 22.58% and the effectiveness of hypertension disease management was 86.20% and 81.26%, respectively. (3) The cost-effectiveness of diabetes mellitus management at Public Health Center 16 Lumpini was more than King Chulalongkorn Memorial Hospital was. There were 10,655.99 and 20,522.39 baht/case disease controllability, respectively. Due to the hypertension disease management, there was the fact that Public Health Center was also more than King Chulalongkorn Memorial Hospital as the same as the diabetes mellitus management was. There were 3255.23 and 5,301.11 baht/case disease controllability, respectively.

Public Health center, therefore, is considered to be an efficient place in cases of chronic disease with non-complicated patients more than teaching hospital does because Public Health center was more cost-effectiveness of chronic disease management than teaching hospital does. Thus, having the primary care unit at Public Health Center should be more appropriated than having the primary care unit at teaching hospital or tertiary hospital.

Field of study …Health Economics. Student's signature ……..
Academic year …. 2004 …. Advisor's signature ……..
Co-advisor's signature …….

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ABBREVIATIONS

DM	=	Diabetes Mellitus
HT	=	Hypertension
FPG	=	Fasting Plasma Glucose
DTX	=	Dextrostrix
OPD	=	Out-patient Department
IPD	=	In-patient Department
PHC	=	Public Health Center
DP	=	Diastolic Blood Pressure
OGTT	=	Oral Glucose Tolerance Test
CDM	=	Chronic Disease Management
CSMBS	=	Civil Servant Medical Benefit Scheme
SSS	=	Social Security Scheme
CC	=	Capital Cost
MC	=	Material Cost
LC	=	Labor Cost
RSC	=	Routine Service Cost
NRPCC	=	Non-revenue Producing Cost Center
RPCC	=	Revenue Producing Cost Center
PS	=	Patient Services
CPI	=	Consumer Price Index
CEA	=	Cost Effectiveness Analysis
ICD	=	International Classification of Disease

CHAPTER I

INTRODUCTION

In this chapter, it can be catagorized into five parts which are the background of this study, the rationale to fulfill the study objectives, the research questions and objectives and the scope of this study.

1.1 Background

Having a good health is an important thing in the human life. Heath status can be shown as the status of the nation. Thailand is one of many countries which has interested in people's health. The Thailand government tries to make everybody have the good health or be able to take care of himself. Everybody should easily access to the health care with the good quality and services. It can be said that, not especially in Thailand, many countries around the world try to establish the health care system nowadays.

Germany took about hundred years to develop the health care system which could cover the entire citizen. Even though Australia had codes of law about the health care for his people but it could not ensure for everybody to access the health care services. They took about seventy years to become as successful as they are today. Despite their efforts since 1930s, the United States is an example country which fails to provide the whole population with the health care systems. Nowadays, about 30% of American citizen still cannot access to health care services although the heath expenditure in the United States obviously increases very rapidly. Experiences from many countries show that the success of health insurance is not only due to the law but due to the collaboration from everybody as well. (Health Systems Research Institute and WHO report, 2004)

On 1 Oct,2001 Thailand introduced 30 Baht scheme to the health care system. This is the big reform in health care system in Thailand. The government introduced 30

baht scheme to 6 pilot provinces and on April 1, 2002 the government announced this scheme for usage in the whole country. Bangkok Metropolis is the one which has to register in this scheme. Bangkok Metropolis is different from other provinces because the administration of health care and financial systems in Bangkok Metropolitan area are different.(Jiruth S., Sureerat N. and Rakchanok B., 2004) At the first phase during 1 April,2002- 30 Sep,2003 Bangkok metropolis area had been devised into 14 zones (inclusive capitation). On 1 Oct,2003 the government had been restructuring of the administration of the 30 baht scheme to be an exclusive capitation and nullity those 14 zones. The arrangements of services were fairly different depending on particularities of each individual zone as well as special characteristics of each provider, that is: (Jiruth S., Sureerat N. and Rakchanok B., 2004)

1. Geographical location
2. Size of catchments area
3. Point of enter into the universal health coverage
4. Composition of providers within the zone
5. Policies of each providers, especially the main contractor and its arrangement with the subcontractors

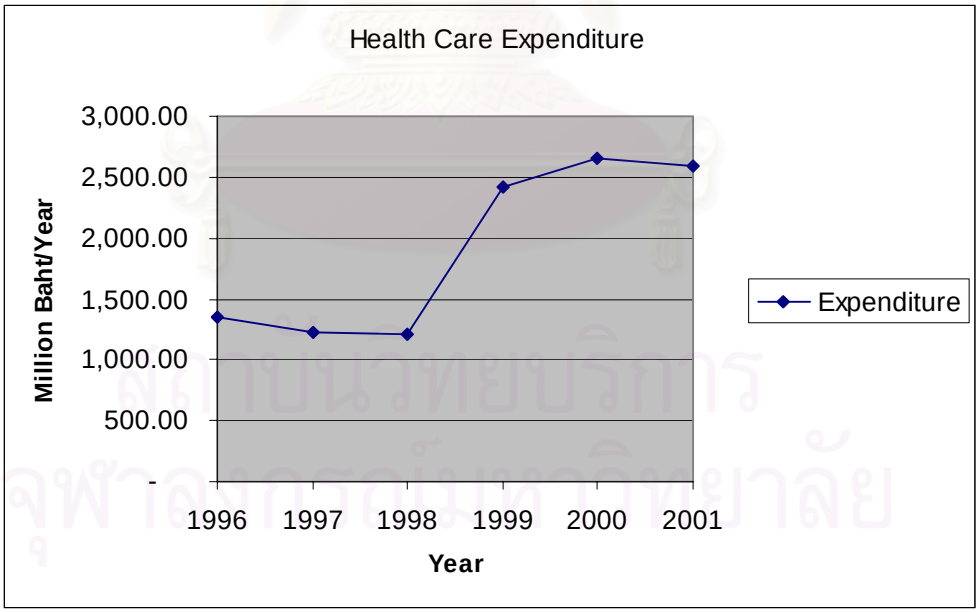
The committee of Bangkok branch reviewed the operation and agreed that the health care system needed the revision. In particular, the provision that freely insured people to access providers at any levels in the network led to unnecessary spending and compromised system efficiency. The committees, therefore, agreed to modify the service system such that insured people have to go through the primary care contractors and if needed, are referred to the higher levels of the health care system. (Jiruth S., Sureerat N. and Rakchanok B., 2004)

1.2 Rationale

The 30 baht scheme affects many systems in health care such as the payment system and referral system. The personnel have to change its action and their performance. After restructuring health care system from Phase I to Phase II , the King

Chulalongkorn Memorial Hospital is the only one tertiary hospital which did not have people under 30 baht scheme registering into this hospital's health care system. By the reason of King Chulalongkorn Memorial Hospital is under the Thai Red Cross, which takes care of the patients in primary care, secondary care and tertiary care by cooperating with faculty of medicine, Chulalongkorn University. The services of King Chulalongkorn Memorial Hospital, therefore, not only treats the patients but also acts as a medical school for the medical doctor students, family doctors, the specialist doctors and nurses in the Thai Red Cross. Due to this fact, King Chulalongkorn Memorial Hospital has completed of high technology, and therefore health care service expenditure of King Chulalongkorn Memorial Hospital would be high. In addition, King Chulalongkorn Memorial Hospital faced with the expectation of the consumer that expected to receive the services with high technology equipment and high price even thought it is not necessary.(Pirom K., Jiruth S. and Sureerat N., 2001).

Figure1.1 King Chulalongkorn Memorial Hospital's expenditure in 1996-2001



Data Source: The Statistic of King Chulalongkorn Hospital in 2001

Thus, the patients in King Chulalongkorn Memorial Hospital have to register in the primary health care at public health center 16 Lumpini to reduce the health care expenditure. From this situation, the system has some gaps behind this because in fact we have less evidences to confirm about the output of the tertiary hospital and primary

health care unit that are not different or not. Thus, in this study, we would like to study about the cost- effectiveness between the King Chulalongkorn Memorial hospital (Tertiary Hospital) and the Public Health Center 16 Lumpini (Primary Health Care) to know which one is more cost- effectiveness.

In this study, it focuses on chronics diseases because nowadays chronic diseases become a serious problem in Thailand. The profile of diseases contributing most heavily to death, illness, and disability among Thai people changed dramatically during the last century. Today, chronic diseases such as cardiovascular disease, hypertension (primarily heart disease and stroke), cancer, and diabetes are among the most prevalent, costly, and preventable of all health problems. The prolonged course of illness and disability from such chronic diseases as diabetes and arthritis results in extended pain and suffering and decreases quality of life. (www.cdc.gov, 2004)

Many patients get sick from the chronic diseases. In the next 20 years the burdens of diseases about 70% come from the chronic diseases (http://epid.moph.go.th,2004) and the patients have to pay a lot of money for diseases such as diabetes and hypertension as shown in the Table 1.1.

Table 1.1 Number and rate of in-patients according to 75 causes of diseases from hospital, Ministry of Public Health per 100,000 populations by region, 2002 (Sorting by number of case)

Cause of illness	**Total cases (Whole country exclude Bangkok Metropolis)**
1. Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified.	419,696
2. Other intestinal infectious diseases	356,673
3. Complication of pregnancy, labor, delivery, puerperium and other obstetric condition, not elsewhere classified.	342,937
4. Single spontaneous delivery	340,077
5. Other infectious and parasitic diseases	244,582
6. Other diseases of the digestive system	229,691
7. Acute upper respiratory infections and other diseases of upper respiratory tract	197,282
8. Hypertensive diseases	**187,162**
9. Diabetes mellitus	**187,141**
10. Pneumonia	153,489

Data source: Bureau of Policy and Strategy Ministry of Public Health,2002

From the table 1.1, number and rate of in-patients according to 75 causes of diseases of the whole country excluded Bangkok Metropolis, the top ten in causes of illness are symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified were about 419,696 cases. Other intestinal infectious diseases were 356,673 cases. Complication of the pregnancy labor, delivery, puerperium and other obstetric condition, not elsewhere classified 342,937 cases. Single spontaneous delivery was 340,077 cases and other infectious and parasitic diseases were about 244,582 cases. Other diseases of the digestive system were 229,691 cases. Acute upper

respiratory infections and other diseases of upper respiratory tract were 197,282 cases. The most important case in the chronic diseases was hypertensive diseases in 2002. This can be approved by the number of inpatients recorded which were about 187,162 cases in the table 1.1. The second was diabetes mellitus; there were about 187,141 cases. Lastly, the number of patients of Pneumonia was 153,489 cases.

From the table 1.2 in Bangkok Metropolis, number and rates of the top ten cause of illness of the in-patients according to 75 causes of diseases from the hospital, Ministry of Public Health per 1,000 populations by region, 2002 shown that the first cause of illness of chronic diseases was chronic renal failure (34,949 cases), after that was hypertensive diseases (about 22,335 cases) and then diabetes mellitus (15,672 cases). But in this study mainly concerns on diabetes mellitus and hypertensive disease because of these 2 diseases greatly depended on patient behavior, and have now been prevented. A lot of people have been suffering from these two diseases during this century and there are, furthermore, high risk and high cost care.

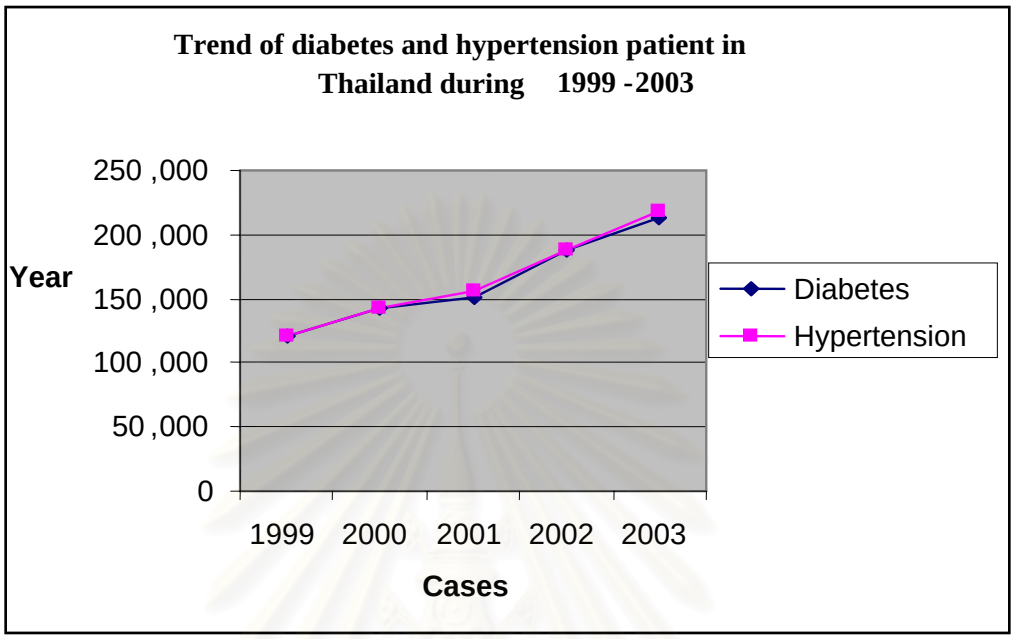
Table 1.2 Number and rate of in-patients according to 75 causes of diseases (Only Bangkok Metropolis) from hospital, Ministry of Public Health per 1,000 populations by region, 2002 (Sorting by number of cases)

Diseases	Public Hospital	Private Hospital	Total Cases
1. Chronic renal failure	34,364	585	34,949
2. Complication of pregnancy, labor, delivery, puerperium and other obstetric condition, not elsewhere classified.	20,269	2,696	22,866
3. **Hypertensive diseases**	**19,286**	3,049	22,335
4. Single spontaneous delivery	19,001	875	19,876
5. Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified.	14,997	3,585	18,682
6. Other diseases of the digestive system	12,363	3,598	15,961
7. **Diabetes mellitus**	**12,558**	3,014	15,672
8. Diseases of the eye and adnexa	14,220	549	14,769
9. Acute upper respiratory infections and other diseases of upper respiratory tract	9,228	5,002	14,230
10. Diseases of the musculoskeletal system	12,688	1,432	14,120

Data source: Bureau of Policy and Strategy Ministry of Public Health, 2002

From table 1.2, during 1999 – 2003 the tendency of diabetes and hypertension patients increased every year. In 1999-2003, the number of diabetes patients was 121,547, 142,088, 151,115, 187,141 and 213,135 cases, respectively and the number of hypertension patients was 120,280, 142,873, 156,442, 187,162 and 218,218 cases, respectively.

Figure1.2 Trend of diabetes and hypertension patients in Thailand during 1999 – 2003 (whole country exclude Bangkok metropolis)



Data Source: Bureau of Policy and Strategy Ministry of Public Health

In the only five years, the tendency of diabetes and hypertension patients increased about two times as compared with the number in 1999. Thus, in this study, it focuses on hypertension and diabetes because these two diseases are the most important chronics diseases. They are high risk and require high cost care.

1.3 Research Questions

1. What is the cost of chronic disease (diabetes and hypertension) management at King Chulalongkorn Memorial Hospital and the Public Health Center 16 Lumpini from provider perspective?
2. What is the effectiveness of chronic disease (diabetes and hypertension) management in terms of disease controllablility at the King Chulalongkorn Memorial Hospital and the Public Health Center 16 Lumpini?
3. Is the management of chronic disease (diabetes and hypertension) at Public Health Center 16 Lumpini more than the King Chulalongkorn Memorial Hospital does?

1.4 Research Objectives

1. To determine the cost of the chronic disease (e.g. diabetes and hypertension) management at the King Chulalongkorn Memorial Hospital and the Public Health Center 16 Lumpini from provider perspectives.
2. To estimate the effectiveness of chronics disease (diabetes and hypertension management at the King Chulalongkorn Memorial Hospital and the Public Health Center 16 Lumpini from provider perspectives.
3. To illustrate that the management of chronic disease at Public Health center 16 Lumpini is more than the management at King Chulalongkorn Memorial Hospital does.

1.5 Scope of Study

This study is about cost-effectiveness analysis of chronic disease (diabetes and hypertension) management by using the secondary data of diabetes mellitus and hypertension patients at the King Chulalongkorn Memorial Hospital and the Public Health Center 16 Lumpini from provider perspective.

Provider perspective

Provider refers to the King Chulalongkorn Memorial Hospital and the Public Health Center 16 Lumpini. The cost in this study focuses only the direct cost.

To compare the cost-effectiveness of chronic disease management between the King Chulalongkorn Memorial Hospital and the Public Health Center 16 Lumpini during 1 Oct, 2003- 30 Sep, 2004 (short term follow up in 1 year). The patients during this time are not the same group which include the patients from every scheme; CSMBS, SSS, 30 baht scheme and out of pocket.

CHAPTER II

LITERATURE REVIEW

In this study, the literature review was divided into three parts as follow: general information, cost criteria and review of the previous study.

2.1 General Information

2.1.1 Overview of the status of Primary and Community Care Services, and the coverage of Health Services. (Jiruth S., Sureerat, Rakchanok, 2004)

The service arrangement and payment mechanisms in Bangkok with respect to the requirements set by the National Health Security Office can be discussed in two phases.

Phase I The period from the April 2001 to September 2003

At the very first stage of the administration of the universal health coverage in the Bangkok area (from October 2001 to September 2003), the whole areas as divided in to 14 zones/ catchments.

Table2.1 List of contracted hospitals and their registered population during the "Inclusive capitation" period between October 1st , 2001 and September 30th , 2003

Zone	Main-contractors	Subcontractors	No. of the insured in The zones	Total Population in the zones
1.	Siriraj Hospital	Siriraj Hospital Bangpai Hospital Srivichai Hospital Payathai Hospital	145,009 52,854 43,689 60,883	302,435
2.	Somdetprapinklow Hospital	Somdetprapinklow H. Luangpotaveesak H. Ratchpipat H. Krongthond H. Patchkasem Bankkhae H. Kasemrad-Bangkhae H. Srivichai 2 H. Bangmod H.	169,357 31,154 32,970 36,771 11,328 72,665 42,016 67,661	463,922
3.	Taksin Hospital	Taksin H. Praram 2 H. Navamin 2 H. Krungthon 2 H.	150,258 39,714 41,004 58,263	289,239
4.	BMA Medical college and Vajira Hospital	BMA Medical college and Vajira Hospital Ananpattana 1 H. Kasenrad-Prachachuen H. Yanhee H.	81,327 17,197 93,280 11,940	289,239
5.	Klang Hospital	Klang Hospital Huachiew Hospital	140,714 25,062	165,776
6.	Jareankrungprechrak Hospital	Jareankrungprechrak H. Kluaynamthai H. Bangna-trad H. Piyamin H.	134,261 36,977 31,617 26,621	229,476
7.	King Chulalongkorn Memorial Hospital	King Chulalongkorn Memorial Hospital	19,807	19,807
8.	Police general Hospital	Police general Hospital Mahaesak Hospital	25,825 22,917	48,742
9.	Lerdsin Hospital	Lerdsin H. Sirinthon H. Mahaesak H. Bangna 1 H. Kluaymanthai H. Piyamin H.	203,567 3,724 24,165 1,307 18,510 16,501	267,774
10.	Ramathibodi Hospital	Ramathibodi Hospital Kasemrad Prachachuen H.	104,716 21,796	61,139
11.	Phramongkutkloa H.	Phramongkutkloa H. Kasemrad H.	53,121 8,018	126,512

Table2.1 (Cont.) List of contracted hospitals and their registered population during the "Inclusive capitation" period between October 1st , 2001 and September 30th , 2003

Zone	Main-contractors	Subcontractors	Numbers of the insured in The zones	Total Population in the zones
12.	Ratchvithi H.	Ratchvithi H. Klongton H. Petcharavej H.	222,939 11,184 71,050	305,173
13.	Bhumiphol H.	Bhummiphol H. B.care medical center Patchvithi H.	200,305 19,349 30,662	250,316
14.	Nopparatratchthanee Hospital	Nopparatratchthanee H. Nongjok H. Lodkrabang H. Sirinthon H. Navamin H. Patpanya H. Kasemrad Sukapiban 3 H.	213,811 52,635 55,823 16,905 36,370 64,939 47,147	478,930

Updated Semtember 30th , 2003

The universal health coverage had been the first launched in October 2001 and then was successfully extended to cover the whole area of Bangkok in April 2002. Experiences learned from the 14 zones during this period were indeed valuable for the restructuring of the administration of the universal coverage. Because the health care policy had been set by agreements, structures, patterns and standards of health care services and the patient referral system of the main contractors in the 14 zones were very much identical. However, arrangements of services were fairly different depending on particularities of each individual zone as well as special characteristics of each provider, that is

(1) Geographical location
(2) Size of catchments area
(3) Point of enter into the universal coverage

(4) Composition of providers within the zone

(5) Policies of each provider, especially the main contractor and its arrangement with the subcontractors

Thus, NHSO decided to changed the system as the phase II

Phase II The period after October 2003

After October 2003, the NSHO came to restructure the administration of the universal coverage. The zoning system was terminated. Therefore, the nexus between the main and subcontractors ceased to exist. Health care providers with enough facilities to provide comprehensive primary care can now be able to contract with the National Health Security Office directly. Private clinics can also join the contract under the name “Happy community Clinic”. As the administration of the universal Health coverage has now been changed, budget must be reallocated accordingly as a consequent. Patient visited each provider can thus be classified into two groups:

(1) Those who had been initially assigned to register with this provider

(2) Those who chose this provider by their own.

Table2.2 No. of registered population in each areas after annul 14 zones.

No.	Contracted Providers	Registered Population
1	Lerdsin Hospital	202,488
2	Nopparatratchthanee Hospital	208,988
3	Ratchvithi Hospital	244,268
4	Somdetprapinklow Hospital	163,981
5	Pharamongkutkloa Hospital	99,699
6	Phumiphol Hospital	193,679
7	BMA Medical college and Vajira Hospital	95,748
8	Nongjok Hospital	50,769

Table2.2 (Cont.) No. of registered population in each areas after annul 14 zones.

No.	Contracted Providers	Registered Population
9	Klang Hospital	128,707
10	Lodkrabang Hospital	45,893
11	Taksin Hospital	161,254
12	Luangpotaveesak Hospital	27,955
13	Jareankrungprecharak Hospital	128,266
14	Mahaesak Hospital	51,512
15	Bangna 1 Hospital	7,196
16	Kluaynamthai -Sukumvit 68 Hospital	4,231
17	Kluaynamthai-Phrakanong Hospital	55,148
18	Bangna-trand Hospital	29,740
19	Navamin Hospital	43,016
20	Yaowarak Hospital	1,226
21	Krongthod 1 Hospital	36,832
22	Bangpai Hospital	50,690
23	Klongton Hospital	16,713
24	Petcharavej Hospital	70,054
25	Srivichai Hospital	45,595
26	Praram 2 Hospital	45,168
27	Patchkasem-Bangkhae Hospital	9,463
28	Kasemrad-Bangkhae Hospital	77,188
29	Srivichai 2 Hospital	43,096
30	Navamin 2 Hospital	50,129
31	Krongthod 2 Hospital	59,911
32	Ananpattana 1 Hospital	16,307
33	Kasemrad-Prachachuen Hospital	136,389
34	Patpanya Hospital	61,437
35	Bangmod Hospital	66,571
36	Huachiew Hospital	26,775
37	Piyamin Hospital	42,375

Table2.2 (Cont.) No. of registered population in each areas after annul 14 zones.

No.	Contracted Providers	Registered Population
38	Public Health Center 2 Ratchaprarod	311
39	Public Health Center 3 Bangsue	1,115
40	Public Health Center 4 Dindang	518
41	Public Health Center 7 Boonmee Pururajrangsan	1,200
42	Public Health Center 8 Boonrewad Ruengrueng	752
43	Public Health Center 9 Prachathipathai	443
44	Public Health Center 15 Ladprao	1,075
45	**Public Health Center 16 Lumpini**	**18,928**
46	Public Health Center 17 Prachanivaj	1,125
47	Public Health Center 18 Mongkon Vonwangtal	606
48	Public Health Center 19 Wongsawang	732
49	Public Health Center 21 Watthadthong	2,314
50	Public Health Center 22 Wattpakboe	2,206
51	Public Health Center 23 Siephraya	871
52	Public Health Center 27 Chanchim-paiboon	1,862
53	Public Health Center 29 Chuang Nuchnet	3,861
54	Public Health Center 31 Erb-jit Tungsubut	1,965
55	Public Health Center 38 Jeed-Thongkambampen	609
56	Public Health Center 39 Rachburana	2,454
57	Public Health Center 40 Bangkhae	805
58	Public Health Center 41 Klongtoei	808
59	Public Health Center 43 Minburi	273
60	Public Health Center 48 Nakwatchara-uthi	719
61	Public Health Center 50 Bung-Khum	544
62	Public Health Center 52 Samsennak	176
63	Public Health Center56 Tabcharoen	16
64	Public Health Center 57 Boonrueng-Lumlert	3,145
65	Public Health Center 58 Lom pimsenphukudom	427
66	Public Health Center59 Tung Karu	1,115
67	**King Chulalongkorn Memorial Hospital**	**0**

Table2.2 (Cont.) No. of registered population in each areas after annul 14 zones.

No.	Contracted Providers	Registered Population
68	Ramathibodi Hospital	45,718
69	Sunghee Hospital	11,346
70	Siriraj Hospital	138,223
71	Police general Hospital	26,746
72	B.care medical center Hospital	21,614
73	Prayathai 3 Hospital	60,061
74	Ratchpipat Hospital	30,386
75	Public Health Center 63 Tiochewassthai Organization	250
76	Kasemrad sukappiban 3 Hospital	52,323
77	Sirinthon Hospital	20,699
78	Dacha Hospital	5,199
79	Bangpakok 5 Primary care unit	1,666
80	Bangpakok primary care unit	301
81	Patchkasem-Bangkhae Primary Care Unit	482
82	Patpanya Hospital	6,386
83	Patpanya 2 Clinic	1,813
84	Sahaclinic Kluaymanthai, Youwaratch branch	1,605
85	Kluaynamthai Primary Care Unit, Thungsonghoung branch	3,020
86	Kluaynamthai Primary Care Unit, Sukumvit 56 branch	1,929
87	Sahaclinicaobaun Kluaynamthai, Sathon Branch	2,984
88	Sahaclinic Kluaynamthai, Sukumvit 101/1 branch	3,413
89	Kluaynamthai Primary Care Unit, Sukumvit 93 branch	5,393
90	Kluaynamthai Primary Care Unit, Ratchada branch36	3,466
91	Kluaynamthai Primary Care Unit, Thonglor Soi 10 branch	2,867
92	Sahacclinic Kluaynamthai, Ram 2 branch	1,389
93	Kluaynamthai Primary Care Unit,Supapong3 branch (Sricon)	1,966
94	Kluaynamthai Primary Care Unit,Klongtoey branch (70 rai)	2,749
95	Navamin Clinic (Ladkrabang Industry Branch)	438
96	Navamin Primary Care Unit, Houngtakhe Branch	388
97	Navamin Primary Care Unit, Ramklow Branch	2,755

Table2.2 (Cont.) No. of registered population in each areas after annul 14 zones

No.	Contracted Providers	Registered Population
98	Navamin Primary Care Unit,Maharnakorn University Branch	1,000
99	Navamin 2 Primary Care Unit	2,523
100	Clinic Chumchonaobaun Kasemrad,Thungsonghoung branch	7,776
101	Kasemrad Primary Care Unit, Kaharomklow branch	6,950
102	Kasemrad Primary Care Unit, Phutthamonthon 2 branch	3,601
103	Kasemrad Primary Care Unit, Hatairatch branch	3,358
104	Kasemrad Primary Care Unit, Tubchanglang branch	103
105	Klongtoey Primary Care Unit	1,601
106	Klongton Primary Care Unit	3,696
107	Srivichaichimpree Primary Care Unit	644
108	Chatlada 1 Clinic	3,425
109	Lasalle Primary Care Unit	1,293
110	Romsrai Primary Care Unit	494
111	Bangbon Primary Care Unit	151
112	Bangkok Inter Primary Care Unit	1,333
113	Patchkasem 54 Primary Care Unit	23
114	Theantalay Clinic	229
115	Bangkunthein 2 clinic	9,912
116	Reaprarung Clinic	6,345
117	Clinicsongpat-Phutthaminthon	1,409
118	Tanarom Clinic	833
119	Phutabucha Clinic	149
120	Ananpattana Clinic	2,129
121	Community health clinic-Piyamin Op-on Vechakum Ram2	4,263
122	Community health clinic-Piyamin Op-on Vechakum WatTa-Klam	3,091
123	Community health clinic-Piyamin Op-on Vechakum Udomrak	2,820
124	Samutsakorn Hospital	0
125	Prakanong 48 Primary Care Unit	2,190
126	Samyan clinic	2,425
127	Kasemrad Primary Care Unit, Jatujak branch	2,460

Table2.2 (Cont.) No. of registered population in each areas after annul 14 zones

No.	Contracted Providers	Registered Population
128	Bangkunthien Primary Care Unit	6,079
129	Bangmod 3 Primary Care Unit	1,361
130	Krungthon 2 Primary Care Unit	4,598
131	Tung Karu Primary Care Unit	1,599
132	Praram 2 Primary Care Unit,Phettongkum branch	253
133	Bang Pai-Krajomthong Primary Care Unit	78
134	Patpanya Primary Care Unit, Pamkyhamhaeng 37 branch	2,458
135	Sukapiban 1 Primary Care Unit	1,011
136	Taw Poon Clinic	1,748
137	Bangna 1 Primary Care Unit, Ram 2 branch	1,600
138	Srinakarin clinic	2,352
139	Patpanya Primary Care Unit, On-Nuch 39	6,665
140	Pat Vechakum clinic	2,743
141	Sutinan Doctor Primary Care Unit	1,210
142	Chasapan 4 Primary Care Unit	1,226
143	Bangna 1 Primary Care Unit, Lasalle branch	4
144	Kasemrad Primary Care Unit, Dhurakitbandij branch	340
145	Department of Correction	8,983
Total		**3,427,541**

Updated Semtember 30th , 2003

2.1.2 Public Health Center 16 Lumpini

History

Established on 1966 form the Bangkok budget and opening on July 13,1967

Location

161/82 Soi Plokjit Praram 4 Rd. , Lumpini , Patumwan district, Bangkok

Responsibility

To response about the health promotion, preventive program and do some general treatment for student and people that allocate in Lumpini and Patumwan areas.

Household = 12,320
Population = 59,866
Family = 14,615
Men = 29,130
Female = 30,736

Total schools responsibility

Bangkok's school 3
Public's school 3
Private's school 7

Community responsibility

Slam community
Pattana-Bonkai
Soi Roam-ruedee
City community
Soi Polo
Soi Prajan
Sa rasin
Soi Plokjit
The back side of Patumwanaram Temple
Home community
Bonkai

Services

1. To service for Mother and child sanitation

1.1 Mother and child sanitation

- Take care of the pregnancy health
- Take care pregnancy after deliver
- Take care of new born and small child

1.2 Family planning

1.3 Sanitation in School

1.4 To do health promotion, Mental care and prevent drugs addicted

1.5 To do about the nutrition

1.6 Primary health care

2. To prevent and control the diseases
3. To services the general treatment

3.1 General treatment clinic

3.2 Dental care clinic

3.3 Drug addict clinic

3.4 TB clinic

3.5 Elderly clinic

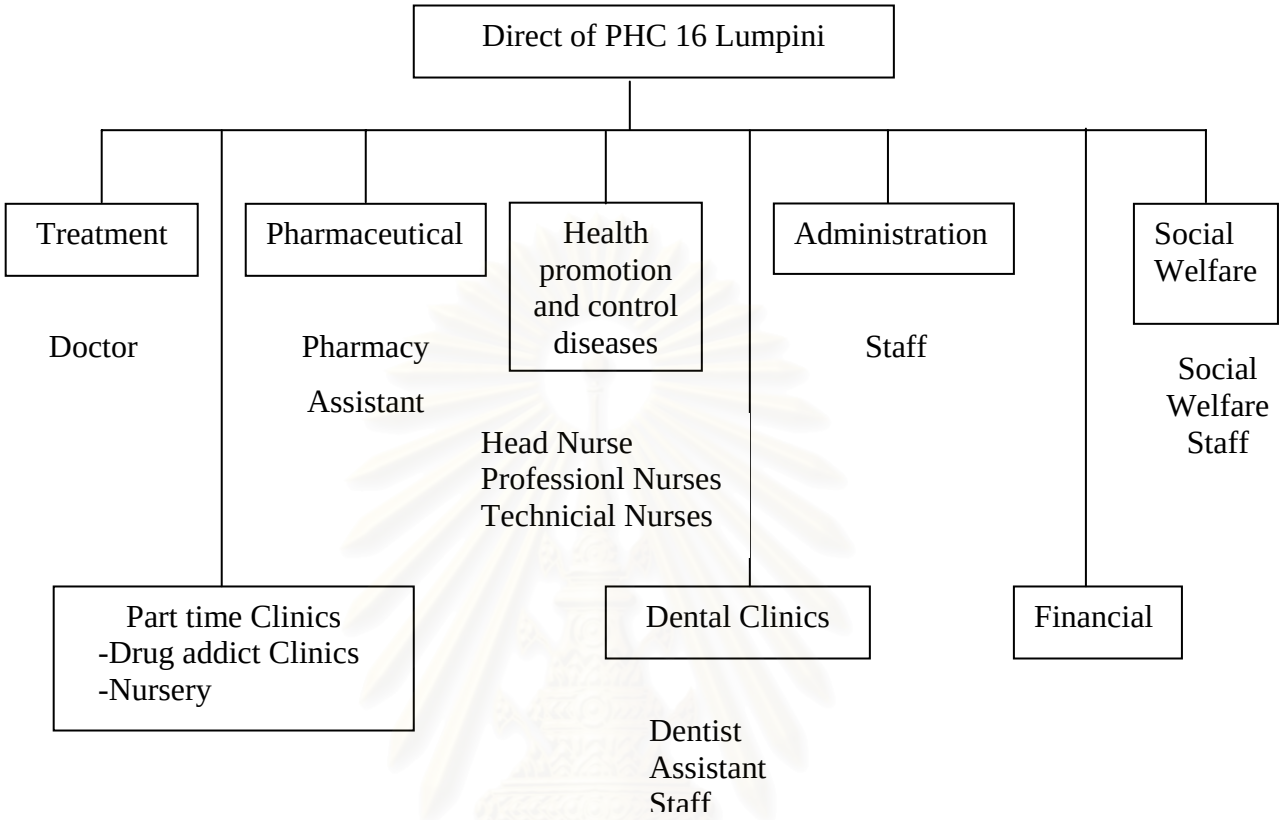
3.6 Diabetes and hypertension clinic

3.7 Part time Clinic (4.00-8.00 pm.)

Contact Hospital

King Chulalongkorn Memorial Hospital

Structure of Public Health Center 16 Lumpini



2.1.3 King Chulalongkorn Memorial Hospital

Location

Situated at 1873 Rama IV Road, Patumwan District, Bangkok 10330, the hospital is bordered by Henri Dunant Road on the west and Rajadamri Road on the east on an area of 136 rai with lawns and greenery. (www.md.chula.ac.th)

In 1999, the King Chulalongkorn Memorial Hospital offered services to 1,180,000 patients. Its services are divided into three categories:

1. General Clinic Monday – Friday 8.00 – 16.00 hrs
2. Extended Service Clinic Monday – Friday 16.30 –20.00 hrs Saturday 8.00 –12.00 hrs
3. Emergency Room Daily 24 hrs

The King Chulalongkorn Memorial Hospital offers both general and specific medical services and provides 1,479 beds for patients of every maladies.

The hospital provides medical services with modern technology as well as conducts research and develops its personnel of all levels on a regular basis. This is testified by the closed collaboration between the hospital and the Faculty of Medicine, Chulalongkorn University.

In addition, the hospital also serves as a training venue for medical students, residents, fellows of the Faculty of Medicine and the School of Radiological Technology.

Arguably, as a center for excellence in various medical disciplines, the hospital is strongly determined to further develop its services.

Out Patient Services of King Chulalongkorn Memorial Hospital

1. General Medicine Clinic
2. Cardiology Clinic+ Hypertension Clinic
3. Diabetes Clinic
4. Dermatology Clinic
5. Special Dermatology Clinic
6. Pulmonary Clinic
7. Endocline Clinic (thyroid,diabetes, etc)
8. Nutrition Clinic
9. Rheumatology Clinic
10. Gastroenterology Clinic
11. Geriatrics Clinic
12. Neurology Clinic
13. Allergy Clinic
14. Hematology Clinic
15. Oncology Clinic
16. Hepatology Clinic

17. General Health Check-up Clinic
18. Health Check-up for Going Overseas Clinic
19. Students' Welfare Clinic
20. Sexually Transmitted Disease Clinic
21. Occupational Medicine Clinic
22. General Orthopedic and Joint Surgery Clinic
23. Spine Clinic
24. Paediatric Orthopaedics Clinic
25. Hand and Microsurgery Clinic
26. Sport Medicine Clinic
27. Physical Medicine and Rehabilitation Clinic
28. Surgery Clinics
29. General Surgery Clinic
30. Plastic Surgery Clinic
31. Neurosurgery Clinic
32. Urosurgery Clinic
33. Cardio-Vascular and Thoracic Surgery Clinic
34. Colorectal Surgery Clinic
35. Forensic Medicine Clinic
36. Gynecology Clinic
37. Family Planning Clinic
38. Menopause / Climacteric Clinic
39. Gynecological Cancer Clinic
40. Family Planning Clinic
41. Menopause / Climacteric Clinic
42. Gynecological Cancer Clinic
43. Gestational Trophoblastic Clinic
44. Marital Relations Clinic
45. Antenatal Clinic
46. Infertility Clinic
47. General Paediatrics Clinic
48. Paediatric Hematology Clinic

49. Paediatric Respiratory Clinic
50. Paediatric Dermatology Clinic
51. Growth and Developmental Clinic
52. Paediatric Infectious Clinic
53. Paediatric Cardiology Clinic
54. Paediatric Endocrinology Clinic
55. Paediatric Neurology Clinic
56. Paediatric Immunology Clinic
57. Paediatric Gastroenterology Clinic
58. Nutrition Clinic
59. Well-baby Clinic Paediatric Surgery Clinic
60. Ear-Nose-Throat Clinic
61. Acupuncture Therapy Clinic
62. Ophthalmology Clinic
63. Phychiatry Clinic
64. Adult Psychiatry Clinic
65. Child and Adolescent Psychiatric Clinic
66. Dental Clinic
67. Social Welfare Clinic
68. Radiation Oncology Clinic

2.1.4 Chronic disease

Chronic diseases are prolonged conditions that often do not improve and are rarely cured completely. Diabetes, depression, congestive heart failure, hepatitis and asthma are the examples of chronic diseases. (www.healthservices.gov.bc.ca, 2004) Chronic illness has a profound effect on the physical, emotional and mental well-being of individuals, often making them difficult to carry on with daily routines and relationships. However, in many cases, deterioration in health can be minimized by the good care. This often depends upon individual choices made on a daily basis.

Chronic Disease management

Chronic disease management (CDM) is a systematic approach to improve health care for people with chronic diseases. Health care can be delivered more effectively and efficiently if the patients with chronic diseases take an active role in their own care and providers are supported with the necessary resources and expertise to better assist their patients in managing their illness.(www.healthservices.gov.bc.ca, 2004)

Diabetes

Diabetes is a disease in which the body does not produce or properly use insulin, which is a hormone that is needed to convert sugar, starches and other food into energy needed for daily life. The cause of diabetes continues to be a mystery, although both genetics and environmental factors such as obesity and lack of exercise appear to play important roles.(www.diabetes.org, 2003)

Diabetes means that your blood glucose (often called blood sugar) is too high. Your blood always has some glucose in it because your body needs glucose for energy to keep you going. But too much glucose in the blood isn't good for your health. (www.diabetes.com, 2004)

Glucose comes from the food you eat and is also made in your liver and muscles. Your blood carries the glucose to all the cells in your body. Insulin is a chemical (a hormone) made in a part of the body called the pancreas. The pancreas releases insulin into the blood. Insulin helps the glucose from food get into your cells. If your body doesn't make enough insulin or if the insulin doesn't work the way it should, glucose can't get into your cells. It stays in your blood instead. Your blood glucose level then gets too high, causing you to have diabetes.

The signs of diabetes are:

- Being very thirsty
- Urinating often

- Feeling very hungry or tired
- Losing weight without trying
- Having sores that heal slowly
- Having dry, itchy skin
- Losing the feeling in your feet or having tingling in your feet
- Having blurry eyesight

You may have had one or more of these signs before you found out that you had diabetes or you may have had no signs at all. People can get diabetes at any age.

In order to determine whether or not a patient has pre-diabetes or diabetes, health care providers conduct a Fasting Plasma Glucose Test (FPG) or an Oral Glucose Tolerance Test (OGTT). Either test can be used to diagnose pre-diabetes or diabetes. The American Diabetes Association recommends the FPG because it is easier, faster, and less expensive to perform.

With the FPG test, a fasting blood glucose level between 100 and 125 mg/dl signals pre-diabetes. A person with a fasting blood glucose level of 126 mg/dl or higher has diabetes.

In the OGTT test, a person's blood glucose level is measured after a fast and two hours after drinking a glucose-rich beverage. If the two-hour blood glucose level is between 140 and 199 mg/dl, the person tested has pre-diabetes. If the two-hour blood glucose level is at 200 mg/dl or higher, the person tested has diabetes.

Type 1 diabetes, formerly called juvenile diabetes or insulin-dependent diabetes, is usually first diagnosed in children, teenagers, or young adults. In this form of diabetes, the beta cells of the pancreas no longer make insulin because the body's immune system has attacked and destroyed them. (www.diabetes.com,2004)The results from the body's failure to produce insulin, the hormone that "unlocks" the cells of the body, allowing glucose to enter and fuel them. Insulin is necessary for the body to be able to use sugar. Sugar is the basic fuel for the cells in the body, and insulin takes the sugar from the blood into the cells.(www.diabetes.org, 2003)

Finding out you have diabetes is scary. But don't panic. Type 1 diabetes is serious, but people with diabetes can live long, healthy, happy lives.

Treatment for type1diabetes includes taking insulin shots or using an insulin pump, making wise food choices, exercising regularly, taking aspirin daily, and controlling blood pressure and cholesterol.

Type 2 diabetes, formerly called adult-onset diabetes or non-insulin-dependent diabetes, is the most common form of diabetes. People can develop type 2 diabetes at any age -- even during childhood. In type 2 diabetes, the pancreas does not make enough insulin, and the fat, muscle, or liver cells do not use it properly. (www.diabetes.com) Insulin is necessary for the body to be able to use sugar. Sugar is the basic fuel for the cells in the body, and insulin takes the sugar from the blood into the cells. When glucose builds up in the blood instead of going into cells, it can cause two problems: (www.diabetes.org, 2003)

- Right away, your cells may be starved for energy.
- Over time, high blood glucose levels may hurt your eyes, kidneys, nerves or heart.

Type 2 diabetes is a chronic disease characterized by high sugar levels and the body's inability to use and/or produce insulin. Sometimes the pancreas does not produce enough insulin. Other times, the cells throughout the body become resistant to the insulin produced by the pancreas, and it is much more difficult for the sugar to enter the cells. This is known as insulin resistance. Being overweight can increase the chances of developing type2 diabetes. Treatment includes using diabetes medicines, making wise food choices, exercising regularly, taking aspirin daily, and controlling blood pressure and cholesterol. (http://care.diabetesjournals.org, 2004)

Criteria for the diagnosis of diabetes

1. Symptoms of diabetes and casual plasma glucose 200 mg/dl (11.1 mmol/l). Casual is defined as any time of day without regard to time of day without

regard to time since last meal. The classic symptoms of diabetes include polyuria, polydipsia, and unexplained weight loss.

2. Fasting Plasma glucose (FPG) 126 mg/dl (7.0 mmol/l). Fasting is defined as no caloric intake for at least 8 hours.

3. 2 –h PG 200 mg/dl (11.1 mmol/l) during an OGTT. The test should be performed as described by the World Health Organization, using a glucose load containing the equivalent of 75-g anhydrous glucose dissolved in water.

People with diabetes work to keep their blood sugar (glucose) as near to normal as possible. Keeping your blood glucose in your target range can help prevent or delay the start of diabetes complications such as nerve, eye, kidney, and blood vessel damage.

When you learned you had diabetes, you and your health care team worked out a diabetes care plan. The plan aims to balance the foods you eat with your exercise and, possibly, diabetes pills or insulin. You can do two types of checks to help keep track of how your plan is working. These are blood glucose checks and urine ketone checks.

Blood Glucose Monitoring Checks

Blood glucose monitoring is the main tool you have to check your diabetes control. This check tells you your blood glucose level at any one time. Keeping a log of your results is vital. When you bring this record to your health care provider, you have a good picture of your body's response to your diabetes care plan. Blood glucose checks let you see what works and what doesn't. This allows you and your doctor, dietitian, or nurse educator to make needed changes.

Here is the list blood glucose ranges for adults with diabetes:

Glycemic control	
A1C	<7.0%
Pre-prandial plasma glucose	90–130 mg/dl (5.0–7.2 mmol/l) Under Controlled
Postprandial plasma glucose	<180 mg/dl (<10.0 mmol/l)
Blood pressure	<130/80 mmHg
Lipids	
LDL	<100 mg/dl (<2.6 mmol/l)
Triglycerides	<150 mg/dl (<1.7 mmol/l)
HDL	>40 mg/dl (>1.1 mmol/l)

Complication

Heart Disease

People with diabetes have extra reason to be mindful of heart and blood vessel disease. Diabetes carries an increased risk for heart attack, stroke, and complications related to poor circulation.(www.diabetes.org,2003)

Kidney Disease/Kidney Transplantation

Diabetes can damage the kidneys, which not only can cause them to fail, but can also make them lose their ability to filter out waste products.

Eye Complications

Diabetes can cause eye problems and may lead to blindness. People with diabetes do have a higher risk of blindness than people without diabetes. Early detection and treatment of eye problems can save your sight.

Neuropathy and Nerve Damage

One of the most common complications of diabetes is diabetic neuropathy. Neuropathy means damage to the nerves that run throughout the body, connecting the spinal cord to muscles, skin, blood vessels, and other organs.

Foot Complications

People with diabetes can develop many different foot problems. Foot problems most often happen when there is nerve damage in the feet or when blood flow is poor. Learn how to protect your feet by following some basic guidelines.

Skin Complications

As many as one-third of people with diabetes will have a skin disorder caused or affected by diabetes at some time in their lives. In fact, such problems are sometimes the first sign that a person has diabetes. Luckily, most skin conditions can be prevented or easily treated if caught early.

Gastroparesis and Diabetes

Gastroparesis is a disorder that affects people with both type 1 and type 2 diabetes

Hypertension

Hypertension or High blood pressure means high pressure (tension) in the arteries. (www.medicinenet.com, 2004)The arteries are the vessels that carry blood from the pumping heart to all of the tissues and organs of the body. High blood pressure does not mean excessive emotional tension, although emotional tension and stress can temporarily increase the blood pressure.

Table 2.3 Classification of blood pressure for aged 18 and older

Category	**Systolic (mmHg)**	**Diastolic (mmHg)**
Optimal	< 120	And < 80
Normal	< 130	And < 85
High normal	130 - 139	Or 85-89 Under Controlled
Hypertension		
Stage 1	140 - 159	Or 90-99
Stage 2	160 - 179	Or 100 – 109
Stage 3	> 180	0r >110

Data source: The Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure 1997

The systolic blood pressure, which is the top number, represents the pressure in the arteries as the heart contracts and pumps blood into the arteries. The diastolic pressure, which is the bottom number, represents the pressure in the arteries as the heart relaxes after the contraction. The diastolic pressure, therefore, reflects the minimum pressure to which the arteries are exposed.

An elevation of the systolic and/or diastolic blood pressure increases the risk of developing heart (cardiac) disease, kidney (renal) disease, hardening of the arteries (atherosclerosis or arteriosclerosis), eye damage, and stroke (brain damage). These complications of hypertension are often referred to as end-organ damage because damage to these organs is the end result of chronic (long duration) high blood pressure. Accordingly, the diagnosis of high blood pressure in an individual is important so that efforts can be made to normalize the blood pressure and, thereby, prevent the complications.

Whereas it was previously thought that diastolic blood pressure elevations were a more important risk factor than systolic elevations, it is now known that for individuals older than 50 years of age systolic hypertension represents a greater risk.

The follow-up recommended for high blood pressure

Diagnosis of the hypertensive should consider carefully and accurately. The hypertension patients in stage I should to recheck in 2 months, stage II should to recheck and evaluate in 1 month and stage III should to evaluate or refer to resource of care immediately or with 1 week depending on clinical situation.

Table2.4 Recommendations for follow up based on initial blood pressure measurement for adults

Initial Blood Pressure (mmHg)		**Follow-up Recommended**
Systolic	**Diastolic**	
< 130	And < 85	Recheck in 2 years
130 - 139	Or 85-89	Recheck in 1 year
140 - 159	Or 90-99	Confirm within 2 months
160 - 179	Or 100 – 109	Evaluate within 1 month
> 180	0r >110	Evaluate or refer to source Of care immediately or Within 1 week depending On clinical situation

Data source: The Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure 1997

The causes of high blood pressure

Two forms of high blood pressure have been described--essential (or primary) hypertension and secondary hypertension. Essential hypertension is a far more common condition and accounts for 95% of hypertension. The cause of essential hypertension is multifactor, that is, there are several factors whose combined effects produce hypertension. In secondary hypertension, which accounts for 5% of hypertension, the high blood pressure is secondary to (caused by) a specific abnormality in one of the organs or systems of the body. (Secondary hypertension is discussed further in a separate section below.)

Essential hypertension affects approximately 75 million Americans, yet its basic causes or underlying defects are not always known. Nevertheless, certain associations have been recognized in people with essential hypertension. For example, essential hypertension develops only in groups or societies that have a fairly high intake of salt, exceeding 5.8 grams daily. In fact, salt intake may be a particularly important factor in relation to essential hypertension in several situations. Thus, excess salt may be

involved in the hypertension that is associated with advancing age, African American background, obesity, hereditary (genetic) susceptibility, and kidney failure (renal insufficiency).

Genetic factors are thought to play a prominent role in the development of essential hypertension. However, the genes for hypertension have not yet been identified. (Genes are tiny portions of chromosomes that produce the proteins that determine the characteristics of individuals.) The current research in this area is focused on the genetic factors that affect the renin-angiotensin-aldosterone system. This system helps to regulate blood pressure by controlling salt balance and the tone (state of elasticity) of the arteries.

Approximately 30 % of cases of essential hypertension are attributable to genetic factors. For example, in the United States, the incidence of high blood pressure is greater among African Americans than among Caucasians or Asians. Also, in individuals who have one or two parents with hypertension, high blood pressure is twice as common as in the general population. Rarely, certain unusual genetic disorders affecting the hormones of the adrenal glands may lead to hypertension. (These identified genetic disorders are actually considered secondary hypertension.)

The vast majority of patients with essential hypertension have in common a particular abnormality of the arteries. That is, they have an increased resistance (stiffness or lack of elasticity) in the tiny arteries that are most distant from the heart (peripheral arteries or arterioles). The arterioles supply oxygen-containing blood and nutrients to all of the tissues of the body. The arterioles are connected by capillaries in the tissues to the venous system (or the veins), which returns the blood to the heart and lungs. Just what makes the peripheral arteries become stiff is not known. Yet, this increased peripheral arteriolar stiffness is present in those individuals whose essential hypertension is associated with genetic factors, obesity, lack of exercise, overuse of salt, and aging. Inflammation also may play a role in hypertension since a predictor of the development of hypertension is the presence of an elevated C reactive protein level (a blood test marker of inflammation) in some individuals.

2.2 Cost Criteria

Cost allocation criteria

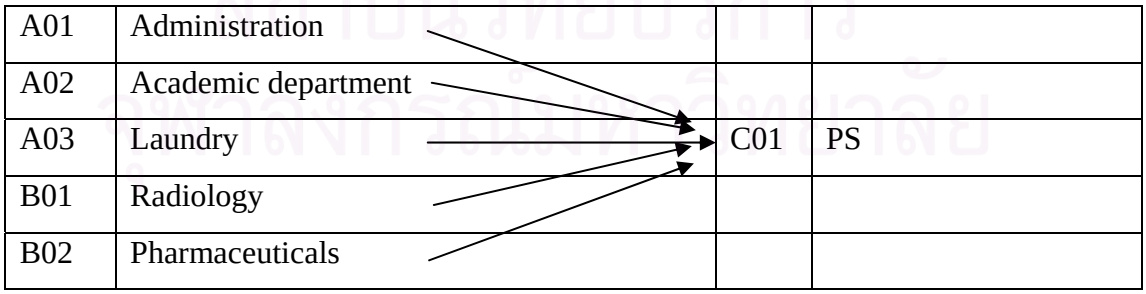
An allocation criterion is the criteria to be designed to allocate costs of any department which do not generate revenues. It indicates relationship of between activity and services of one cost center to others. (Yoawared, 2001)

There are many way to allocated the cost and in each way has some different (Berman HJ., 1986)

1) Direct Distribution Method

Direct distribution method is provided for allocation of the transient cost centre (TCCs) to the absorbing cost centre (ACCs). The interdepartmental demands among the general service centers are ignored. Then the actual or expected costs assigned to the general service centers are apportioned directly to the patient service centers. The major advantages of the direct apportionment method are its simplicity and the ease with it is understood. The major disadvantage is that it fails to reflect interdepartmental exchanges among the general service centers.

Figure 2.1 The relationship of the cost center by direct distribution method(Viroj,1997)

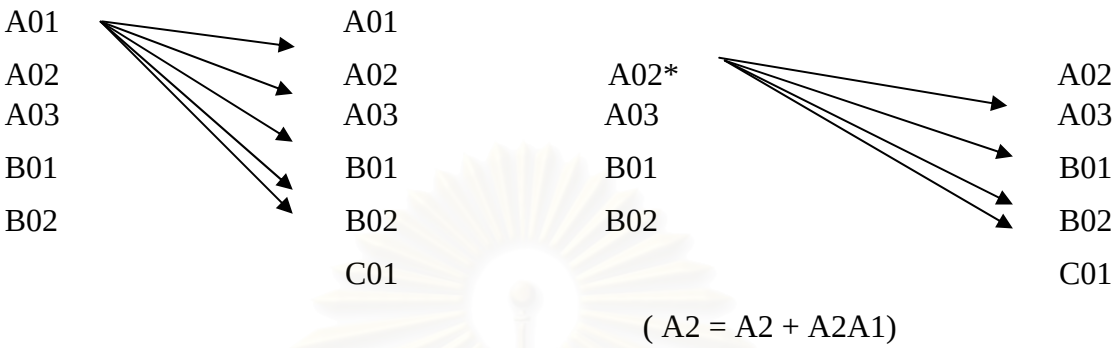


2) Step Down Method

Step down method is provided for the allocation of the costs of general service centers to other general service units and in turn to patient service of final cost centers. Under this method, the advantages are the costs of the general service center serving the most departments (both general service and patient service) had allocated first. The cost of the general center serving the second largest numbers of departments are allocated next, and so on. If two departments serve an equal number of departments, another criterion such as relative costliness should be used to determine the order of apportionment.

The total cost of the first general service center is apportioned to each of other centers. Next, the total cost of the second general service center and the apportionment from the first to the second general service center are allocated to each of the remaining support centers to the patient centers. The disadvantage is the first general service center is closed and no allocation from other support centers to this unit is permitted under the step down method. Similarly, once the accumulated costs in the remaining centers are apportioned, these unit the total costs accumulated in the last general service center are apportioned directly to the patient service or final cost center.

Figure 2.2 The allocation of the cost result from the use of the step down method (Viroj, 1997)

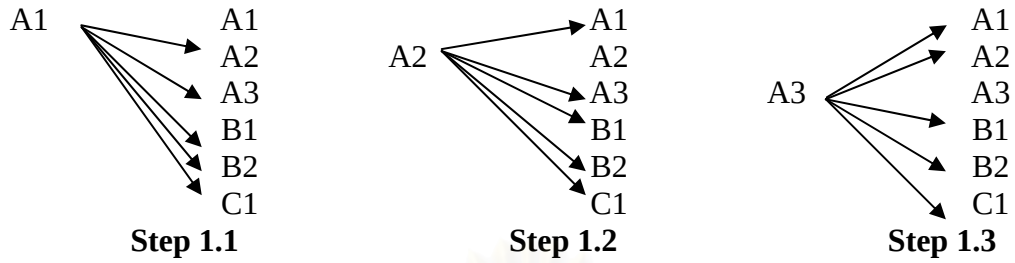


A03*	A03				
B01	B01	B01*	B01		
B02	B02	B02	B02	B02*	B02
	C01		C01		C01
(A3*=A3+A3A1+A3A2)		(B1*=B1+B1A1+B1A2+B1A3)		(B2*= B2+B2A2+B2A2+B2A3+B2B1)	
Step 3		**Step 4**		**Step 5**	

3) Double Distribution Method

The double distribution method uses two rounds of allocations. This tends to overcome some of the weaknesses inherent in the step down. In the first distribution, the costs assigned to the general service units are allocated to all the other departments (both general service and patient service) in accordance with measures of the relative demand exerted on the entity whose costs are apportioned. After the first distribution, the cost allocated to the general service units them are redistributed to the final cost centers either the direct or the step down method.

Figure 2.3 The first allocation step of Double distribution method (Viroj, 1997)



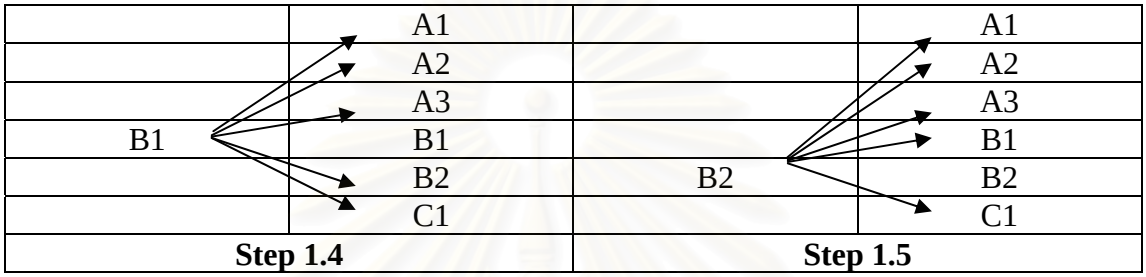
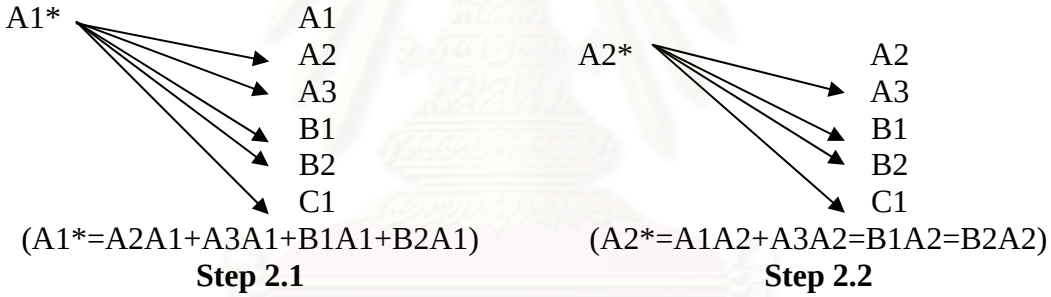
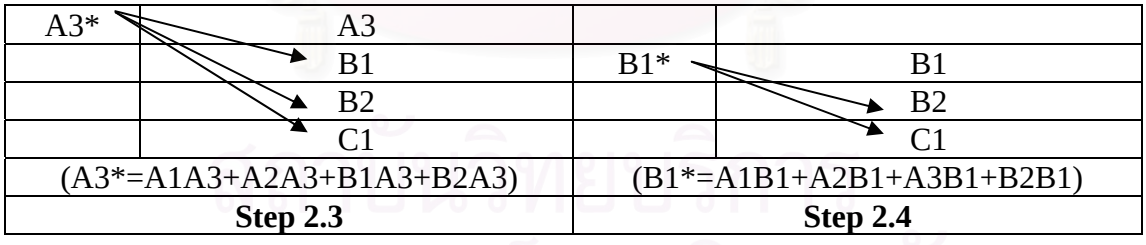
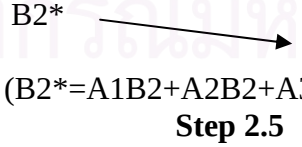


Figure 2.4 The second allocation step of Double distribution method (Viroj, 1997)







4) Simultaneous equations method

This method uses infinite round of allocation unit. The advantage is no cost left in that cost center. The calculation is done by computer excel program. The result under this method is the most accurate among the results of all methods. But the disadvantage is that it can not show how the cost of one cost center is allocated to other cost centers.

Relate data from step down method, the illustration of the cost finding techniques has been simplified by assuming that the hospital is composed of three general service centers and three final cost centers. However, when performing cost analysis in a hospital consisting of many general service and final cost centers, it is necessary only to expand the number of rows and column of the matrix accordingly. For instance, suppose that the hospital is composed of five general service centers and five final cost centers. The accommodate such an organizational arrangement; we might modify the matrix equation.

To use multiple distributions to best advantage, a computer should be used. In fact, a method of distributing interrelated costs has been devised in which simultaneous equations are programmed on a computer.

Several researches were done to determine unit costs of hospital services. There were many health studies concerning in cost. The methodology of each was different in details, but the main objective was to use the results as a tool to manage the limiting resources of the organization.

Figure2.5 Show the relationship of the simultaneous Equation method

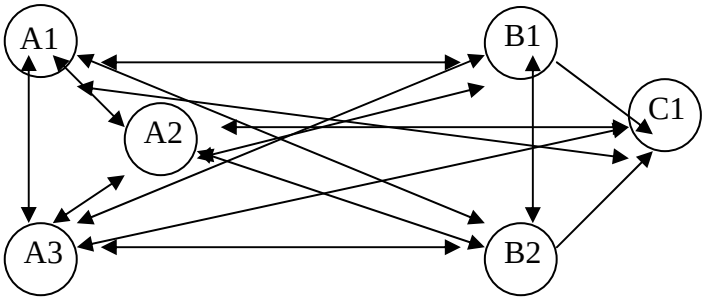


Table2.5 Comparison between the cost allocation methods

	Direct	Step down	Double	Simultaneous
Receive cost when allocated to other	No	No	Yes	Yes
Allocated into TCCs	No	Yes	Yes	Yes
Equality in TCCs	Yes	No	Yes	Yes
No. of allocated step	1	1	2	infinity
Difficulty	Easy	Easy	Medium	Difficult
Computer used	No	No	No	Necessary
Accumulate	Accept	Accept	High	Highest

2.3 Review of the previous Study

Pirom Kamolratanakul, Jiruth Sriratanaban, Sureerat Ngamkaitphaisan. (2001) studied about the Cost Analysis of Patient Services in King Chulalongkorn Memorial Hospital: Patients Services Areas.The Purposes of this research were to explore the total cost and unit cost of out-patient department (OPD) and in-patient department (IPD) services in each patient ward, cost of health welfare patient, health care cost of hospital personnel, cost of each Diagnosis Related Group (DRG), cost of laboratory tests and radiological investigations from the provider perspective. Data were collected in 6 months, during October 1, 2000 – March 31, 2001. The hospital departments were grouped into (1) 30 Non-revenue Producing Cost Centers (NRPCCs). (2) 26 Revenue Producing Cost Centers (RPCCs), and (3) 89 Patient Service areas (PS).The hospital direct costs were categorized to labour cost (LC), material cost (MC), and capital cost (CC). Two approaches of categorization of full cost applied: (1) total direct cost (TDC) and total indirect cost (TIC), and (2) routine service cost (RSC) and medical care cost (MCC). The simultaneous equation method was used to allocate cost from NRPCCs and RPCCs to PSs. The total costs of treating 425 DRGs cost based on 19,191 patients were calculated from the unit cost of wards and operation rooms. The analysis also inclined 450 laboratory tests and 163 radiological investigations.

Based on the data of 183,814 in-patient days, it was found that the general IPD services, excluding critical care unit, cost 1,089,842,638 baht in total or 5,929.05 baht

per patient day. The structures of the cost were that LC: MC: CC equal 20: 67: 13, TDC: TIC equal 60:40, and RSC: MCC equal 62.63: 37.37

The OPD services totaled 462,422 visits incurring 832,297,031 baht of total cost, or 1,799.86 baht per visit on average. The structures of the cost were that LC: MC: CC equal 4: 91:6, TDC: TIC: equal 78: 22 and RSC: MCC equal 32.75:67.25

There were 12,467 patients days of critical inpatient care services costing 209,539,109 baht, or 18,374.68 baht per patient day. The structures of the cost were that LC: MC: CC equal 22: 61: 17, TDC: TIC equal 70: 30, and RSC: MCC equal 58.91: 41.09

There were nine operation rooms, 50 operation beds, costing 149,497,765 baht in total or 2,428.57 baht per hour bed on average.

The OPD services of health welfare patients in 6 months totaled 46,001 visits, costing 31,868,380 baht or 692.78 baht per visit on average. The destitute IPD patient totaled 8,373 admissions, costing 340,693,225 baht in total, 4, 8552.63 baht per patient day or 40,689.50 baht per admission.

The total cost results lead to the guidelines to plan for contracting the health insurance systems. The hospital board of directors and department chiefs including NRPCC, RPCC and PS departments and units should consider engineering their work systems, human resources systems, material control systems, and durable articles as well as hospital space using for the most benefit in order to decrease the service costs. Nevertheless, the cost containment should preserve the service quality of each unit. In addition, the charge price should be revisal.

Siwanee Santanee (1998) conducted cost of medicine check up in common chronic diseases among the elderly. The objectives of the research are to determine

(1) The providers' unit cost of medicine check-up for the elderly by type of health care services each individual.

(2) The providers' total cost of medical check-up for elderly.
(3) The providers' total cost of medical check-up for three common chronic illnesses among the elderly namely: hypertension, diabetes, and ischemic heart diseases
(4) The study will also determine the recovery ratio of the medical check-up cost in term of the providers' unit cost by each type of health care services.

The study compares the cost of Chulalongkorn medical check-up program with the World Health Organization standard medical program. The study also conducted a retrospective data collection of medical check-up cost from secondary data sources at Chulalongkorn Hospital during 1996-1997. The data were then analyzed into direct and indirect cost, which were then in turn disaggregated into labor cost, equipment cost, material cost, public utility cost and the cost for testing the accuracy standard of equipments.

The study found that the total medical check-up cost of each individual elderly is 796.61. The cost of the hypertension is 220.34 baht. For diabetes mellitus is 212.26 baht and 341.29 baht for ischemic heart diseases. This study found the cost recovery ratio for Chulalongkorn Hospital to be 1.10. Based on the estimated forecast population increase between 1990-2010 done by the population division of the Nation Economics a Social Development cost of the elderly for the year 1998.In year 1998 the population increased 173,720 people. The estimate costs of 2000-2002 years are 1,555,796,872 baht, 1,598,935,677 baht and 1,644,364,356 baht respectively.

Poompat Chumchia (1999) studied about cost analysis of diabetic outpatients of health cardholders and non-health cardholders in Sena Hospital. It's concern about the low cost recovery in the public health facilities that provide health care for chronic diseases. Diabetes is the chronic and costly disease due to its complications. The objective of this study is to analyze the provider cost for diabetics at OPD in Sena Hospital for both Health Care holders and non Health Care holders. He found that the cost per visit for diabetes in each group (1) diabetics without complications, (2) diabetics with hypertension and (3) diabetics with heart diseases. The cost per visit who

are Health Card holders is 339.90, 636.13 and 748.74 baht, respectively and the annual cost per person per year was 2,461.31, 5,209.90 and 6,311.88 baht, respectively, with the annual cost per person per year 2,413.33, 5,156.66 and 6,294. baht, respectively. The cost per visit for diabetics out of pockets was 334.72, 631.17 and 746.72 baht, respectively, with the annual cost per year 2,413.33, 5,156.66 and 6,294.85 baht, respectively. The cost per visit for diabetics in the elderly group was 365.72, 706.19 and 750.98 baht, respectively, and the annual cost per person per year was 2,655.13, 5889.62 and 6,383.33 baht, respectively. The average utilization rate among the 3 groups of diabetics is quite high but slightly different among the elderly, the out of pocket and Health Card holders at 8.07, 7.94 and 7.91 visits per person per year, respectively. However, the estimated cost per visit of the out of pocket cases in these 3 groups only based on small sample sizes. Especially, in diabetics without complications and diabetics with heart disease, the sample size was only one case each.

Vidhavas La-orkhun (2002) studied about cost analysis of inpatient children with heart disease at Chulalongkorn Memorial hospital. The objective is to study the total cost and unit cost of the inpatient children with heart disease at King Chulalongkorn Memmorial Hospital. The patients admitted to pediatric inpatient cardiology unit during June 1, 2002-November 30, 2002. Medical care cost was collected from the patient's record and routine service cost used data from "Cost analysis of the patients services in King Chulalongkorn Memorial Hospital" by Pirom Kamolratanakul, 2001. The average cost per one patient, cost per different methods of treatment, cost per different types of heart diseases and cost per different age group of patient were calculated. During the study period, 175 patients were admitted and there were 2,165 patient days. The average patient day was 12.4 days. Total medical care cost , cost per one patient , cost per one patient day was 8,747,037 baht , 49,4983.07 baht and 4,040.20 baht respectively. Total cost per one patient was 95,343.90 baht, and total cost per one patient day was 7,706.78 baht. The medical care cost encountered 52% of the total cost and the cost from surgery was 43% of medical care cost. Patient with high treatment cost included newborn patient, patient with cyanotic heart disease, and patient who need surgical treatment. The cost for treatment children with heart

diseases was high; newborn patients, patient with cyanotic heart diseases and patient who need surgical treatment.

Jeerawan Wannawake (1990) studied about a study of unit cost of the out-patient in Chulalongkorn Hospital. The out-patient department (O.P.D) of Chulalongkorn Hospital, one of the most modernized O.P.D in Asia, consists of 24 floors fully equipped with modern technologies. The cost of building the facility was approximately US $20,000,000 in 1989. Because of these high costs, the administrator of the hospital needs additional management information for future plan. The objective of this study is to find the unit cost of the out-patient department in the fiscal year of 1990 from the perspective of providers. This is a descriptive study to collected data by using prospective and retrospective surveys. All sections of the out-patient department will be classified into three cost centre categories: patient service, revenue calculated from labor cost, material cost and capital cost in each centre. Costs will be then allocation criteria. The final full costs of the patient service will be divided by the total number of the patient visits to produce the unit costs. The ratio of labor cost: material cost: capital cost was 3: 6: 2. The unit cost of the out-patient department at Chulalongkorn Hospital was 241.73 baht. Routine service costs and costs from revenue-producing cost centers are 46.24 and 52.76 percent respectively.

Supasit Pannarunothai (1998) studied about cost- effectiveness of DM and high blood pressure care management compared between urban medical centre and Nakornratchasrima Hospital. The purpose of this research is to analyst activity based costing of the urban medical centre and analyst the cost- effectiveness of DM and high blood pressure care management on provider and consumer perspective. Major finding were as follows; the urban medical centre had the total cost 3,725,517.64 baht. The total cost care from labor cost 45.76%, medical cost 43.30% and non-medical cost 32.95% of the total cost. The unit cost of the Nakornratchasrima Hospital was 196 baht/unit. The cost- effectiveness of the diabetes patients in provider perspectives at the urban medical centre was about 3,051 baht, Nakornratchasrima Hospital (in district) was about 3,540 baht and Nakornratchasrima Hospital (outside district) was about 4,573 baht. The cost- effectiveness in patient perspective was 4,651 , 9.339 and 14,151

retrospectively. For the hypertensive diseases, at the urban medical centre was about 1,277 baht Nakornratchasrima Hospital (in district) was about 1,609 baht and Nakornratchasrima Hospital (outside district) was 1,621 baht. The cost- effectiveness of high blood pressure in patient perspectives were 4,575 , 5,791 and 5,880 baht retrospectively. The cost- effectiveness in diabetes patients has a lot of different but the cost- effectiveness in hypertension patients weren't too much different. Because the physician had often visited to diabetes patient house more than hypertension Patients house and the effectiveness of the hypertensive diseases weren't different as the diabetes.

CHAPTER III

RESERCH METHODOLOGY

In this chapter, it can be divided into four parts. Those are study design, conceptual framework, cost and effectiveness.

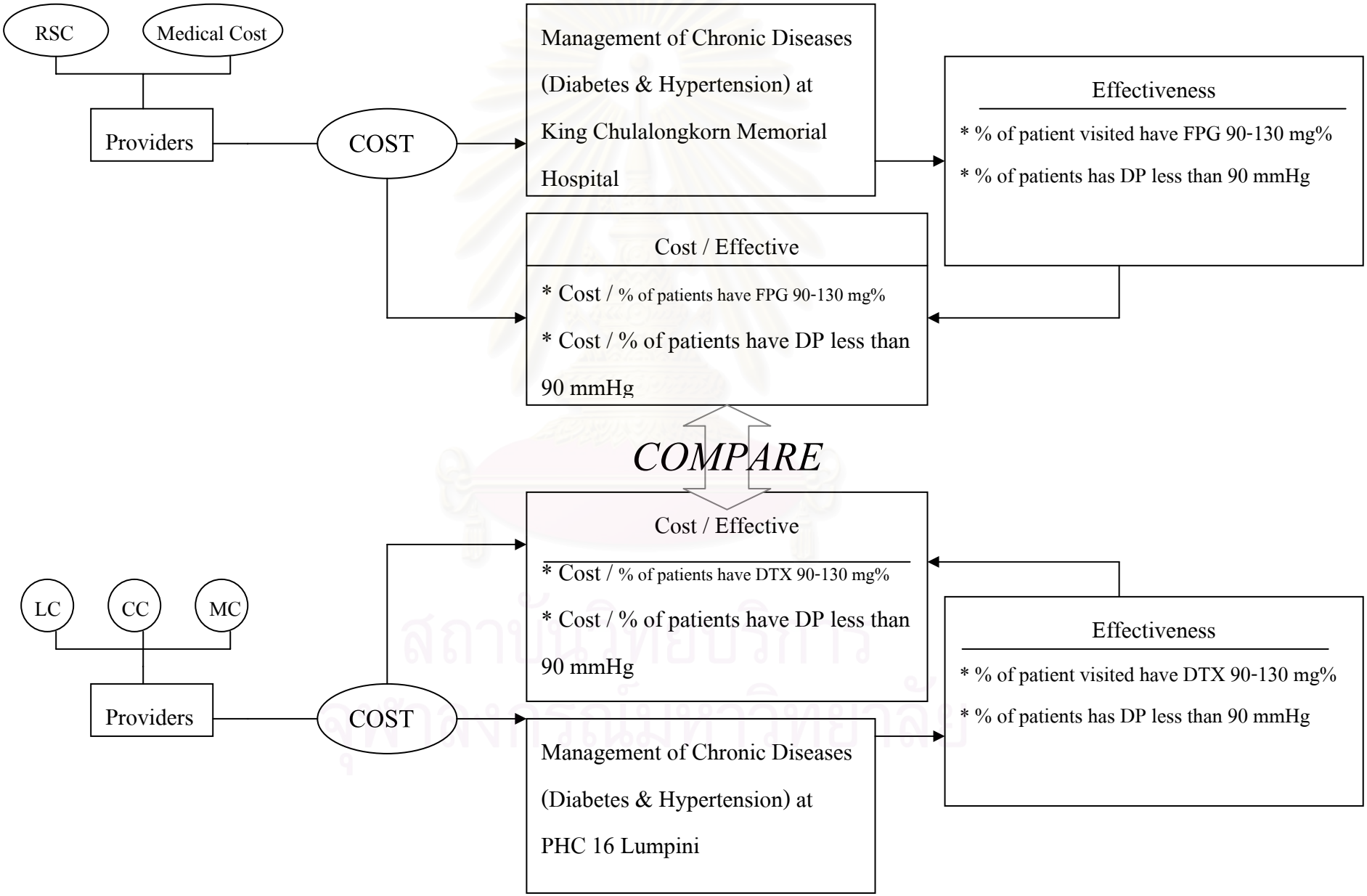
3.1 Study Design

This is the retrospective study in order to answer the following questions. The first question in this study is to answer how to estimate the cost of chronic disease management. The another question is how to determine the effectiveness of chronic disease management and compare the cost-effectiveness of chronic disease management between the King Chulalongkorn Memorial Hospital and the Public Health Center 16 Lumpini. It is the descriptive design by using the secondary data from the King Chulalongkorn Memorial Hospital and the Public Health Center 16 Lumpini since 1 Oct,2003 until 30 Sep,2004.

3.2 Conceptual Framework

Due to the conceptual framwork of this study, it can be catagorized into three parts. First of all, the data analysis of this study is during 1 Oct, 2003 – 30 Sep, 2004 and the cost component of the Public Health Center 16 Lumpini can be identified as the labor cost, the material cost and the capital cost. The cost collected from the King Chulalongkorn Memorial Hospital sides can be catagorized into the routine service cost and the medical cost. Secondly, in this study, the data analysis is scoped on the patients who pass all criteria such as the patients who is non-complicated. The effectiveness measures in terms of disease controllability. The result can be expected to illustrate in the effectiveness part. Last but not least, this study is to compare the cost-effectiveness ratio between the King Chulalongkorn Memorial Hospital's cost-effectiveness and the Public Health Center 16 Lumpini's cost-effectiveness.

Figure 3.1 Conceptual framework of this study



3.3 Cost

3.3.1 Perspective or point of view

The cost from provider perspectives means the expenditure that occurs from the services which provider prepared to the patients; the labor cost, the material cost and the capital cost.

3.3.2 Cost at Public Health Center 16 Lumpini

The cost allocation criteria in this study follows the district hospital costing manual step from the ministry of public health in Thailand (Viroj T., 2004)

3.3.2.1 To analyze the system and administrative structure for classify the department to the cost center. Cost by the cost center divided in 3 group

- Non-revenue producing cost center (NRPCC)
  Non-revenue producing cost center are cost centers that does not charge directly for their services. They provide supporting services to both other non- revenue producing costs centers, revenue producing cost centers, and patient services for example, housekeeping, administration and laundry etc. These cost centers do not produce revenue to the hospital.
- Revenue producing Cost center (RPCC)
  Revenue producing cost centers are cost centers that are not only to provide services responsible but also generate revenue by those services to the hospital such as laboratory and physiotherapy etc.
- Patient services (PS)
  Patient services are the cost centers that are responsible directly for patient services. It is separated in 2 parts that are outpatient and inpatient.

3.3.2.2 To calculate the total direct cost

1. Labor Cost

The labour cost is the expenses paid to the employee in returns of services rendered including others monetary fringe benefit such as wage, salary and overtime.

2. Material cost

The material cost is the cost of resources that have duration less than one year including the utility expenses, for example, the water supply expense, the electrical expense and the maintenance expense for durable equipment and building.

3. Capital cost

The capital cost is the cost of resources which have a useful life of one year or more. These include the cost of buildings, equipment and vehicles. Capital costs were collected in terms of each cost center and were checked to the equipment register of each cost centers.

The cost of equipment and building were calculated from the purchases prices to be the cost in the present year or assessed from the price list which could be purchased in that year.

The capital cost in the present year was calculated from the purchased price in year t by the following formula. Straight-line Method (Michael M.Coltman (1982) uses to spreads the cost of the asset, less any estimated trade-in or scrap value, equally over each year of the life of the asset. The equation for calculating the annual amount of depreciation is

$$\frac{\text{Cost of asset} - \text{Trade in Value}}{\text{Service life of assets in year}}$$

For example, there are initial cost 16,000 baht; trade in value 1,000 baht, at end of five year life. Annual depreciation will, therefore, be

$$\frac{16{,}000\text{-}1{,}000}{5 \text{ years}} = \frac{15{,}000}{5} = 3{,}000 \text{ baht per year}$$

In the provider side, the retrospective determination of provider cost. The cost of individual treatment of each patient due to the number of patient and unit cost will be calculated as the following formula.

Total Direct Cost = Labor Cost + Material Cost + Capital cost

3.3.2.3 OPD cost calculated

The cost in provider perspectives was allocated by using the simultaneous equation method. The unit cost of diabetes mellitus and hypertension diseases was calculated by the proportions of visited in OPD.

Table3.1 The cost component and measurement of provider perspectives at Public Health Center 16 Lumpini

Perspective	The cost component	Measurement	Value
Provider	1. Labor cost - Doctors - Dentist - Pharmacy - Nurses - Nurse aids - Social welfare staff - Health Worker - Security	- Baht/year	Time allocation for patient (hour)
	2. Capital cost 2.1 Equipment - Office equipment - Medical equipment 2.2 Building	 -Time allocation (Apportion) -Space utilization (sq.m)	 - Depreciate the equipment's cost - Depreciate the building's price.
	3. Material cost 3.1 Medical equipment - Medicine - Laboratory - Small equipment 3.2 Office equipment 3.3 Public utility - Telephone - Electricity - Water Supply - Maintenance	 - Unit of used - Number of test - Unit of used - Unit of used - Unit of used - Unit of used - Unit of used - Unit of used	 - Cost - Cost - Cost - Calculated from the bill of the PHC 16 Lumpini (apportion)

3.3.3 Cost at King Chulalongkorn Memorial Hospital

The cost at the King Chulalongkorn Memorial Hospital used the secondary data from the King Chulalongkorn Memorial Hospital's database and the cost analysis of the Patients Services at the King Chulalongkorn Memorial Hospital by Sureerat Ngamkiatphaisan (2003). In this study, it divided cost into two groups as following:

1. Routine service cost

The routine service cost refers from the cost analysis of Patients Services at the King Chulalongkorn University by Sureerat Ngamkiatphaisan (2003) and the routine service cost in 2003 was adjusted by the percentage of change in the consumer price index to the cost in the year 2004. The routine service cost was based on year 2002.

The consumer price index (CPI) is calculated to measure the average price movements of goods and services purchased by households throughout the country. It reflects the change of the cost of purchasing goods and services in a fixed “market basket”, but it is not designed to measure changes of the cost of living attributed to changes in the consumption structure of households. (www.stat.go.jp, 2005)

The computation of the rate of change in CPI can be calculated as follows:

$$\text{Rate of change (\%)} = \frac{I_t - I_{t-1}}{I_t} \times 100$$

$$= \left(\frac{I_t}{I_{t-1}} - 1 \right) \times 100$$

I_t : Index of the observation period

I_{t-1} : Index of the previous period

The routine service cost included the labor cost, the material cost and the capital cost and excludes the medical cost.

2. Medical Cost

The medical care cost is the cost that occur from the individual patients as follows:

Cost of medicine

Cost of non-medicine

Cost of laboratory testing

The medical cost was collected from the computer database of the patient medical records included medicines, medical equipment and laboratory. This medical cost included the charge price about 18% though 7% which comes from the administrative cost. Thus, in this study, it adjusted the cost from patient's medical records by minus 18% .

The cost of diabetes mellitus and hypertension management (CDMHT) at the King Chulalongkorn Memorial Hospital can be summarized in the below equation.

CDMHT = RSC of OPD + (Total medical price - (Total medical price x (18/100)))

Table 3.2 The cost center of Public Health Center 16 Lumpini

Code	Cost Center NRPCC	Code	Cost Center RPCC	Code	Cost Center PS&NPS
A01	Administration	B01	Pharmaceutical	C01	Treatment
A02	Financial			C02	Dental Clinic
A03	Clerk			C03	Drug Addict Clinic
A04	Social Welfare			C04	Child Sanitation
A05	Health promotion & control diseases				

3.4 Effectiveness

3.4.1 The effectiveness of the diabetes diseases

- Average of Fasting Plasma Glucose (FPG) of diabetes patients per one year from King Chulalongkorn Memorial Hospital and Average dextrostrix (DTX) from Public Health Center 16 Lumpini.
- No. of visited of the diabetes patients
- % of patients visited that have of FPG or DTX between 90–130 mg%. (Diseases controllable)

3.4.2 The effectiveness of the hypertension diseases

- Average of Diastolic Blood Pressure (DP) of hypertension patients per year from King Chulalongkorn Memorial Hospital and Primary Health Center 16 Lumpini.
- No. of visited of the hypertension patients.
- % of patients visited that have the diastolic pressure less that 90 mmHg. (Diseases controllable)

3.5 Cost- effectiveness Analysis (CEA)

The cost-effectiveness analysis is one forms of full economic evaluation, which both the costs and consequences of health program or treatments are examined. (Michael F. Drummond, Greg L. Stoddart and George W. Torrance, 1994) Given the difficulties of placing monetary values on life and health, as well as valuing other intangible benefit, cost-effectiveness analysis (CEA) sometimes provides a more practical approach to decision making than cost benefit analysis (CBA).(Gerber and Phelps,1997). Cost-effectiveness analysis compares the cost of achieving a particular non-monetary objective, such as lives saved. In cost-effectiveness analysis, one assumes that the objective is desirable even if the benefits have not been evaluated in monetary terms (strictly speaking, each of the projects might yield negative net benefit

were it feasible to compute those net benefits). Though the valuation of benefits is avoided, the problems of determining cost remain. (Sherman Folland, Allen C. Goodman and Miron Stano, 2003)

According to the study mentioned above, in this study the cost-effectiveness can be measured by the following equation:

$$\textbf{Cost-Effectiveness ratio Of diabetes management} = \frac{\textbf{Total Cost}}{\textbf{\% of patients visited that have FPG or DTX between 90–130 mg\%}}$$

$$\textbf{Cost-Effectiveness ratio Of hypertension management} = \frac{\textbf{Total Cost}}{\textbf{\% of patients visited that have the diastolic pressure less than 90 mmHg}}$$

3.6 Population

The target population is all of the diabetes and hypertension patients who were treated by the King Chulalongkorn Memorial Hospital and the Public Health Center 16 Lumpini during Oct 1, 2003- Sep 30, 2004.

Eligibility Criteria of the patient who was selected by following criteria:

1. Inclusion criteria

- The patients who were diagnosed from the doctor that they were diabetes and have fasting plasma glucose or DTX more than 130 mg%
- The patients who were diagnosed from the doctor that they were hypertension and have diastolic more than 90 mmHg.
- The patients who had been treated at OPD.

2. Exclusion criteria

- The patients who had complication diseases during the study periods.
- The patients who had been treated at IPD.

3.7 Hypothesis

The cost-effectiveness of chronic disease management at the Public Health Center 16 Lumpini is more than the King Chlalongkorn Memorial Hospital does.

3.8 Assumptions

1. Both of the King Chulalongkorn Memorial Hospital and the Public Health Center 16 Lumpini type of treatment can be comparable in cases of non-complicated patients.

2. The treatment of CSMBS, SSS, Out of pocket and 30 baht schemeand other (for example, private insurances) are not different in cases of non-complicated patients.

3.9 Data Collecting

The calculation of the cost of the provider is based on the secondary data from the cost analysis of the King Chulalongkorn Memorial Hospital report. For the Public Health Center 16 Lumpini cost calculated by using the secondary data. The patients' data is the secondary data collected from the patient files from both of the King Chulalongkorn Memorial Hospital and the Public Health Center 16 Lumpini.

3.10 Possible Benefit

The policy implications confirm the cost-effectiveness of primary health care unit at the Public Health Center has more than the cost-effectiveness of primary health care unit at tertiary care or teaching hospital.

CHAPTER IV

ANALYSIS AND RESULT

In this study, the cost-effectiveness analysis of chronic disease management: comparison between the King Chulalongkorn Memorial Hospital and the Public Health Center 16 Lumpini can be identified into four steps. First step of this study is due to the general characteristics of subject in the study. In this step, it can be catagorized into four scopes which are gender, age, health insurance schemes and the number of visited. Secondly, in this study of the part of the cost analysis, it can be studied into three parts which are the total cost, the cost of diabetes mellitus patients' management and the cost of hypertension patients' management compared between the data collected from the King Chulalongkorn Memorial Hospital and the data from the Public Health Center 16 Lumpini. The another step of this study is to identify the effectiveness which is the comparison between the effectiveness of management of chronic diseases at the King Chulalongkorn Memorial Hospital and the effectiveness of management of chronic diseases at the Public Health Center 16 Lumpini in terms of diabetes mellitus patients and hypertension patients. The last step of this study is to study the cost-effectiveness of both cost-Effectiveness ratio of diabetes mellitus patients' management and cost-Effectiveness ratio of hypertension patients' management.

4.1 General characteristics of subjects in the study

Due to the general characteristics of the subjects in this study, it can be catagorized into four parts by scopes of the study: gender, age, health insurance schemes and the number of visited.

4.1.1 Gender

The general characteristics of the diabetes mellitus patients in table 4.1 show the proportion of male and female patients in this study.The percentage gender from the King Chulalongkorn Memorial Hospital of male is 49.39% and female is 50.61% of the total patients about 164 patients and the ratio between male and female patient is

1:1.03. At the Public Health Center 16 Lumpini's ratio between male and female patient is 1: 2.70 . The proportion of male is 27.04% and female is 72.96%.

Table 4.1 Gender of diabetes mellitus patients at King Chulalongkorn Memorial Hospital and Public Health Center 16 Lumpini

Gender	King Chulalongkorn Memorial Hospital		Public Health Center 16 Lumpini	
	No. of patients	Percentage	No. of patients	Percentage
Male	81	49.39	83	27.04
Female	83	50.61	224	72.96
Total	164	100.00	307	100.00

As the table 4.2 shown the general characteristics of hypertension patients, the percentage of male is 35.87% and female is 64.13%. of the total patients, 184 patients, at King Chulalongkorn Memorial Hospital and its ratio is 1:1.78. At the Public Health Center 16 Lumpini's ratio between male and female patient is 1: 1.94 and the proportion of male is 33.98% and female is 66.02%.

Table 4.2 Gender of hypertension patients at King Chulalongkorn Memorial Hospital and Public Health Center 16 Lumpini

Gender	King Chulalongkorn Memorial Hospital		Public Health Center 16 Lumpini	
	No. of patients	Percentage	No. of patients	Percentage
Male	66	35.87	122	33.98
Female	118	64.13	237	66.02
Total	184	100.00	359	100.00

4.1.2 Age

The average age from the study of diabetes patients at the King Chulalongkorn Memorial Hospital is 51 years old. The largest proportion age is ranged 51- 60 (28.05 %) and 27.44%, 17.07%, 14.02%, 7.32%, 4.88%, 1.22% are in 41-50, 31-40 , 61- 70, 71-80, ≤30 , 81- 90 , respectively. The statistics indicates, the patient aged between 41-60 years old as the major problem at the King Chulalongkorn Memorial Hospital. At Public Health Center 16 Lumpini, the largest proportion of age group is 61 – 70, accounting for 29.32 % of its population, 51-60 age group is accounting for 27.04%, 41-50 age group is accounting for 21.82%, 71 – 80 age group is accounting for 10.75%, 31-40 age group is accounting for 8.14% and 81-90 age group is accounting for 2.93% respectively. The statistic indicates that the diabetes mellitus patients aged between 41-70 years are the majority at Public Health Center 16 Lumpini, the same range of age as at King Chulalongkorn Memorial Hospital, which is approximately 70% of the total patients.

Table 4.3 Age of diabetes patients at King Chulalongkorn Memorial Hospital and Public Health Center 16 Lumpini

Age group	**King Chulalongkorn Memorial Hospital**		**Public Health Center 16 Lumpini**	
	No.	**Percentage**	**No.**	**Percentage**
≤30	8	4.88	0	0.00
31 – 40	28	17.07	25	8.14
41 – 50	45	27.44	67	21.82
51 – 60	46	28.05	83	27.04
61 – 70	23	14.02	90	29.32
71 – 80	12	7.32	33	10.75
81 - 90	2	1.22	9	2.93
Total	**164**	**100.00**	**307**	**100.00**

The table 4.4 shows the frequency of age at King Chulalongkorn Memorial Hospital and Public Health Center 16 Lumpini in terms of studying the hypertension. The average age of population is 59 years old. The most proportion age is ranged 51-60 (34.78 %) and 21.20%, 17.93%, 16.85%, 6.52%, 2.72% are in 61- 70, 41-50, 71-80, 31-40 , and 81- 90 , respectively. The statistics indicates, the patient aged between 41-70 years old as the major problem at the King Chulalongkorn Memorial Hospital. The genearal characteristics of hypertension patients age at Public Health Center are similar with the hypertension patient at the King Chulalongkorn Memorial Hospital. The patient aged between 41-70 years old as the major problem. The most proportion age is ranged 61 – 70 (30.92 %), 51-60 (27.30%), 41-50 (20.61%), 71 – 80 (10.86%), 31-40 (9.75%) and 81-90 (0.56%) respectively.

Table 4.4 Age of hypertension at King Chulalongkorn Memorial Hospital and Public Health Center 16 Lumpini

Age group	**King Chulalongkorn Memorial Hospital**		**Public Health Center 16 Lumpini**	
	No.	Percentage	**No.**	Percentage
≤ 30	0	0	0	0.00
31 – 40	12	6.52	35	9.75
41 – 50	33	17.93	74	20.61
51 – 60	64	34.78	98	27.30
61 – 70	39	21.20	111	30.92
71 – 80	31	16.85	39	10.86
81 - 90	5	2.72	2	0.56
Total	**184**	**100.00**	**359**	**100.00**

4.1.3 Health Insurance schemes

The patients who were treated at the King Chulalongkorn Memorial Hospital and the Public Health Center 16 Lumpini have many types of health insurance schemes such as the civil servant medical benefit scheme (CSMBS), the social security scheme (SSS), the 30 baht scheme and the out of pocket.

Table 4.5 shows the frequency of diabetes mellitus patients in each health insurance schemes at the King Chulalongkorn Memorial Hospital and the Public Health Center 16Lumpini. The most patients at King Chulalongkorn Memorial Hospital in this study pay out of their pocket 64.63%, 18.29% for SSS and 17.07% for CSMBS. At the Public Health Center 16 Lumpini, the most of patients were registered with the 30 baht scheme 60.91%, 32.90% for paying the out of their pocket and 6.19% for paying the CSMBS.

Table 4.5 Frequency of diabetes mellitus patient in each health insurance schemes at King Chulalongkorn Memorial Hospital and Public Health Center 16 Lumpini

Health insurance scheme	**King Chulalongkorn Memorial Hospital**		**Public Health Center 16 Lumpini**	
	No.	Percentage	**No.**	Percentage
CSMBS	28	17.07	19	6.19
SSS	30	18.29	0	0.00
30 baht scheme	0	0.00	187	60.91
Out of pocket	106	64.63	101	32.90
Total	**164**	**100.00**	**307**	**100.00**

Table 4.6 shows the frequency of hypertension patient in each health insurance schemes at the King Chulalongkorn Memorial Hospital and the Public Health Center 16 Lumpini. The most patients at the King Chulalongkorn Memorial Hospital in this study paying out of their pocket 73.37%, 15.22% for the CSMBS and 11.41% for the SSS. At the Public Health Center 16 Lumpini, the most of patients were registered with the 30 baht scheme 56.82%, 38.16% for paying out of their pocket and 5.01% for CSMBS.

Table 4.6 Frequency of hypertension patients in each health insurance schemes at King Chulalongkorn Memorial Hospital and Public Health Center 16 Lumpini

Health insurance scheme	King Chulalongkorn Memorial Hospital		Public Health Center 16 Lumpini	
	No.	Percentage	**No.**	Percentage
CSMBS	28	15.22	18	5.01
SSS	21	11.41	0	0.00
30 baht scheme	0	0.00	204	56.82
Out of pocket	135	73.37	137	38.16
Total	**184**	**100.00**	**359**	**100.00**

4.1.2 Visited

Table 4.7 shows the average of diabetes mellitus patient visited in year 2004 at the King Chulalongkorn Memorial Hospital and the Public Health Center 16 Lumpini. The patients at King Chulalongkorn Memorial Hospital visited average 4 visited/year and the patients at Public Health Center 16 Lumpini visited average 7 visited/year.

Table 4.7 Average of diabetes mellitus patients visited in year 2004 at King Chulalongkorn Memorial Hospital and Public Health Center 16 Lumpini

Place	No. of patient visited	No.0f patients	Average visited /year
King Chulalongkorn Memorial Hospital	621	164	4
Public Health Center 16 Lumpini	1,996	307	7

Table 4.8 shows the average of hypertension patient visited in year 2004 at the King Chulalongkorn Memorial Hospital and the Public Health Center 16 Lumpini. The patients at the King Chulalongkorn Memorial Hospital visited average 4 visited/year

and the patients at Public Health Center 16 Lumpini visited average 7 visited/year as same as the diabetes mellitus patients.

Table 4.8 Average of hypertension patients visited in year 2004 at King Chulalongkorn Memorial Hospital and Public Health Center 16 Lumpini

Place	No. of patient visited	No.0f patients	Average visited /year
King Chulalongkorn Memorial Hospital	797	184	4
Public Health Center 16 Lumpini	2566	359	7

From the table 4.9, in 2004, the total patient visited at the Public Health Center 16 Lumpini was 58,092 visited/year compared to the OPD case which was 23,571 visited (40.58%) and the dental clinic visited that was 8,327 (4.33%). The number of drug addict was 11,864 visited (20.42%)and the number of day care was 14,330 visited/year (24.67%).

Table 4.9 Total patients visited in year 2004 at Public Health Center 16 Lumpini

Patient Services	No. visits	Percentage
OPD	**23,571**	**40.58**
Dental Clinic	8,327	14.33
Drug Addict Clinic	11,864	20.42
Day Care	14,330	24.67
Total	**58,092**	**100.00**

It can be seen from the table 4.9, the number visits of OPD at the Public Health Center 16 Lumpini was 23,571 which was calculated into the percentage of 40.58% from all number of visits in the year of 2004. Therefore, from the table 4.10 which shows the average of the diabetes mellitus and the hypertension patients visited as out patients in the year of 2004, it can be indicated that the number of visit per year of the diabetes mellitus was 1,996 (8.47%) and the number of visit per year of the hypertension was 2,566 (10.88%) from all of the OPD 23,571 (100%).

Table 4.10 Average of diabetes mellitus and hypertension patients visited as out patients in year 2004

Diseases	No. visits (per year)	Percentage of OPD
- Diabetes Mellitus	1,996	8.47
- Hypertension	2,566	10.88
- Other diseases	19,009	80.65
Total	**23,571**	**100.00**

4.2 Cost analysis

4.2.1 King Chulalongkorn Memorial Hospital

4.2.1.1 Total cost

Routine service cost & Medical cost

The cost in this part used the cost analysis of patient service in the King Chulalongkorn Memorial Hospital by Sureerat Ngamkaitphasan that studied in 2003. This routine service cost was adjusted by percentage change of CPI.

Table 4.11 Percentage change of consumer price index

Year	CPI	% change
2002 (base year)	100.0	-
2003	101.8	1.80
2004	104.6	2.75

Source: www.indexpr.moc.go.th

From the table 4.12, it can be indicated that the total cost which had already been adjusted in 2004 was 7,222,265,025 baht, and the unit cost was 667.16 baht/visited. There are included routine the service cost which was 506,623,868 baht and the medical cost of 6,715,641,153 baht. The ratio between RSC : Medical Cost was 1 : 13.26.

Table 4.12 Routine service cost of OPD at King Chulalongkorn Memorial Hospital (Baht)

	Routine Service Cost		Medical Care Cost		Full Cost	
Department	Total 2004	Unit Cost	Total	Unit Cost	Total	Unit Cost
Emergency Room	44,535,597	79.59	372,384,246	665.45	416,919,844	745.04
Investigate No.9	6,426,586	13.83	102,533,715	220.58	108,960,301	234.41
Preadmission	1,510,005	57.36	31,913,651	1,212.15	33,423,656	1,269.11
OPD1*	61,809,979	42.64	1,113,030,431	767.76	1,174,840,409	810.40
OPD2	29,694,833	32.83	296,349,393	327.61	326,044,227	360.44
OPD3**	53,013,712	48.97	1,657,930,335	1,531.46	1,710,944,048	1,580.43
OPD5	31,418,755	51.92	485,884,205	802.89	517,302,961	854.81
OPD6	37,570,548	42.75	708,973,448	806.88	746,543,996	849.64
OPD7	40,660,860	56.83	203,664,525	284.64	244,325,386	341.46
OPD8	27,426,778	38.46	35,938,553	50.40	63,365,330	88.86
OPD9	59,613,233	88.40	189,161,128	280.49	248,774,362	368.88
OPD10	22,098,655	44.72	296,579,381	600.17	318,678,036	644.89
OPD11	44,322,059	57.34	306,730,520	396.86	351,052,579	454.21
OPD12	18,941,242	37.80	474,364,200	946.81	493,305,442	984.62
Dental Clinic	9,558,122	19.01	119,619,717	237.84	129,177,839	256.83
OPD13	18,022,903	37.54	320,583,705	667.86	338,606,608	705.41
Total OPD Cost	**506,623,868**	**46.80**	**6,715,641,153**	**620.35**	**7,222,265,025**	**667.16**

* OPD1 where hypertension patients were treated

** OPD3 where diabetes mellitus patients were treated

4.2.1.1 Cost of diabetes mellitus

The unit cost of the diabetes mellitus was calculated from the unit cost of routineservice cost of OPD3 which the diabetes mellitus patients were treated and the unit cost of the medical cost was calculated from the patient's medical records.

From the table 4.13, the study found that the cost of medicine was 615,036.90 baht , cost of medical equipment was 47,168.86 baht and the cost of laboratory was 478,301.10 baht, respectively. The ratio among the cost of medicine, the cost of non-medicine and the cost of laboratories is 13: 1 : 10 at the King Chulalongkorn Memorial Hospital.

Table 4.13 Medical Cost of diabetes mellitus at King Chulalongkorn Memorial Hospital.

Medical Cost	**Diabetes mellitus** (Baht)
Cost of Medicine	615,036.90
Cost of Non-Medicine	47,168.86
Cost of laboratory	478,301.10
Total Medical Cost	**1,140,507.86**

From the table 4.13 which shows how to calculate the total medical cost of diabetes mellitus at the King Chulalongkorn Memorial Hospital, table 4.14 shows the comparison of the total cost of OPD3 and the total diabetes mellitus cost. It can be indicated that the total diabetes mellitus cost was only 0.07% compared to the total OPD3 cost.

Table 4.14 Percentage of the total cost of diabetes mellitus of OPD3

	Total Cost (Baht)	**Percentage** (%)
1. OPD3	1,710,944,048.00	100
2.Diabetes mellitus patients	1,170,917.21	0.07

As it can be shown from table 4.15 about how to calculate the unit cost of diabetes mellitus from the King Chulalongkorn Memorial Hospital, the routione service cost of OPD3 was 48.97 baht/visited compared with the average medical cost which was 1836.56 baht/visited. Therefore, unit cost of diabetes mellitus was 1885.53 baht/visited. (the visit number of diabetes mellitus was 621 visited from table 4.7)

Table 4.15 Unit cost of diabetes mellitus at King Chulalongkorn Memorial Hospital.

Cost	**Unit cost (baht/visited)**
1.Routine service cost of OPD3	48.97
2.Medical cost	1836.56
Unit cost of diabetes mellitus	**1885.53**

4.2.1.2 Cost of hypertension

From table 4.16, the unit cost of hypertension was calculated from the unit cost of routine service cost of OPD1 in which hypertension patients were treated and the unit cost of medical cost was calculated from the patient's medical records.

The study found that the cost of medicine, the cost of non-medicine and the cost of laboratory were 701,514.90 baht, 1,851.56 baht and 103,447.10 baht, respectively.

Table 4.16 Medical Cost of hypertension at King Chulalongkorn Memorial Hospital.

	Diabetes mellitus (Baht)
Cost of Medicine	701,514.90
Cost of Non-Medicine	1,851.56
Cost of laboratory	103,447.10
Total Medical cost	**806,813.60**

From the table 4.17 shows the comparison of the total cost of OPD1 and the total cost of hypertension. It can be indicated that the total cost of hypertension patients was only 0.07% compared to the total OPD1 cost.

Table 4.17 Percentage of the total cost of hypertension of OPD1

	Total Cost (Baht)	**Percentage** (%)
1. OPD1	1,174,840,409.00	100
2. Hypertension patients	840,797.66	0.07

As it can be shown from table 4.18 about how to calculate the unit cost of hyperintension from the King Chulalongkorn Memorial Hospital, the routione service cost of OPD1 was 42.64 baht/visited compared with the unit medical cost which was 1012.31 baht/visited. Therefore, the unit cost of diabetes mellitus was 1054.95 baht/visited. (the visit number of diabetes mellitus was 747 visited from table 4.8)

Table 4.18 Unit cost of hypertension at King Chulalongkorn Memorial Hospital.

Cost	**Unit cost (baht/visited/person)**
1.Routine service cost of OPD1	42.64
2.Medical cost	1012.31
Unit cost of hypertension	**1054.95**

4.2.2 Public Health Center 16 Lumpini

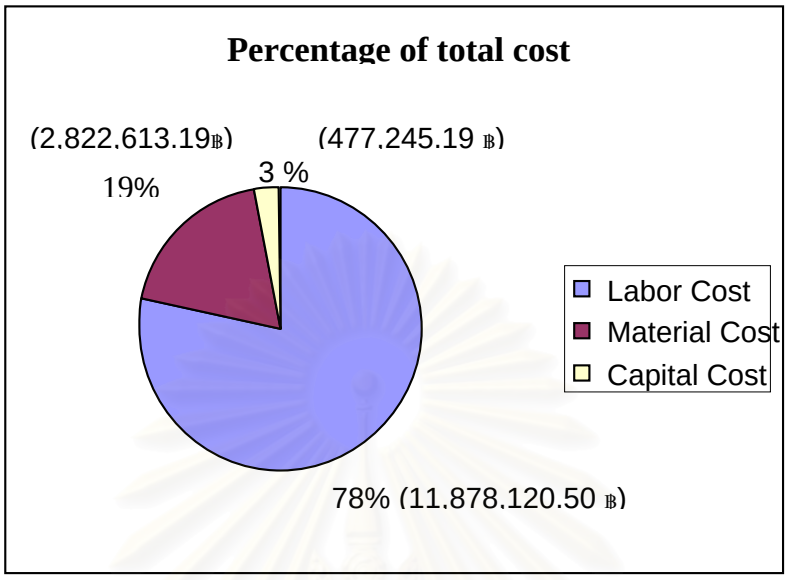
4.2.2.1 Total cost

The total cost included the labor cost, the material cost and the capital cost at the Public Health Center 16 Lumpini was 15,177,978.88 baht.

Table 4.19 Percentage of each cost item of Public Health Center 16 Lumpini

Type of cost	Amount (Baht)	%	Total	%
1.Labor Cost			**11,878,120.50**	**100.00**
Salary	8,601,950.00	72.42		
Extended	783,380.00	6.60		
Position benefit allowance	272,800.00	2.30		
Mobile clinic	78,060.00	0.66		
Non - private practice incentive	429,900.00	3.62		
Drug Addict	88,410.00	0.74		
Reward	587,220.00	4.94		
Extra benefit	85,772.00	0.72		
Monthly benefit	85,361.00	0.72		
Child benefit allowance	739,551.50	6.23		
CSMBS (Hospital fee)	125,716.00	1.06		
2. Material Cost			**2,822,613.19**	**100.00**
Water Supply	15,772.45	0.56		
Electricity	331,581.49	11.75		
Telephone	33,297.48	1.18		
Petroleum	47,756.92	1.69		
Maintenance	605,522.60	21.45		
Medicine & Equipment	1,484,900.81	52.61		
Office Equipment	12,021.80	0.43		
Printing Equipments	15,359.64	0.54		
Food Supply	276,400.00	9.79		
3. Capital Cost			**477,245.19**	**100.00**
Depreciate of Equipments	395,245.19	82.82		
Depreciate of Building	82,000.00	17.18		

Figure 4.1 Percentage of the total at Public Health Center 16 Lumpini



From figure 4.1, the most expenditure at the Public Health Center 16 Lumpini was the labor cost. There are 78%, 19% for the material cost and 3% for the capital cost.

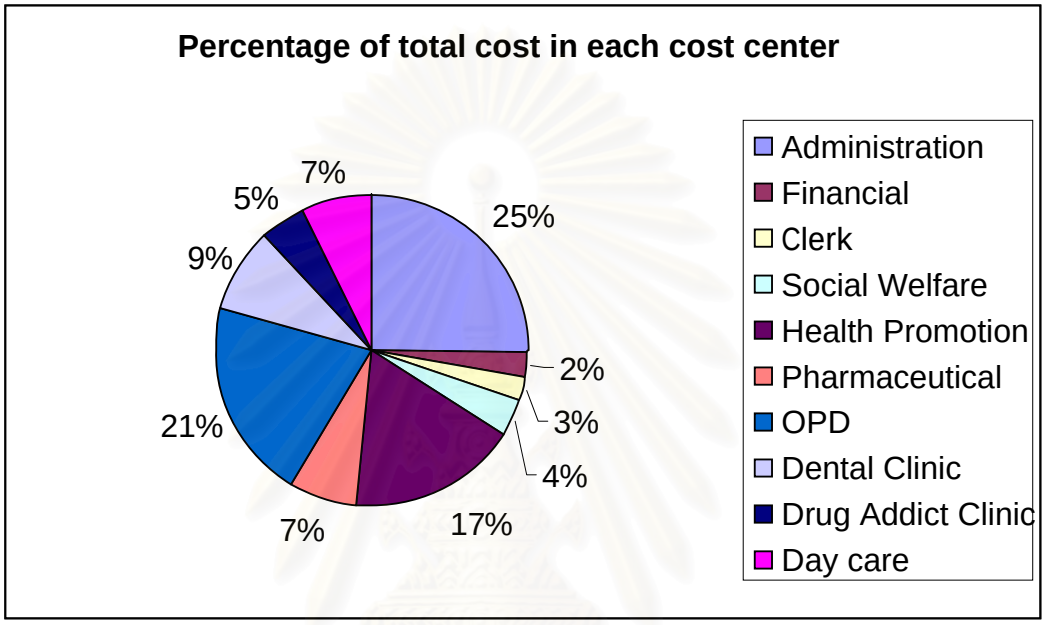
It can be indicated that the total direct cost of the Public Health Center 16 Lumpini was the combination from ten cost center from table 4.20 and their code. This total direct cost was **15,177,978.88** baht.

Table 4.20 Total cost of Public Health Center 16 Lumpini in each cost center (baht)

Code	Cost Center	Labor Cost	Material Cost	Capital Cost	TDC
A01	Administration	2,682,748.10	1,003,623.78	166,055.00	3,852,426.88
A02	Financial	338,950.00	0.00	4,428.00	343,378.00
A03	Clerk	362,880.00	0.00	40,010.80	402,890.80
A04	Social Welfare	590,387.00	321.00	10,250.00	600,958.00
A05	Health Promotion	1,384,020.40	1,234,121.29	2,000.00	2,620,141.69
B01	Pharmaceutical	857,920.00	188,518.77	540.00	1,046,978.77
C01	OPD	2,884,853.60	206,117.35	55,831.00	3,146,801.95
C02	Dental Clinic	1,169,000.00	46,611.00	151,170.39	1,366,781.39
C03	Drug Addict Clinic	670,465.40	0.00	45,200.00	715,665.40
C04	Day care	936,896.00	143,300.00	1,760.00	1,081,956.00
	Total	**11,878,120.50**	**2,822,613.19**	**477,245.19**	**15,177,978.88**

The most expenditure at the Public Health Center 16 Lumpini was the labor cost, the materail cost and the capital cost were 78%, 19%, and 3% ,respectively.

Figure4.2 Percentage of total cost in each cost center at Public Health Center 16 Lumpini



From table 4.21, the unit cost of the public health center 16 Lumpini in each cost center of OPD, dental clinic, drug addict clinic and day care were 370.08, 446.01, 90.14 and 116.65.

Table 4.21 Unit cost of Public health center 16 Lumpini in each cost center

Cost center	Visited	Total cost (baht)	Unit cost (baht)
OPD	23,571	8,723,100.67	370.08
Dental Clinic	8,327	3,713,934.62	446.01
Drug Addict Clinic	11,864	1,069,411.22	90.14
Day Care	14,330	1,671,532.37	116.65

4.2.2.2 Cost of diabetes mellitus patients

In the table 4.22, it can be indicated that the unit of diabetes mellitus and other diseases was the same at 370.08 baht per visited by calculating from the total cost and the visited.

Table 4.22 Cost of diabetes mellitus patients calculated by the proportion of total cost at OPD of diabetes patients visited.

	Visited	**Total Cost**	**Unit Cost**
- Diabetes Mellitus	1,996	738,679.67	370.08
- Other diseases	21,575	7,984,476.00	370.08
Total	**23,571**	**8,723,100.67**	**370.08**

4.2.2.3 Cost of hypertension patients

In the table 4.23, it can be indicated that the unit of hypertension and other diseases was the same at 370.08 baht per visited by calculating from the total cost and the visited.

Table 4.23 Cost of hypertension patients calculated by the proportion of total cost at OPD of diabetes patients visited.

	Visited	**Cost**	**Unit Cost**
- Hypertension	2,566	949,625.30	370.08
- Other diseases	21,005	7,773,475.37	370.08
Total	**23,571**	**8,723,100.67**	**370.08**

4.3 Effectiveness

4.3.1 King Chulalongkorn Memorial Hospital

4.3.1.1 Diabetes mellitus patients

The effectiveness in terms of disease controllabilty in this study were measured by fasting plasma glucose (FPG) values that were recorded from the patient files. Though, the total number of diabetes mellitus patients in this study were 164 patients. The study found that the average FPG was 149.20 mg% and 34.79 % of total visited that have the FPG between 90 -130 mg % (see table 4.24)

Table 4.24 Average FPG and Percentage of patient visited which have FPG between 90-130 mg% at King Chulalongkorn Memorial Hospital

	Total visited (621 visited)
Average of FPG	149.20
% of patient visited that have FPG between 90-130 mg%	34.79%

4.3.1.2 Hypertension patients

Table 4.25 shows the effectiveness of hypertension patients in terms of disease controllability which have 184 patients in this study. It can be found that 86.20 % of visited having DP less than 90 mmHg.

Table 4.25 Percentage of patient visited that have DP less than 90 mmHg at King Chulalongkorn Memorial Hospital

	Total visited (797 visited)
% of visited that have DP less than 90 mmHg	86.20%

4.3.2 Public Health Center 16 Lumpini

4.3.2.1 Diabetes mellitus patients

The effectiveness of disease controllability at the Public Health Center in this study was measured by fasting plasma glucose values which were recorded from the patient files. Although, the total number of diabetes mellitus patients in this study was 1,996 patient. The study found that the average FPG is 174.16 mg% and 22.58 % of total visited which have FPG between 90 – 130 mg% (see table 4.26)

Table 4.26 Average FPG and percentage of patient visited that have FPG between 90-130 mg% at Public Health Center 16 Lumpini

	Total visited (1,996 visited)
Average of FPG	174.16
% of patient visited that have FPG between 90-130 mg%	22.58%

4.3.2.2 Hypertension patients

Table 4.27 shows the effectiveness of hypertension patients in terms of disease controllability which have 359 patients in this study. This study found 81.26% of visited which have DP less than 90 mmHg.

Table 4.27 Percentage of patient visited that have DP less than 90 mmHg at Public Health Center 16 Lumpini

	Total visited (2,566 visited)
% of visited that have DP less than 90 mmHg	81.26%

4.4 Cost-Effectiveness

4.4.1 Cost-Effectiveness of diabetes mellitus patient

This study found that the cost-effectiveness of diabetes mellitus at the Public Health Center 16 Lumpini was 10,655.99 baht per disease controllability patient for one case which was better than the King Chulalongkorn Memorial Hospital (20,522.39 baht per disease controllability patient for one case). Although the effectiveness of the King Chulalongkorn Memorial Hospital was higher than the Public Health Center 16 Lumpini, the average cost of the King Chulalongkorn Memorial Hospital was greater than the Public Health Center 16 Lumpini about five times.

Table 4.28 Cost-Effectiveness of diabetes mellitus in terms of disease controllability at King Chulalongkorn Memorial Hospital and Public Health center in budget year 2003

	Total cost (baht/case/year)	**Effectiveness (%)**	**C/E (disease controllable)**
CU Hospital	7,139.74	34.79	20,522.39
PHC16 Lumpini	2,406.12	22.58	10,655.99

4.4. 2 Cost-Effectiveness hypertension patient

This study found that the cost-effectiveness of diabetes mellitus at the Public Health Center 16 Lumpini was 3,255.23 baht per disease controllability patient for one case which was better than the King Chulalongkorn Memorial Hospital was (5,301.11 baht per disease controllability patients for one case). The effectiveness at the King Chulalongkorn Memorial Hospital and the Public Health Center 16 Lumpini were not quite different. However the average cost of the King Chulalongkorn Memorial Hospital is greater than Public Health Center 16 Lumpini above two times.

Table 4.29 Cost-Effectiveness of hypertension in term of disease controllable at King Chulalongkorn Memorial Hospital and Public Health center in budget year 2003

	Total cost (baht/case/year)	**Effectiveness (%)**	**C/E (disease controllable)**
CU Hospital	4,569.55	86.20	5,301.11
PHC16 Lumpini	2,645.20	81.26	3,255.23

CHAPTER V

CONCLUSION AND DISCUSSION

In this chapter, it can be catagorized into five parts: conclusion, discussion, reccommendation, limitation and further study.

5.1 Conclusion

- General Characteristics

The proportion of diabetes mellitus patients of male at the King Chulalongkorn Memorial Hospital was higher than the Public Health Center 16 Lumpini. There were 49.39% at the King Chulalongkorn Memorial Hospital and 27.04% at the Public Health Center 16 Lumpini. The proportion of female at the King Chulalongkorn Memorial Hospital was higher than the Public Health Center 16 Lumpini as the same as the proportion of male. There were 50.61% and 72.96%, respectively.

For hypertension patient cases, the proportion of male and female at the King Chulalongkorn Memorial Hospital and the Public Health Center 16 Lumpini were similar. According to the proportions of male were 35.87% and 33.98%, and female were 64.13% and 66.02%, respectively.

The characteristics of age of diabetes mellitus and hypertension patients at the King Chulalongkorn Memorial Hospital and the Public Health Center 16 Lumpini were almost the same. The major problem of these two diseases study are the age between 41- 70 years old.

The next general characteristics of health insurance scheme of the diabetes melitus and hypertension patients at the King Chulalongkorn Memorial Hospital are diffirent from the Public Health Center 16 Lumpini. The most patients at the King Chulalongkorn Memorial Hospital pay out of their pockets. Next was the SSS and the

CSMBS. On the other hand, the most patients at the Public Health Center 16 Lumpini were registered in the 30 baht scheme, out of pocket and CSMBS respectively.

The final part of general characteristic is the average of diabetes mellitus patient and hypertension patient visited in year 2004 at the King Chulalongkorn Memorial Hospital and the Public Health Center 16 Lumpini which was the same as 4 visited/year and 7 visited/year respectively.

- Cost

The cost at the King Chulalongkorn Memorial Hospital was calculated from the routine service cost and medical care cost. The routine service cost was calculated from the cost analysis of patient service in the King Chulalongkorn Memorial Hospital by Sureerat Ngamkaitphasan (2003). This routine service cost was adjusted by percentage change of CPI as the based year is 2002 with different of percentage change in CPI and the year 2003 to 2004 was 2.75%. The OPD cost of the King Chulalongkorn Memorial Hospital has increased from 70 billions in 2003 baht to 72 millions baht in 2004. Most cost of the King Chulalongkorn Memorial Hospital is the cost of the medical care cost such as the medicine and non-medicine cost. This study found that about 90% was medical care cost and 10% for the routine service cost, there are similar as Pirom Kamol-Raltanakul was the study in the year of 2001. The most cost of medical care cost is the cost of medicine.

The cost of the Public Health Center 16 Lumpini compared with the King Chulalongkorn Memorial Hospital was totally different. At the Public Health Center 16 Lumpini, the most of the cost came from the labor cost which was about 78% of the total cost. It is the important cost for treatment which have to pay for the specialist. Secondly is 19% for the material cost and 3% for the capital cost. This study found that the labor cost of OPD was higher than the another department.

The unit cost of diabetes mellitus and hypertensions of the King Chulalongkorn Memorial Hospital was higher than the Public Health Center 16 Lumpini. The unit cost of diabetes mellitus at the King Chulalongkorn Memorial Hospital and the Public

Health Center 16 Lumpini were 1885.53 and 370.08 baht/visited, respectively and hypertension are 1054.95 and 370.08 baht/visited, respectively.

- Effectiveness

The effectiveness in the average fasting plasma glucose (FPG) and the average dextrostrix (DTX) and the percentage of number patient visited which have FPG or DTX between 90-130 mg% indicated that the patients who were treated at the King Chulalongkorn Memorial Hospital had the FPG better than Public Health Center16 Lumpini did but there were not too much different. The percentage number patient visited which have the FPG between 90-130 mg% was 34.79 mg% for the King Chulalongkorn Memorial Hospital and the Public Health Center16 Lumpini, the percentage number patient visited that have DTX between 90-130 mg% was 22.58 mg%. And for hypertension, the effective was not different at the King Chulalongkorn Memorial Hospital and the Public Health Center16 Lumpini. There were 86.20 % and 81.26% of the hypertension patients that have diastolic less than 90 mmHg for the King Chulalongkorn Memorial Hospital and the Public Health Center16 Lumpini, respectively.

5.2 Discussion

This study collected the data from the Public Health Center 16 Lumpini and the King Chulalongkorn Memorial Hospital's pateints file. All of the the patients who had diabetes mellitus and hypertension with non-complicated was collected at the Public Health Center 16 Lumpini but the patients from the King Chulalongkorn Memorial Hospital were selected by pulling the data from the International Classification of Diseases for the tenth division (ICD 10) code of diabetes mellitus (E11) and hypertension (I10) which were the code for non-complicated diabetes mellitus and hypertension. After the data was rechecked, it could be found that the patients was pulled from the ICD 10 code were not all non-complicated diabetes mellitus and non-complicated hypertension; therefore, it was necessary to recheck all of the patient files This could also be found that the non-complicated diabetes mellitus patients 164

patients from the entire 2,615 patients. For the hypertension patients case which were pulled from the ICD 10 code I10, there were 14,693 patients altogether. As the limitation of time and the worker at patient files department could find patient files in limited. They could find only 1,500 files from 14,693 files (10.21%). And it could be found that the only 184 patients were non-complicated hypertension. If there is enough time to study, it can be advised that the data be all screened of. all 14,693 files from ICD 10 code I10.

The general characteristics between the King Chulalongkorn Memorial Hospital and the Public Health Center 16 Lumpini were a little bit different in the health insurance scheme.The female patients at the King Chulalongkorn Memorial Hospital and the Public Health Center 16 Lumpini were higher than the male patients did and there were very similar to the general population ratio in Thailand. For the age of patients in these two places are similar in the diabetes mellitus and the hypertension patients. Almost of the patients age are between 40-71 years old in boths of the King Chulalongkorn Memorial Hospital and the Public Health Center 16 Lumpini. For the health insurance scheme's characteristics at the King Chulalongkorn Memorial Hospital and the Public Health Center 16 Lumpini are diffirent. The King Chulalongkorn Memorial Hospital did not have the 30 baht scheme patients to register with the hospital because of its policy, but the Public Health Center 16 Lumpini had the patients in the 30 baht scheme to register there.

Moreover, the cost of treatment at the King Chulalongkorn Memorial Hospital was high because the position of the King Chulalongkorn Memorial Hospital was the tertiary medical cares which support the lower hospital and teaching hospital for the medical doctor students, family doctors, speacialist doctors and the nurses in the Thai red cost, so there are many cost items, lot of high technology and facilities. Anothor reason was the cost of medicine . There were many types of medicine in the teaching hospital because the patients in there were completed with non-complicated patients and complicated patients. And in terms of severity, some of the patients was whether severe or not. The King Chulalongkorn Memorial Hospital would like to reduce the cost, so the cost of medicine should be considered and also in the appropriated of

medicine treated to the patients. Next, the controllability of the used medicine and the hospital medicine list should be concentrated. And for the cost of laboratory testing can be reduced the total cost by investigated only the necessary things and following the clinical guidelines to make sure that there are not over treated. Furthermore, the another reason for high cost of the King Chulalongkorn Memorial Hospital was due to the fact that the medical cost in the total cost was combined wiht the cost of complicated cases; therefore, from these, it can be said that the cost of the King Chulalongkorn Memorial Hospital was overestimated However, the administrators should focus on the quality and the standard of medical care in the meantime with reducing the total medical cost.

The highest cost item of the Public Health center 16 Lumpini is the labor cost because the hospital staffs have to take care of the patients frequently and they do not have any high technology. So all their proesses has been run by the health worker. The material cost and capital cost were purchased more than five years and twenty years, respectively ; therefore, the value definitely became zero. On the other hand, the Public health Center 16 Lumpini is primary health care, the material cost and capital cost are not expensive when compared with the treatment at secondary or tertiary care. Thus, the cost management should focus on the labor cost. In particular, there were difficultities to reduce the labor cost because almost all of the workers at the Public Health Center 16 Lumpini are the government’s employee. If the Public Health Center 16 Lumpini restructure the personel of the organization, it can affect to the long run production and it would be reducd the competition in health care unit.

The effectiveness of diabetes mellitus patients between the King Chulalongkorn Memorial Hospital and the Public Health Center 16 Lumpini are not quite different. The differences can be occured from the differences of the equipment. The data collected from the King Chulalongkorn Memorial Hospital measured by the fasting plasma glucose (FPG) but the Public Health Center measured by dextrostrix (DTX) because of limited resources. The investigation by using Fasting Plasma Glucose has more accurate than dextrostrix which the Public Health Center 16 Lumpini used but the errors that occur from dextrostix can be accepted. The investigation, however, by FPG costes more than investigation by dextrostrix does about four times. For hypertension,

the treatments depends on the medicine and patient's behavior of taking the medicine followed by the doctor more than the equipment as diabetes mellitus does. So, the effectiveness are not diffirent in hypertension patients in both of the King Chulalongkorn Memorial Hospital and the Public Health Center 16 Lumpini.

However, the cost-effectiveness shows that the Public Health Center 16 Lumpini is more than the King Chulalongkorn Memorial Hospital does in the patients who have chronic diseases with non-complicated. The comparison between the results from this study with the cost-effectiveness of DM and high blood pressure care management compared between urban medical centre and the Nakornratchasrima Hospital (Supasit, 1998) found that the cost-effectiveness at the urban medical centre had more cost-effectiveness than Nakornratchasri Hospital did. It means that the primary care unit leads to more cost-effectiveness of diabetes mellitus and hypertension in case of patients who have chronic diseases with non-complicated. There are similar with the results of this study.

The cost-effectiveness of chronic disease management of the Public Health Center is more than the teaching or tertiary hospital does in cases of the chronic disease (diabetes mellitus and hypertension) management with non-complicated because from this study the cost at the King Chulalongkorn Memorial Hospital is higher than the cost at Public Health Center 16 Lumpini does at the same time at the effectiveness in terms of disease controllability are similar.

5.3 Recommendation

Public Health center is considered to be an efficient place more than the King Chulalongkorn Memorial Hospital because the Public Health center has more han King Chulalongkorn Memorial Hospital. Thus, having the primary care unit at the Public Health Center should appropriate more than having the primary care unit at teaching or tertiary hospital.

5.4 Limitations of this study

1. This study is a retrospective design which some data were underestimated or poorly recorded or unrecorded such as the cost of medicine; if the patients during this period were admitted at the King Chulalongkorn Memorial Hospital with another problem, when they were discharged from the hospital, the doctor may order some medicine for diabetes mellitus or hypertension to the patients. Thus, the patients will have medicine for 2-3 months and they do not visit to the hospital. The cost in this study does not include it because there were not recorded in OPD patients' medical records.

2. The study only analyzed on the provider perspectives.The cost of care and treatment incurred by the patients and society perspectives have not been included in the cost calcultion in this study.

5.5 Further Study

5.5.1 Further studies will be done with prospective approach rather than a retrospective approach because the retrospective study shows that it was not perfect and entirely covered, for example some costs were underestimated.

5.5.2 The study was followed up the patient in 1-year period, so the result in this study shows the effectiveness as an output or intermediate outcome. Further studies should be done in long-term period to follow up with the patients to find out the outcome and the most accurate result.

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APPENDICES

Data gathering forms 1: Salary and fringe benefit of organization's member (LC)
Month………..

Member' name	Salary	overtime allowance	position benefit allowance	Hospitali-zation fees	child benefit allowance	non-private practice incentive	home rental benefit allowance	Other…	Total

Data gathering forms 2: Usage time of each person working in many cost centers (LC)
Member' name……………………

Cost center code	Cost center list	Month……..			Total	Time proportion in each cost center	Total of salary and other fringe benefit	Labor cost
		No. of hours						
		Day 1	Day 2	Day….				

Data gathering forms 3: Labor cost conclusion

Cost center code	Cost center list	Labor cost of member working only one cost center	Labor cost of member working many cost center	Total

Data gathering form 4: Material cost (MC)
Cost center name……..

Type of material cost	Month…..	Month……	Month…..	Month…..	Month……	Total
Medical materials cost						
Drug cost						
Laboratory cost						
Small equipment						
Non-Medical cost						
Equipment						
Telephone cost						
Water supply cost						
Electricity cost						
Other public utilities cost						

Data gathering form 5: Material cost conclusion (MC)

Cost center code	Cost center list	Drug cost	Medical supplies cost	Non medical materials cost	Water supply cost	Electricity cost	Other utilities cost	Total MC

Data gathering form 6: Medical equipment cost (CC)
Cost center name…………….

Medical equipment list	Numbers	Price/Unit	Total price	Received year	Usage time	Depreciation value/year

Data gathering form 7: Building cost I (CC)

Building list	Price	Received year	Usage time	Area (Square meters)	Depreciation value/year

Data gathering form 8: Building cost II (CC)
Building name…… Depreciation value…….

Cost center code	Cost center list	Occupied Area (Square meters)	Occupied Area proportion of cost center	Depreciation value of each cost center

Data gathering form 9: Capital cost conclusion (CC)

Cost center code	Cost center list	Depreciation value of medical equipment cost	Depreciation value of building cost	Total

Data gathering form 10: Total direct cost

Cost center code	Cost center list	Total labor cost	Total material cost	Total capital cost	Total direct cost

Data gathering form 11: Allocation criteria

Cost center code	Cost center list	A01	A02	A03	A04	A05	B01	B02	B03	B04	PS01	PS02	PS03
A01													
A02													
A03													
A04													
A05													
B01													
B02													
B03													
B04													
PS01													
PS02													
PS03													
PS04													

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