A STUDY OF RESOURCE UTILIZATION UNDER DIFFERENT HEALTH INSURANCE SCHEMES AT SAMUT SAKHON HOSPITAL

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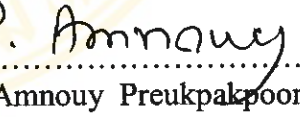

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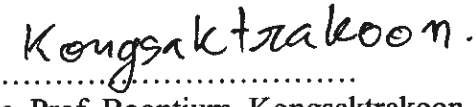

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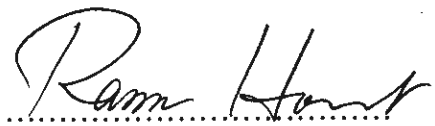

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A STUDY OF RESOURCE UTILIZATION UNDER DIFFERENT HEALTH INSURANCE SCHEMES AT SAMUT SAKHON HOSPITAL

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ABSTRACT

This study was a retrospective descriptive research. The objective was to determine resource utilization by patients at Samut Sakhon Hospital during fiscal year 2002. The study is performed by collecting electronic data from DISPENSE and STAT program. The resource utilization was determined as frequencies of outpatient (OP) and inpatient (IP) services used by each patient as well as total charge for health care services. Comparison of resources used among Diabetes mellitus (DM) and non-DM patients and among patients under different health insurance schemes were also determined.

Results revealed that 201,965 patients were treated in 2002. Overall, average outpatient visits per patient, average admission per person, and average days per admission were 2.76, 1.19 and 4.82 respectively; whereas 4,623 DM patients had more utilization than non-DM's (8.04, 1.79 and 8.02, respectively). For overall OP services, the average charge per visit was 253.65 bahts and charge per patient was 618.31 bahts. For IP, average charge per admission was 5,495.55 bahts, charge per day was 1,125.94 bahts and charge per patient was 6,597.41 bahts. DM patient had higher charges than non-DM both in OP (639.32 and 4,864.95 bahts respectively) and IP services (10,595.99 and 15,456.69 bahts respectively). Moreover, DM patients had higher charges for all services such as drugs, lab tests, and medical supplies. When comparing charges among patients with different health insurance, government officers had the higher utilization rate and hospital charges than other health insurance types (such as Social Security or Universal Coverage)

These findings indicated that patient with chronic illness such as DM had higher use of health resources than patients without chronic illness. Also, difference in health insurance affects resources utilization in medical treatment. Determination of health resource utilization can be done from available electronic database that provides useful information for health resource management for hospital administrators.

KEY WORDS: RESOURCES UITLIZATION / HOSPITAL CHARGE / HEALTH INSURANCE / DIABETES MELLITUS

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ศึกษาการใช้ทรัพยากร ตามระบบประกันสุขภาพต่างๆ ณ โรงพยาบาลสมุทรสาคร (A STUDY OF RESOURCE UTILIZATION UNDER DIFFERENT HEALTH INSURANCE SCHEMES AT SAMUT SAKHON HOSPITAL)

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บทคัดย่อ

การศึกษาครั้งนี้เป็นการศึกษาแบบเก็บข้อมูลย้อนหลัง มีวัตถุประสงค์เพื่อประเมินการใช้ทรัพยากรของผู้ป่วยที่มารับบริการ ณ โรงพยาบาลสมุทรสาคร ปีงบประมาณ 2545 (1 ตุลาคม 2544 – 30 กันยายน 2545) ซึ่งเก็บรวบรวมข้อมูลทางอิเลคทรอนิกส์จากโปรแกรม DISPENSE และ STAT โดยประมวลข้อมูลเป็นร้อยละของความถี่ของการมาใช้บริการและค่าใช้จ่ายในการรักษาพยาบาลผู้ป่วย นอกจากนี้ศึกษาและเปรียบเทียบการใช้ทรัพยากรระหว่างผู้ป่วยเบาหวาน และผู้ป่วยไม่ได้เป็นเบาหวาน ตามระบบประกันสุขภาพ

ผลการศึกษาพบว่า ปีงบประมาณ 2545 จำนวนผู้ป่วยที่มารับการรักษาพยาบาลทั้งหมด 201,965 คน พบว่าค่าเฉลี่ยการมาโรงพยาบาลต่อคน ค่าเฉลี่ยการนอนโรงพยาบาลต่อคน และค่าเฉลี่ยวันนอนต่อการนอนโรงพยาบาล 2.76, 1.19 และ 4.82 ตามลำดับ นอกจากนี้พบว่าผู้ป่วยเบาหวาน 4,623 คน มาใช้บริการรักษาพยาบาลมากกว่าผู้ป่วยที่ไม่ได้เป็นเบาหวาน คือ 8.04, 1.79 และ 8.02 ตามลำดับ มูลค่าการรักษาพยาบาลผู้ป่วยนอกพบว่า ค่าใช้จ่ายโดยเฉลี่ยต่อการมาโรงพยาบาล 253.65 บาท และค่าใช้จ่ายโดยเฉลี่ยต่อผู้ป่วยนอก 618.31 บาท มูลค่าการรักษาพยาบาลผู้ป่วยในพบว่า ค่าใช้จ่ายเฉลี่ยต่อการนอนโรงพยาบาล 5,495.55 บาท ค่าใช้จ่ายต่อวันนอน 1,125.94 บาท และค่าใช้จ่ายเฉลี่ยต่อคน 6,597.41 บาท ค่าใช้จ่ายผู้ป่วยเบาหวานมากกว่าผู้ป่วยไม่ได้เป็นเบาหวานทั้งผู้ป่วยนอก (639.32 และ 4,864.95 บาท ตามลำดับ) และผู้ป่วยใน (10,595.99 และ 15,456.69 บาท) นอกจากนี้ ผู้ป่วยเบาหวานมีค่าใช้จ่ายสูงในทุกการบริการ เช่น ยา ตรวจทางห้องปฏิบัติการ และ วัสดุทางการแพทย์ เมื่อเปรียบเทียบค่าใช้จ่ายผู้ป่วย แยกตามระบบประกันสุขภาพพบว่า ข้าราชการมีการใช้บริการ และค่าใช้จ่ายรักษาพยาบาลสูงกว่าระบบประกันสุขภาพอื่นๆ (เช่น ประกันสังคม หรือ 30 บาท)

ผลที่ได้จากการศึกษาบ่งชี้ว่าผู้ป่วยโรคเรื้อรัง เช่น โรคเบาหวาน มีการใช้ทรัพยากรมากกว่าผู้ป่วยที่ไม่ได้เป็นโรคเรื้อรัง รวมทั้งความแตกต่างของระบบประกันสุขภาพส่งผลต่อการรักษาพยาบาล ดังนั้นการพิจารณาข้อมูลการใช้ทรัพยากร โดยใช้ข้อมูลอิเลคทรอนิกส์ที่มีอยู่ในโรงพยาบาลสามารถใช้เป็นข้อมูลพื้นฐานในการจัดการบริหารทรัพยากรสุขภาพ

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CHAPTER I
INTRODUCTION

Background and Rationale

The government of Thailand has implemented a policy to achieve universal health insurance under the slogan "Thirty baht for curing every disease". This policy of universal health care coverage was implemented in all provinces in the fiscal year 2002 (1).

The universal health insurance (30 Baht scheme) is a new scheme that extends to cover all people under the same standard, equity, and quality of health care. Benefit packages give an importance to primary health care, health promotion and prevention rather than treatment of disease. Beneficiaries will use primary health care facilities before being referred, if necessary to higher-level facilities (2). When these patients received medical services, they would pay 30 baht per visit as co-payment.

The major reform that affects most health care providers has been the health care financing with the aim to redistributing resources. Before universal health care coverage, most health care financing was retrospective fee-for-service payment and global budget. Under the universal health insurance begins in fiscal year 2002, the government pays this scheme by prospective capitation payment, which will cover most of Thailand's population. The financing reform allocated the Ministry of Public Health (MOPH) budget based on the number of people who live nearby the health care facilities. This payment method is resulting in having more money for highly-populated and under-staffed hospitals in rural areas but less money will go to big hospitals (3, 4). Thus, this will influence health care facilities to restrict health care services provided to beneficiaries. Health care financing has made public health

facilities to engage extensively in cross-subsidies. Hospitals overcharge the government routinely and extensively when civil servants come for treatment, and use that money to provide services for other groups in the population (1).

Moreover, during the first six-month of the full-scale 30 baht scheme, Hospital-based data suggest that, number of outpatient visits has increased substantially from the same period of the year before. Number of inpatients has been in line with in the past few years. However, there was no evidence of poorer quality of medical care or utilization of health within this scheme even though there was evidence of provider's bias in service provision (3).

The introduction of prospective payment system was used in many foreign countries (5). According to Russell and Manning study, (6) prospective payment has reduced Medicare's hospital expenditures substantially by more than 20 percent after six years of introduction (1983-1989) in the United Stated. The implementation of the Medicare's prospective payment system (PPS) affect that hospital utilization was substantially decreased. Indicators of resource utilization were hospitalizations, annual office visits, prescription drugs, common tests and procedure with rates estimated on both a per-visit and per-year basis and total hospital charges for the hospital stay (7-9).

Thus, in according to this issue, health care system is changing rapidly. Health care manager need to recognize hospital utilization. One major part of utilization of health is drug utilization. Moreover, prior studies suggested that patient's insurance status affect prescription drug costs. The implementing of capitation payment would alter dispensing behavior and influence physician's prescribing to lower prescription costs such as substituting lower-cost generic equivalents, changing the quantities of drugs dispensed per prescription, optimizing the drug dosage regimen, changing the types of drugs dispensed within a therapeutic category, switching to nonprescription (OTC) drug (10).

As mentioned that it is necessary to perform resource utilization study both in the total patients who were treated in hospital and in the chronic diseases' patients which trend to use many resources rather than other diseases. However, health care

utilization study that performed at the general hospital, focus on Diabetes mellitus (DM) and non-Diabetes mellitus (DM).

Diabetes mellitus is a significant chronic disease that occur in people around the world. There was one of studies attempting to estimate the prevalence of diabetes for years 2000 and 2030. This study forecasted that the total number of people with diabetes is projected to rise from 171 million in 2000 to 366 million in 2030 (11). Besides, diabetes imposes large economic burden. There were several researchers on the cost of diabetes and comparison hospital utilization among various health insurance types (12-15). Nevertheless, this kind of analysis is rarely conducted in Thailand.

To have a burden of resources utilization of diabetes and non-diabetes. Therefore, this study was designed to study in hospital utilization. The location of this study is Samut Sakhon Hospital. It is a 509-bed general hospital in Samut Sakhon Province. It has enrolled in the pilot project (six provinces) of the universal health care coverage program in April 2001. However, there is no evidence that Samut Sakhon Hospital evaluate resource utilization in order to represent the economic burden of different health care schemes.

At the Pharmacy Department and the Medical Record Department at Samut Sakhon Hospital, there are data of outpatients/inpatients from DISPENSE program and STAT program. Therefore, to determine resource utilization effectively, all resources can be evaluated by collecting data from these programs.

General Objective

The objective of this study is to analyze resource utilization of outpatients and inpatients under different health insurance at Samut Sakhon Hospital in the fiscal year 2002.

Specific Objective

There are four specific objectives as the following:

1. To determine utilization rate for health care services of patients in each health insurance scheme.
2. To determine total hospital charges of treatment in each health insurance scheme.
3. To analyze and compare resource utilization of patients with Diabetes mellitus disease between different health insurance schemes.

    - To determine utilization rate of Diabetes mellitus and non-Diabetes mellitus patients.

    - To determine total hospital charges of Diabetes mellitus and non-Diabetes mellitus patients.

    - To determine charges per Diabetes mellitus and non-Diabetes mellitus patients.

    - To determine and compare resources utilization Diabetes mellitus and non-Diabetes mellitus patients.

Benefits

The results of this study can be used as the economic burden of different health care schemes. Furthermore, it could be used as basic information of utilization of Diabetes mellitus and non-Diabetes mellitus patients and can be useful for evaluation of resource utilization between health care schemes.

Definition of terms

Resource utilization is the use of various types of health services such as drug, laboratory, operation and other services for treatment of an illness.

Utilization rate is the number of times a patient comes for treatment in a health care facility during a period of time. (1 year).

Universal Health Coverage Scheme (30 Baht Schemes) provides health care benefits to the population who are not under the Civil Servant Medical Benefit Schemes (CSMBS) or Social Security Schemes (SSS).

Civil Servant Medical Benefits Schemes (CSMBS) provides health care benefit to government officials and their dependents (parents and up to three children).

Social Security Schemes (SSS) provides health care benefit to patient who enrolled under Social Security insurance coverage (including their families).

DISPENSE program is for OPD and IPD dispensing at the Pharmacy department.

STAT program is from medical record department.

ICD-10 is the international Statistical Classification of Disease and Related Health Problems.

Diabetes mellitus is defined as a syndrome characterized by chronic hyperglycemia and disturbances of carbohydrate, fat and protein metabolism associated with absolute or relative deficiencies in insulin secretion and/or insulin action.

Non-Diabetes mellitus is defined as patients who were not diagnosed Diabetes mellitus.

Hospital bed-days is calculated by date of discharges minus date of admit and plus one.

DM only is Diabetes mellitus patient without other diseases

DM with complication/co-morbidity is Diabetes mellitus patient with polyneuropathies, retinal vascular disorder, glaucoma, optic neuritis, essential hypertension, ischaemic heart disease, intracerebral haemorrhage, heart failure, arteries and capillaries diseases, cellulitis, chronic renal failure, gangrene and infection of the skin

DM with other diseases is Diabetes mellitus patient with diseases, except of complication and co-morbidity diseases

CHAPTER II
LITERATURE REVIEW

The literature review is divided into 4 parts: I) Implementation of the Universal Health Insurance; II) Resource Utilization; III) Diabetes mellitus; IV) Economic burdens of Diabetes mellitus

Part I: Implementation of the Universal Health Insurance

During the past several decades (1945-2001), Thai health system had various social and health protection schemes. These schemes had been developed at different paces resulting in variations in terms of benefits packages, provider payment methods, financing sources and level of government subsidy (1). These variations led to several problems in the Thai health care system. These problems can be divided into three major parts. First, the rapid growth of Thai health care expenditures was higher than GDP growth rate. The health care expenditures per capita increased from 545 baht in 1980 to 4,663 baht in 1998, a 9-fold difference in two decades (1). Second, inefficiency of health care insurance was found in retrospective fee-for-service payment mechanism. This payment is a hospital reimbursement based on charges for patients services provided such as pharmacy, surgery or laboratory (2). It induces higher utilization of services (9). For example, the Civil Servant Medical Benefit Schemes (CSMBS) expenditure has been increased at 14 percent per annum during 1988-1997. But the number of CSMBS patients did not increase as rapidly as the expenditures. In addition, Tangcharoensathien et al, showed that CSMBS patients have longer hospital stay (13.4 days) than patients in other health insurance scheme (4.9 days). In 1999, CSMBS patients were admitted to hospital 0.142 times a year, twice the admission rates of other health insurance (1). Finally, inequity of health care

benefits was compared in various health insurance schemes. Social Security Schemes (SSS) is the only scheme that used prospective capitation payment. This payment provides health care facilities a specific sum of money for the ongoing care of a person or group of people for a particular period of time. When compared with fee-for-service reimbursement, it provides incentives for health care facilities to reduce resource utilization such as tests and procedures (5). Moreover, some SSS patients complained about the quality of services and worry that the quality of care would be lower than other schemes (1,4). Although Thai health system has various health insurance schemes for Thai people, but by 1966, 30 percent of the population were still uninsured (1). Thus, the government has implemented the policy of universal health care coverage in all provinces in the fiscal year 2002 (1).

The universal health insurance (30 baht scheme) is a new scheme that covers the population who are not under the CSMBS or SSS. This scheme has consolidated all existing health insurance programs undertaken by the Ministry of Public Health (MOPH)-including the health welfare program for the low income and the voluntary health card scheme. Thus, this scheme will expand universal coverage to all people of Thailand.

The major reform that affects most health care providers has been the health care financing reform with the aim to redistributing resources. Before universal health care coverage, most health care financing was retrospective fee-for-service payment and global budget. Under the universal health insurance begins in fiscal year 2002, the government pays this scheme by prospective capitation payment, which will cover most of Thailand's population. The financing reform allocated MOPH budget based on the number of people who live nearby the health care facilities. This payment method is resulting in having more money for highly-populated and under-staffed hospitals in rural areas but less money will go to big hospitals (3, 4). Thus, this will influence health care facilities to restrict health care services provide to beneficiaries. Moreover, health care financing reform has made public health facilities to engage extensively in cross-subsidies. This will influence hospitals to overcharge the government routinely and extensively when civil servants come for treatment, and use that money to provide services for other groups in the population (1). Furthermore,

during the first six-month of the full-scale 30 baht scheme, hospital-based data suggest that, number of outpatient visits has increased substantially from the same period of the year before. Number of inpatients has been in line with in the past few years (3).

However, there was no evidence of poorer quality of medical care or utilization of health within this scheme even though there was evidence of provider's bias in service provision (3).

Part II: Resource Utilization

The introduction of prospective payment system was used in many countries (7). For example, in 1983, the United Stated replaced its cost-based system of reimbursement for hospitals with Diagnosis Reimbursement Group (DRG) prospective payment. Instead of receiving payment for the costs actually incurred in caring for Medicare patients, hospitals receive a rate fixed in advance for each admission. This payment for a patient within any DRG varies somewhat by region and hospital types (e.g., teaching or non-teaching). The hospital in most cases receives the same revenue form Medicare no matter what is done to the patient during the hospital admission or how long the patient stays in the hospital. The primary purpose of the new payment system was to slow the rapid growth of Medicare expenditures, the bulk of which are for hospital care (8). According to Russell and Manning study, (6) prospective payment has reduced Medicare's hospital expenditures substantially by more than 20 percent after seven years of introduction (1983-1990).

The effect of Medicare's prospective payment system (PPS) on Medicare beneficiaries and providers has been studied extensively. Studies indicate that hospital utilization was substantially decreased with the implementation of the PPS. Data from the Health Care Financing Administration show the remarkable declines in length of stay (LOS) among Medicare recipients. Without doubt, the DRG system under PPS was extremely successful in its goal of reducing hospital lengths of stay. Moreover, Muller (16) showed that PPS inpatient admissions was decreased by approximately 5% during the first year (the fiscal year 1983), and further decreasing by approximately 9% in the second year (the fiscal year 1984). Furthermore, by 1988, 5

years after the DRG system had been installed, overall Medicare admissions to the hospital declined by 13 percent (17).

It is more profitable for hospitals to discharge patients sooner and thus avoid the added expense of extra days of care. Many of these patients discharged earlier may be cared for at home, by family or home health care services. Thus, it is possible that PPS may result not in net savings to the health care system but rather in shifting of costs from hospital to home health are services (18). Scheffler et al. (19), studied that PPS has been associated with significant declines in hospital admissions and length of stay for both Medicare and non-Medicare populations.

In addition to hospitalization, other indicators of resource utilization are studied, annual office visit, prescription drugs, common test and procedure with rates estimated on both a per-visit and per-year basis and total hospital charges for the hospital stay (10, 17, 20). Sloan et al. (21) showed that PPS has resulted in reduction of many non-surgical procedures. The largest decrease was in serology and blood chemistry for Medicare patients and in blood chemistry and chest X-ray for non-Medicare patients.

Long ML et al. (22) showed there were fewer diagnosis tests, fewer laboratory tests and fewer X-rays after PPS. For example, there were no reduction in the proportion of patients that receive at least one diagnosis test but a reduction in the average number of diagnosis tests per period.

One major part of utilization of health is drug utilization. Magee et al. (23) showed that drug charges were 8.6-10.8% of the hospital charges and was strongly related to hospital charges. No matter which provider payment method will be employed, the types and prices of drugs will remain issues of concern in terms of insurance costing. If capitation payment is used, the types and the prices of drugs will be one of the input factors for calculating capitation rates. These days, there are different levels of drug cost in therapeutic drug class. For example, generic drugs are at lower cost than brand drugs (1). Thus, prior studies suggested that patient's insurance status affect prescription drug costs. Mott et al., (10) shows that prescription orders covered by private insurance (private third party and indemnity) were

significantly less likely to allow the opportunity for generic drug use relative to uninsured prescriptions.

The implementing of capitation payment would alter dispensing behavior and influence physician's prescribing to lower prescription costs such as substituting lower-cost generic equivalents, changing the quantities of drugs dispensed per prescription, optimizing the drug dosage regimen, changing the types of drugs dispensed within a therapeutic category, switching to nonprescription (OTC) drug (24).

Several parameters were used to measure drug utilization in health care facilities.

- Drugs per prescription (25)

The number of drugs per prescription is used to measure drug consumption. Hogerzeil HV et al. (26) studied the pattern of drug use in 12 developing countries and found that the number of drugs per prescription ranged from 1.4 to 3.8. The number of drugs per prescription is high in the third world (more than 2) compared with developed countries (less than 2). This suggested that there is over-prescription of drugs in third world countries.

- Commonly used drugs

In India, the most commonly prescribed groups of drugs were vitamins (in 67% of prescription), antimicrobials (66%), analgesics (54%), antihistamine (28%) and antidiarrhoeals (7%). A similar pattern of drug use was observed in developing countries (25). These studies suggested that there is overuse of antihistamines and vitamins, which may be irrational.

- Drug cost per patient day or per clinic visit

These indicators provide a broad picture of the cost of drugs products by separating the drug costs of inpatient and outpatient hospital services (27).

- Pharmacologic-cost indicators

This indicator finds the total cost of drug products in each pharmacologic classification and then were divided the cost by the number of patients being treated

for a given disease. It determined the cost of drug products in each pharmacologic group used by patients for a given period (27).

- Disease-drug cost indicator

Total cost of drugs administered to a given patient being treated for a give disease was determined (27). The purpose of this indicator is to determine the drug cost of treating specific diseases and comparison of the cost of treating for different diseases. It's useful in justifying and controlling drug costs.

Part III: Diabetes mellitus

Diabetes mellitus is a significant chronic disease in many parts of the world. It is characterized by hyperglycemia and disturbances of carbohydrate, fat, and protein metabolism arising from absolute or relative deficiencies in insulin action and/or insulin secretion (28). It may be suspected or recognized clinically by the presence of characteristic systems such as excessive thirst, polyuria and unexplained weigh loss.

The clinical classes of diabetes classified by the American Diabetes Association in 1997 and World Health Organization in 1988 are divided into four groups as the following (29):

i. Type 1 diabetes mellitus

ii. Type 2 diabetes mellitus

iii. Other types of diabetes mellitus

iv. Gestational diabetes mellitus

Type I diabetes mellitus

It is caused by an autoimmune process that destroys insulin-producing β-cells in the pancreas. Thus, person with type 1 diabetes is unable to produce insulin and depend upon insulin to sustain life. Clinical characteristics of patient with type 1 diabetes are normally included;

i. Age less than 20 years old,

ii. Symptoms of disease occur suddenly,

iii. Patient is usually thin, and

iv. if the patient does not receive treatment with insulin immediately, acute complications maybe occurred.

Type 2 diabetes mellitus

It occurs primarily in adults, particularly the elderly. In contrast to type 1 diabetes, person with type 2 diabetes can still produce insulin, but may be insulin resistant.

Characteristics of patient with type 2 diabetes comprise;

i. Age more than 30 years old,

ii. Symptoms of diabetes occur slowly or no symptoms,

iii. Patient may have a body weight that ranges from normal to excessive,

iv. There is family history of diabetes.

Other types of diabetes mellitus

It is caused by other conditions or syndromes such as pancreatic disease, removal of pancreatic tissue and endocrine disease (acromegaly, cushing's syndrome)

Gestational diabetes mellitus

Gestational diabetes mellitus is a designation specifically for women whose diabetes is first recognized or has its onset during pregnancy. In many women with gestational diabetes, glucose tolerance reverts to normal after parturition. But in others, diabetes or impaired glucose tolerance persists.

However, there are only two major groups of diabetes; type 1 and type 2 diabetes, will be mostly focused on published literatures.

Diabetes is one of major health problems because of diabetes complications and co-morbidities. It causes absence from work, disability and premature death.

There are two major subtypes of diabetes complication (25,26): acute and chronic

1. **Acute complications**

Acute complications include diabetic ketoacidosis, hyperglycemic hyperosmolar nonketoacidosis syndrome (HHNS) and hypoglycemia.

Diabetes ketoacidosis may occur in diabetic patients who also have an active infectious process, discontinue insulin therapy, and are subjected to stress. Sign and symptoms of DKA include polydipsia, polyuria, weakness, fruity breath, dry mucus membranes, tachycardia and hypotention.

HHNS is a life-threatening emergency usually seen in the elderly or undiagnosed person. It is characterized by four principal features:

i. severe hyperglycemia (>800 mg/dl)
ii. absence of ketoacidosis
iii. profound dehydration
iv. neurologic signs or depressed sensorium to coma

Hypoglycemia almost occurs in diabetic patients who use insulin, who intake insufficient food and concomitant hypoglycemic drugs, and who have excess excise. Symptoms of hypoglycemia include a parasympathetic response (nausea, hunger, or flatulence), diminished cerebral function (confusion, agitation, lethargy or personality changes), sympathetic response (tachycardia, sweating, or tremor), coma and convulsion.

2. **Chronic complications**

They are classified into microvascular and macrovascular complication (29).

Microvascular includes retinopathy, nephropathy and neuropathy.

Macrovascular includes coronary heart disease (ischemic heart disease, myocardial infarction), and cerebrovascular disease (stroke), and peripheral vascular disease (foot ulcer, gangrene)

Prevalence of Diabetes mellitus

Diabetes mellitus is a chronic disease that occurs in people around the world. A number of studies have been undertaken to determine the prevalence of diabetes in different populations around the world. For example, one study provides estimates of the global prevalence of diabetes in the year 2000 (as used in the World Health Organization [WHO] Global Burden of Disease Study) and projections for 2030 (11). It provides that the total number of people with diabetes is projected to rise from 171 million in 2000 to 366 million in 2030. The prevalence of diabetes for all age-groups worldwide was estimated to be 2.8% in 2000 and 4.4% in 2030. Moreover, globally diabetes mellitus prevalence is similar in men and women but it is slightly higher in men less than 60 years of age and in women at older ages. Overall, diabetes prevalence is higher in men, but there are more women with diabetes than men. This study is applied to estimate the prevalence of diabetes for individual countries, classified as developing and developed countries. It was found that the majority of people with diabetes are in the 45-to 64-year age range in developing countries. In contrast, the majority of people with diabetes in developed countries are over 64 years of age. Thus, by 2030, it is estimated that the number of people with diabetes with over 64 years of age will be more than 82 million in developing countries and over 48 million in developed countries (11). In a large developed country, the United Stated (US.), the National Health Interview Survey with Bureau of Census indicated that the number of Americans with diagnosed diabetes is projected to increase 165%, from 11 million in 2000 to 29 million in 2050 (32). Thus, the trend of the incidence rate has increased over the period of the time. Data from the 1978-81 National Health Interview Survey in the U.S showed an average of 23 new cases of diabetes per 10,000 populations per year (28).

The Thailand, although the incidence rate of diabetes is not available however Medical Association of Thailand showed that the prevalence rate of diabetes in 1965 was about 2.3%. This survey was conducted in Bangkok by using urine test in 64,808 persons and FBS test in 2,856 suspected persons. In 1971, The Diabetes Association of Thailand surveyed 322,953 samples in Thailand by urine test. It was found that there were 8,110 diabetes patients or the prevalence rate was 2.5% (33). After that, during 1971 to 1986 there were several surveys but there were usually

focused on population in some hospitals and communities (33). The wide range of prevalence rates from these survey were 0.08% to 15.3% depending on factors such as population group, diagnosis criteria of diabetes and a period of time. However, the prevalence rate generally increased with age. The prevalence rate in population between the age of 30 to 60 years was 4.7% while it was 10-15% in population over the age of 60 years (11, 32).

Part IV: Economic burdens of Diabetes mellitus

Diabetes is not only a major health problem but also imposes large economic cost. One of the reasons may be that the mortality rate and the incidence rate of diabetes increase over the period of time world-wide (28, 12). Another reason of expenditure impact is high incidence rate of health care resource use, health care services for medical conditions directly related to complication of diabetes. People with diabetes are at greater risk for neurological disease, peripheral vascular disease, cardiovascular disease, renal disease, endocrine/metabolic complication, ophthalmic disease and other chronic complications. In the U.S, Diabetes is the fifth leading cause of death by diseases because diabetes also contributes to higher rates of co-morbidity. A recent study by the American Diabetes Association has estimated diabetes costs in 2002. This study found that total health care expenditures attributable to diabetes were estimated at $132 billion (12). Of these, $91.8 billion in direct health care expenditures was attributable to diabetes, $39.8 billion in indirect expenditure resulting from lost workdays, restricted activity days, mortality and permanent disability. The largest component of health care costs (41% of the national cost) was institutional care (i.e., hospital inpatient care and nursing home care), followed by outpatient care, at $20 billion (15% of the national cost of diabetes) and outpatient medication and supplies, $17.5 billion (13% of the national cost of diabetes) (30).

When analyzed in medical expenditures per capita, this study was found that $13,243 for people with diabetes and $2,560 for people without diabetes. Furthermore, when adjusting for difference in age, sex and race/ethnicity between the

population with and without diabetes, people with diabetes had medical expenditures that were approximately 2.4 times higher than expenditures that would be incurred by the same group in the absence of diabetes (12). For economic aspect of diabetes in the United Kingdom, it is estimated that the care of people with diabetes accounts for 4 to 5% of the total health budget (13). Moreover, health care spending per people with diabetes is more than double what spending would be without diabetes (12, 13).

Majority of these studies have been widely studied the economic aspects of type II diabetes, with the result that type II diabetes is presented in about 85 to 90% of all persons with diabetes (28). For example, one study evaluated more than 7,000 patients with type II diabetes in eight countries (Belgium, France, Germany, Italy, the Netherlands, Spain, Sweden and the United Kingdom). This result found that total direct medical costs of type II diabetes was estimated at EUR 29 billion a year (1999 values). The estimated average yearly cost per patient was EUR 2,834 a year (13).

Growing cost of diabetes health care has recently been a major concern in many countries. Thus, there are many studies to estimate the expenditures and evaluation of the portion of health care resource use attributable to diabetes. The major effect to use health care resource is the result that people with diabetes are at greater risk for chronic complication and various co-morbidities. Moreover, diabetes-related complications impact is high incidence rate in lost productivity resulting from lost work days, lost home services permanent disability and premature mortality. These factors will raise the cost of medical care. Thus, further studies might investigate the health care expenditures and health care resource utilization that associated with diabetes persons. For example, a Veterans Administration (VA) study in veterans was done with diabetes who sought care in VA facilities between 1994 and 1998. This study found that the average number of discharges per person was decreased from 1.68 to 1.61 while an increase in average number of outpatient visits was 4.5 in 1997 and 4.6 in 1998. When studied in expenditures, the direct cost of diabetes-related VA services for veterans totaled $1.67 billion in 1998, which included $214.8 million in outpatient care and $1.45 billion in inpatient care. Thus, hospitalizations represent 87% of total costs (14).

For many individuals, diabetes is often characterized by diabetes-related complication and co-morbidity. Ramsey et al; presented that prevalence of complication in diabetes person was much higher than the prevalence of those condition in the matched control group without diabetes. This study was observed from 1992 to 1995 in a large health maintenance organization. Prevalence ratios contrasting the diabetes and control group without diabetes were highest for eye disease and foot ulcer (ratios=16:1 and 6:1, respectively) and lowest for hypertension (ratio=1.6:1). The incidence rates of complications for diabetic and non-diabetic patients had ratios similar to the prevalence. Then, comparison of annual costs showed that health care costs for individuals with diabetes-related complication were at a minimum twice as high and as much as 26 times greater than the annual health care costs for patients without diabetes or the complication, especially foot ulcers and eye disease. This may reflect the fact that foot ulcers and eye disease are particularly severe for those with diabetes compared with those with these conditions but no diabetes (15). In the U.S, diabetes is estimated that 50% have some degree of peripheral neuropathy (28, 15) and can result in foot ulceration and amputation. For foot ulceration, the prevalence of foot ulceration to include only foot ulcers that are primary neuropathy in origin (65% of foot ulcer), while peripheral neuropathy complication may occur in 50% of diabetes patient. Therefore, In the U.S. the total annual cost of treating diabetic peripheral neuropathy (DPN) and its complications was $10.91 billion. Moreover, these costs of treating was very sensitive to the prevalence of foot ulceration, which incurs relatively high long-term costs and require many resource treatment. Thus, the increase progression of diabetes-related complication will have the result that highest health care costs (34).

In the year 2002, O'Brien et al. (35), study to estimate the direct medical cost of managing microvascular and macrovascular complication of type II diabetes mellitus. The estimated costs were reported in terms of event and state costs. The event cost was associated with resource use specific to the acute episode and subsequent care in the first year. While state costs were the annual costs of continual management. Data were obtained from many sources, including inpatient, ambulatory and emergency department care. This study found that the mean event costs for ischemic stroke was generated a greater financial burden ($40,209 per person). The

end-stage renal diseases had the highest in the state cost ($37,022 per person). Thus, the estimated costs presented a picture of the cost attributable to the complications of diabetes (36).

For the Europeau study, R William et al. (36), showed that the incidence of complication in foot ulcer and sight threatening retinopathy accounted for the highest annual incidence (2%) of microvascular complication. For the effect of complication on costs, this study confirmed that complications can have an impact on the overall direct medical costs of patients with type II diabetes. The presence of microvascular complication led to 70% increase in costs compared to patients with no complications (EUR 2563 and EUR 1505). Costs for patients with macrovascular complication (EUR 3148) were twice as high as patients with no complication. These patients with both microvascular and macrovasular complication (EUR 5226), increased costs by 3.5-fold over those without complication (37). Moreover, a very large proportion of the increase in direct medical cost was attributable to an increase in hospitalization expenditures. For patients with only microvascular or macrovascular complications, the incremental increase in hospitalization cost was 100% and 200%, respectively, compared with costs for patients without complications. However, inpatients with both classes of complications, hospitalization costs were increased by a total of 450% (37). Furthermore, there is study to describe and analyze the time course of medical care costs caused by a type II diabetes, from the time of diagnosis through the first 8 postdiagnostic years. The economic burden of diabetes is immediately apparent from the time of diagnosis. In year 1, total medical costs were 2.1 times higher for patients with diabetes compared with those without diabetes. Diabetes-associated incremental costs averaged $2,257 per type 2 diabetic patient per year during the first 8 postdiagnostic years. Annual incremental costs varied relatively little over the period but were higher during years 1, 7, and 8 because of higher-cost hospitalizations for causes other than diabetes or its complications (41). Thus, the influence of many factors affecting these costs such as the number of co-morbidities and complications (especially renal dysfunction) (37, 38, 39 and 40).

Investigation on costs of diabetes-related complication was related to healthcare utilization. For example, in 1995, the health care financing administration

national health expenditure for diabetes, including expenditure for chronic complication of diabetes, unrelated conditions for which diabetes are at higher risk, and various co-morbidities were classified into types of health service. This found that hospital care accounted for 52% of estimated expenditures for diabetes. Physician and other professional services were second largest at 19% of the total. Home health and nursing home care accounted for about 90 to 120% of the total, while prescription drugs and medical supplies were about 5% and just over 1%. While expenditures for most health services decrease as age increase, spending peaks at age 75 to 84 years for home health care and nursing home care (41). Furthermore, studies the influence of different factors affecting these cost presented that direct cost of patient with insulin-dependent diabetes mellitus (type I) was $5,160 higher than for a patient with noninsulin-dependent diabetes during the 3-year study (41).

In 2002, the American Diabetes Association (ADA) study on the national cost of diabetes. This was found that the majority of health care costs was institutional care (i.e., hospital inpatient care and nursing home care) 41% of the national cost of diabetes. Outpatient cares, comprised 15% of the national cost of diabetes while the cost of outpatient medication and supplies comprised 13% of the national costs of diabetes (12).

Drug utilization

Drug is the major part of treatment and is essential to health care for most diabetic individuals. Drug treatment is a costly part of overall health care for diabetes because anti-diabetic medications are relatively expensive and diabetic individuals often need expensive additional medication.

Use of anti-diabetic drugs had been evaluated in several studies. For example, in a Finland study (42), showed that cost of medications taken by all individuals with diabetes were 3.5 times greater than costs of medications taken by non-diabetes individuals. Costs of medications for individuals with diabetes accounted for 41% in anti-diabetic drugs. These anti-diabetic drugs were composed of insulin preparation (61%) and oral anti-diabetic agents (39%). After excluding anti-diabetic drugs, costs of medication taken by all individuals with diabetes were still over 2 times the costs of medication for non-diabetes individual. The costs and

distribution of costs differed markedly between individuals with type I and type II diabetes. The costs of all medications for individuals with type I diabetes ($1,272/patient) were 12 times greater than those non-diabetes individuals ($101/patient), whereas type II diabetes, annual medication costs ($1,151/patient) were lower than type I diabetes. In individuals with type I diabetes, insulin treatment accounted for 62% of the total costs of medications, but the costs of medications other than anti-diabetic agents were almost 5 times higher in individuals with type I diabetes than in non-diabetes individuals. Individuals with type II diabetes, oral anti-diabetic agents accounted for 21% and cost of insulin accounted for 18% of the total costs of medications. Costs of medication other than anti-diabetic medications were 2 times higher than those for non-diabetic individuals. Thus, the higher costs were mostly attributable to insulin therapy of individuals with type I diabetes. The higher costs for individuals with type II diabetes were related to the cost of medications other than anti-diabetic medication (42). Furthermore, there is the study on the patterns and costs of drug prescribing during a 1-year study period (1995) in U.K (43). The overall numbers of drug items dispensed and the proportions of diabetic and non-diabetic patients who received these items were determined. Mean prescribing rate were calculated. Each rate was the average number of drug items dispensed per patient. This study found that the mean dispensed prescribing rates for all drugs (excluding anti-diabetic medication) were higher across all age-group for diabetic patients. Meanwhile, patients with type I diabetes were 2.07 times and patients with type II diabetes were 1.70 times more likely to be dispensed a drug item than people without diabetes (43).

Thus, diabetes is a significant burden in terms of morbidity and the concomitant use of and expenditures for health care services. The economic burden of diabetes and its complication is large. When the fraction of total health care expenditures, unrelated conditions for which diabetes are at higher risk of utilization of health services, and co-morbidities that raise the cost of medical care are also included, total expenditures increase 2.5 times of expenditures in diabetes without complication or co-morbidities (37). Diabetes burden will surely increase as the population grows larger and older. Obiviously, efforts to delay or avoid complications of diabetes would be beneficial not only to the patient, but also to the health care

system. Furthermore, it is important for policy makers to have up-to-date information about prevalence, incidence and costs. Documenting the human and economic burden of diabetes is a first step in achieving awareness of progressive diabetes.

CHAPTER III
METHODOLOGY

Study Design

This was a cross-sectional descriptive study.

Study Location

Data of this study were collected at Samut Sakhon Hospital, a 509-bed general institution in Samut Sakhon province.

Study Period

Medical record data and prescription drug data were collected from STAT program and DISPENSE management program. These data were recorded during fiscal year 2002, October 2001-September 2002.

Data Sources

The data were gathered from hospital database; STAT program, DISPENSE management program and accounting report. The two programs were electronic data and accounting report is supportive data in hard copy only. STAT program is from medical record department. Data needed are characteristics of outpatients and inpatients who received treatment at Samut Sakhon Hospital during by 2002. These data were separated into outpatient department and inpatient department. Data were collected in dBase file format (.DBF extension).

For outpatient department; the following information was gathered:

1. HN (Hospital number)
2. NAME (Name of patients)
3. CHANGWAT (Patient's hometown)
4. SEX (male or female)
5. MARRIAGE (Single, Married, Separated, Divorced, Widowed and Priest)
6. DATE (Date of outpatient visit)
7. WARD(Antenatal care, Dental, Ear Eye Nose Throat, Emergency, General practice, Gynecology, Medicine, Pediatric, Orthopaedic, Psychiatry, Surgery)
8. DG1 (Principal diagnosis)
9. DG2 (Co-morbidity)
10. DG3 (Complication)
11. DG4 (Other diagnosis)
12. PTTYP (Patients' type of health insurance coverage)

For inpatient department; the following information was gathered;

1. AN (Admission number)
2. NAME (Name of patients)
3. CHANGWAT (Patient's hometown)
4. SEX (male or female)
5. MARRIAGE (Single, Married, Separated, Divorced, Widowed and Priest)
6. WARD (Medicine, Surgery, Gynecology, Pediatric, Ear Eye Nose Throat, Orthopaedics, Psychiatry)
7. DATEADM (Date of admission)
8. DATEDSC (Date of discharge)

9. DG1 (Principal diagnosis)
10. DG2 (Co-morbidity)
11. DG3 (Complication)
12. DG4 (Other diagnosis)
13. PTTYP (Patients' type of health insurance coverage)

DISPENSE management program is prescription data collecting program. This program keeps records of dispensing data from outpatient department (OPD) and inpatient department (IPD). The database is composed of 26 tables.

1. COMPNY (File of company)
2. CTRLNO (Number of documents' company)
3. DCHGELST (Items of drug change)
4. DEPARTMT (Names of department)
5. DOCTOR (Names of doctors)
6. DOSAGE (Dosages of drugs)
7. DRGUFREQ (Frequency of drugs)
8. DRGUMTHD (Method of drug use)
9. DRGUTIME (Drugs time)
10. DROUTINE (Names of drugs to use routine)
11. DRTLIST (Drugs list to use routine)
12. DSYNONYM (Drugs code)
13. INVADD (Drugs to use co-ordinate)
14. INVENTRY (Drug inventory)
15. PERSONNL (Personnel)
16. PHARCOGR (Pharmacological group)
17. PRSCRIPT (Component of prescription)

18. PRSCLIST (Drug list in prescription)
19. PTNTYPE (Patient's type of health insurance coverage)
20. PTYPDISC (Discount of patients)
21. SALEUNIT (Sale unit)
22. SRVCTYPE (Service type)
23. TITLE (Title of name)
24. USEUNIT (Use unit of drugs)
25. WRKPRNTR (Data of printer)
26. WRKSTATN (Data of computer)

Prescription data used in this study were records in PRSCRIPT and PRSCLIST tables. PRSCRIPT database keep the major components of prescription, with the following fields:

1. SYS_PRSC (Number of the prescription)
2. ENTRY_STAT (Status of work)
3. CHKPRNT (Check print)
4. CHKCONF (Check confirmation)
5. CHKPRSC (Check prescription)
6. CHKDISP (Check dispense)
7. PN (Prescription number)
8. DATE (Date of prescription)
9. HN (Hospital number)
10. Title (Title of name)
11. PTNNAME (Name of patients)
12. PTNLNAME (Last name of patients)
13. AGE (Age of patient)

14. PTNTYPE (Patient's type of insurance coverage)
15. PHYSCODE (Code of physician)
16. PHYSDEPT (Department of physician)
17. DIAGNOS (Diagnosis)
18. BEGTIME (Begin receive prescription)
19. CALTIME (Time of key prescription)
20. PRSCTIME (Time of prescription filling)
21. CONDATE (Date of receive drug)
22. TOTPRICE (Total price)
23. TOTCOST (Total cost)
24. TOTITEM (Total items)
25. REFUND (Refund drug cost)
26. SOCDISC (Discount)
27. SRVCOST (Service cost)
28. PTYPEDISC (Discount of patient type)
29. PTNPAIP (Payment of patient)

PRSCLIST database is about drug list in prescription. It has the following tables;

1. SYS_PRSC (Number of system)
2. MRKPRNT (Data of printer)
3. DATE (Date of prescription)
4. HN (Hospital number)
5. RCVPAIP (Receive or paid drug)
6. Drug code (Drug code)
7. SRVCCODE (Service code)

8. PERSDISC (Discount of insurance type)
9. SALEUNT (Sale unit)
10. QUANT (Quantity of service)
11. UPRICE (Unit price)
12. DOSE (Dose)
13. USEUNIT (Use unit)
14. DRGUFREQ (Drug frequency)
15. DRGUTIME (Drug time)
16. DRGUMTHD (Method of drugs)
17. DRGUCMMT (Comment of drug)
18. ASSTLBL (Assistant label)
19. DRUGNAME (Drugs name)
20. PN (No. of prescription)

For inpatient DISPENSE program, there was difference from outpatient DISPENSE program because it was supported in unit dose system; the following information was gathered:

IPD_PSCT keep major components of the prescription, with following records:

1. PSCT_ID (Prescription number)
2. DATE (Date of prescription)
3. HN (Hospital number)
4. AN (Admission number)
5. SUMTOTAL (Charge in prescription)

IPD_PSCTMC database is about drug list in prescription, with following tables:

1. PSCT_ID (Prescription number)
2. MC_ID (Drug or service code)

3. KMC_ID (Resource code)
4. USE (Number of drug or services)
5. TOTAL (Total number of drug or services)
6. MC_PRICE (Price per unit)

Accounting report had data about population that registered such as Social security, foreign worker and UC covered by different health care schemes in hospital. Meanwhile, CSMBS population in Samut Sakhon was retrieved from National Health Security office.

Population and Sample

All outpatients and inpatients who were treated at Samut Sakhon Hospital during October 2001 to September 2002 were included in the study. In addition, a sub-group analysis of patients with DM will be done for further comparison among patients with the same specific disease.

Data Collection Procedure

I. Data retrieval and transfer

STAT program and DISPENSE management program were not designed to record data on the LAN (Local area network). First, data in dBase (.dbf) file format were converted to file format ACCESS program (.mdb) and MS Excel program (.xls). Data to be retrieved for analysis were history and utilization data of patients who received treatment at Samut Sakhon hospital. Type of treatment were categorized as; outpatient department (OPD) and inpatient department (IPD). The characteristics of patients were determined such as hospital number (HN), admission number (AN), gender, age, marriage, residence, patient's insurance coverage, disease diagnosis, date of hospital visits, date of hospital admission and discharge. For insurance coverage, they were classified into five major types; Civil Servant Medical Benefits Schemes

(CSMBS), self-pay, Social Security Scheme (SSS), Universal Health Coverage Scheme (UC) and foreign worker.

Meanwhile, DISPENSE management program was transferred to ACCESS program (.mdb). These data were records of resource utilization from OPD and IPD. Data of types of services were retrieved; types of services; drugs and medical supplies, lab, X-ray, EKG, etc; quantity of services and charge of each service. Data from two programs were collected during October 2001 to September 2002. Meanwhile, population in various health insurance type data was recorded from account report, except in self-pay and CSMBS.

II. Identification of DM patients

The ICD-10 (International Statistics Classification of Diseases and Related Health Problem Revision 10) was used for patient classification. This system is the international code to classify of diseases and related health problems.

Diabetes mellitus (DM) disease is identified by 5 major ICD-10 codes: E10 (Insulin-dependent diabetes mellitus), E11 (Non-insulin dependent diabetes mellitus), E12 (Malnutrition-related diabetes mellitus), E13 (Other specified diabetes mellitus) and E14 (Unspecified diabetes mellitus). Patients who have either one of these ICD codes, either as principal diagnosis (DG1), co-morbidity (DG2), complication (DG3), or other diagnosis (DG4), will be identified as DM patients. Patients without diagnosis of E10-E14 will be classified as non-DM patients. Then, all DM patients were divided into three groups;

1) DM only patients are DM patients without any co-morbidity/complications or other diseases.

2) DM with complication/co-morbidity patients are DM patients who had any of diagnosis complication and co-morbidity.

3) DM with other diseases patients are DM patients who had other diagnosis, except complication or co-morbidity.

In this study, complication and co-morbidity of DM were classified according to ICD-10; as the following:

G60-G64 Polyneuropathies and other disorders of the peripheral nervous system

G60 - Hereditary and idiopathic neuropathy

G61 - Inflammatory polyneuropathies

G62 - Other polyneuropaties

G63 - Polyneuropathies in diseases classified elsewhere

G64 - Other disorders of peripheral nervous system

H34-H36 Disorders of choroids and retina

H34 - Retinal vascular occlusions

H35 - Other retinal disorders

H36 - Retinal disorders in diseases classified elsewhere

H40-H42 Glaucoma

H40 - Glaucoma

H42 - Glaucoma in diseases classified elsewhere

H46-H48 Disorders of optic nerve and visual pathways

H46 - Optic neuritis

H47 - Other disorders of optic (2^{nd}) nerve and visual pathways

H 48 – Disorders of optic (2^{nd}) nerve and visual pathway in diseases classified elsewhere

I10 Essential (primary) hypertension

I20-I25 Ischaemic heart diseases

I20 - Angina pectoris

I21 - Acute myocardial infarction

I22 - Subsequent myocardial infarction

I23 - Certain current complications following acute myocardial

I24 - Other acute ischaemic heart disease

I25 - Chronic ischaemic heart disease

I50 Heart failure

I60-I69 Cerebrovascular diseases

I60 - Subarachnoid haemorrhage

I61 - Intracerebral haemorrhage

I62 - Other nontraumatic intracranial haemorrhage

I63 - Cerebral infarction

I64 - Stroke, not specified as haemorrhage or infarction

I65 - Occlusion and stenosis of precerebral arteries, not resulting in cerebral infarction

I66 - Occlusion and stenosis of cerebral arteries, not resulting in cerebral Infarction

I67 - Other cerebrovascular diseases

I68 - Cerebrovascular disorders in diseases classified elsewhere

I69 - Sequelae of cerebrovascular disease

I70-I79 Disease of arteries, arterioles and capillaries

I70 - Atherosclerosis

I71 - Aortic aneurysm and dissection

I72 - Other aneurysm

I73 - Other peripheral vascular diseases

I74 - Arterial embolism and thrombosis

I77 - Other disorders of arteries and arterioles

I78 - Diseases of capillaries

I79 - Disorders of arteries, arterioles and capillaries in diseases classified elsewhere

L00-L08 Infections of the skin and subcutaneous tissue

L00 – Staphylococcal scalded skin syndrome

L01 – Impetigo

L02 – Cutaneous abscess, furuncle, skin syndrome

L03 – Cellultis

L04- Acute lymphadenitis

L05 – Pilonidal cyst

L08 – Other local infections of skin and subcutaneous tissue

N18-N19 Renal failure

N18- Chronic renal failure

N19 – Unspectified renal failure

R02 Gangrene, not elsewhere classified system

III. Determination of health care utilization

Analysis of health care utilization will be compared between DM and non-DM patients. Furthermore, separated analysis will be done for OPD and IPD services among the two groups.

- Determination of health care utilization rate

Data of health care utilization rates are the frequency of hospital visit by DM and non-DM patients. This data were reviewed from STAT program. Data from this program has more details about; total number of outpatients and inpatients, the number of hospital visits, the number of hospital admission and the number of hospital bed-days. In addition, comparison of health care utilization will be done among patients with different health insurance schemes.

- Determination of total hospital charges

After the data of utilization rate analysis, DM and non-DM patients who used various health care services for treatment of hospital charges determined are total

hospital charges for treatment in DM and non-DM patients under different health insurance schemes will be calculated from DISPENSE program. In DISPENSE data, health services were classified into major four parts; drugs, medical supplies, medical services and miscellaneous.

1. Drugs (Essential drugs and Non-essential drugs),
2. Medical services (such as operation, X-ray, dressing, dialysis, ultrasound, EKG),
3. Medical supplies (such as medical equipment, artificial organ, walking stick, walker)
4. Miscellaneous (such as room, ICU, telephone expenditures, emergency vehicles)

Therefore, charges of treatment were collected from drug prescribed, services and medical supplies charges during treatment. In addition, study of total hospital treatment charges in DM patients will be furthered classified by status of diseases and each health insurance type.

For drug utilization, more detailed analysis could be done from the DISPENSE program. These data were separated in major types of services; drugs and non-drugs. In the part of drug, this study was divided into Essential drugs (ED) and Non-essential drugs (NED) and number of drug item dispensed per prescription. Then, charges of DM and non-DM patients were extracted in average charges per visit, charges per admission, charges per day, charges per item, charges per prescription and charge per person. Finally, these charges are compared in terms of resource utilization per patient across the health insurance schemes.

Data Analysis

The data were analyzed as descriptive statistics (frequency and mean) using structured query language (SQL) Microsoft Access and MS EXCEL.

1. Patients characteristics

Characteristics of DM and non-DM patients were determined for outpatients and inpatients such as gender, age, marital status, residence and patient's insurance coverage type. The frequency of patients' characteristics who received treatment in this hospital was determined.

2. Health care utilization rate

Health care utilization rate was determined separated by for DM and non-DM, and for outpatients and inpatients.

Utilization rate is the number of times a patient comes for treatment in a health care facility during a period of time (1 year).

Population is the number of person who register in each other health insurance schemes.

Outpatient utilization rate

Outpatient utilization rate was computed as number of visit per patient, number of visit per capita and % access to health care for DM and non-DM outpatients.

1) Average visit per outpatient $= \frac{\text{Total number of outpatient visits}}{\text{Total number of outpatients}}$

2) Average visit per capita $= \frac{\text{Total number of OP visits}}{\text{Total population}}$

3) % Access to health services $= \frac{\text{Total number of patients X 100}}{\text{Total population}}$

Inpatient utilization rate

Inpatient utilization rate was computed as number of admission per patient, number of admission per capita, length of stay per admission (length of stay was computed by discharge date minus the admission date and plus one day) and access to health care for DM and non-DM inpatients.

1) Average admission per patient = $\frac{\text{Total number of admission}}{\text{Total number of inpatients}}$

2) Average admission per capita = $\frac{\text{Total number of admission}}{\text{Total population}}$

3) Average length of stay per admission= $\frac{\text{Total number of hospital days}}{\text{Total number of admissions}}$

4) % Access to health services = $\frac{\text{Total number of inpatients}}{\text{Total population}} \times 100$

3. Total hospital charges

Total hospital charges are consisted of drugs, medical supplies, medical services and miscellaneous during treatment. Therefore, total hospital charges were computed by summing all services charges provided to DM and non–DM outpatients and inpatients.

Outpatient charges

Calculation of average charges of treatment was computed as charges per outpatient and charges per visit.

1) Average charges per patient = $\frac{\text{Total hospital charges of outpatient services}}{\text{Total number of outpatients}}$

2) Average charges per visit = $\frac{\text{Total hospital charges of outpatient}}{\text{Total number of visits}}$

Inpatient charges

Calculation of average charges of treatment was computed as charges per admission, charges per day and charges per inpatient.

1) Average charges per patient = $\frac{\text{Total hospital charges of inpatient}}{\text{Total number of inpatients}}$

2) Average charges per admission = $\frac{\text{Total hospital charges of inpatient}}{\text{Total number of admissions}}$

3) Average charges per day = $\frac{\text{Total hospital charges of IPD}}{\text{Total number of hospital-bed days}}$

Comparison of resource utilization

The types of resource utilization are categorized into two major types; drugs and non-drugs (medical supplies, medical services or other services). Use of drugs and non-drugs treatment will be compared between DM and non-DM outpatients and inpatients. Furthermore, there are comparison of resource utilization among various health insurance types (CSMBS, Social Security, UC, Self-pay and foreign-worker).

Outpatient's resource utilization

Calculation of average charges of service was computed as charges of services per prescription, charges of services per item and charges of services per visit in each health insurance schemes.

1) Charges of services per prescription = $\frac{\text{Total charges of services}}{\text{Total number of prescription}}$

2) Charges of services per item = $\frac{\text{Total charges of services}}{\text{Total number of items}}$

3) Charges of services per visit = $\frac{\text{Total charges of services}}{\text{Total number of visits}}$

Inpatient's resource utilization

Calculation of average charges of service was computed as charges of services per item, charges of services per admission and charges of services per day in each health insurance schemes.

$$\text{1) Charges of services per item} = \frac{\text{Total charges of services}}{\text{Total number of items}}$$

$$\text{2) Charges of services per admission} = \frac{\text{Total charges of services}}{\text{Total number of admission}}$$

CHAPTER IV
RESULTS

The results of this study were divided into four parts: 1) Characteristics of patients, 2) Health care utilization rate, 3) Total hospital charges, and 4) Comparison of resource among health insurance schemes

Part 1: Characteristics of Patients

A total of 201,965 patients were treated at Samut Sakhon hospital during October 2001 to September 2002. These patients were classified as 201,073 outpatients and 34,038 inpatients. It was found that 33,146 patients had both OPD and IPD services this fiscal year.

Table 1 shows characteristics of all patients. These data were retrieved from STAT program. The majority of patients live in Samut Sakhon province. Most patients were female (54.50% of outpatients, 57.73% of inpatients) and single (53.50% and 51.31%, respectively). For age range, outpatients and inpatients were 25-44 years old (37.46% and 30.15%, respectively).

For insurance coverage, self-pay outpatients accounted for 35.03%, followed by patient under by Social Security (27.29%), UC (17.36%), foreign worker (12.40%) and CSMBS (6.58%) respectively. Most inpatients are self-pay (43.08%) and followed by UC (22.92%), Social Security (20.01%), CSMBS (7.65%) and foreign worker (5.14%) respectively. Moreover, the numbers of patients' insurance coverage were greater than the number of patients, with the result that patients used different health insurance types in each visit or admission.

Table 1 Characteristics of all patients at Samut Sakhon Hospital in 2002*

Characteristics	Outpatient		Inpatient	
	N	%	N	%
1. Gender				
Male	91,490	45.50	14,388	42.27
Female	109,583	54.50	19,650	57.73
Total	**201,073**	100.00	**34,038**	100
2. Age group				
0-4 year	18,389	9.15	7,211	21.19
5-9 year	13,120	6.52	1,969	5.78
10-14 year	8,286	4.12	1,027	3.02
15-24 year	58,864	29.27	7,264	21.34
25-44 year	75,319	37.46	10,264	30.15
45-59 year	15,704	7.81	2,583	7.59
60-69 year	6,490	3.23	1,800	5.29
>=70 year	4,901	2.44	1,920	5.64
Total	**201,073**	100.00	**34,038**	100.00
3. Marriage				
Single	107,580	53.50	17,464	51.31
Married	87,849	43.69	15,273	44.87
Separated	3,400	1.69	882	2.59
Divorced	1,051	0.52	160	0.47
Widowed	660	0.33	127	0.37
Priest	533	0.27	132	0.39
Total	**201,073**	100.00	**34,038**	100.00
4. Residence				
Samut Sakhon	143,252	71.24	22,340	65.63
Others	57,821	28.76	11,698	34.37
Total	**201,073**	100.00	**34,038**	100.00
5. Health insurance types**				
CSMBS	14,459	6.58	2,643	7.65
Self-pay	76,919	35.03	14,883	43.08
Social Security	59,918	27.29	6,912	20.01
UC	38,123	17.36	7,916	22.92
Foreign worker	27,237	12.40	1,774	5.14
Not classified	2,943	1.34	415	1.20
Total**	**219,599**	100.00	**34,543**	100.00

CSMBS = Civil Servant Medical Benefit Scheme, UC = Universal Health Coverage Scheme
* Data was retrieved from STAT program.
** Some patients had more than one type of health insurance

There were 4,623 diabetes mellitus (DM) patients (2.29% of all patients); 4,464 outpatients and 985 inpatients. Among these, 821 DM patients came to the hospital as both outpatients and inpatients. Table 2 and table 3 show characteristics of

Diabetes mellitus (DM) patients and non-DM patients as outpatient and inpatient. When compared with non-DM patients, DM patients were mostly female (67.17% of outpatients and 71.68% of inpatients) and older than 45 years old (82.86% of DM outpatients and 90.45% of DM inpatients).

Most DM patients were married (78.46% of DM outpatients and 76.14% of DM inpatients). For insurance coverage, the majority of DM patients were under UC (46.96% of DM outpatients, 54.84% of DM inpatients) and followed by CSMBS, self-pay, Social Security and foreign worker.

Table 2 Characteristics of Diabetes mellitus (DM) and non-DM outpatients at Samut Sakhon Hospital in 2002*

Characteristics	Non-DM		DM		ALL	
	N	%	N	%	N	%
1. Gender						
Male	90,026	45.79	1,464	32.78	91,490	45.50
Female	106,583	54.21	3,000	67.17	109,583	54.49
Total	**196,609**	100.00	**4,464**	100.00	**201,073**	100.00
2. Age group						
0-4 year	18,383	9.35	6	0.13	18,389	9.15
5-9 year	13,114	6.67	6	0.13	13,120	6.52
10-14 year	8,277	4.21	9	0.19	8,286	4.12
15-24 year	58,795	29.90	69	1.54	58,864	29.27
25-44 year	74,643	37.97	676	15.15	75,319	37.46
45-59 year	14,077	7.16	1,627	36.46	15,704	7.81
60-69 year	5,249	2.67	1,241	27.80	6,490	3.23
>=70 year	4,071	2.07	830	18.60	4,901	2.44
Total	**196,609**	100.00	**4,464**	100.00	**201,073**	100.00
3. Marriage						
Single	107,191	53.49	389	8.72	107,580	53.50
Married	84,345	43.69	3,504	78.46	87,849	43.69
Separated	2,949	1.69	451	10.10	3,400	1.69
Divorced	1,003	0.52	48	1.07	1,051	0.52
Widowed	629	0.32	31	0.69	660	0.33
Priest	492	0.2)	41	0.92	533	0.27
Total	**196,609**	100.00	**4,464**	100.00	**201,073**	100.00
4. Residence						
Samut sakhon	139,376	70.89	3,876	86.83	143,252	71.24
Others	57,233	29.11	588	13.17	57,821	28.76
Total	**196,609**	100.00	**4,464**	100.00	**201,073**	100.00
5. Health insurance type**						
CSMBS	13,420	6.26	1,039	19.90	14,459	6.58
Self-pay	75,955	35.43	964	18.46	76,919	35.03
Social Security	59,332	27.68	586	11.22	59,918	27.29
UC	35,671	16.64	2,452	46.96	38,123	17.36
Foreign worker	27,221	12.70	16	0.31	27,237	12.40
Not classified	2,779	1.30	164	3.14	2,943	1.34
Total	**214,378**	100.00	**5,221**	100.00	**219,599**	100.00

CSMBS = Civil Servant Medical Benefit Scheme, UC = Universal Health Coverage Scheme
* Data were retrieved from STAT program. ** Some patients had more than one type of health insurance.

Table 3 Characteristics of Diabetes mellitus (DM) and non-DM inpatients at Samut Sakhon Hospital in 2002*

Characteristics	Non-DM		DM		ALL	
	N	%	N	%	N	%
1. Gender						
Male	14,109	42.69	279	28.32	14,388	42.27
Female	18,944	57.31	706	71.68	19,650	57.73
Total	**33,053**	100.00	**985**	100.00	**34,038**	100.00
2. Age group						
0-4 year	7,211	21.82	0	0.00	7,211	21.1
5-9 year	1,969	5.96	0	0.00	1,969	5.78
10-14 year	1,020	3.09	5	0.50	1,027	3.02
15-24 year	7,257	21.95	7	0.70	7,264	21.34
25-44 year	10,182	30.80	82	8.36	10,264	30.15
45-59 year	2,309	6.99	274	27.86	2,583	7.59
60-69 year	1,480	4.48	320	32.44	1,800	5.29
>=70 year	1,623	4.91	297	30.15	1,920	5.64
Total	**33,053**	100.00	**985**	100.00	**34,038**	100.00
3. Marriage						
Single	17,399	52.64	65	6.60	17,464	51.31
Married	14,523	43.94	750	76.14	15,273	44.87
Separated	741	2.24	141	14.31	882	2.59
Divorced	149	0.45	11	1.12	160	0.47
Widowed	123	0.37	4	0.41	127	0.37
Priest	118	0.36	14	1.42	132	0.39
Total	**33,053**	100.00	**985**	100.00	**34,038**	100.00
4. Residence						
Samut sakhon	21,498	65.04	842	85.51	22,340	65.63
Others	11,555	34.96	143	14.49	11,698	34.37
Total	**33,053**	100.00	**985**	100,00	**34,038**	100.00
5. Health insurance types**						
CSMBS	2,388	7.12	255	25.20	2,643	7.65
Self-pay	14,746	43.98	137	13.54	14,883	43.09
Social Security	6,864	20.47	48	4.74	6,912	20.01
UC	7,361	21.95	555	54.84	7,916	22.92
Foreign worker	1,773	5.29	1	0.10	1,774	5.14
Not classified	399	1.19	16	1.58	415	1.20
Total	**33,531**	100.00	**1,012**	100.00	**34,543**	100.00

CSMBS = Civil Servant Medical Benefit Scheme, UC = Universal Health Coverage Scheme

* Data were retrieved from STAT program.

** Some patients had more than one type of health insurance.

For type of DM patients, it was found that the majority of DM patients were type II DM (99.82% of DM outpatients and 96.75% of DM inpatients). Furthermore, the number and type of DM patients for each department was shown in appendix A.

Theses DM patients classified by outpatient/inpatient and with/without complications were shown in table 4. Total number of DM patients at Samut Sakhon hospital in 2002 were 4,628 persons. These patients were composed of 4,464 outpatients and 985 inpatients. Of these DM patients, 821 used both outpatient and inpatient services in this fiscal year and 164 DM patients were treated only as inpatient.

Three group of DM patients categorized by diagnosis are: DM only, DM with complication/co-morbidity and DM with other diseases. Most of DM patients (58.41%) have complication or co-morbidity. Meanwhile, DM only patients were just 16.79% of total DM patients.

Table 4 Diabetes mellitus patients classified by outpatient/inpatient and with/without complications

	Outpatient		**Inpatient**		**Total**	
	N	**%**	**N**	**%**	**N**	**%**
DM only	762	17.07	64	6.50	**777**	**16.79**
DM with complication/co-morbidity	2,360	52.87	878	89.14	**2,703**	**58.41**
DM with other diseases	1,342	30.06	43	4.36	**1,148**	**24.80**
Total	**4,464**	**100.00**	**985**	**100.00**	**4,628**	**100.00**

DM only = Diabetes mellitus patients without complication and other diseases
DM with complication/co-morbidity = DM patients with polyneuropathies, retinal vascular disorder, glaucoma, optic neuritis, essential hypertension, ischaemic heart disease, intracerebral haemorrhage, heart failure, arteries and capillaries diseases, cellulitis, chronic renal failure, gangrene and infection of the skin
DM with other diseases = DM patients with diseases other than complications and co-morbidity

When compared that in outpatient and inpatient services, DM patients were mostly DM with complication or co-morbidity, especially in inpatient services (89.14%). Furthermore, DM only patient was the lowest in outpatient services, whereas DM with other diseases patient was the lowest in inpatient services.

Primary diagnoses of patients at Samut Sakhon hospital were shown in table 5. It shows the proportion of outpatient visit and inpatient admission classified by ICD-10. These were 566,003 outpatient visits. Factors influencing health status and contact with health services (Z00-Z99), i.e. medical care, contraceptive management, general examination, etc. was primary diagnosis that have the biggest proportion of outpatients visits (28.48%) followed by diseases of the respiratory system (J00-J99) (20.07%) and diseases of the digestive system (K00-K93) (8.77%) respectively. Meanwhile, there were 40,447 inpatient admissions. The majority of hospital admissions was pregnancy, childbirth and the puerperium (O00-O99) (16.85%) followed by infections/parasitic diseases (A00-B99) (13.55%) and injury/poisoning /certain other consequences of external causes (S00-T98) (12.75%) respectively.

Table 5 Number of outpatient visits and inpatient admission classified by primary diagnosis (ICD-10) at Samut Sakhon Hospital in 2002

ICD-10	Primary diagnosis	Outpatient		Inpatient	
		Visit	%	Admission	%
-	Not classify	944	0.17	31	0.08
A00-B99	Certain infections and parasitic diseases	27,866	4.92	5,481	13.55
C00-D48	Neoplasms	1,011	0.18	530	1.31
D50-D89	Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	680	0.12	274	0.68
E00-E90	Endocrine, nutritional, and metabolic diseases	25,045	4.42	892	2.21
F00-F99	Mental and behavioural disorders	4,046	0.71	403	1.00
G00-G99	Diseases of the nervous system	9,457	1.67	581	1.44
H00-H59	Diseases of the eye and adnexa	13,849	2.45	825	2.04
H60-H95	Diseases of the ear and mastoid process	5,275	0.93	80	0.20
I00-I99	Diseases of the circulatory system	21,171	3.74	1,642	4.06
J00-J99	Diseases of the respiratory system	113,578	20.07	4,246	10.50
K00-K93	Diseases of the digestive system	49,635	8.7)	3,231	7.99
L00-L99	Diseases of the skin and subcutaneous tissue	18,426	3.26	477	1.18
M00-M99	Diseases of the musculoskeletal system and connective tissue	30,014	5.30	532	1.32
N00-N99	Diseases of the genitourinary system	10,491	1.85	1,316	3.25
O00-O99	Pregnancy, childbirth and the puerperium	8,218	1.45	6,816	16.85
P00-P96	Certain conditions originating in the perinatal period	42	0.01	842	2.08
Q00-Q99	Congenital malformations, deformations and chromosomal abnormalities	174	0.03	80	0.20
R00-R99	Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	31,078	5.49	2,002	4.95
S00-T98	Injury, poisoning and certain other consequences of external causes	32,712	5.78	5,156	12.75
V01-Y98	External causes of morbidity and mortality	1,093	0.19	3	0.01
Z00-Z99	Factors influencing health status and contact with health services	161,198	28.48	5,007	12.38
	TOTAL	**566,003**	**100.00**	**40,447**	**100.00**

ICD-10 = International Statistical Classification of Diseases and Related Health Problems
Data were retrieved from STAT program.

Part 2: Health Care Utilization Rate

Table 6 shows the utilization rate of health services by patients under different health insurance type. It was found that 201,073 outpatients had 556,003 visits. Consequently, the average outpatient visits per person was 2.7652. When these data was classified by patient's insurance coverage, the total number of 219,599 patients had 556,003 visits. This indicated that some patients used different health insurance type during the year. Then, the range number of patient visits, by this group of patients are showed in appendix B. The majority of outpatient visits were patients under Social Security (35.78% of all visits), followed by UC (23.55%) and self-pay (23.32%) respectively. Meanwhile, CSMBS had the highest average annual visit per person (3.8499 visits), followed by UC and Social Security (3.4973 and 3.3781 visits per year respectively). Furthermore, foreign worker had the lowest average visit per person (1.3594 visits).

IPD data showed that 34,038 inpatients had 40,447 admission and 194,994 hospital bed-days. Thus, average admission per person was 1.1883 and average days per admission were 4.8210 days. The range number of admission and hospital bed-days are showed in appendix C and appendix D. According to types of health insurance coverage, most of admission (39.01%) and number of hospital bed-days (34.32%) were self-pay. CSMBS had the highest average length of stay per admission (7.1631 days), whereas self-pay had the lowest average days per admission (4.2415 days).

For average admission per patient, UC patients had the highest admission 1.3540 per person, followed by CSMBS (1.3409) and Social Security (1.1593).

Table 6 Health services utilization of all patients classified by health insurance type at Samut Sakhon Hospital in 2002

Utilization	Patient's insurance coverage						
	CSMBS	Self-pay	Social Security	UC	Foreign worker	Not Classified	Total
Outpatient							
Visit	55,666	132,053	202,408	133,326	37,026	5,524	566,003
(%)	(9.83)	(23.32)	(35.78)	(23.55)	(6.56)	(0.97)	(100)
No. of patients	14,459	76,919	59,918	38,123	27,237	2,943	219,599
(%)	(6.58)	(35.03)	(27.29)	(17.36)	(12.40)	(1.34)	(100)
Visit/Person	**3.8499**	**1.7168**	**3.3781**	**3.4973**	**1.3594**	**1.8770**	**2.5774**
Inpatient							
Admission	3,544	15,779	8,013	10,718	1,896	497	40,447
(%)	(8.76)	(39.01)	(19.81)	(26.50)	(4.69)	(1.23)	(100)
No. of patients	2,643	14,883	6,912	7,916	1,774	415	34,543
(%)	(7.65)	(43.09)	(20.01)	(22.92)	(5.14)	(1.20)	(100)
Admission/person	**1.3409**	**1.0602**	**1.1593**	**1.3540**	**1.0688**	**1.1976**	**1.1709**
Hospital bed-day	25,386	66,927	34,615	57,194	8,352	2,520	194,994
(%)	(13.02)	(34.32)	(17.75)	(29.33)	(4.28)	(1.29)	(100)
Days/Admission	**7.1631**	**4.2415**	**4.3199**	**5.3363**	**4.4051**	**5.0704**	**4.8210**

CSMBS = Civil Servant Medical Benefit Scheme, UC = Universal Health Coverage Scheme

Table 7 shows the accessibility to health services, average visit and admission per capita in various insurance types. For outpatient department, the highest of access to health care services were patients under foreign worker (90.36% patients per population), followed by Social Security (61.16% patients per population), CSMBS (59.93% patients per population) and UC (25.58% patients per population), respectively. However, average visit per population data shows that patients under CSMBS had the highest value (2.3074 visits per population), followed by Social Security (2.0659 visits per population), foreign worker (1.2284 visits per population) and UC (0.8947 visits per population).

For inpatient department, CSMBS patients have the highest of access to health care (10.96% patients per population), followed by Social Security (7.05% patients per population), foreign worker (5.89% patients per population) and UC (5.31% patients per population). An, average admission per population were the same direction of access to health care services (the first and the second ranks). This pointed out that in

both departments, CSMBS were more likely to have access to health services than other health insurance type.

Table 7 Access to health services, average visit and admission per capita classified by health insurance type at Samut Sakhon Hospital in 2002

Utilization	Health care insurance coverage			
	CSMBS	Social Security	UC	Foreign worker
Outpatient				
Visit	55,666	202,408	133,326	37,026
Total population	*24,125	97,977	149,024	30,142
Visit/capita	**2.3074**	**2.0659**	**0.8947**	**1.2284**
No. of patients	14,459	59,918	38,123	27,237
% population with OP service	**59.93**	**61.16**	**25.58**	**90.36**
Inpatient				
Admission	3,544	8,013	10,718	1,896
Admission/capita	**0.1469**	**0.0818**	**0.0719**	**0.0629**
No. of patients	2,643	6,912	7,916	1,774
% population with IP service	**10.96**	**7.05**	**5.31**	**5.89**

CSMBS = Civil Servant Medical Benefit Scheme, UC = Universal Health Coverage Scheme
Population= The number of people who register in Samut Sakhon hospital.
* = CSMBS population prevalence in Samut Sakhon province

All DM patients' utilization rate classified by health insurance type is shown in table 8. Then, the range number of DM patient visits, by this group of patients are showed in appendix E. For outpatient department (OPD), there were 4,464 persons. These patients had 35,884 visits. Thus, an average DM outpatient had 8.0385 visits per person.

When comparing the utilization rate among insurance types, the number of DM patient were increased, because patient use more than one health insurance type in other visit. DM outpatients under UC had the majority of visits (54.74%), followed by CSMBS (23.78%) and Social Security (11.22%). However, CSMBS patients had the highest visits per person (8.2127 visits), as self-pay had the lowest average visits per person (3.2541 visits).

For inpatient department (IPD), 985 DM inpatients admitted into the hospital. These patients had 1,766 admission and had 14,171 hospital bed-days. Consequently, average admission per person was 1.7929 and average length of days per admission

was 8.0243. The range number of admission and the hospital bed-days by these groups of patients are shown in appendix F and G. When analyzed in more details, patients under UC had the majority of DM admission (59.29%) and length of stay (54.84%), followed by CSMBS and self-pay. Moreover, UC patients had the highest of admission per person (1.8865), whereas CSMBS had the highest days per admission (10.6222 days). Meanwhile, self-pay and foreign worker had the lowest admission per person (1.2628 and 1.0000) and Social Security had the lowest days per admission (6.2289 days).

Table 8 Utilization rate of Diabetes mellitus patients classified by health insurance type at Samut Sakhon Hospital in 2002

Utilization	Patient's insurance coverage						
	CSMBS	Self-pay	Social Security	UC	Foreign worker	Not Classified	Total
Outpatient							
Visit	8,533	3,137	4,026	19,643	60	485	35,884
(%)	(23.78)	(8.74)	(11.22)	(54.74)	(0.17)	(1.35)	(100)
No. of patients	1,039	964	586	2,452	16	164	5,221
(%)	(19.90)	(18.46)	(11.22)	(46.97)	(0.31)	(3.14)	(100)
Visit/Person	**8.2127**	**3.2541**	**6.8703**	**8.0110**	**3.7500**	**2.9573**	**6.8730**
Inpatient							
Admission	442	173	83	1,047	1	20	1,766
(%)	(25.03)	(9.80)	(4.70)	(59.29)	(0.06)	(1.132)	(100)
No. of patients	255	137	48	555	1	16	1,012
(%)	(25.20)	(13.54)	(4.74)	(54.84)	(0.10)	(1.58)	(100)
Admission/person	**1.7333**	**1.2628**	**1.7292**	**1.8865**	**1.0000**	**1.2500**	**1.7451**
Hospital bed-day	4,695	1,173	517	7,666	7	113	14,171
(%)	(33.13)	(8.28)	(3.65)	(54.10)	(0.05)	(0.80)	(100)
Days/Admission	**10.6222**	**6.7803**	**6.2289**	**7.3219**	**7.0000**	**5.6500**	**8.0243**

CSMBS = Civil Servant Medical Benefit Scheme, UC = Universal Health Coverage Scheme

For non-DM patients, Table 9 shows the health services utilization rates. 196,609 non-DM outpatients had 530,119 visits. Thus, average non-DM outpatients had 2.6963 visits per person. Based on types of payment status, the number of non-DM patient were increased, because patient use more than one health insurance type in other visit. The majority of non-DM outpatients visits were Social Security (37.42%) and followed by self-pay (24.32%), UC (21.45%), CSMBS (8.89%) and foreign

worker (6.97%). Meanwhile, CSMBS had the highest average visits per person (3.5121), whereas self-pay (1.6973) and foreign worker (1.3580) had the two lowest average visits per person.

In non-DM inpatients, these 33,053 patients had 38,681 admission and 180,823 hospital bed days. Therefore, average admission per person was 1.1703 and average length of stays per admission was 4.6747 days. When comparing the utilization of inpatients among various types of payment status, most of admission (40.35%) and hospital bed-days (36.36%) were self-pay patient and followed by UC, Social Security, CSMBS and foreign worker. Meanwhile, UC had the highest admission per person (1.3138), whereas self-pay had the lowest average admission per person (1.0583). Moreover, CSMBS had the longest days per admission (6.6702 days), but self-pay had the lowest days per admission (4.2134 days).

Table 9 Health services utilization of non-DM patients classified by health insurance types at Samut Sakhon Hospital in 2002

Utilization	Patient's insurance coverage						
	CSMBS	Self-pay	Social Security	UC	Foreign worker	Not Classified	Total
Outpatient							
Visit	47,133	128,916	198,382	113,683	36,966	5,039	530,119
(%)	(8.89)	(24.32)	(37.42)	(21.45)	(6.97)	(0.95)	(100)
No. of patients	13,420	75,955	59,332	35,671	27,221	2,779	214,378
(%)	(6.26)	(35.43)	(27.68)	(16.64)	(12.70)	(1.30)	(100)
Visit/Person	**3.5107**	**1.6973**	**3.3436**	**3.1870**	**1.3580**	**1.8132**	**2.4728**
Inpatient							
Admission	3,102	15,606	7,930	9,671	1,895	477	38,681
(%)	(8.02)	(40.35)	(20.50)	(25.00)	(4.90)	(1.23)	(100)
No. of patients	2,388	14,746	6,864	7,361	1,773	399	33,531
(%)	(7.12)	(43.98)	(20.47)	(21.95)	(5.29)	(1.19)	(100)
Admission/person	**1.2990**	**1.0583**	**1.1553**	**1.3138**	**1.0688**	**1.1955**	**1.1536**
Hospital bed-day	20,691	65,754	34,098	49,528	8,345	2,407	180,823
(%)	(11.44)	(36.36)	(18.86)	(27.39)	(4.62)	(1.33)	(100)
Days/Admission	**6.6702**	**4.2134**	**4.2999**	**5.1213**	**4.4037**	**5.0461**	**4.6747**

CSMBS = Civil Servant Medical Benefit Scheme UC = Universal Health Coverage Scheme

When analyzed in more details, 17,391 outpatients (8.65% of all outpatients) and 491 inpatients (1.42% of all inpatients) came into hospital and used more than one type of health insurance coverage. For outpatient, 16,733 non-DM outpatients (8.51% of non-DM outpatients) and 658 DM outpatients (14.74% of DM outpatients) used more than one type of health insurance type. These non-DM outpatients visit into hospital 29,780 visit. Thus, average visit per person was 1.7797 visit. Most visits used health insurance type under self-pay (46.54%) and followed by Social Security (28.35%), UC (17.74%), respectively. Meanwhile, DM patients had 6,137 visits. Thus, average visit per person 9.3267 visit, higher than the overall average of all DM patients, 8.0385.

This indicated that these DM outpatients tend to visit hospital more frequently. The majority of DM patient visits were patients under UC (55.92%) and followed by self-pay (16.49%) and Social Security (14.78%), respectively.

For inpatient, 465 non-DM inpatients (1.41% of non-DM inpatients) and 26 DM inpatients (2.64% of DM inpatients) admitted into the hospital using various insurance types (943 and 53 admission, respectively). Thus, average admission per

person was 2.0280 (non-DM inpatients) and 2.0385 (DM inpatients). Most non-DM inpatients admission was patients under self-pay (39.98%) and followed by UC (34.15%) and Social Security (14.53%), respectively. Meanwhile, majority of DM inpatient admission were patients under UC (39.62%), self-pay (30.19%), CSMBS and Social Security (11.32%), as shown in Table 10.

Table 10 Health care utilization by patient with more than one health insurance coverage

Insurance coverage	No. of outpatient visit			No. of inpatient admission		
	Non-DM	DM	Total	Non-DM	DM	Total
No. of patients (patient)	**16,733**	**658**	**17,391**	**465**	**26**	**491**
CSMBS	400	393	793	26	6	32
(%)	(1.34)	(6.40)	(2.21)	(2.76)	(11.32)	(3.21)
Self-pay	13,859	1,012	14,871	377	16	393
(%)	(46.54)	(16.49)	(41.40)	(39.98)	(30.19)	(39.46)
Social security	8,444	907	9,351	137	6	143
(%)	(28.35)	(14.78)	(26.04)	(14.53)	(11.32)	(14.36)
UC	5,282	3,432	8,714	322	21	343
(%)	(17.74)	(55.92)	(24.26)	(34.15)	(39.62)	(34.44)
Foreign worker	372	-	372	6	-	6
(%)	(1.25)		(1.04)	(0.64)		(0.60)
Not classify	1,423	393	1,816	75	4	79
(%)	(4.78)	(6.40)	(5.06)	(7.95)	(7.55)	(7.93)
Total	**29,780**	**6,137**	**35,917**	**943**	**53**	**996**
(%)	**(100.00)**	**(100.00)**	**(100.00)**	**(100.00)**	**(100.00)**	**(100.00)**

CSMBS = Civil Servant Medical Benefit Scheme, UC = Universal Health Coverage Scheme

The number of DM patients categorized by diagnosis are showed in table 11. Three groups of DM patients are: DM only, DM with complication/ co-morbidity and DM with other diseases. From 4,464 DM outpatients, a little over half of DM patients (52.87%) have other diabetic-related co-morbidity and complications. Thus, DM with complication/co-morbidity had the highest utilization rate (9.6331 visits per person), whereas DM only had the lowest utilization rate (3.7717 visits per person).

Table 11 Utilization rate of Diabetes mellitus (DM) patients categorized by diagnosis of DM at Samut Sakhon Hospital in 2002

Utilization	Diagnosis						
	DM only	DM with complication/ co-morbidity			DM with Other diseases		Total
		DM	Complication /co-morbidity	Other diseases	DM	Other diseases	
Outpatient							
Visit	2,874	11,916	3,433	7,385	5,172	5,104	**35,884**
(%)	(8.01)	(33.21)	(9.57)	(20.58)	(14.41)	(14.22)	**(100.00)**
No. of patients	762	2,360			1,342		**4,464**
(%)	(17.07)	(52.87)			(30.06)		**(100.00)**
Visit/Person		**5.0492**	**1.4547**	**3.1292**	**3.8539**	**3.8033**	
	3.7717	**9.6331**			**7.6572**		**8.0385**
Inpatient							
Admission	73	552	285	805	-	51	**1,766**
(%)	(4.13)	(31.26)	(16.14)	(45.58)	(0.00)	(2.89)	**(100.00)**
No. of patients	64	878			43		**985**
(%)	(6.50)	(89.14)			(4.36)		**(100.00)**
Admission/person		**0.6287**	**0.3246**	**0.9169**	**0.0000**	**1.1860**	
	1.1406	**1.8702**			**1.1860**		**1.7929**
Hospital bed-day	315	3,988	2,618	6,778	-	472	**14,171**
(%)	(2.22)	(28.14)	(18.47)	(47.83)	-	(3.33)	(100.00)
Days/Admission		**7.2246**	**9.1860**	**8.4199**	**-**	**9.2549**	
	4.3151	**8.1510**			**9.2549**		**8.0243**

DM only = Diabetes mellitus patients without complication and other diseases
DM with complication/co-morbidity = DM patients with polyneuropathies, retinal vascular disorder, glaucoma, optic neuritis, essential hypertension, ischaemic heart disease, intracerebral haemorrhage, heart failure, arteries and capillaries diseases, cellulitis, chronic renal failure, gangrene and infection of the skin
DM with other diseases = DM patients with diseases other than complications and co-morbidity

For, 985 DM inpatients, the majority of them was DM with complication/co-morbidity (89.14%). Thus, DM with complication/co-morbidity had the highest admission per person (1.8702), whereas DM with other diseases had the longest days per admission (9.2549 days). As, DM without diseases had the lowest admission per person (1.1406) and days per admission (4.3151 days).

The majority of DM with complication/co-morbidity admission resulted from the primary diagnosis of other diseases (0.9169 admission per person), but primary diagnosis of complication or co-morbidity made these patients stay in hospital longer (9.1860). Meanwhile, as result of all DM with other diseases admission was primary diagnosis of other diseases.

The comparison of utilization rate by patients' insurance coverage and diagnosis of DM are presented in table 12, 13. Table 12 shows the utilization rate of DM outpatient categorized by types of DM and health insurance type. Thus, DM outpatient without other diseases under UC had the greatest number of average visit per person (4.4205) followed by CSMBS (4.0331), Social Security (3.4643), Self-pay (2.0539) and foreign worker (1.5000) respectively. Meanwhile, DM outpatient with complication/co-morbidity had the majority of utilization rate in patients under CSMBS (9.4927) followed by UC (9.3088), Social Security (7.4409), foreign worker (6.0000) and Self-pay (3.9900). Moreover, DM with other diseases patients had the majority of utilization rate in patients under Social Security (7.4656) followed by CSMBS (7.2838), UC (7.1752), foreign worker (4.2000) and Self-pay (3.2407).

Thus, the three first ranks of utilization rate of DM outpatient were patients under UC, CSMBS and Social Security. Meanwhile, Self-pay and foreign worker had the lowest utilization rate as outpatient.

Table 12 Utilization rate of Diabetes mellitus outpatients categorized by health insurance type at Samut Sakhon Hospital in 2002

Utilization	Patient's insurance coverage						
	CSMBS	**Self-pay**	**Social Security**	**UC**	**Foreign worker**	**Not classify**	**Total**
DM only							
Visit	488	495	291	1,556	6	38	**2,874**
(%)	(16.98)	(17.22)	(10.13)	(54.14)	(0.21)	(1.32)	**(100.00)**
No. of patients	121	241	84	352	4	25	**827**
(%)	(14.63)	(29.14)	(10.16)	(42.56)	(0.48)	(3.02)	**(100.00)**
Visit/person	**4.0331**	**2.0539**	**3.4643**	**4.4205**	**1.5000**	**1.5200**	**3.4752**
DM with complication/co-morbidity							
Visit	5,838	1,592	1,891	13,172	12	229	**22,734**
(%)	(25.68)	(7.00)	(8.31)	(57.94)	(0.05)	(1.01)	**(100.00)**
No. of patients	615	399	254	1,415	2	70	**2,755**
(%)	(22.32)	(14.48)	(9.22)	(51.36)	(0.07)	(2.54)	**(100.00)**
Visit/person	**9.4927**	**3.9900**	**7.4444**	**9.3088**	**6.0000**	**3.2714**	**8.2519**
DM with other diseases							
Visit	2,207	1,050	1,844	4,915	42	218	**10,276**
(%)	(21.48)	(10.22)	(17.94)	(47.83)	(0.41)	(2.12)	**(100.00)**
No. of patients	303	324	247	685	10	70	**1,639**
(%)	(18.49)	(19.77)	(15.07)	(41.79)	(0.61)	(4.27)	**(100.00)**
Visit/person	**7.2838**	**3.2407**	**7.4656**	**7.1752**	**4.2000**	**3.1143**	**6.2697**

DM only = Diabetes mellitus patients without complication and other diseases
DM with complication/co-morbidity = DM patients with polyneuropathies, retinal vascular disorder, glaucoma, optic neuritis, essential hypertension, ischaemic heart disease, intracerebral haemorrhage, heart failure, arteries and capillaries diseases, cellulitis, chronic renal failure, gangrene and infection of the skin
DM with other diseases = DM patients with diseases other than complications and co-morbidity

Utilization rate in DM inpatient categorized by types of DM and health insurance type was shown in table 13. This data found that DM only and DM with complication/co-morbidity had the longest days per admission in patients under CSMBS (5.5455 days and 10.6174 days, respectively). Meanwhile, DM with other diseases inpatient had the highest days per admission in Social Security (18.000) when compared to other types of health insurance coverage. However, when based on an average admission per person, inpatients under CSMBS had the majority of admission per DM only patient (1.2222). Moreover, inpatient under UC had the highest admission per DM with complication/co-morbidity (1.9526) and Social Security had the highest admission in DM with other diseases patient (2.0000). Meanwhile, Self-pay had the lowest number of admission per person in all type of DM.

Table 13 Utilization rate of Diabetes mellitus inpatient categorized by health insurance type at Samut Sakhon Hospital in 2002

Utilization	Patient's insurance coverage						
	CSMBS	**Self-pay**	**Social Security**	**UC**	**Foreign worker**	**Not classified**	**Total**
DM only							
Admission	11	18	7	35	-	2	**73**
(%)	(15.07)	(24.66)	(9.59)	(47.95)		(2.74)	**(100.00)**
Hospital bed-day	61	66	27	156	-	5	**315**
(%)	(19.37)	(20.95)	(8.57)	(49.52)		(1.59)	**(100.00)**
Days/admission	**5.5455**	**3.6667**	**3.8571**	**4.4571**	**-**	**2.5000**	**4.3151**
No. of patients	9	18	6	29	-	2	**64**
(%)	(14.06)	(28.13)	(9.38)	(45.31)		(3.13)	**(100.00)**
Admission/person	**1.2222**	**1.0000**	**1.1667**	**1.2069**	**-**	**1.0000**	**1.1406**
DM with complication/ co-morbidity							
Admission	413	149	74	988	1	17	**1,642**
(%)	(25.15)	(9.07)	(4.51)	(60.17)	(0.06)	(1.04)	**(100.00)**
Hospital bed-day	4,385	1,067	454	7,364	7	107	**13,384**
(%)	(32.76)	(7.97)	(3.39)	(55.02)	(0.05)	(0.80)	**(100.00)**
Days/admission	**10.6174**	**7.1611**	**6.1351**	**7.4534**	**7.0000**	**6.2941**	**8.1510**
No. of patients	231	113	41	506	1	13	**905**
(%)	(25.52)	(12.49)	(4.53)	(55.91)	(0.11)	(1.44)	**(100.00)**
Admission/person	**1.7879**	**1.3186**	**1.8049**	**1.9526**	**1.0000**	**1.3077**	**1.8144**
DM with other diseases							
Admission	18	6	2	24	-	1	**51**
(%)	(35.29)	(11.76)	(3.92)	(47.06)		(1.96)	**(100.00)**
Hospital bed-day	249	40	36	146	-	1	**472**
(%)	(52.75)	(8.47)	(7.63)	(30.93)		(0.21)	**(100.00)**
Days/admission	**13.8333**	**6.6667**	**18.000**	**6.0833**	**-**	**1.0000**	**9.2549**
No. of patients	15	6	1	20	-	1	**43**
(%)	(34.88)	(13.95)	(2.33)	(46.51)		(2.33)	**(100.00)**
Admission/person	**1.2000**	**1.0000**	**2.0000**	**1.2000**	**-**	**1.0000**	**1.1860**

DM only = Diabetes mellitus patients without complication and other diseases
DM with complication/co-morbidity = DM patients with polyneuropathies, retinal vascular disorder, glaucoma, optic neuritis, essential hypertension, ischaemic heart disease, intracerebral haemorrhage, heart failure, arteries and capillaries diseases, cellulitis, chronic renal failure, gangrene and infection of the skin
DM with other diseases = DM patients with diseases other than complications and co-morbidity

For further analyses, all DM patients were divided into three patterns of services utilization; one of DM patients with visit OPD only, second of DM patients with both OPD and IPD services in this fiscal year and the last one of DM patients with IPD service only. The utilization rate of these DM patients was shown in table 14.

Table 14 Utilization rate of outpatient and inpatient services by Diabetes mellitus (DM) patients at Samut Sakhon Hospital in 2002

	Outpatient Services only	Outpatient and inpatient services	Inpatient services only	Total
DM only				
Visit	2,505	369	-	2,874
(%)	(74.82)	(25.18)	-	(100.00)
Admission	-	63	10	73
(%)	-	(86.30)	(13.70)	(100.00)
No. of patient	713	55	9	777
(%)	(91.76)	(7.08)	(1.16)	(100.00)
Visit/patient	**3.5133**	**6.7091**	**-**	**3.6988**
Admission/patient	**-**	**1.1455**	**1.1111**	**0.0940**
DM with complication/co-morbidity				
Visit	16,589	6,145	-	22,734
(%)	(72.97)	(27.03)		(100.00)
Admission	-	1,440	202	1,642
(%)	-	(87.70)	(12.30)	(100.00)
No. of patient	1,825	734	144	2,703
(%)	(67.52)	(27.15)	(5.33)	(100.00)
Visit/patient	**9.0899**	**8.3719**	**-**	**8.4107**
Admission/patient	**-**	**1.9618**	**1.4028**	**0.6075**
DM with other diseases				
Visit	8,244	2,032	-	10,276
(%)	(80.23)	(19.77)		(100.00)
Admission	-	38	13	51
(%)	-	(74.51)	(25.49)	(100.00)
No. of patient	1,105	32	11	1,148
(%)	(96.25)	(2.79)	(0.96)	(100.00)
Visit/patient	**7.4606**	**63.500**	**-**	**8.9512**
Admission/patient	**-**	**1.1875**	**1.1818**	**0.0444**

DM only = Diabetes mellitus patients without complication and other diseases
DM with complication/co-morbidity = DM patients with polyneuropathies, retinal vascular disorder, glaucoma, optic neuritis, essential hypertension, ischaemic heart disease, intracerebral haemorrhage, heart failure, arteries and capillaries diseases, cellulitis, chronic renal failure, gangrene and infection of the skin
DM with other diseases = DM patients with diseases other than complications and co-morbidity

When compared in type of DM patient and received treatment in department, it was found that DM with other diseases had the highest average visits per person (8.9512), followed by DM with complication/co-morbidity (8.4107) and DM only (3.6988). Meanwhile, DM with complication/co-morbidity had the highest in

inpatient service utilization; average admission per person 0.6075 whereas DM with other diseases had the lowest average admission per person (0.0444).

When analyzed in patterns of services utilization, the majority of OPD service only was DM with complication or co-morbidity patient (9.0899 visit per person). In addition to, the majority of IPD service only was DM with complication/co-morbidity patient too. For utilization of OPD and IPD services in this fiscal year, DM with other diseases had the highest average visit per person (63.5000), but DM with complication/co-morbidity had the highest average admission per person (1.9618). Furthermore, DM only had the lowest in utilization of OPD services only, OPD and IPD services in this fiscal year and IPD service only.

Part 3: Total Hospital Charges For Treatment

Total charges of treatment in 2002 fiscal year were collected from DISPENSE management program. Table 15 shows that total charges and charges per visit of outpatients by primary diagnosis (ICD-10)

For outpatient department, total charges of outpatient services were 124,229,958 bahts. These charges were for 489,707 visits. Thus, average outpatient charges per visit was 253.68 bahts. The majority percentage of charges in treatment were for factors influencing health status and contact with health services (Z00-Z99) (19.59%), followed by diseases of respiratory system (J00-J99), endocrine/nutritional/metabolic diseases (E00-E90) and diseases of the circulatory system (I00-I99) (11.62%, 10.95% and 9.10% respectively). Thus, comparison of charges per visit showed that patients with diseases of the circulatory system (I00-I99) had the highest of charges (619.38 bahts) followed by endocrine/nutritional/metabolic diseases (608.88 bahts), neoplasms (473.08 bahts) and external causes of morbidity or mortality (429.53 bahts).

For inpatient department in table 16, there were only 7-month of data for analysis, the rest was not recorded in electronic form. Total inpatient charges were 116,054,964 bahts, for 21,118 admission (52.21% of total admission in STAT program) and length of stays of 103,074 days (52.86% of total length of stays in STAT program). Thus, average inpatient charges per admission was 5,495.55 bahts and average charges per day was 1,125.94 bahts. Based on primary diagnosis of inpatient charges, diagnosis of injury/poisoning/certain other consequences of external causes (S00-T98) had the majority percentage of charges (18.42%), followed by pregnancy/childbirth/the puerperium (O00-O99), diseases of digestive system (K00-K93) and diseases of respiratory system (J00-J99) (10.22%, 9.53% and 8.64% respectively).

Meanwhile, these data show that diseases of the eye and adnexa (H00-H59) had the highest average charges per admission (21,696.90 bahts) followed by external causes of morbidity or mortality (17,890.50 bahts), neoplasms (13,189.27 bahts) and diseases of the circulatory system (11,035.46 bahts). Moreover, average charges per day were in the same directions of average charges per admission, except in the third

and forth rank (diseases of the circulatory system and injury/poisoning/certain other consequences of external causes, respectively).

Diabetes mellitus (DM) was in the primary diagnosis of endocrine, nutritional and metabolic diseases (E00-E90). It was found that this primary diagnosis ranked second for average charges per visit (608.88 bahts). Meanwhile, inpatients' charges ranked the sixth in average charges per admission (8,711.02 bahts) and average charges per day (1,106.51 bahts).

Table 15 Total charges (Bahts), charge per visit classified by primary diagnosis group of outpatient services (ICD-10)

ICD-10	Primary diagnosis	Charges	%	Visit	%	Charge/ Visit
A00-B99	Certain infections and parasitic diseases	4,212,563	3.39	22,261	4.55	189.24
C00-D48	Neoplasms	239,377	0.19	506	0.10	473.08
D50-D89	Diseases of the blood and blood-forming organs and certain disorders	76,867	0.06	378	0.08	203.35
E00-E90	Endocrine, nutritional, and metabolic diseases	13,607,833	10.95	22,349	4.56	608.88
F00-F99	Mental and behavioural disorders	546,691	0.44	3,271	0.67	167.13
G00-G99	Diseases of the nervous system	1,008,240	0.81	8,478,	1.73	118.92
H00-H59	Diseases of the eye and adnexa	2,153,176	1.73	11,424	2.33	188.48
H60-H95	Diseases of the ear and mastoid process	978,527	0.79	4,415	0.90	221.64
I00-I99	Diseases of the circulatory system	11,299,332	9.10	18,243	3.73	619.38
J00-J99	Diseases of the respiratory system	14,435,224	11.62	102,457	20.92	140.89
K00-K93	Diseases of the digestive system	5,410,389	4.36	34,800	7.11	155.47
L00-L99	Diseases of the skin and subcutaneous tissue	3,115,635	2.51	15,938	3.25	195.48
M00-M99	Diseases of the musculoskeletal system and conncective tissue	4,740,858	3.82	26,389	5.39	179.65
N00-N99	Diseases of the genitourinary system	1,718,529	1.38	8,546	1.75	201.09
O00-O99	Pregnancy, childbirth and the puerperium	400,265	0.32	2,313	0.47	173.05
P00-P96	Certain conditions originating in the perinatal period	3,607	0.00	22	0.00	163.95
Q00-Q99	Congenital malformations, deformations and chromosomal	31,198	0.03	105	0.02	297.12
R00-R99	Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere	3,543,099	2.85	23,625	4.82	149.97
S00-T98	Injury, poisoning and certain other consequences of external causes	8,970,021	7.22	24,903	5.09	360.20
V01-Y98	External causes of morbidity and mortality	278,766	0.22	649	0.13	429.53
Z00-Z99	Factors influencing health status and contact with health services	24,332,748	19.59	84,923	17.34	286.53
	Not classified	23,127,013	18.62	73,712	15.05	313.75
	TOTAL	**124,229,958**	**100.00**	**489,707**	**100.00**	**253.68**

ICD-10 = International Statistical Classification of Diseases and Related Health Problems

Table 16 Total charges (Bahts), charge per admission and charge per day classified by primary diagnosis of inpatients services (ICD-10)*

ICD-10	Primary diagnosis	Charges (%)	Admission (%)	Length of stays (%)	Charge /Admission	Charge /day
A00-B99	Certain infections and parasitic diseases	8,657,389 (7.46)	2,591 (12.27)	12,420 (12.05)	3,341.33	697.05
C00-D48	Neoplasms	3,904,024 (3.36)	296 (1.40)	3,905 (3.79)	13,189.27	999.75
D50-D89	Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	318,559 (0.27)	140 (0.66)	350 (0.34)	2,275.42	910.17
E00-E90	Endocrine, nutritional, and metabolic diseases	3,893,825 (3.36)	447 (2.12)	3,519 (3.41)	8,711.02	1,106.51
F00-F99	Mental and behavioural disorders	230,368 (0.20)	204 (0.97)	547 (0.53)	1,129.26	421.15
G00-G99	Diseases of the nervous system	890,873 (0.77)	294 (1.39)	1,148 (1.11)	3,030.18	776.02
H00-H59	Diseases of the eye and adnexa	8,548,578 (7.37)	394 (1.87)	1,856 (394)	21,696.90	4,605.91
H60-H95	Diseases of the ear and mastoid process	295,388 (0.25)	46 (0.22)	490 (0.48)	6,421.48	602.83
I00-I99	Diseases of the circulatory system	9,082,186 (7.83)	823 (3.90)	6,346 (6.16)	11,035.46	1,431.17
J00-J99	Diseases of the respiratory system	10,030,588 (8.64)	2,389 (11.31)	12,306 (11.94)	4,198.66	815.10
K00-K93	Diseases of the digestive system	11,057,587 (9.53)	1,664 (7.88)	7,999 (7.76)	6,645.18	1,382.37
L00-L99	Diseases of the skin and subcutaneous tissue	2,122,763 (1.83)	258 (1.22)	3,351 (3.25)	8,227.76	633.47
M00-M99	Diseases of the musculoskeletal system and conncective tissue	2,446,008 (2.11)	269 (1.27)	2,202 (2.14)	9,092.97	1,110.81
N00-N99	Diseases of the genitourinary system	3,611,761 (3.11)	650 (3.08)	3,741 (3.63)	5,556.55	965.45
O00-O99	Pregnancy, childbirth and the puerperium	11,866,482 (10.22)	3,390 (16.05)	12,264 (11.90)	3,500.44	967.59
P00-P96	Certain conditions originating in the perinatal period	838,945 (0.72)	335 (1.59)	3,037 (2.95)	2,504.31	276.24
Q00-Q99	Congenital malformations, deformations and chromosomal abnormalities	201,376 (0.17)	39 (0.18)	228 (0.22)	5,163.49	883.23
R00-R99	Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	2,264,353 (1.95)	1,066 (5.05)	3,573 (3.47)	2,124.16	633.74
S00-T98	Injury, poisoning and certain other consequences of external causes	21,381,161 (18.42)	2,567 (12.16)	15,303 (14.85)	8,329.24	1,397.19
V01-Y98	External causes of morbidity and mortality	35,781 (0.03)	2 (0.01)	12 (0.01)	17,890.50	2,981.76
Z00-Z99	Factors influencing health status and contact with health services	906,240 (0.78)	2,367 (11.21)	8,460 (8.21)	382.86	107.12
	Not classify	13,470,729 (11.61)	887 (4.20)	17 (0.02)	15,186.84	792,395.82
	TOTAL	**116,054,964 (100.00**	**21,118 (100.00)**	**103,074 (100.00)**	**5,495.55**	**1,125.94**

ICD-10 = International Statistical Classification of Diseases and Related Health Problems

* = IPD data in DISPENSE management program had only 7 month

Table 17 presents total charges of DM and non-DM in outpatient and inpatient department. Total charges of outpatient were 124,229,958 bahts. They composed of 16.88% for DM outpatients' charges and 83.12% non-DM charges. Of the total charges of inpatient (116,054,964 bahts), 8.39% was DM inpatient charges and 91.61% was non-DM charges.

When comparing charges between DM patients and non-DM patients, this indicated that average charges per visit of DM outpatient (639.32 bahts) were 2.83 time higher charges than non-DM outpatient (225.99 bahts). Meanwhile, average charges per admission between DM inpatient and non-DM inpatient was twice as much as non-DM outpatient charges (10,595.99 and 5,263.49 bahts, respectively).

Table 17 Total hospital charges (Bahts), charge per visit, charge per admission and charge per patient of Diabetes mellitus (DM) and non-DM patient for fiscal year 2002

	Outpatient			**Inpatient***		
	DM	**Non-DM**	**Total**	**DM**	**Non-DM**	**Total**
Charges (%)	20,972,811 (16.88)	103,257,147 (83.12)	124,229,958 (100.00)	9,737,713 (8.39)	106,317,251 (91.61)	**116,054,964 (100.00)**
Visit /admission (%)	32,805 (6.73)	456,902 (93.27)	489,707 (100.00)	919 (4.35)	20,199 (95.65)	**21,118 (100.00)**
No. of patients	4,311 (2.22)	196,609 (97.78)	200,920 (100.00)	630 (2.89)	16,961 (97.11)	**17,591 (100.00)**
Charge/visit Mean ± S.D.	**639.32** 502 ± 998.53	**225.99** 220.34 ± 546.84	**253.68** 249.08 ± 600.49	**10,595.99** 11,049.32 ± 25,369.52	**5,263.49** 4,626.39 ± 10,727.26	**5,495.55** 5,495.55 ± 15,496.06
Charges/patient Mean ± S.D.	**4,864.95** 4,638.93 ± 12,454.21	**525.19** 647.57 ± 4,511.46	**618.31** 748.96 ± 4,910.59	**15,456.69** 16,539.12 ± 32,690.25	**6,268.34** 5,162.86 ± 11,950.82	**6,597.41** 6,224.46 ± 17,228.80

* IPD file had only 7- month data

For average charges per patient, outpatient treatment charges was 618.31 bahts and inpatient treatment charges was 6,597.41 bahts per patient. When comparing charges between DM patients and non-DM patients, health care services for DM patient treatment charges was higher than non-DM patient treatment charges both outpatient and inpatient department, especially average annual charges per patient in outpatient treatment. It was found that average annual charges per DM patient was approximately nine-fold charges of non-DM outpatient.

Table 18 presents the comparison charges data of DM outpatient and DM inpatient categorized patients into 3 groups; DM only, DM with complication/co-morbidity and DM with other diseases. For DM outpatient charges, it was found that 68.07% of total DM outpatient charges were DM with complication/co-morbidity treatment, and followed by DM with other diseases (24.98%) and DM only (6.95%). When compared an average charges per visit, DM with complication/co-morbidity had the highest charges per visit (701.00 bahts), followed by DM with other disease (551.23 bahts) and DM only (496.65 bahts). When analyzed in more detail, DM with complication/co-morbidity patients and DM with other diseases patients which visited the health care by primary diagnosis of DM had the highest average charges per visit (744.67 bahts and 558.18 bahts) than other primary diagnosis.

For average DM charges per patient, it was found that DM with complication/co-morbidity had the highest charges (6,087.52 bahts per patient), and followed by DM with other diseases (3,993.46 bahts per patient) and DM only (2,229.59 bahts per patient).

For inpatient department, the majority of inpatient charges treatment was DM with complication/co-morbidity (95.52% of total DM inpatient charges). An average charge per admission in DM with other diseases had the highest charges (12,196.57 bahts), followed by DM with complication/co-morbidity (10,904.24 bahts) and DM only (3,625.07 bahts).

When compared an average charges per admission among primary diagnosis, all DM with other diseases patients admitted into hospital by primary diagnosis of other diseases that the highest charges (12,196.57 bahts). Meanwhile, DM with complication/co-morbidity patients had the highest average charges per admission by primary diagnosis of complication/co-morbidity (12,526.60 bahts). Then, comparison of average charge per admission by primary diagnosis of DM was found that DM patients who had complication/co-morbidity (9,508.00 bahts) had higher charges than DM patients who had not complication/co-morbidity (3,625.07 bahts).

Table 18 Total charges (Bahts), charge per visit and charge per admission of Diabetes mellitus (DM) outpatient/inpatient with and without complications/co-morbidity

Patient	Outpatient					Inpatient				
	Charges	Visit	No. of patients	Charge /visit	Charge/ patient	Charges	Admission	No. of patients	Charge/ Admission	Charge/ patient
DM only	**1,458,151**	**2,936**	**654**	**496.65**	**2,229.59**	**155,878**	**43**	**38**	**3,625.07**	**4,102.05**
(%)	**(6.95)**	**(8.95)**	**(15.17)**			**(1.60)**	**(4.68)**	**(6.03)**		
DM with complication/ co-morbidity	**14,275,237**	**20,364**	**2,345**	**701.00**	**6,087.52**	**9,301,314**	**853**	**571**	**10,904.24**	**16,289.52**
(%)	**(68.07)**	**(62.08)**	**(54.40)**			**(95.52)**	**(92.82)**	**(90.63)**		
- DM	7,996,988	10,739		744.67		2,624,208	276		9,508.00	
(%)	(38.13)	(32.74)				(26.95)	(30.03)			
-Complication/ co-morbidity	1,785,815	2,457		726.83		1,891,517	151		12,526.60	
(%)	(8.52)	(7.49)				(19.42)	(16.43)			
- Other diseases	4,492,434	7,168		626.73		4,785,589	426		11,233.78	
(%)	(21.42)	(21.85)				(49.15)	(46.35)			
DM with other diseases	**5,239,423**	**9,505**	**1,312**	**551.23**	**3,993.46**	**280,521**	**23**	**21**	**12,196.57**	**13,358.14**
(%)	**(24.98)**	**(28.97)**	**(30.43)**			**(2.88)**	**(2.50)**	**(3.33)**		
- DM	2,586,038	4,633		558.18		-	-		-	
(%)	(12.33)	(14.12)								
- Other diseases	2,653,385	4,872		544.62		280,521	23		12,196.57	
(%)	(12.65)	(14.85)				(2.88)	(100.00)			
Total	**20,972,811**	**32,805**	**4,311**	**639.32**	**4,864.95**	**9,737,713**	**919**	**630**	**10,595.99**	**15,456.69**
	(100.00)	**(100.00)**	**(100.00)**			**(100.00)**	**(100.00)**			

DM only = Diabetes mellitus patients without complication and other diseases

DM with complication/co-morbidity = DM patients with polyneuropathies, retinal vascular disorder, glaucoma, optic neuritis, essential hypertension, ischaemic heart disease, intracerebral haemorrhage, heart failure, arteries and capillaries diseases, cellulitis, chronic renal failure, gangrene and infection of the skin

DM with other diseases = DM patients with diseases other than complications and co-morbidity

Part 4: Comparison of Resource Utilization Among Health Insurance Schemes

Table 19 shows the comparison of charges, the number of resources, average charges per item, average items per patient and average charges per patient in outpatient. In outpatient, the majority of total outpatients' charges were drugs' charges (54.23%), followed by medical services (43.77%), medical supplies (1.95%) and other (0.06%). When compared the utilization of resources, average items per outpatient was the highest in drugs charges (7.39 items per patient). Moreover, it was found that average drug charges per patient (335.32) was higher than other parts of resources. Then, comparison of DM and non-DM outpatient indicated that the majority of total charges were drugs charges. In addition, drugs charges of DM outpatients (73.00% of total charges) were higher than non-DM patients (50.42% of total charges). When compared the utilization of resources, average items per patient in DM outpatients was higher than that of non-DM patients in all parts of resources. In addition to, DM patient also had the higher average charge per item than non-DM patient. Thus, average charge per DM patient was 9.24 time higher than non-DM patient charges. Moreover, it was found that medical supplies and drugs charge per DM patient was more than 12 time of non-DM charge per patient.

Table 20 shows that comparison of charges, number of resources, average charges per item and average charge per patient between DM inpatient and non-DM inpatient. This pointed out that inpatients' charges had the bigger proportion of the medical service charges (67.97% of total DM inpatient charges) and followed by drugs charges (16.63%), medical supplies (13.17%) and other (2.23%). However, when comparing the number of resources and average charges per item between DM and non-DM inpatient. An average charge per item in various services, non-DM inpatients charges was higher than that of DM inpatients' charges. But, when compared the average charges per patient in all parts of resources, it was found that average charges per DM patient were higher than non-DM inpatients' charges in all parts of resources.

Table 19 Comparison of charges, number of resources, average charge per item, average item per patient and average charge per patient in outpatient.

Services	Non-DM	(%)	DM	(%)	Total	(%)
N	**196,609**		**4,311**		**200,920**	
Drugs						
- Charge	52,062,432	(50.42)	15,310,152	(73.00)	67,372,584	(54.23)
- Items	1,342,773	(65.37)	142,846	(69.45)	1,485,619	(65.74)
- Charge/item	**38.77**		**107.18**		**45.35**	
- Items/ patient	**6.83**		**33.14**		**7.39**	
- Charge/patient	**264.80**		**3,551.42**		**335.32**	
Medical services						
- Charge	49,321,287	(47.77)	5,048,155	(24.07)	54,369,442	(43.77)
- Items	676,934	(32.95)	59,075	(28.72)	736,009	(32.57)
- Charge/item	**72.86**		**85.45**		**73.87**	
- Items/patient	**3.44**		**13.70**		**3.66**	
- Charge/patient	**250.86**		**1,170.99**		**270.60**	
Medical supplies						
- Charge	1,817,171	(1.76)	601,920	(2.87)	2,419,091	(1.95)
- Items	34,377	(1.67)	3,728	(1.81)	38,105	(1.69)
- Charge/item	**52.86**		**161.46**		**63.48**	
- Items/patient	**0.17**		**0.86**		**0.19**	
- Charge/patient	**9.24**		**139.62**		**12.04**	
Other**						
- Charge	56,257	(0.05)	12,584	(0.06)	68,841	(0.06)
- Items	172	(0.00)	27	(0.01)	199	(0.00)
- Charge/item	**327.08**		**466.07**		**345.93**	
- Items/patient	**0.0009**		**0.006**		**0.001**	
- Charge/patient	**0.29**		**2.92**		**0.34**	
Total						
- Charge	**103,257,147**	**(100.00)**	**20,972,811**	**(100.00)**	**124,229,958**	**(100.00)**
- Items	**2,054,256**	**(100.00)**	**205,676**	**(100.00)**	**2,259,932**	**(100.00)**
- Charge/item	**50.26**		**101.97**		**54.97**	
- Items/patient	**10.45**		**47.71**		**11.25**	
- Charge/patient	**525.19**		**4,864.95**		**618.31**	

** Other = room, special room, ICU room, other expenditures, telephone expenditures and vehicles

Table 20 Comparison of charges, number of resources, average charge per item and average charges per patient in inpatient

Services	Non-DM	(%)	DM	(%)	Total	(%)
N	**16,961**		**630**		**17,591**	
Drugs						
- Charges	17,289,577	(16.26)	2,009,864	(20.64)	19,299,441	(16.63)
- Items	312,534	(50.30)	38,935	(55.60)	351,469	(50.84)
- Charge/item	**55.32**		**51.62**		**54.91**	
- Charge/patient	**1,019.37**		**3,190.26**		**1,097.12**	
Medical services						
- Charges	72,322,170	(68.03)	6,558,350	(67.35)	78,880,520	(67.97)
- Items	167,217	(26.91)	16,897	(24.13)	184,114	(26.63)
- Charge/item	**432.50**		**388.14**		**428.43**	
- Charge/patient	**4,264.03**		**10,410.08**		**4,484.14**	
Medical supplies						
-Charge	14,488,473	(13.63)	795,571	(8.17)	15,284,044	(13.17)
- Items	131,502	(21.17)	12,990	(18.55)	144,492	(20.90)
- Charge/item	**110.18**		**61.24**		**105.78**	
- Charge/patient	**854.22**		**1,262.81**		**868.86**	
Other**						
- Charge	2,217,031	(2.08)	373,928	(3.84)	2,590,959	(2.23)
- Items	10,041	(1.62)	1,204	(1.72)	11,245	(1.63)
- Charge/item	**220.50**		**310.57**		**230.14**	
- Charge/patient	**130.54**		**593.54**		**147.29**	
Total						
- Charge	**106,317,251**	**(100.00)**	**9,737,713**	**(100.00)**	**116,054,964**	**(100.00)**
- Items	**621,294**	**(100.00)**	**70,026**	**(100.00)**	**691,320**	**(100.00)**
- Charge/item	**171.12**		**139.00**		**167.87**	
- Charge/patient	**6,268.16**		**15,456.69**		**6,597.41**	

** Other = room, special room, ICU room, other expenditures, telephone expenditures and vehicles

DM charges of outpatient and inpatient prescription by insurance coverage are shown in table 21 and 22. Table 21 presents a comparison of total items and charges (Bahts) of DM outpatients categorized by health insurance coverage. It was found that the total number of prescriptions were 34,160 prescriptions. The majority of DM outpatients' prescriptions were patients under UC group (50.11%), followed by CSMBS (19.93%) and unclassified (12.07%), respectively. Total hospital DM

outpatients' charges were 20,972,811 bahts. The majority of charges were for patient under UC group (42.92%), followed by CSMBS (33.59%), Social Security (6.80%), self-pay (4.59%) and foreign worker (0.12%). As, the number of items were in similar direction of charges in prescription (UC 52.83%, CSMBS 20.40%, Social Security 9.29%, self-pay 6.30% and foreign worker 0.10%).

The average charges per prescription was the highest in patients under CSMBS group (1,034.42 bahts), followed by UC (525.81 bahts), foreign worker (540.38 bahts), Social Security (400.34 bahts) and self-pay (385.55 bahts). Meanwhile, CSMBS had the highest average charges per item (167.83 bahts), followed by foreign worker (120.37 bahts), UC (82.84 bahts), Social Security (74.67 bahts) and self-pay (74.43 bahts).

When analyzed in more detail, total hospital charges of DM outpatients as, drugs and non-drugs, it was found that patient under UC had the highest total charges and the number of items. Moreover, it was found that average drugs and non-drugs charges per prescription in patient under UC were lower than CSMBS (385.75 and 778.44 bahts for drugs, 140.06 and 255.98 bahts for non-drugs). In addition, average drugs and non drugs chargse per item in patient under UC were lower than CSMBS, too (86.40 and 178.63 bahts for drugs, 74.40 and 141.75 bahts for non drugs).

For average charge per person, patient under CSMBS had the highest charges per person (6,973.60 bahts), followed by UC (3,725.51 bahts), Social Security (2,529.12 bahts), foreign worker (1,814.14 bahts) and self-pay (1,286.37 bahts). Meanwhile, average charge per visit is the same direction as average charge per person, except in foreign worker.

Table 21 Comparison of total items and charge (Bahts) of DM outpatient prescription under various health insurance schemes

Services	CSMBS	Self-pay	SSS	UC	Foreign Worker	Not classified	Total
No. Rx	**6,809**	**2,499**	**3,563**	**17,118**	**47**	**4,124**	**34,160**
(%)	(19.93)	(7.32)	(10.43)	(50.11)	(0.14)	(12.07)	(100.00)
No. visit	**6,388**	**2,410**	**3,485**	**16,514**	**47**	**3,962**	**32,806**
(%)	(19.47)	(7.35)	(10.62)	(50.34)	(0.14)	(12.08)	(100.00)
No. person	**1,010**	**749**	**564**	**2,416**	**14**	**2,179**	**6,932**
(%)	(14.57)	(10.81)	(8.14)	(34.85)	(0.20)	(31.43)	(100.00)
Drugs							
Total charge	5,300,375	653,744	992,098	6,603,268	21,434	1,739,233	15,310,152
(%)	(75.25)	(67.85)	(69.55)	(73.36)	(84.39)	(69.20)	(73.00)
Total item	29,672	8,264	12,927	76,431	129	15,423	142,846
(%)	(70.70)	(63.84)	(67.67)	(70.34)	(61.14)	(67.67)	(69.45)
Average charge/person	**5,247.90**	**872.82**	**1,759.04**	**2,733.14**	**1,531.00**	**798.18**	**2,208.62**
Average charge/visit	**829.74**	**271.26**	**284.68**	**399.86**	**456.04**	**438.98**	**466.88**
Average charge/Rx	**778.44**	**261.60**	**278.44**	**385.75**	**456.04**	**421.73**	**448.19**
Average charge/item	**178.63**	**79.11**	**76.75**	**86.40**	**166.16**	**112.77**	**107.18**
Average items/patient	**29.38**	**11.03**	**22.92**	**31.64**	**9.21**	**7.08**	**20.61**
Non-drugs							
Total charge	1,742,966	309,747	434,326	2,397,570	3,964	774,086	5,662,659
(%)	(24.75)	(32.15)	(30.45)	(26.64)	(15.61)	(30.80)	(27.00)
Total item	12,296	4,681	6,176	32,225	82	7,370	62,830
(%)	(29.30)	(36.16)	(32.32)	(29.66)	(38.86)	(32.33)	(30.55)
Average charge/person	**1,725.71**	**413.55**	**770.08**	**992.37**	**283.14**	**355.25**	**816.89**
Average charge/visit	**272.85**	**128.53**	**124.63**	**145.18**	**24.34**	**195.38**	**172.61**
Average charge/Rx	**255.98**	**123.95**	**121.80**	**140.06**	**84.34**	**187.70**	**165.77**
Average charge/item	**141.75**	**66.17**	**70.32**	**74.40**	**48.34**	**105.03**	**90.13**
Average items/patient	**12.17**	**6.25**	**10.95**	**13.34**	**5.86**	**3.38**	**9.06**
Total							
Total charge	**7,043,341**	**963,491**	**1,426,424**	**9,000,838**	**25,398**	**2,513,319**	**20,972,811**
(%)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)
Total item	**41,968**	**12,945**	**19,103**	**108,656**	**211**	**22,793**	**205,676**
(%)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)
Average charge/person	**6,973.60**	**1,286.37**	**2,529.12**	**3,725.51**	**1,814.14**	**1,153.43**	**3,025.51**
Average charge/visit	**1,102.59**	**399.79**	**409.30**	**545.04**	**540.38**	**634.36**	**639.30**
Average charge/Rx	**1,034.42**	**385.55**	**400.34**	**525.81**	**540.38**	**609.44**	**613.96**
Average charge/item	**167.83**	**74.43**	**74.67**	**82.84**	**120.37**	**110.27**	**101.97**
Average items/patient	**41.55**	**17.28**	**33.87**	**44.97**	**15.07**	**10.46**	**29.67**

No. Rx = The number of prescriptions, Non-drug = Medical services, medical supply and others
CSMBS = Civil Servant Medical Benefit Scheme, UC = Universal Health Coverage Scheme
SSS= Social Security Scheme

Table 22 shows the comparison of total items and charge (Bahts) of DM inpatients department. These DM inpatients charge was from 919 hospital admission. Patient under UC group had the majority of admission (59.29%) followed by CSMBS (25.03%), self-pay (9.80%), SSS (4.70%) and foreign worker (0.06%). Hospital-bed day had the same direction of admission.

Total hospital charges of DM inpatients were 9,737,713 bahts. When compared charges among various health insurances types, patients under UC had the biggest proportion of total charges (47.55%), followed by CSMBS (43.51%), self-pay (5.97%), Social security (1.61%) and foreign worker (0.04%).

When compared this data among various health insurance type, it was found that patient under UC had the majority of charges and number of items in both drugs and non-drugs parts. Meanwhile, the highest average charges per day, charges per admission and charges per patient were for patient under CSMBS (285.80, 3,322.04 and 4,685.42 bahts for drugs charges, 1,208.23, 14,043.15 and 19,806.52 bahts for non-drugs charges, respectively). In addition, CSMBS had the highest average charges per day, charges per admission and charges per patient in health care services (1,494.04, 17,365.19 and 24,491.94 bahts, respectively). As, foreign worker had the lowest charges for treatment.

For average charges per person, CSMBS had the highest average charges per person (24,491.94 bahts), and followed by UC (13,042.20 bahts), self-pay (8,069.10 bahts), Social Security (7,476.14 bahts) and foreign worker (4,096.00 bahts).

Table 22 Comparison of total items and charges (Bahts) of DM inpatients under various health insurance schemes

Services	CSMBS	Self-pay	SSS	UC	Foreign Worker	Not classified	Total
Length of Stay	**2,836**	**631**	**235**	**4,480**	**7**	**101**	**8,290**
(%)	(33.13)	(8.28)	(3.65)	(54.10)	(0.05)	(0.80)	(100)
Admission	**244**	**84**	**35**	**538**	**1**	**17**	**919**
(%)	(25.03)	(9.80)	(4.70)	(59.29)	(0.06)	(1.13)	(100)
No. patients	**173**	**72**	**21**	**355**	**1**	**16**	**638**
(%)	(25.20)	(13.54)	(4.74)	(54.84)	(0.10)	(1.58)	(100.00)
Drugs							
Total charge	810,578	85,620	48,036	1,032,668	1,005	31,957	2,009,864
(%)	(19.13)	(14.74)	(30.60)	(22.30)	(24.54)	(24.86)	(20.64)
Total item	14,347	2,531	837	20,698	39	483	38,935
(%)	(56.14)	(52.15)	(52.41)	(55.99)	(54.17)	(49.29)	(55.60)
Charge/day	**285.80**	**135.69**	**204.41**	**230.51**	**143.57**	**316.41**	**242.44**
Charge/Admission	**3,322.04**	**1,019.29**	**1,372.46**	**1,919.46**	**1,005.00**	**1,879.82**	**2,187.01**
Charge/person	**4,685.42**	**1,189.17**	**2,287.43**	**2,908.92**	**1,005.00**	**1,997.31**	**3,150.26**
Not drugs							
Total charge	3,426,528	495,355	108,963	3,597,314	3,091	96,598	7,727,849
(%)	(80.87)	(85.26)	(69.40)	(77.70)	(75.46)	(75.14)	(79.36)
Total item	11,210	2,322	760	16,269	33	497	31,091
(%)	(43.86)	(47.85)	(47.59)	(44.01)	(45.83)	(50.71)	(44.40)
Charge/day	**1,208.23**	**785.03**	**463.67**	**802.97**	**441.57**	**956.42**	**932.19**
Charge/Admission	**14,043.15**	**5,897.08**	**3,113.23**	**6,686.46**	**3,091.00**	**5,682.24**	**8,408.98**
Charge/person	**19,806.52**	**6,879.93**	**5,188.71**	**10,133.28**	**3,091.00**	**6,037.38**	**12,112.62**
Total							
Total charge	**4,237,106**	**580,975**	**156,999**	**4,629,982**	**4,096**	**128,555**	**9,737,713**
(%)	**(100.00)**	**(100.00)**	**(100.00)**	**(100.00)**	**(100.00)**	**(100.00)**	**(100.00)**
Total item	**25,557**	**4,853**	**1,597**	**36,967**	**72**	**980**	**70,026**
(%)	**(100.00)**	**(100.00)**	**(100.00)**	**(100.00)**	**(100.00)**	**(100.00)**	**(100.00)**
Charge/day	**1,494.04**	**920.72**	**668.08**	**1,033.48**	**585.14**	**1,272.82**	**1,174.63**
Charge/Admission	**17,365.19**	**6,916.37**	**4,485.68**	**8,605.91**	**4,096.00**	**7,562.06**	**10,595.99**
Charge/person	**24,491.94**	**8,069.10**	**7,476.14**	**13,042.20**	**4,096.00**	**8,034.69**	**15,262.87**

Non-drug = Medical services, medical supply and others
CSMBS = Civil Servant Medical Benefit Scheme, UC = Universal Health Coverage Scheme
SSS= Social Security Scheme

The comparison of charges per visit, charges per person and charges per prescription in DM outpatients with and without complications were presented in table 23.

For all DM outpatients, DM with complication/co-morbidity patients had the biggest charges in treatment, followed by DM with other diseases patients and DM only. Thus, DM with complication/co-morbidity had the majority of charges per person (3,716.23 bahts), charges per visit (700.91 bahts) and charges per prescription (671.97 bahts) while DM only had the lowest average charges.

When compared charges in various patients' insurance types, it was found that patient under UC had the majority of total charges in three groups of DM patients whereas patient under CSMBS had the highest average charges per person, average charges per visit and average charges per prescription in all groups of DM outpatient. Moreover, foreign worker had the lowest charges per prescription, charges per visit and charges per person in both DM only and DM with complication/co-morbidity patients whereas self-pay had the lowest charges per prescription, charges per visit and charges per person in DM with other diseases patients. Meanwhile, patients under UC and Social Security were the second and the third ranks in average charges per prescription, average charges per visit and charges per person in both DM only and DM with complication/co-morbidity.

Table 23 Comparison of charges (Bahts) by DM outpatients with and without complications and co-morbidity under different health insurance scheme

	Patient's insurance						
	CSMBS	**Self-pay**	**SSS**	**UC**	**Foreign Worker**	**Not Classified**	**Total**
DM only							
Charge	309,203	132,384	114,827	733,568	663	167,638	1,458,283
(%)	(21.20)	(9.08)	(7.87)	(50.30)	(0.05)	(11.50)	(100.00)
Visit	463	398	260	1,483	5	327	2,936
(%)	(15.77)	(13.55)	(8.86)	(50.51)	(0.17)	(11.14)	(100.00)
No. of patients	111	164	70	336	3	244	928
(%)	(11.96)	(17.67)	(7.54)	(36.21)	(0.32)	(26.29)	(100.00)
Rx	473	408	262	1,494	5	334	2,976
(%)	(15.89)	(13.71)	(8.80)	(50.20)	(0.17)	(11.22)	(100.00)
Charge/person	**2,785.61**	**807.22**	**1,640.39**	**2,183.24**	**221.00**	**687.04**	**1,571.43**
Charge/visit	**667.83**	**332.62**	**441.64**	**494.65**	**132.60**	**512.65**	**496.69**
Charge/Rx	**653.71**	**324.47**	**438.27**	**491.01**	**132.60**	**501.91**	**490.01**
DM with complication/co-morbidity							
Charge	5,010,633	569,712	763,993	6,311,388	1,750	1,616,567	14,274,043
(%)	(35.10)	(3.99)	(5.35)	(44.22)	(0.01)	(11.33)	(100.00)
Visit	4,318	1,238	1,635	10,878	11	2,284	20,364
(%)	(21.20)	(6.08)	(8.03)	(53.42)	(0.05)	(11.22)	(100.00)
No. of patients	607	324	249	1,407	2	1,251	3,840
(%)	(15.81)	(8.44)	(6.48)	(36.64)	(0.05)	(32.58)	(100.00)
Rx	4,633	1,285	1,666	11,278	11	2,369	21,242
(%)	(21.81)	(6.05)	(7.84)	(53.09)	(0.05)	(11.15)	(100.00)
Charge/person	**8,254.75**	**1,758.37**	**3,055.97**	**4,485.71**	**875.00**	**1,292.22**	**3,716.23**
Charge/visit	**1,160.41**	**460.19**	**466.99**	**580.20**	**159.09**	**707.78**	**700.91**
Charge/Rx	**1,081.51**	**443.36**	**458.58**	**559.62**	**159.09**	**682.38**	**671.97**
DM with other diseases							
Charge	1,723,505	261,395	547,604	1,955,882	22,985	729,114	5,240,485
(%)	(32.89)	(4.99)	(10.45)	(37.32)	(0.44)	(13.91)	(100.00)
Visit	1,607	774	1,589	4,153	31	1,351	9,505
(%)	(16.91)	(8.14)	(16.72)	(43.69)	(0.33)	(14.21)	(100.00)
No. of patients	292	261	244	673	9	684	2,163
(%)	(13.50)	(12.07)	(11.28)	(31.11)	(0.42)	(31.62)	(100.00)
Rx	1,703	806	1,635	4,389	31	1,422	9,946
(%)	(17.12)	(8.10)	(16.44)	(43.73)	(0.31)	(14.30)	(100.00)
Charge/person	**5,902.41**	**1,001.51**	**2,244.28**	**2,906.21**	**2,553.89**	**1,065.96**	**2,422.79**
Charge/visit	**1,072.50**	**337.72**	**344.62**	**470.96**	**741.45**	**539.68**	**551.34**
Charge/Rx	**1,012.04**	**324.31**	**334.93**	**445.63**	**741.45**	**512.74**	**526.89**

DM only = Diabetes mellitus patients without complication and other diseases
DM with complication/co-morbidity = DM patients with polyneuropathies, retinal vascular disorder, glaucoma, optic neuritis, essential hypertension, ischaemic heart disease, intracerebral haemorrhage, heart failure, arteries and capillaries diseases, cellulitis, chronic renal failure, gangrene and infection of the skin
DM with other diseases = DM patients with diseases other than complications and co-morbidity

The comparison of treatment charge by DM inpatient with and without complication/co-morbidity were shown in table 24.

When compared charges among various patients' insurance type, it was found that patient under UC had the majority of total charges in all three groups of DM inpatients. However, patients under CSMBS had the highest average charges per admission, average charges per day and average charges per person in DM only and DM with complication/co-morbidity. As, DM with other diseases patients under Social Security had the highest in average charges per admission and average charges per patient. But, patients under Social Security had the lowest average charges per day, average charges per admission, average charges per patient in DM only and DM with complication/co-morbidity. Meanwhile, DM with other diseases had the lowest average charges per admission and average charges per person in self-pay.

Table 24 Comparison of charges per admission, charge per day, charge per person by (bahts) DM inpatients by primary diagnosis and health insurance type

	Patient's insurance						
	CSMBS	**Self-pay**	**SSS**	**UC**	**Foreign Worker**	**Not classified**	**Total**
DM only							
Charge	45,990.81	30,736.55	5,821.15	70,048.30	-	3,281.55	155,878.36
(%)	(29.50)	(19.72)	(3.73)	(44.94)		(2.11)	(100.00)
No. patients	7	7	3	19	-	2	38
(%)							
Admission	7	7	3	24	-	2	43
(%)	(16.28)	(16.28)	(6.98)	(55.81)		(4.65)	(100.00)
Hospital bed-day	41	32	15	115	-	5	208
(%)	(19.71)	(15.38)	(7.21)	(55.29)		(2.40)	(100.00)
Charge/Admission	**6,570.12**	**4,390.94**	**1,940.38**	**2,918.68**	**-**	**1,640.78**	**3,625.08**
Charge/day	**1,121.73**	**960.52**	**388.08**	**609.12**	**-**	**656.31**	**749.42**
Charge/person	**6,570.12**	**4,390.94**	**1,940.38**	**3,686.75**	**-**	**1,640.78**	**4,102.06**
DM with complication/co-morbidity							
Charge	4,077,596	523,502	111,637	4,461,307	3,852	123,421	9,301,314
(%)	(43.84)	(5.63)	(1.20)	(47.96)	(0.04)	(1.33)	(100.00)
No. patients	158	61	17	328	1	11	576
(%)							
Admission	229	74	30	505	1	14	853
(%)	(26.85)	(8.68)	(3.52)	(59.20)	(0.12)	(1.64)	(100.00)
Hospital bed-day	2,724	575	184	4,302	7	95	7,887
(%)	(34.54)	(7.29)	(2.33)	(54.55)	(0.09)	(1.20)	(100.00)
Charge/Admission	**17,806.10**	**7,074.35**	**3,721.24**	**8,834.27**	**3,852.00**	**8,815.76**	**10,904.24**
Charge/day	**1,496.91**	**910.44**	**606.72**	**1,037.03**	**550.26**	**1,299.16**	**1,179.32**
Charge/person	**25,807.57**	**8,582.00**	**6,566.88**	**13,601.55**	**3,852.00**	**11,220.09**	**16,148.11**
DM with other diseases							
Charge	110,052.28	27,447.50	38,867.02	102,124.63	-	2,029.00	280,520.43
(%)	(39.23)	(9.78)	(13.86)	(36.41)		(0.72)	(100.00)
No. patients	8	3	1	8	-	1	21
(%)							
Admission	8	3	2	9	-	1	23
(%)	(34.78)	(13.04)	(8.70)	(39.13)		(4.35)	(100.00)
Hospital bed-day	71	24	36	63	-	1	195
(%)	(36.41)	(12.31)	(18.46)	(32.31)		(0.51)	(100.00)
Charge/Admission	**13,756.54**	**9,149.17**	**19,433.51**	**11,347.18**	**-**	**2,029.00**	**12,196.54**
Charge/day	**1,550.03**	**1,143.65**	**1,079.64**	**1,621.03**	**-**	**2,029.00**	**1,438.57**
Charge/person	**13,756.54**	**9,149.17**	**38,867.02**	**12,765.58**	**-**	**2,029.00**	**13,358.12**

DM only = Diabetes mellitus patients without complication and other diseases
DM with complication/co-morbidity = DM patients with polyneuropathies, retinal vascular disorder, glaucoma, optic neuritis, essential hypertension, ischaemic heart disease, intracerebral haemorrhage, heart failure, arteries and capillaries diseases, cellulitis, chronic renal failure, gangrene and infection of the skin
DM with other diseases = DM patients with diseases other than complications and co-morbidity

Table 25 presents the comparison of the number of items, total charges, average charge per item in DM outpatient/inpatient by primary diagnosis.

In OPD treatment, the parts of drugs were classified into essential drugs (ED) and non-essential drugs (NED). All types of DM outpatient had the majority of ED charges. For average OPD treatment charges per item, this data found that Non-essential drugs (NED) charges were approximately four times of essential drugs (ED) and non-drugs charges (only found in DM without diseases and DM with complication/co-morbidity). The average NED charges per item in DM with other diseases was approximately two times of other charges. Furthermore, average NED charges per item was the highest in DM with complication/co-morbidity patients (363.12 bahts) while DM with other diseases patients were the highest average non-drug charges per item (99.16 bahts).

In IPD treatment, data of ED and NED was not complete. This data found that average non-drugs charge per item was higher than drugs charges within all groups of DM inpatient. Average non-drugs charges per item were approximately five times of average drugs charges per item within DM only and DM with complication/co-morbidity, but DM with other diseases had average non-drugs charges per item 3 times of average drugs charges per item.

Table 25 Comparison of total items, total charges, average charge per item (Bahts) DM outpatient/inpatient by primary diagnosis

Charge	Outpatient			Inpatient		
	Charge	Items	Charge/ item	Charge	Items	Charge/ item
DM only						
Drugs	**1,047,256**	**11,066**	**94.64**	**28,503.36**	**812**	**35.10**
(%)	(71.82)	(64.36)		(18.29)	(51.39)	
- ED	822,362	10,376	79.26			
(%)	(56.40)	(60.34)				
- NED	224,894	690	325.93			
(%)	(15.42)	(4.01)				
Non- drugs	**410,895**	**6,129**	**67.04**	**127,375**	**768**	**165.85**
(%)	(28.18)	(35.64)		(81.71)	(48.61)	
Total	**1,458,151**	**17,195**	**84.80**	**155,878.36**	**1,580**	**98.66**
(%)	**(100.00)**	**(100.00)**				
DM with complication/co-morbidity						
Drugs	**10,806,637**	**97,811**	**110.48**	**1,919,097**	**39,025**	49.18
(%)	(75.70)	(71.63)		(20.63)	(55.99)	
- ED	7,953,965	89,955	88.42			
(%)	(55.72)	(65.88)				
- NED	2,852,672	7,856	363.12			
(%)	(19.98)	(5.75)				
Non- drugs	**3,468,600**	**38,732**	**89.55**	**7,382,217**	**30,672**	**240.68**
(%)	(24.30)	(28.37)		(79.37)	(44.01)	
Total	**14,275,237**	**136,543**	**104.55**	**9,301,314**	**69,697**	**133.45**
(%)	**(100.00)**	**(100.00)**		**(100.00)**	**(100.00)**	
DM with other diseases						
Drugs	**3,456,543**	**33,953**	**101.80**	**62,676.43**	**841**	**74.53**
(%)	(65.97)	(65.38)		(22.34)	(44.43)	
- ED	2,742,352	30,677	89.39			
(%)	(52.34)	(59.07)				
- NED	714,191	3,276	218.01			
(%)	(13.63)	(6.31)				
Non- drugs	**1,782,880**	**17,979**	**99.16**	**217,844**	**1,052**	**207.08**
(%)	(34.03)	(34.62)		(77.66)	(55.57)	
Total	**5,239,423**	**51,932**	**100.89**	**280,520.43**	**1,893**	**148.19**
(%)	**(100.00)**	**(100.00)**		**(100.00)**	**(100.00)**	

DM only = Diabetes mellitus patients without complication and other diseases
DM with complication/co-morbidity = DM patients with polyneuropathies, retinal vascular disorder, glaucoma, optic neuritis, essential hypertension, ischaemic heart disease, intracerebral haemorrhage, heart failure, arteries and capillaries diseases, cellulitis, chronic renal failure, gangrene and infection of the skin
DM with other diseases = DM patients with diseases other than complications and co-morbidity
ED = Essential drugs
NED = Non essential drugs

Utilization of treatment in DM outpatient was shown in table 26. These data compared total charges, the number of item and average charges per item in DM outpatient treatment. It was found that DM with complication/co-morbidity used the highest ratio of drugs and non-drugs charges (76:24), followed by DM only (72:28) and DM with other diseases (66:34), especially DM with complication/co-morbidity who visited hospital by primary diagnosis of DM (78:21)

When comparing drugs charges, all groups of DM outpatient used more than fifty percentages of ED charges. Meanwhile, the highest NED charges were used in DM with complication/co-morbidity outpatient.

For average charges per item, DM with complication/co-morbidity had the highest average drugs charges per item (110.48 bahts), especially DM patients who visited the hospital because of complication/co-morbidity (113.25 bahts). When drug charges divided by ED and NED charges, it was found that DM with complication/co-morbidity had the highest average NED charges per item (363.12 bahts), especially DM with complication/co-morbidity who visited hospital by primary diagnosis of DM (435.37 bahts). Meanwhile, DM with other diseases had the highest average ED charges per item (89.39 bahts), especially DM with other diseases who visited hospital by primary diagnosis of other diseases (94.74 bahts).

In the part of non drugs charges, DM with other diseases had the highest average not drugs charges per item (99.16 bahts), especially DM with other diseases who visited hospital by primary diagnosis of other diseases (127.91 bahts).

Table 26 Comparison of total item, total charges and average charge per item (Bahts) DM outpatients by primary diagnosis

	Primary diagnosis of DM								
	DM			Complication or co-morbidity			Other diseases		
	Charge	Items	Charge /item	Charge	Items	Charge /item	Charge	Items	Charge /item
DM only									
Drugs	1,047,256	11,066	94.64	-	-	-	-	-	-
(%)	(71.82)	(64.36)							
-ED	822,362	10,376	79.26	-	-	-	-	-	-
(%)	(56.40)	(60.34)							
-NED	224,894	690	325.93	-	-	-	-	-	-
(%)	(15.42)	(4.01)							
Non-drugs	410,895	6,129	67.04	-	-	-	-	-	-
(%)	(28.18)	(35.64)							
Total	1,458,151	17,195	84.80	-	-	-	-	-	-
(%)	(100.00)	(100.00)							
DM with complication/co-morbidity									
Drugs	6,245,201	57,536	108.54	1,463,099	11,397	128.38	3,098,337	28,881	107.28
(%)	(78.09)	(71.95)		(81.93)	(74.67)		(68.97)	(69.89)	
-ED	4,725,338	54,047	87.43	1,022,896	10,418	98.19	2,205,731	25,495	86.52
(%)	(59.09)	(67.59)		(57.28)	(68.25)		(49.10)	(61.70)	
-NED	1,519,863	3,489	435.62	440,203	979	449.65	892,606	3,386	263.62
(%)	(19.00)	(4.36)		(24.65)	(6.41)		(19.87)	(8.19)	
Non-drugs	1,751,806	22,426	78.11	322,716	3,867	83.45	1,394,078	12,444	112.03
(%)	(21.91)	(28.05)		(18.07)	(25.33)		(31.03)	(30.11)	
Total	7,997,007	79,962	100.01	1,785,815	15,264	117.00	4,492,415	41,325	108.71
(%)	(100.00)	(100.00)		(100.00)	(100.00)		(100.00)	(100.00)	
DM with other diseases									
Drugs	1,871,730	18,440	101.50	-	-	-	1,584,813	15,513	102.16
(%)	(72.38)	(65.70)					(59.73)	(65.00)	
-ED	1,464,941	17,194	85.20	-	-	-	1,277,411	13,483	94.74
(%)	(56.65)	(61.26)					(48.14)	(56.49)	
-NED	406,789	1,246	326.48	-	-	-	307,402	2,030	151.43
(%)	(15.73)	(4.44)					(11.59)	(8.51)	
Non-drugs	714,308	9,625	74.21	-	-	-	1,068,572	8,354	127.91
(%)	(27.62)	(34.30)					(40.27)	(35.00)	
Total	2,586,038	28,065	92.14	-	-	-	2,653,385	23,867	111.17
(%)	(100.00)	(100.00)					(100.00)	(100.00	

DM only = Diabetes mellitus patients without complication and other diseases
DM with complication/co-morbidity = DM patients with polyneuropathies, retinal vascular disorder, glaucoma, optic neuritis, essential hypertension, ischaemic heart disease, intracerebral haemorrhage, heart failure, arteries and capillaries diseases, cellulitis, chronic renal failure, gangrene and infection of the skin
DM with other diseases = DM patients with diseases other than complications and co-morbidity

Table 27 presented the comparison of total item, total charges and average charges per item in DM inpatient classified by primary diagnosis. This data showed that DM with complication/co-morbidity used the highest ratio of drugs charges to non drugs charges (21:80), followed by DM with other diseases (22:78) and DM only (18:82).

For average charges per item, non drugs charges had increased approximately fivefold over drugs charge in DM only and DM with complication/co-morbidity. Meanwhile, DM with other diseases had not-drugs charges approximately three times as much as drugs charges.

When comparing DM inpatient by primary diagnosis, this found that DM with complication/co-morbidity who admitted into hospital by primary diagnosis of complication/co-morbidity had the highest drugs and not-drugs charges (59.28 and 247.22 bahts). Meanwhile, DM without other diseases had the lowest average drugs and non-drugs charges per item (35.10 and 165.85 bahts). Moreover, DM with other diseases had the highest average charges per item (drugs and non-drugs) in DM inpatient treatment (148.19 bahts).

Table 27 Comparison of total item, total charges and average charge per item (Bahts) DM inpatients by primary diagnosis

	Primary diagnosis of DM								
	DM			**Complication or co-morbidity**			**Other diseases**		
	Charge	**Items**	**Charge /item**	**Charge**	**Items**	**Charge /item**	**Charge**	**Items**	**Charge /item**
DM only									
Drugs	28,503	777	36.68	-	-	-	-	-	-
(%)	(18.29)	(51.39)							
Non drugs	127,375	735	173.30	-	-	-	-	-	-
(%)	(81.71)	(48.61)							
Total	155,878	1,512	103.09	-	-	-	-	-	-
(%)	(100.00)	(100.00)							
DM with complication/co-morbidity									
Drugs	551,053	11,827	46.59	451,719	7,620	59.28	916,325	17,898	51.20
(%)	(21.00)	(57.33)		(23.88)	(54.84)		(19.15)	(55.63)	
Non drugs	2,073,155	8,804	235.48	1,439,798	6,274	229.49	3,869,264	14,277	371.86
(%)	(79.00)	(42.67)		(76.12)	(45.16)		(80.85)	(44.37)	
Total	2,624,208	20,631	127.20	1,891,517	13,894	136.14	4,785,589	32,176	148.73
(%)	(100.00)	(100.00)		(100.00)	(100.0		(100.00)	(100.00)	
DM with other diseases									
Drugs	-	-	-	-	-	-	62,676	806	77.76
(%)							(22.34)	(44.43)	
Non drugs	-	-	-	-	-	-	217,845	1,008	216.12
(%)							(77.66)	(55.57)	
Total	-	-	-	-	-	-	280,521	1,814	154.64
(%)							(100.00)	(100.00)	

DM only = Diabetes mellitus patients without complication and other diseases
DM with complication/co-morbidity = DM patients with polyneuropathies, retinal vascular disorder, glaucoma, optic neuritis, essential hypertension, ischaemic heart disease, intracerebral haemorrhage, heart failure, arteries and capillaries diseases, cellulitis, chronic renal failure, gangrene and infection of the skin
DM with other diseases = DM patients with diseases other than complications and co-morbidity

CHAPTER V
DISCUSSION

Discussion was presented in three parts: descriptive characteristics of patients, health care utilization rate, total hospital charges for treatments and resource utilization of diabetes mellitus (DM) and non-DM patients

1. Descriptive Characteristics of Patients

The total number of 201,965 patients were treated in 2002-fiscal year. These patients were classified to 201,073 outpatients and 34,038 inpatients. Among these, there were 33,146 (16.41% of total patients) who were treated both in outpatient department and inpatient department. The majority of all patients were the same directions both outpatients and inpatients i.e. female, age range, insurance coverage. For health insurance coverage, mostly all patients were self-pay (35.03% of outpatients, 43.09% of inpatients). Thus, from this percentage, this might be explained that many people may register under UC at other provinces so they must pay out of pocket when they were treated in this hospital.

When considering total number of diabetes patients treated in this hospital, thay accounted for 2.29% of total patients. Characteristics of diabetes patients were different from all patients. Mostly diabetes patients were female. For age range, diabetes patients were mostly more than 45 years old. Meanwhile, the majority of DM patients were patients under UC (46.96% of DM outpatients, 54.84% of DM inpatients). This part of insurance coverage is associated with the age range of DM patients. UC has covered the majority of population that comprised of older peoples, students people and people who had lower wages. For type of diabetes patients, this study found that the majority of diabetes patients were type II diabetes (99.82% of DM

outpatients and 96.75% of DM inpatients). When comparing frequency distribution of number of diabetes in other studies, type II diabetes patient is presented in about 85 to 90% of all persons with diabetes. This pointed that the majority of diabetes patients which was found in this study was nearly the same as that other studies.

2. Health Care Utilization Rate

From the total number of outpatients, average outpatient visits per person was 2.7652. When these visits were classified by patients' insurance coverage, the sum of outpatients in each health insurance was higher than the total of outpatients. Consequently, it could be estimated that many outpatients (8.65% of total outpatients) used more than one insurance scheme in each visit in to hospital. This might be explained that this study was done in the transitional period of universal coverage and investigation of insurance scheme in each patient was not connected in various health schemes. When comparing utilization rate of health services by patients under different health insurance scheme, this was found that CSMBS had the highest average annual visit per person, followed by UC and Social Security. However, the majority of all visits were not patients under CSMBS, but Social Security had the majority of all visits.

For IPD data, when comparing the number of inpatients' admission and hospital-bed days by patients under different health insurance type, the number of inpatients were increased too. This found that (1.42% of total inpatients) inpatients were admitted in various health insurance. Moreover, this study was shown that these patients with more than one health insurance tend to use more health care resources than people with only health insurance. Thus, the number of outpatients with more than one health insurance tend to use more health care resource than inpatients with more than one health insurance. When analyzed in each health insurance type, UC had the majority of average annual admission per person, while CSMBS had the highest average days per admission. But, self-pay had the lowest average days per admission and average admission per person.

Accessibility to health services, data of population in different health insurance type were not known data exactly. Population data were retrieved population data from accounting reports. These reports had the number of population who registered in this hospital; Social Security, UC and foreign worker. Meanwhile, CSMBS population data were retrieved from files in Health Security Office. Consequently, population of CSMBS was data of total CSMBS people that lived in Samut Sakhon provinces. From this study, CSMBS had the highest access to IP health care services in both the percentage of population with IP services and average admission per population. In addition, CSMBS had the highest average visits per population. Furthermore, patients under Social Security had the second ranks in the accessibility in both OP and IP services.

For DM patients' utilization rate was higher than non-DM patient both in OP and IP services. DM outpatients' utilization rate was estimated three times more than non-DM outpatients' utilization rate. When comparing utilization rate among insurance type, the percentage of DM patients who used more than one type of health insurance types were more than non-DM patients with more than 1 health insurance types. In addition to, these DM patients had tend to used more health care services than DM patient with only one health insurance. DM patients under UC had the majority of visits which it was different in non-DM outpatients visits (Social Security). However, CSMBS outpatients had the highest average visits per person in both DM outpatients and non-DM outpatients.

For DM inpatients, utilization rate in DM patients were higher than non-DM patients. Consequently, average admission per person and average days per admission in DM patients were 1.5 and 1.7 times more than non-DM patients, respectively. Based on types of payment status, UC had the majority of admission and length of stay, whereas non-DM patients were self-pay patients. However, CSMBS patients had the highest average days per admission, whereas UC had the highest admission per person in both DM patients and non-DM patients. Meanwhile, self-pay had the lowest utilization rate in DM patients and non-DM patients. When analyzed in more details, this study found that the number of DM patients' utilization who used more than one types of health insurance scheme was more than non-DM patients, especially in outpatients' visits.

From analyzed of DM patients by primary diagnosis, majority of DM patients were DM with complication/co-morbidity, especially in inpatients (89.14% of DM inpatients). Consequently, DM with complication/co-morbidity had the highest in average visits per person and admissions per person. Factors that influencing DM with complication/co-morbidity used health services were diabetes outpatients, whereas diabetes inpatients had the result that of other diseases. In the parts of days per admission, DM with other diseases had the longest days per admission that result from other diseases. However, factors that influence DM with complication/co-morbidity patients to admitted longer days were complication/co-morbidity. The results from these STAT program databases were retrieved from electronic database. This mean the staff at medical record department filled diagnosis data from medical records. Thus, there were some chances of mistakes in data.

The comparison of utilization rate by patient insurance and diagnosis of DM were the same situation of diabetes patients under various health insurance. For outpatient department, this study presented that UC and CSMBS had the highest of utilization rate in outpatients. In addition, self-pay had the lowest of utilization rate in outpatients. For inpatient, CSMBS and UC had the same average admission per person rate in the same situation of DM patients. Moreover, Social Security had the highest admission per person in DM with other diseases. Meanwhile, self-pay had the lowest utilization rate in inpatients. Thus, from this study, it could be estimated that people who was not covered insurance coverage must pay expenditures by yourselves to each visit in to hospital. This had an incentive for patient to minimize the utilization of health services rates. Furthermore, people who had health insurance coverage were one of the factors that affect them to increase utilization rates.

When further analyzed, comparison of DM patients by patterns of services utilization and health insurance type, this indicated that status of disease were related to patterns of services utilization. For example, DM patients with both OPD and IPD services in this fiscal year were severe diabetic patients group and tend to use more resource utilization. Furthermore, this study found that DM with complication or co-morbidity was the majority of DM patients. Thus, the majority of DM patients tended to use more services utilization. This pointed out that the patterns of diabetic service treatment were related to status of diabetic patients. For example, DM with

complication/co-morbidity was the factors that patients visited or admitted into hospitals more than DM with not complication/co-morbidity or other diseases.

3. Total Hospital Charges For Treatments and Resources Utilization of DM and non-DM Patient

Data of hospital charges were retrieved from DISPENSE management program in this fiscal year 2002. For inpatients, there was only 7-month of inpatient data for analysis, the rest was not recorded in electronic form. While, outpatient data were completed. Total inpatient charges were presented inpatient treatment resulted from 21,118 admission and 103,074 hospital-bed days. These admissions and hospital bed-days were accounted for 52.21% of all admission and 52.86% of all hospital bed-days in STAT program. Thus, actual total hospital charges of inpatient were higher. For outpatient, total charges of outpatients were for 489,707 visits. These visits were less than outpatient visits in STAT program about 76,388 visits. This might be explained that a number of prescriptions were collected in other departments. Thus, total charges of outpatients might be increased.

However, when compared charges in the primary diagnosis of outpatient, patients with diseases of the circulatory system had the highest average charges per visit followed by endocrine/nutritional/metabolic diseases, neoplasms and external causes of morbidity or mortality. For inpatient, average charges per admission and average charges per day were in the same directions, in the first and the second. This study found that diseases of the eye and adnexa had the highest average charges followed by external causes of morbidity or mortality. While the diseases of the circulatory system ranked the third in average charges per day.

Moreover, the 15% of outpatient visits can not be identified by their primary diagnosis of patients. This might be explained that staffs might not be recorded diagnosis data. In addition, some visits had not recorded in the medical record department. While, that of admission which can not be identified their primary diagnosis of patients was only 2%.

Total charges of diabetes diseases was about 10.88% of outpatient charges and 8.39% of inpatient charges. When comparing average charges per unit, this indicated that average diabetes patients' charges were higher than non-DM charges both outpatient and inpatient, especially average charges per outpatient. Thus, the difference of average DM charges per outpatient were estimated six fold of non-DM charges per patient.

The comparison charges data of DM patients with and without complication/co-morbidity, this study found that the majority of total charges was DM with complication/co-morbidity. In addition, this diabetic group had the majority of charges per visit and charge per patient both in outpatient and inpatient. Meanwhile, DM with other diseases inpatients had the highest in average charges per admission. Although, these patients' average charges per admission were the highest, average charges per patient was less than DM with complication/co-morbidity.

However, when considered charges data of DM patients' pattern of treatment, this indicated that DM patient with OP and IP services in this fiscal year had the highest average charges per admission and average charges per day in inpatient were less than average charges in DM with other disease. This might be explained that most of DM patient with OP and IP services in this fiscal year were DM patients with complication/co-morbidity. However, these results were compared in only primary diagnosis of DM patients, but other diagnosis in DM patients would effect of health care services treatment too. For example, DM with complication/co-morbidity who had the primary diagnosis of DM would have one or other diagnosis of diseases in visit or admission. Thus, actual charges of treatment presented that charges of DM and other diseases.

Moreover, comparison total hospital charges in treatment such as drugs, medical services of treatment and medical supplies between DM patients and non-DM patients were studied. In outpatients, the utilization of resources, average charges per item and per patient were higher than that of non-DM patients, especially in the drugs charges.

On the other hand, in inpatients, the majority of percentages in inpatient charges were medical services. Meanwhile, non-DM patients had the highest utilization of resources and the average charges per item than DM patients, but

average charges per patient was the highest in DM patients. When compared in various health insurances types, this study found that CSMBS had the highest charges in every parts of treatment both in OP and IP services. Furthermore, average charges per unit was higher than other health insurance types; average charge per visit/admission, average charges per length of stay, average charges per prescription, average charges per items and average charges per patients. Meanwhile, the lowest average charge per unit was found in self-pay patient.

An analysis of resources utilization according to conditions of diabetes found that DM with complication/co-morbidity outpatient had the largest percentage of drug charges used much non-essential drugs rather than other groups. This might indicate that the effect of complication or co-morbidity of diabetes disease thus might use more non-essential drugs than other conditions of diseases. Thus, many uses of non-essential drugs would affect the increased charges of treatment.

As mentioned about pattern of utilization rates, total hospital charges and resources utilization under different types of health insurance schemes, this pointed out that one factor that enable the resources utilization were health insurance schemes. CSMBS had the majority of utilization rates and total hospital charges, whereas self-pay had the lowest of these values both in outpatients and inpatients. In addition to, DM patients and non-DM patients had the same direction. This study was divided health insurance schemes in to three major of payment status of patients; fee-for service, capitation and free-of-charges. Fee-for-service patients, particularly patients who were covered with government and state enterprise medical benefit scheme had no limitation of amount of payment and reimbursement thus physicians might not concern cost of drugs per prescription of these patients. This hospital provided hospital services to fee-for-service patients rather than capitation and free-of-charges. Moreover, fee-for-services and capitation had much utilization rate than free-of-charges. As the result that, in free-for-service patients, self-pay patients or patients who were not covered with any types of health insurance and have to pay out-of-pocket, these group of patients should be taken into concern since most of utilized resources in these groups.

The study of comparison in DM patients was found that, conditions and patterns of treatment in diabetes are associated with utilization rates and total hospital

charges, especially DM with complication/co-morbidity and DM with OP and IP in this fiscal year. In order to reduce total hospital charges, this should be decrease incidence of other diabetic-related co-morbidity and complications. In addition to, the effect of other diseases is resulted that DM patients increase utilization rate and induce to increase total hospital charges too. Thus, this hospital should set strategy to reduce utilization rate and hospital charges, particularly the diabetes patients which was a chronic disease. Diabetes patient which was a chronic disease accounted for the largest percentages of total resources utilization both in outpatient and inpatient.

CHAPTER VI
CONCLUSION AND RECOMMENDATION

Utilization Rate

The number of 201,965 patients were treated at Samut Sakhon Hospital in the fiscal year 2002. Among these, there were classified to 201,073 outpatients and 34,038 inpatients. Utilization rate for health care services in OP was found 2.7652 visits per person, whereas in IP data, showed that average admission per person was 1.1883 and average days per admission were 4.8210 days. When these utilization rates was classified by patient's insurance coverage, CSMBS had the highest average visit per person (9.8499 visits) and length of stays per admission (7.1631 days). Meanwhile, UC patients had the highest admission per patient (1.3540).

In these patients, 4,623 Diabetes patients were about 2.29% of all patients; 4,464 outpatients and 985 inpatients. DM utilization rate was 8.0385 visits per person in OP services. Meanwhile, average admission per person was 1.7929 and average length of stays per admission was 8.0243. When analyzed in various patient's insurance types, CSMBS had the highest visits per person (8.2127 visits) and had the highest days per admission (10.6222 days). As, UC patients had the highest of admission per person (1.8865).

When analyzed in non-DM patients, average non-DM outpatients had 2.6963 visits per person, whereas average admission per person was 1.1703 and average length of stays per admission was 4.6747 days. From analyzed of the results, average visits per person, average admission per person and average days per admission in DM patients were higher than non-DM patients both in outpatient and inpatient services.

Other factors which should be studied into concerns in DM patients were the conditions of diabetes. First, study in complication or co-morbidity or other diseases

which categorized by primary diagnosis of diabetes; DM only, DM with complication/co-morbidity and DM with other diseases. This study found that DM patients with complication/co-morbidity had the highest utilization rate both in outpatient and inpatient (9.6331 visits per person and 1.8702 admission per person), whereas DM with other diseases had the highest in average days per admission (9.2549 days). As, DM only had the lowest utilization rate both in outpatient and inpatient (3.7717 visits per person, 1.1406 admission per person and 4.3151 days per admission).

The second factor, patterns of services utilization in DM patients were studied. This was categorized into three groups; DM with OPD only, DM with both OPD and IPD services in this fiscal year and DM with IPD services only. This study found that utilization of OP and IP services in this fiscal year had the highest average visits per person and average admission per person in all conditions of diabetes. But, in DM with complication/co-morbidity had the highest average visits per person in patterns of OP services only. Furthermore, majority of DM patients were DM with complication/co-morbidity. In addition, mostly DM visit OPD and admit IPD in this fiscal year was DM patients with complication/co-morbidity.

When compared in various health insurance types, patients under CSMBS, UC and Social Security were the first ranks of utilization rate of DM outpatients. Meanwhile, self-pay and foreign worker had the lowest utilization rate in OP services. In IP services, CSMBS had the longer length of stays per admission in DM only and DM with complication/co-morbidity. Moreover, CSMBS had the highest admission per person in DM only. Meanwhile, Social Security had the highest in average admission per person and the longest days per admission in DM with other diseases.

Total Hospital Charges of Treatment

The total hospital of 200,920 outpatient services were 124,229,958 bahts. These charges were for 489,707 visits. The average annual charges per visit was 253.65 bahts and average charges per person was 618.31 bahts. Meanwhile, total 17,591 inpatient charges were 116,054,964 bahts, for 21,118 admission and length of

stays 103,074 days (only 7-month of data). Thus, average charges per admission was 5,495.55 bahts, average charges per day was 1,125.94 bahts and average charges per person was 6,597.41 bahts.

For diabetes charges, DM outpatients charges were 16.88% of outpatients' charges and DM inpatients' charges were 8.39% of inpatients' charges. When comparing charges between DM patients and non-DM patients, DM patients charges were higher than non-DM outpatients charges; average charge per visit (639.32 and 225.99 bahts, respectively) and average charges per person (4,864.95 and 525.19 bahts, respectively). Moreover, inpatient treatment charges in DM was higher than non-DM inpatients charges; average charges per admission (10,595.99 and 5,263.49 bahts, respectively) and average charges per patient (15,456.69 and 6,268.34 bahts, respectively).

When compared total hospital charges in DM services by conditions of diabetes, DM with complication/co-morbidity had the higher charges than other groups of DM both in outpatient and inpatient. However, DM with other diseases had the highest charges in average charges per admission.

When compared charges among primary diagnosis, DM patients which visited health care by primary diagnosis of DM had the highest average charges per visit than other primary diagnosis. Meanwhile, DM inpatients which admitted health cares by primary diagnosis of complication/co-morbidity had the highest average charges per admission (12,526.60 bahts).

Thus, conditions and patterns of treatment in diabetes are associated with utilization rates and total hospital charges, especially DM with complication/co-morbidity and DM with OPD and IPD in this fiscal year. In addition to, the effect of diabetic-related co-morbidity and complication is resulted that DM patient increase utilization and total hospital charges.

Resource Utilization Among Health Insurance

The comparison total hospital charges in OPD treatment was found that 54.23% of hospital charges were drugs charges. Moreover, drug parts were the highest in average items per patients (7.39 items) and average drugs charges per

patient (335.32 bahts). For inpatient charges, 69.97% of inpatient charges were medical services. Moreover, comparison total hospital charges in treatment such as drugs, medical services of treatment and medical supplies between DM patients and non-DM patients were studied. In outpatient, the utilization of resources and average charges per item were higher than that of non-DM patients, especially in the drugs charges. In the other hand, in inpatient, the majority of percentage in inpatient charges were medical services. DM patients were the highest utilization of resources and the average charges per patient than non-DM patients.

When compared by insurance coverage types, CSMBS had the highest average charges per person, average charges per visit, average charges per prescription, average charges per items. In addition to, CSMBS had the highest in average number per patient too, where as self-pay had the lowest average charges. Meanwhile, the results in IP services were the same as OP services. In addition to, DM patients and non-DM patients had the same direction.

An analysis of resources utilization according to conditions of diabetes found that DM with complication/co-morbidity outpatient had the largest percentage of drug charges used much non-essential drugs rather than other groups. This might indicate that the effect of complication or co-morbidity of diabetes disease thus might use more non-essential drugs than other conditions of diseases.

Recommendations

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1. In this study, resource utilization was studied in 1-year and in transition duration Universal coverage. Therefore, the study of resource utilization under different insurance schemes should be studied after transition of payment systems in order to obtain more accurate data.
2. The total health care charges and the average charges of diabetes per patient can be used to estimate the overall charges of diabetes treatment at other health care facilities. However, similarity of health care facilities characteristics should be concerned.

3. For calculating charges of health care treatment, charges data was estimated in hospital because actual cost data were not available. Therefore, further studies should study cost for hospital treatment in order to obtain accurate data.
4. From the result of study, the filled diseases data was retrieved from electronic database only. Thus, data should be recorded in medical record in order to increase accuracy.
5. To measure the hospital charges of treatment and resource utilization, it should be compared in characteristics and patterns of diseases in other health insurances patients.
6. To calculate DM charges of treatment, it should be separated charges of other disease from charges of DM with complication/co-morbidity in order to known the factor to increase charges of DM.

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APPENDIX

APPENDIX A

Characteristics of type I and type II Diabetes mellitus patients in outpatient and inpatient at Samut Sakhon Hospital in 2002*

Characteristics	Type I DM				Type II DM			
	Outpatient		Inpatient		Outpatient		Inpatient	
	N	%	N	%	N	%	N	%
1. Gender								
Male	2	25.00	14	43.75	1,462	32.81	265	27.81
Female	6	75.00	18	56.25	2,994	67.19	688	72.19
Total	**8**	100.00	**32**	100.00	**4,456**	100.00	**953**	100.00
2. Age group								
0-4 year	-	-	-	-	6	0.13	-	-
5-9 year	-	-	-	-	6	0.13	-	-
10-14 year	-	-	1	3.12	9	0.20	4	0.41
15-24 year	-	-	1	3.12	69	1.55	6	0.62
25-44 year	-	-	7	21.88	675	15.15	75	7.92
45-59 year	3	37.50	8	25.00	1,625	36.47	267	27.98
60-69 year	2	25.00	9	28.13	1,239	27.81	310	32.51
>=70 year	3	37.50	6	18.75	827	18.56	291	30.55
Total	**8**	100.00	**32**	100.00	**4,456**	100.00	**953**	100.00
3. Marriage								
Single	1	12.50	6	18.75	388	8.70	59	6.19
Married	6	75.00	23	71.88	3,498	78.50	727	76.29
Separated	1	12.50	2	6.25	450	10.10	139	14.59
Divorced	-	-	-	-	48	1.08	11	1.15
Widowed	-	-	-	-	31	0.70	4	0.42
Priest	-	-	1	3.12	41	0.92	13	1.36
Total	**8**	100.00	**32**	100.00	**4,456**	100.00	**953**	100.00
4. Address								
Samut sakhon	8	100.00	27	84.38	3,868	86.80	817	85.73
Others	-	-	5	15.62	588	13.20	136	14.27
Total	**8**	100.00	**32**	100.00	**4,456**	100.00	**953**	100.00
5. Health insurance type*								
CSMBS	2	22.22	8	24.24	1,037	19.90	247	25.23
Self-pay	-	-	9	27.27	964	18.50	128	13.08
Social Security	1	11.11	-	-	585	11.22	48	4.90
UC	6	66.66	16	48.49	2,446	46.93	539	55.06
Foreign worker	-	-	-	-	16	0.31	1	0.10
Not classify	-	-	-	-	164	3.15	16	1.63
Total	**9**	100.00	**33**	100.00	**5,212**	100.00	**979**	100.00

CSMBS = Civil Servant Medical Benefit Scheme, UC = Universal Health Coverage Scheme
* Data were retrieved from STAT program. ** Some patients had more than one type of health insurance.

APPENDIX B

The number of outpatients in various visits at Samut Sakhon Hospital in 2002.

Number of visit	Number of Outpatient	Number of visit	Number of Outpatient	Number of visit	Number of Outpatient
1	102,001	36	14	87	1
2	35,713	37	3	90	2
3	17,909	38	6	92	1
4	11,519	39	5	94	1
5	7,909	40	3	98	1
6	5,880	41	6	102	1
7	4,630	42	7	104	1
8	3,459	43	3	105	2
9	2,647	44	4	109	1
10	2,030	45	2	111	1
11	1,527	46	1	112	1
12	1,276	47	2	114	1
13	1,057	48	5	121	1
14	755	49	1	157	1
15	565	50	1	170	1
16	442	51	5	171	1
17	352	52	2	172	1
18	245	53	1	182	1
19	216	54	2	210	1
20	145	55	5	217	1
21	131	56	2	228	1
22	101	57	1		
23	83	59	1		
24	75	60	1		
25	50	61	1		
26	52	62	3		
27	35	63	1		
28	37	64	2		
29	26	67	2		
30	21	70	1		
31	17	72	1		
32	15	74	1		
33	10	75	1		
34	11	82	1		
35	11	84	1		

The range of visits per person classified by health insurance types at Samut Sakhon Hospital in 2002

Visit/person	All patients	CSMBS	SSS	Self-pay	UC	Others
Average	2.8149	3.8499	3.3780	1.7168	3.4973	1.4098
Max	228	217	112	105	228	55
Min	1	1	1	1	1	1
Standard deviation	3.6169	6.0876	3.5676	1.7525	4.3886	1.2609
Median	1	2	2	1	2	1
Mode	1	1	1	1	1	1

CSMBS = Civil Servant Medical Benefit Scheme, UC = Universal Health Coverage Scheme
SSS = Social Security Schemes, Other = Foreign worker and not classified

APPENDIX C

The number of admission in various hospital bed-days at Samut Sakhon Hospital in 2002

Number of hospital bed-day	Number of Admission	Number of hospital bed-day	Number of Admission	Number of hospital bed-day	Number of Admission
1	2,124	41	10	86	1
2	7,786	42	11	88	1
3	11,512	43	6	89	3
4	7,690	44	7	90	2
5	3,564	45	7	92	1
6	2,040	46	14	94	4
7	1,260	47	9	95	1
8	927	48	11	97	1
9	632	49	8	98	1
10	412	50	11	99	2
11	352	51	8	101	1
12	266	52	1	102	2
13	238	53	8	104	1
14	160	54	9	107	2
15	172	55	5	108	1
16	124	56	1	109	1
17	126	57	3	112	1
18	103	58	6	119	1
19	76	59	4	121	1
20	71	60	2	123	2
21	45	61	5	124	1
22	58	62	6	126	1
23	64	63	3	132	1
24	38	64	4	134	2
25	38	65	3	139	1
26	28	66	3	143	1
27	24	67	3	150	1
28	36	68	3	158	1
29	34	69	4	182	1
30	24	70	1	187	1
31	29	71	3	190	1
32	16	72	3	230	1
33	29	77	4	250	1
35	19	80	3		
36	19	81	2		
37	19	82	4		
38	9	83	1		
39	4	84	1		
40	11	85	1		

The range number of length of stay per admission classified by health insurance types at Samut Sakhon Hospital in 2002

LOS/admission	All patients	CSMBS	SSS	Self-pay	UC	Others
Average	8.0266	7.1631	4.3199	4.2415	5.3363	4.5433
Max	250	250	187	230	190	72
Min	1	1	1	1	1	1
Standard deviation	12.9919	10.9064	5.5325	5.3691	7.6164	6.6783
Median	5	4	3	3	4	1
Mode	3	3	3	3	3	1

CSMBS = Civil Servant Medical Benefit Scheme, UC = Universal Health Coverage Scheme
SSS = Social Security Schemes, Other = Foreign worker and not classified

APPENDIX D

The number of inpatients in various all admissions at Samut Sakhon Hospital in 2002

Number of admission	Number of all patient
1	29,943
2	3,006
3	630
4	210
5	112
6	46
7	32
8	21
9	10
10	5
11	6
12	4
13	5
14	1
15	1
18	3
24	1
26	1
82	1

The range of admission per person classified by health insurance types at Samut Sakhon Hospital in 2002

Admission/person	All patients	CSMBS	SSS	Self-pay	UC	Others
Average	1.1883	1.3409	1.1593	1.0602	1.3540	1.0932
Max	82	18	12	12	82	10
Min	1	1	1	1	1	1
Standard deviation	0.8243	0.9046	0.5126	0.3162	1.3913	0.4162
Median	1	1	1	1	1	1
Mode	1	1	1	1	1	1

CSMBS = Civil Servant Medical Benefit Scheme, UC = Universal Health Coverage Scheme
SSS = Social Security Schemes, Other = Foreign worker and not classified

APPENDIX E

The number of DM patients in various all DM outpatient visits at Samut Sakhon Hospital in 2002.

Number of visit	Number of DM patient	Number of visit	Number of DM patient
1	292	36	2
2	250	39	1
3	270	43	1
4	299	44	1
5	353	45	1
6	523	50	1
7	512	51	2
8	380	64	2
9	320	98	1
10	240	171	1
11	162	217	1
12	176		
13	144		
14	120		
15	93		
16	57		
17	48		
18	38		
19	32		
20	30		
21	19		
22	12		
23	15		
24	15		
25	6		
26	6		
27	6		
28	10		
29	5		
30	3		
31	2		
32	5		
33	3		
34	3		
35	1		

The range number of DM visit per patient classified by health insurance types at Samut Sakhon Hospital in 2002

Visit/person	All DM patients	CSMBS	SSS	Self-pay	UC	Others
Average	8.0379	8.2127	6.8703	3.2541	8.011	3.0278
Max	217	217	34	64	171	17
Min	1	1	1	1	1	1
Standard deviation	6.8506	8.9829	4.9279	3.739	6.1921	2.7875
Median	7	7	6	2	7	2
Mode	6	6	6	1	7	1

CSMBS = Civil Servant Medical Benefit Scheme, UC = Universal Health Coverage Scheme
SSS = Social Security Schemes, Other = Foreign worker and not classified

APPENDIX F

The number of DM admission in various hospital bed-days at Samut Sakhon Hospital in 2002

Number of hospital bed-days	Number of admission	Number of hospital bed-days	Number of admission
1	48	46	3
2	262	47	1
3	296	48	1
4	246	49	1
5	181	50	3
6	133	51	5
7	108	53	2
8	85	59	1
9	67	62	1
10	43	68	2
11	40	69	1
12	29	80	1
13	25	81	1
14	18	82	1
15	13	88	1
16	16	90	1
17	17	92	1
18	7	98	1
19	10	102	1
20	8	108	1
21	6	121	1
22	8	134	2
23	11	139	1
24	2	250	1
25	2		
26	2		
27	8		
28	6		
29	6		
30	5		
32	3		
33	4		
34	2		
35	2		
36	4		
37	1		
38	1		
41	1		
42	2		
44	2		
45	1		

The range number of DM length of stay per admission classified by health insurance types at Samut Sakhon Hospital in 2002

LOS/admission	All DM patients	CSMBS	SSS	Self-pay	UC	Others
Average	8.0243	10.6222	6.2289	6.7803	7.3219	5.7143
Max	250	250	36	81	139	22
Min	1	1	1	1	1	1
Standard deviation	12.9886	17.6607	5.8629	10.9124	11.2404	5.5330
Median	5	6	4	4	4	4
Mode	3	3	4	2	3	2

CSMBS = Civil Servant Medical Benefit Scheme, UC = Universal Health Coverage Scheme
SSS = Social Security Schemes, Other = Foreign worker and not classified

APPENDIX G

The number DM patients in various admissions at Samut Sakhon Hospital in 2002

Number of admission**	Number of DM patient*
1	581
2	229
3	83
4	43
5	23
6	13
7	4
8	6
9	1
10	1
18	1

* Total number of 985 DM inpatients, ** Total number of 1,766 admission

The range number of DM admission per person by health insurance types at Samut Sakhon Hospital in 2002

Admission/person	All DM patients	CSMBS	SSS	Self-pay	UC	Others
Average	1.7929	1.7333	1.7292	1.2628	1.8865	1.2353
Max	18	6	10	4	18	3
Min	1	1	1	1	1	1
Standard deviation	1.3873	1.0646	1.5262	0.6096	1.5353	0.5623
Median	1	1	1	1	1	1
Mode	1	1	1	1	1	1

CSMBS = Civil Servant Medical Benefit Scheme, UC = Universal Health Coverage Scheme
SSS = Social Security Schemes, Other = Foreign worker and not classified

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