CHAPTER III

METHODOLOGY

The study endeavored to assess impacts of health insurance payment methods on behavior of hospitals encompassed access to care, equity, and quality dimensions of care that influenced efficiency of practice patterns. The synopsis of the conceptual framework was illustrated in the Exhibit 3.1. This chapter comprises five parts – overview, tracer selection, definitions of variables, data collection, and data analysis.

Overview of the Conceptual Framework

In relation to the conceptual framework depicted in Exhibit 3.1., payment methods of health insurance schemes had influence over many aspects of behavior of hospitals. Practice patterns with different access to care, equity care, and/or quality dimensions of care that hospitals provided to patients might be augmented or lessened depending upon payment methods of health insurance schemes. The dissimilar patterns of patient care might result in divergent efficiency of health care services.

Normally, treatment patterns of different kinds of diseases required different amounts of resources. Some diseases like non-complicated common cold and diarrhea may bring about low expenditure while some diseases like cancer may be a high cost disease. Consequently, the intensity of impacts of health insurance payment methods on the practice patterns of different kinds of diseases was so diverse. In order to explicate throughout these impacts on every kind of diseases, appropriate tracer conditions should be selected to represent all-encompassing practice patterns in the study.
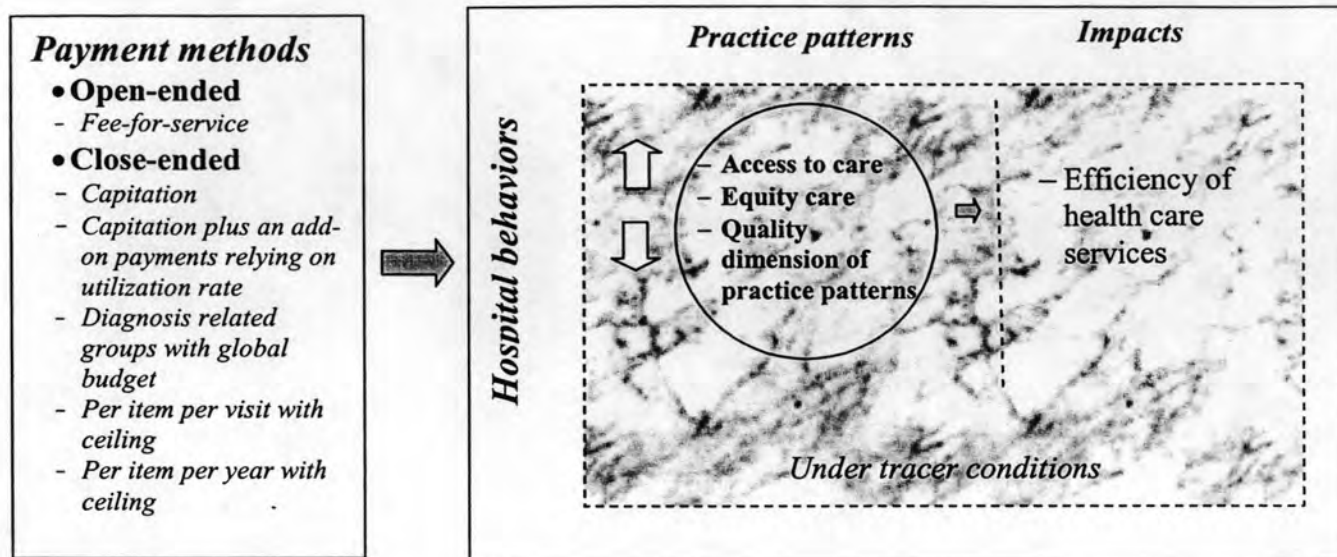
Payment methods
- **Open-ended**
  - *Fee-for-service*
- **Close-ended**
  - *Capitation*
  - *Capitation plus an add-on payments relying on utilization rate*
  - *Diagnosis related groups with global budget*
  - *Per item per visit with ceiling*
  - *Per item per year with ceiling*

Hospital behaviors

Practice patterns   *Impacts*

- Access to care
- Equity care
- Quality, dimension of practice patterns

- Efficiency of health care services

Under tracer conditions

Exhibit 3.1: Conceptual framework of this study

Operationalization

All elements in the conceptual framework were operationalized into more lucid explanations as follows:

1. Payment methods of health insurance systems

    Generally, each public hospital in Thailand provides health care services for patients who mostly are beneficiaries of many health insurance systems, for example, the 30-Baht Policy for every disease (30-Baht Scheme), the Social Security Scheme (SSS), and the Civil Servant Medical Benefit Scheme (CSMBS). The rest patients are a minority group of patients with private health insurance or out-of-pocket payment by themselves. Each health insurance payer pays hospitals by dissimilar methods. Furthermore, some payers use more than one payment method for patients with different health care conditions. Payment methods of the three major health insurance

systems were

1.1. The 30-Baht Scheme

    1.1.1. Capitation for outpatients with general diseases

    1.1.2. Diagnostic Related Groups (DRGs) with Global budget for inpatients with both general and high-cost diseases

    1.1.3. Per item per year with ceiling for outpatients with high-cost diseases in fiscal year 2003

    1.1.4. Per item per visit with ceiling for outpatients with high-cost diseases in fiscal year 2004 – 2005

1.2. The SSS

    1.2.1. Capitation for both outpatients and inpatients with general diseases, plus an add-on payment at the end of each year relying on utilization rates of each hospital

    1.2.2. Per item per year with ceiling for both outpatients and inpatients with high-cost diseases

1.3. The CSMBS

    1.3.1. Fee-for-service of both outpatients and inpatients with both general and high-cost diseases.

All of the payment methods were grouped into two categories – open-ended and close-ended payments. The open-ended group was payment for every item of health care services without any limitations while the close-ended group was payment with limitations of the same amount per year for each beneficiary in the list of each hospital, of the certain budget per year for each hospital, or of the same amount per hospital visit or per disease with or without ceiling. In this study fee-for-service payment method was classified as the open-ended group, whereas the rest methods were classified as the close-ended group.

Hypothetically, significant incentives of open-ended payment were increases in

both intensities and costs of health care provide to patients. In contrast, close-ended payment incentives were decreases in both the intensities and costs of care. In comparison to each other, close-ended payment had a tendency to augment efficiencies of health care services with a higher risk of under-treatments while open-ended payment had a tendency to diminish efficiencies of the services with a higher risk of over-treatments.

2. Hospital behaviors

In the study hospital behaviors denoted reactions of hospitals to payment mechanisms of health insurance systems. The behaviors were described as two dimensions – practice patterns and impact on efficiency of health care services. The practice patterns comprised access to care, equity care, and quality dimension of practice patterns. Consequences of practice patterns were efficiencies of health care services which were the final impacts of the payment methods. Concepts of all terms related to the hospital behaviors were articulated below.

2.1. Practice patterns

Practice patterns are intensities of health care services consisted of physical examinations and laboratory tests for diagnosis, treatment procedures, drugs prescribed, and monitoring processes that hospitals provided to patients. Payment methods may affect practice patterns of care provided to patients with different health insurance systems. In the study three dimensions of the practice patterns – access to care, equity care, and quality dimension of the patterns – were determined as follows:

2.1.1. Access to care

Access to care indicated opportunities for having on not having access to required practices or for having higher or lower level of access to the practices. Required practices were diagnosis examinations or tests, procedures of treatments, drug use, and/or monitoring processes that recommended for every patient by credible evidence-based clinical

practice guidelines for each disease conditions.

2.1.2. Equity care

Equity care was equal opportunities for every patient to obtain equal health care services. In this study assessments of the equity care was to compare the distribution of costs of drug used for treatment of patients with the same ailment conditions but the different health insurance payment methods. Data of patients from all three hospitals in the study was brought together for calculations of an equity index for comparisons among payment methods.

Owing to differences of costs and charges of the same drug products among hospitals that drug utilization data had to be merge together, one particular standard drug cost for each individual drug product with the same brand and generic name, dosage form, and strength of the product had to be set. The standard drug costs were identified from purchase costs or selling charges of drug products relying on the following situations:

1) If data of purchase costs of drug products in the largest hospital in the study was available, these costs were identified as standard drug costs of drug products for every studied hospital.

   For the reason that all three recruited hospitals in the study were in the same network, the standard costs were set in relation to the purchase costs of the largest hospital which had the most extensive list of drugs. Therefore, it was comfortable to use only one list of purchase drug costs from the largest hospital as a standard for calculation of the equity index. In addition, the other smaller hospitals normally also tend to use the same brand of drug products as the largest hospital – the leader of the hospital network.

2) If data of purchase costs of drug products in the largest studied hospital was not available, 70 percent of selling charges of the drug products were identified as the standard drug costs for each hospital.

   These standard drug costs were calculated on the basis of not more

than 30 percent mark-up price setting rules regularly implemented in all public hospitals in Thailand.

2.1.3. Quality dimension of practice patterns

In order to elucidate quality of health care services, two aspects of appropriate practice patterns were considered as follows:

1) Adherence to standard treatment guidelines (STGs)

Practice patterns with satisfactory quality were care that physicians provided to patients with adherence to specified STGs focusing on the critical recommendations which were minimum standards of care for each and every patient with particular disease conditions.

2) Management patterns of adverse drug reactions (ADRs)

ADRs were unintended effects of drug uses with normal dosage regimens. Generally, many ADRs could be avoided, for example, hair-loss of valpoate In this study ADRs were side effects identified by physicians and recorded on medical records during treatment processes. If manifestation of ADRs was come about but was not recorded on medical records, it was not taken into consideration.

When ADRs were acquired, appropriate management of the reactions complying with evidence-based clinical treatment guidelines might be removal of drug used, a decrease in dosage, or adding one or more drugs to treat the ADRs but keeping the principal drug causing those side effects.

2.2. Impacts of practice patterns

Dissimilar patterns of access to care, equity care, and quality dimension of care for patients covered by different payment methods may bring about different impacts on efficiency of health care services.

2.2.1. Efficiency of health care services

In general, efficiencies of health services involve many aspects of care

but this study nevertheless focuses on economic efficiency. Cost-effectiveness analysis was used to measure the efficiency in this study. Regarding costs in the efficiency equation, standard drug costs were calculated as mentioned above. For effectiveness, intended treatment effects, like cure or not-cure, were assessed at the end of treatment procedures or at the end of the year.

3. Tracer conditions

In an attempt to explain impacts of payment methods on practice patterns and efficiency of health care services provided to patients with different health insurance systems, disease factors may influence the health care practice patterns. Therefore, appropriate disease conditions had to be thoroughly and carefully identified in order to elucidate payment incentives under all characteristics of the influences. Examples of tracer conditions that may affect practice patterns were chronic or acute diseases, general or high-cost diseases, diseases that required outpatient or inpatient visits or both, etc.

Selection of Tracer Conditions

As mentioned earlier, tracers selected for the study were illnesses commonly found in hospitals in Thailand. Rationale and criteria for selection of tracer conditions are described below.

1. Relationships among point of services, type of diseases, and health insurance payment methods

With the intention to denote every potential aspect of the impacts, inclusion criteria pertaining to the relationships of three factors comprised point of services, type of diseases, and health insurance payment methods were set as follows:

- Point of services:

This factor signified the character of hospital visits that patients were supposed to obtain in relation to their diseases. The point of services was classified into three categories – outpatient visits only, inpatient visits only, and both outpatient and inpatient visits. Payment methods of outpatient and inpatient visits of some health insurance schemes were dissimilar as shown in Table 3.2.

- Type of diseases:

Relating to treatment expenditure on various diseases, some catastrophic diseases, such as cancer and end-stage renal disease (ESRD), typically consumed enormous amount of health care costs. Consequently, the Social Security and the 30 Baht scheme made a distinction between payment methods for high-cost and general diseases. The payment methods of per item per visit with ceiling and per item per year with ceiling were implemented for the high-cost diseases of the Social Security and the 30 Baht scheme as depicted in Table 3.2.

- Health insurance payment methods:

Individual health insurance payers paid hospitals by various payment methods for their beneficiaries. In 2003 – 2005, five payment methods were applied for the three major health insurance schemes, the CSMBS, SSS, and 30 Baht Scheme. The five modes of payment for different point of services and type of diseases were illustrated in Table 3.2.

1) Capitation was a payment with a fix rate per year for each beneficiary in the list of each health care provider. This method was implemented for

    - The 30-Baht patients with general diseases that required outpatient visits only

    - The SSS patients with general diseases that required both outpatient and inpatient visits

2) Diagnostic Related Groups (DRGs) with Global budget was a payment per case or episode of each diagnosis of disease together with a comprehensive payment per health care provider. This method was implemented for

    – The 30-Baht patients with general or high-cost diseases that required inpatient visits only

3) Fee-for-service was a payment per unit or item of health care service. This method was implemented for

    – The CSMBS patients with any diseases that required any types of hospital visits

4) Per item per visit with ceiling was a payment per hospital visit for each patient with a certain upper limit determined by the health insurance payer. This method was implemented for

    – The 30-Baht patients with high-cost diseases in 2004-2005 that required outpatient visits only

5) Per item per year with ceiling was a payment per year for each patient with a certain upper limit determined by the health insurance payer. This method was implemented for

    – The 30-Baht patients with high-cost diseases in 2003, that required outpatient visits only

    – The SSS patients with high-cost disease that required both outpatient and outpatient visits

When the relationships of all these three factors – point of services, type of diseases, and health insurance payment methods – were considered circumspectly, selected tracers were classified into six tracer conditions that represented all kinds of patients as follows:

Condition 1: Patients with general diseases that required outpatient visits only

Condition 2: Patients with general diseases that required inpatient visits only

Condition 3: Patients with general diseases that required both outpatient and inpatient visits

Condition 4: Patients with high-cost diseases that required outpatient visits only

Condition 5: Patients with high-cost diseases that required inpatient visits only

Condition 6: Patients with high-cost diseases that required both outpatient and inpatient visits

The summary of the relationships is illustrated in Table 3.1.

Table 3.1   The summary of the relationships among point of services, type of diseases, and health insurance payment methods

Health insurance payment methods	Point of services					
	Outpatient visits only		Inpatient visits only		Both outpatient and inpatient visit	
	general diseases	high-cost diseases	general diseases	high-cost diseases	gereral diseases	high-cost diseases
Capitation	✓ (30-Baht – 2003-2005)	-	-	-	✓ (SSS)	-
DRGs with global budget	-	-	✓ (30 baht project)	✓ (30 baht project)-	-	-
Fee-for-service	✓ . (CSMBS)	✓ (CSMBS)	✓ (CSMBS)	✓ (CSMBS)	✓ (CSMBS)	✓ (CSMBS)
Per item per visit with ceiling	-	✓ (30-Baht – 2004-2005)	-	-	-	-
Per item per year with ceiling	-	✓ (30-baht – 2003)	-	-	-	✓ (SSS)

Notes: "30-Baht" means patients with the 30-Baht Policy for every disease

"SSS" means patients with the Social Security Scheme

"CSMBS" means patients with the Civil Servant Medical Benefit Scheme

2. Duration of treatments

In relation to duration of treatments, diseases were able to be classified into two groups – acute diseases with short duration of treatments and chronic diseases with long duration of treatments. Acute diseases were illnesses that could be completely cured in short duration such as common cold, tuberculosis, appendicitis, acute low back pain, gastrointestinal (GI) bleeding etc., whereas chronic diseases were illnesses that required longer period of time (more than 3 month)[29] for treatments. In addition, some chronic diseases were not able to be completely cured, for example, epilepsy, diabetes, hypertension, etc.

When both the relationships among point of services, type of diseases, and health

insurance payment methods as mentioned earlier and duration of treatments were taken into consideration, selected tracers were classified into five conditions that also represented treatment durations, in Exhibit 3.3., as follows:

Condition 1: Patients with acute diseases that required outpatient visits only. Examples of common diseases that satisfied this condition were *common cold, acute low back pain, etc.*

Condition 2: Patients with acute diseases that required inpatient visits only. Examples of common diseases that satisfied this condition were *appendicitis, acute GI bleeding, etc.*

Condition 3: Patients with acute diseases that required both outpatient and inpatient visits. Examples of common diseases that satisfied this condition were *tuberculosis, pneumonia, etc.*

Condition 4: Patients with chronic diseases that required both outpatient and inpatient visits. Examples of common diseases that satisfied this condition were *diabetes, hypertension, epilepsy, etc.*

Condition 5: Patients with high-cost diseases regardless of duration of treatments and point of services. Examples of common diseases that satisfied this condition were *lung cancer, etc.*
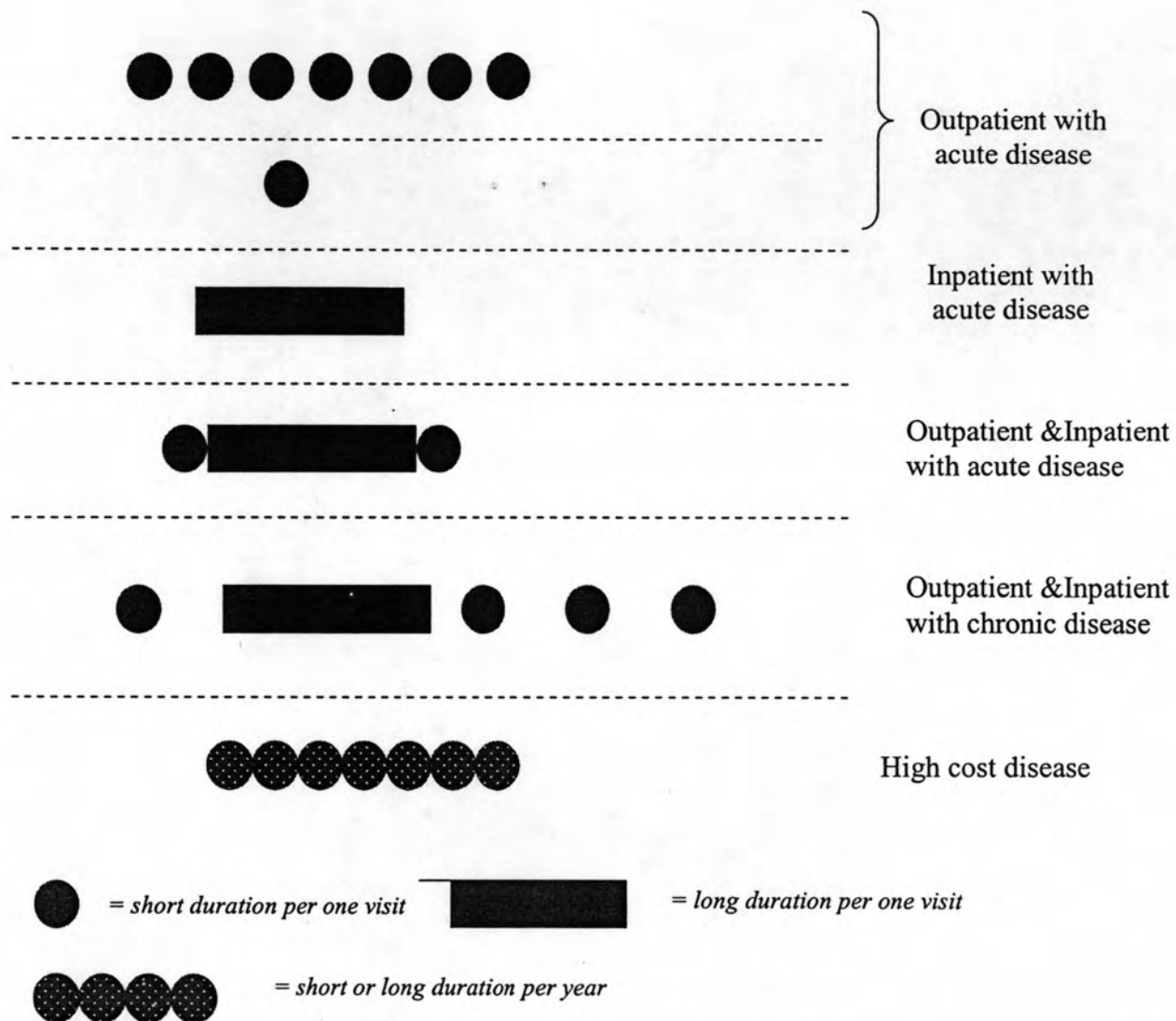
Exhibit 3.2: Tracer conditions concerning duration of treatments

3. Other specific criteria

In addition to the relationships among point of services, type of diseases, and health insurance payment methods and the duration of treatments, some other factors might also influence the selection of tracer conditions. Four added inclusion criteria were pondered to facilitate more practicability of the selection of tracer conditions as follows:

1) Diseases that were amenable to major treatments using medicines

According to the main objective of the study which was to assess impacts of health insurance payment mechanisms focusing on drug utilization patterns, the selected diseases for tracer conditions should be limited mainly to diseases that were amenable to major treatments using medicines. Some diseases were able to manage by medicines, for example, diabetes, hypertension, common cold, acute low back pain, GI bleeding, small cell lung cancer and epilepsy. Additionally, some diseases were able to improve survival by medicines, for example, stage III and IV non-small cell lung cancer. Therefore, other diseases with major treatments other than drug therapy were not included in the study.

2) Diseases that the data of clinical outcomes recorded in medical records was available and accessible for data collection.

In order to assess impacts of health insurance payment methods on efficiency of health care services, the data on clinical outcomes from medical records was required for calculations of the efficiency. Consequently, availability and accessibility of the data were also essential for selection of tracer conditions.

Theoretically, clinical outcome data of every disease should be recorded on and able to retrieve from medical records. In reality, such data was exceedingly difficult to be searched out, especially for the acute diseases like common cold

and acute low back pain. For acute gastrointestinal bleeding, however, physicians normally recorded clinical outcome status of each patient in the discharge summary documents.

3) Diseases that data of the diagnosis in the International Classification of Diseases version 10 (ICD-10) coding system was available and retrievable from the computerized information system of hospitals

For health care data collection from electronic databases of hospitals in the study, diagnosis data recorded in the system of ICD-10 code was crucial for identification of patients with certain tracer conditions.

In theory, the ICD-10 codes should be recorded in the electronic information systems of hospitals for all principal diagnosis, complications, co-morbidity, and other diseases. Nonetheless, in practice incomplete ICD-10 codes were entered into the electronic databases of hospitals by ICD-10 trained coders or physicians themselves. Normally, the major diagnosis or underlying diseases, like diabetes and/or hypertension, were routinely recorded. On the contrary, the minor or other diseases, like common cold or other acute illnesses, were frequently disregarded, except for acute low back pain that was typically a chief complaint that physicians concerned. Thus, the ICD-10 codes of this disease were typically recorded.

4) Diseases that were relatively uncomplicated

Some kinds of diseases, especially chronic diseases, had complicated patterns with other complications and/or co-morbidities, for example, diabetes with a complication of renal disease and a co-morbidity of hypertension. The data collection of health care expenditures, quality, and outcomes of these kinds of diseases will be excessively convoluted. Consequently, only uncomplicated diseases were preferred as tracer conditions in this study owing to distinctive identification of health care costs, quality, and outcomes of each individual disease.

The overall inclusion criteria from 1) the relationships among point of services, type of diseases, and health insurance payment methods, 2) the duration of treatments, and 3) the other specific criteria were integrated for selection of the foremost apposite tracer conditions as shown in Table 3.2.

Table 3.2   The final criteria for selection of the appropriate tracer diseases

Tracer conditions		Other specific criteria				Final selected tracer diseases
Type of diseases and duration of treatments	Common diseases in each type of diseases	Amenable to major treatments using medicines	Available and accessible clinical outcome data	Available and retrievable ICD-10 data	Relatively uncomplicated diseases	
General – acute diseases	Common cold	✓	✗	✗	✓	• Acute low back pain • Acute UGIB
	Acute low back pain	✓	✗/✓	✓	✓	
	Acute UGIB	✓	✓	✓	✓	
General – chronic diseases	Diabetes	✓	✓	✓	✗	• Epilepsy
	Hypertension	✓	✓	✓	✗	
	Epilepsy	✓	✓	✓	✓	
High-cost diseases	Lung cancer	✓	✓	✓	✓	• Lung cancer
	ESRD	✗/✓	✓	✓	✗	

Note: "Acute UGIB" means acute upper gastrointestinal bleeding

When the entire inclusion criteria were thoroughly and scrupulously pondered to encompass all kind of illness, four final tracer diseases were selected – acute low back pain, acute upper gastrointestinal bleeding (UGIB), epilepsy, and lung cancer. Among all common general acute diseases, the ailments of acute low back pain and acute UGIB were relatively agreed with all inclusion criteria and therefore were selected as the emblematic tracer conditions of this class of diseases. Acute low back pain characterized the condition of short duration of treatment that required outpatient visit only while acute UGIB typified the condition of short duration of treatment with inpatient visit only. As for the general chronic diseases, epilepsy was the most appropriate representative tracer condition in this class. This ailment illustrated the condition of long-term care that necessitated both outpatient and inpatient visits. The last tracer condition was lung cancer that epitomized the high-cost diseases regardless of the treatment duration.

Research Design

A retrospective cross-sectional design was applied in the study with the intention to compare effects of different payment methods of different health insurance systems, as an independent variable, on various hospital behaviors, as dependent variables. The first component of the dependent variables, comprised practice patterns and their impacts on efficiency of health care services, was assessed under certain tracer conditions.

Studied hospitals

Three public hospitals with different sizes were recruited in the study. All of them were in the same network and ministry.

Definitions of Variables

As portrayed in the conceptual framework of this study, Exhibit 3.1., the independent variable was payment methods of health insurance systems while the dependent variables were access to care, equity care, quality dimension of practice patterns, efficiency of health care services, and potential cost shifting. The definitions of each variable were described below.

Independent variable

1. **Payment method of health insurance systems**

   The payment method was the independent variable of the study that was classified by payment incentives into two groups:

   1) *Open-ended group*, with incentives to increase both costs of care and services provided to patients, consisted of
      1.1) *Fee-for-service payment*, which was the payment method for beneficiaries of the CSMBS regardless of point of services and type of diseases

2) *Close-ended group*, with incentives to decrease both costs of care and services provided to patients, consisted of

    2.1) *Capitation payment*, which was the payment method for beneficiaries of the 30-Baht Scheme with outpatient visits for treatments of general diseases

    2.2) *Capitation payment plus an add-on payment* at the end of each year relying on utilization rates of each hospital which was the payment method for beneficiaries of the SSS with both outpatient and inpatient visits for treatments of general diseases

    2.3) *DRGs* with global budget, which was the payment method for beneficiaries of the 30-Baht Scheme with inpatient visits for treatments of both general and high-cost diseases

    2.4) *Per item per year with ceiling*, which was the payment method for beneficiaries of the 30-Baht Scheme with outpatient visits for treatments of high-cost diseases in 2003 and for beneficiaries of the SSS with both outpatient and inpatient visits for treatments of high-cost diseases

    2.5) *Per item per visit with ceiling*, which was the payment method for beneficiaries of the 30-Baht Scheme with outpatient visits for treatments of high-cost diseases in 2004-2005.

Dependent variables

1. **Practice patterns of health care services**

The practice patterns were intensities of health care services provided to patients, for example, physical examinations and laboratory tests for diagnosis, treatment procedures, drugs prescribed, and monitoring processes that hospitals provided to patients. In order to systematically reflect the practice patterns of the entire character of health care needs, the assessments were performed in patients with the particular conditions selected by the final inclusion criteria stated in the earlier part of Selection of Tracer Conditions. The dimensions of practice patterns assessed in the study were

1.1. Access to care

The likelihood of patients to obtain appropriate basic necessities of treatments of the specified tracer disease conditions that complied with evidence-based standard treatment guidelines was defined as the access to care in this study. The variables indicated access to care were

1) Percentage of patients who were prescribed required drugs to treat those tracer disease conditions compared among individual payment methods

2) Percentage of patients who were ordered diagnosis or treatment procedures, for example, the Magnetic Resonance Imaging (MRI), Computerized Tomography Scan (CT-scan), or gastroscopy, for those tracer disease conditions compared among individual payment methods

1.2. Equity care

The equity care was examined as distribution of costs of the various practice patterns provided to patients for treatment of the specified tracer disease conditions. The variable indicated equity care in this study was

1) The Shorrocks index of order 2 calculated to assess distribution of costs of drugs actually used to treat those tracer disease conditions compared among individual payment methods

1.3. Quality dimension of practice patterns

The medical care provided to patients with adherence to recommendations of evidence-based standard treatment guidelines was defined as quality care. The variables indicated quality dimension of practice patterns were

1) Percentage of patients who received drug therapy to treat those tracer disease conditions according to what specified in the standard treatment guidelines compared among individual payment methods

2) Percentage of patients with acquired ADRs from drug therapy of certain tracer disease conditions who were managed to eradicate or alleviate manifestations of the ADRs with compliance with standard treatment guidelines compared among individual payment methods

2. Efficiency of health care services

The costs and the effectiveness of care for treatment of the selected tracer disease conditions were calculated to determine efficiencies of health care services. The variable indicated financial efficiencies of care in this study was ratio of standard costs of treatments to clinical outcome effectiveness for the actual treatments that patients obtained compared among individual payment methods

The Relationships Among Independence and Dependent Variables and the Final Selected Tracer Diseases

Based on the entire inclusion criteria for the final selection of tracer diseases, four diseases – acute low back pain, acute upper gastrointestinal bleeding (AUGIB), epilepsy, and lung cancer diseases – were selected to be tracers in the study. The summary of relationships among independent and dependent variables and the final selected tracer diseases is portrayed in Table 3.4.

1. *Relationships among independence variables and the final selected tracer diseases*

Tracer1:   Acute low back pain

This tracer was the selected general disease that signified

1) The close-ended capitation payment of the 30-Baht Schemes for outpatient visits

2) The close-ended capitation payment of the SSS plus an add-on payment at the end of each year, relying on utilization rates of each hospital for both outpatient and inpatient visits

3) The open-ended fee-for-service payment of the CSMBS for both outpatient and inpatient visits

Tracer2:   Acute upper gastro-intestinal bleeding

This tracer was the selected general disease that signified

1) The close-ended DRGs with global budget payment of the 30-Baht Schemes for

inpatient visits

2) The close-ended capitation payment of the SSS plus an add-on payment at the end of each year, relying on utilization rates of each hospital for both outpatient and inpatient visits

3) The open-ended fee-for-service payment of the CSMBS for both outpatient and inpatient visits

Tracer3:   Epilepsy

This tracer was the selected general disease that signified

1) The close-ended capitation payment of the 30-Baht Schemes for outpatient visits

2) The close-ended DRGs with global budget payment of the 30-Baht Schemes for inpatient visits

3) The close-ended capitation payment of the SSS plus an add-on payment at the end of each year, relying on utilization rates of each hospital for both outpatient and inpatient visits

4) The open-ended fee-for-service payment of the CSMBS for both outpatient and inpatient visits

Tracer4:   Lung cancer

This tracer was the selected high-cost disease that signified

1) The close-ended per item per year with ceiling payment of the 30-Baht Scheme in 2003 and per item per visit with ceiling payment in 2004-2005 for outpatient visits

2) The close-ended DRGs with global budget payment of the 30-Baht Schemes for inpatient visits

3) The close-ended per year with ceiling payment of the SSS for both outpatient and inpatient visits

4) The open-ended fee-for-service payment of the CSMBS for both outpatient and inpatient visits

2. Relationships among dependent variables and the final selected tracer diseases

Tracer1:   Acute low back pain

This tracer was the selected general disease that reflected hospital behaviors, responded to the payment methods, with the consideration of

1) Access to care

For treatments of acute low back pain, physicians had various choices of prescription drugs from the traditional non-steroidal anti-inflammatory drugs (NSAIDs), such as ibuprofen or diclofenac tablets, or paracetamol with the lowest prices to the newest COX-2 inhibitors, such as etoricoxib, with the highest prices. Even regarding only the traditional NSAIDs, choices of drug products were varied from the simplest plain tablet with the lowest prices to the high-technology sustain-released tablet with higher prices. Normally, COX-2 inhibitors are suitable for patients with risks of gastro-intestinal bleeding, for example, elderly patients with the history of peptic ulcers, while patients without any risks of gastro-intestinal bleeding can use the inexpensive traditional NSAIDs safely. Therefore, this disease was a viable tracer for assessment of access to new drugs in patients with different health insurance payment methods.

In relation to diagnosis procedures of this disease, only the simple and inexpensive x-ray equipment was the procedure of choice. For that reason, this disease was not possible to assess the access to high cost and high technology equipment.

2) Equity care

Owing to the various choices of drug therapy for this disease, costs of care could be differed. As a result, the distribution of drug costs that implied equity care in this disease was able to be assessed.

Tracer2:   Acute upper gastro-intestinal bleeding

This tracer was the selected general disease that reflected hospital behaviors, responded to the payment methods, with the consideration of

1) Access to care

The diagnosis and treatment monitoring processes of this disease required an

imaging technology of gastroscopy to detect bleeding in the gastro-intestinal tracts, according to the strong recommendations of the Gastroenterological Association of Thailand. As for pharmacological treatment of the disease, the standard drug therapy was not complicated. Normally, the proton pump inhibitors (PPIs) were considered as a drug of choice. Therefore, this disease was a suitable tracer to assess the access to high technology equipment and necessitated drugs.

2) Equity care

Normally, every patient with AUGIB should be obtained PPIs as a drug of choice. However, costs of PPIs are various (2-350 baht/day) depending on type of dosage form and company. Therefore, equity care could be assessed by this disease tracer.

3) Quality dimension of practice patterns

Generally, most patients with this disease have the first hospital visit at the emergency room (ER) and then have to transfer to admit in the hospitals as inpatients. Accordingly, information of treatment processes and outcomes recorded on the medical records were quite complete compared to recording of other diseases. Therefore this disease was a superior tracer for assessment of quality dimension of practice patterns.

4) Efficiency of health care services

This disease was also a proper tracer to calculate the financial efficiencies of health care services in the study due to the complete data recoded on the medical records, the same reason as 3).

Tracer3: Epilepsy

This tracer was the selected general chronic disease that reflected hospital behaviors, responded to the payment methods, with the consideration of

1) Access to care

The foremost treatment strategy of epilepsy normally is drug therapies. Nevertheless, most of traditional antiepileptic drugs brought about serious ADRs. Thus, general goals of drug therapies in epilepsy are to dispose of seizures with the least ADRs. Most of the innovative drugs were developed to rectify these

ADRs, but the prices were very high. Therefore, this disease was a proper tracer to determine the access to new drugs.

2) Equity care

Since epilepsy is a chronic disease that required drug therapies for a long time, physicians normally have to make a decision to prescribe drugs that meet the recommendations of standard treatment guidelines and perpetually afforded by patients or hospital providers. The option of traditional antiepileptic drugs was inexpensive but caused more ADRs. In contrast, the option of new antiepileptic drugs was expensive but caused less ADRs. Consequently, this disease was a remarkable tracer to a measure the equity care.

3) Quality dimension of practice patterns

Usually, neurologists who take care of patients with epilepsy were fully aware of ADRs of the antiepileptic drugs they prescribed. Once the ADRs occur, they have to manage the manifestations of the reactions. In general, the ADRs were able to be treated by two alternative approaches:

− To discontinue of the antiepileptic drugs prescribed

− To reduce dosage of the antiepileptic drugs prescribed

However, these practice patterns might be varied with the potential dependence on the payment incentives. Therefore, this disease was an apposite tracer to assess the quality dimension of practice patterns.

4) Efficiency of health care services

Normally, with the cautious awareness of the neurologists who take care of patients with epilepsy, the information of clinical outcomes recoded on medical records of these patients is quite completed. For that reason, this disease was also a proper tracer to calculate the financial efficiencies of health care services in the study.

Tracer4: Lung cancer

This tracer was the selected high-cost disease that reflected hospital behaviors, responded to the payment methods, with the consideration of

1) Access to care

The practices for diagnosis and treatment monitoring of this disease required the high cost and high technology apparatuses like computerized tomographic scan (CT scan) and magnetic resonance imaging (MRI). Therefore, this tracer was fit for assessment of access to high cost and high technology equipment in this study.

In addition, on account of various ADRs caused by chemotherapeutic treatments of this disease such as severe nausea and vomiting and anemia with white blood cell reduction. For handling of these side effects, anti-emetic drugs and granulocyte colony stimulating factors (G-CSF) were necessitated for the management of these ADRs. These drugs, especially the G-CSF, were extremely expensive that risked being under-used in the close-ended patients and over-used in the open-ended patients. Therefore, this disease was a fabulous tracer to assess the access to obtain these drugs among patient patients with different health insurance systems.

2) Equity care

As total costs of care for this disease including chemotherapeutic treatment and management of the ADRs like G-CSF were very high, payment incentives might have highly potential effects on equal opportunities to obtain these treatments. Therefore, this tracer was highly appropriate for determination of equity care.

3) Quality dimension of practice patterns

Normally, a wide choice of practice patterns of lung cancer was finished up with rather the same unimpressive final outcomes. The overall increase of the median survival months of patients with lung cancer was not more than 29 months with an average of approximately 12 months depending on a choice of drug regimens. Besides, the details of the outcomes recorded on the medical records were readily available. Accordingly, this tracer was appropriate for deliberation of the quality of practice patterns.

4) Efficiency of health care services.

This disease was a suitable tracer to determine financial efficiencies of health care services provided to patients among patients with dissimilar health insurance

systems by the same reason of 3).

Table 3.3. The summary of relationships among independent and dependent variables and the final selected tracer diseases

		Close –ended						Open-ended
Group of payment methods								
Schemes		30 baht				SSS		CSMBS
Type of diseases		General diseases		High-cost diseases		General diseases	High-cost diseases	General & High-cost diseases
Point of services		Outpatient	Inpatient	Outpatient	Inpatient	Outpatient& Inpatient		Outpatient & Inpatient
Payment methods		Capitation	DRGs with global budget	Per item per year · with ceiling (2003) / Per item per visit with ceiling (2004-2005)	DRGs with global budget	Capitation plus an add-on payment relying on UR	Per item per year with ceiling	Fee-for-service.
• Access to care • Equity care		**Acute low back pain**				**Acute low back pain**		**Acute low back pain**
			AUGIB			**AUGIB**		**AUGIB**
		Epilepsy				**Epilepsy**		**Epilepsy**
				Lung cancer			**Lung cancer**	**Lung cancer**
• Quality dimension of practice patterns • Efficiency of health care services			**AUGIB**			**AUGIB**		**AUGIB**
		Epilepsy				**Epilepsy**		**Epilepsy**
				Lung cancer			**Lung cancer**	**Lung cancer**

Note: AUGIB means acute upper gastro-intestinal bleeding
AR & UR mean administration and utilization rates
DRGs mean diagnosis related groups

Data Collection

The pertinent data in this study was collected from two major sources – electronic health care databases, paper medical records. From the electronic databases, patients' demographic data, health insurance benefits, and items and costs of prescribed drugs and treatment procedures were retrieved for assessment of practice patterns – access to care

and equity care. From the paper medical records, data of clinical outcomes were collected for assessment of quality dimension of practice patterns and efficiency of health care services.

Electronic health care databases

The secondary data on an individual patient level from the diagnosis and drug dispensing databases of computerized hospital information system from 1 October 2002 to 30 September 2005, three fiscal years, was exploited for assessment of impacts of health insurance payment methods on hospital behaviors in this study. Sequences to identify patients with the four final selected tracer diseases from the databases were to enroll patients who qualified for inclusion and exclusion criteria and to verify accuracy of the data by the specific drugs prescribed for individual patients with the particular diseases. This verification process was required to perform since this study involved drug prescribing patterns. However, this process was not applied for acute low back pain because treatments of this disease were not specific to drug remedies only.

The International Statistical Classification of Diseases and Related Health Problems, tenth revision (ICD-10) codes in the diagnosis databases and hospital drug codes in the dispensing databases were used for the data selection and verification.

Inclusion and exclusion criteria

In order to retrieve precise transaction data of patient care for the electronic databases of hospitals, inclusion and exclusion criteria below were exploited.

1. Inclusion criteria

The data retrieval was carried on with a step-by-step approach as follows:

Step 1: select all transaction data of patient care from 1 October 2002 to 30 September 2005

Step 2: select the transaction data from Step 1 by the ICD-10 codes for the four tracer diseases – acute low back pain, acute upper gastro-intestinal bleeding, epilepsy, and lung cancer – the list of ICD-10 as shown in Exihibit 3.4.

Step 3: select the transaction data from Step 2 by the specified drug codes for treatment of

- *acute upper gastro-intestinal bleeding*: antacid, H_2 blocker, proton pump inhibitor (PPI), **IV** fluid, sandostatin, colloidal substance, tranxenamic acid, vitamin K and factor VII
- *epilepsy*: anti epileptic drugs
- *lung cancer*: antineoplastic drugs

The reason for data selection in this step was to include only patients who obtain drug therapy as a focus of this study.

2. *Exclusion criteria*

Data of patients with the following criteria was excluded from the study.

1) Patients with more than one health insurance schemes during 1 October 2002 - September 2005 were excluded. For example, patients with the Social Security Scheme in 2002-2003 who turned to the 30 Baht Scheme in 2004-2005 were excluded.

2) For patients with acute low back pain, ones who had ICD-10 codes for diagnosis in the transaction data of this disease more than six consecutive weeks was excluded. The continual low back pains for more than six weeks were classified as sub-acute and chronic low back pain, not low back pain.

3) For patients with acute upper gastro-intestinal bleeding, most of care services were inpatient care. This tracer was considered for inpatient point of services in the study. Accordingly, transaction data of outpatient care for these patients was excluded.

4) For patients with epilepsy, transaction data of hospital visits with antiepileptic drugs less than 90 consecutive days, which was beyond the definition of chronic diseases in this study, was excluded. In addition, patients with purely diagnosis of status epilepticus or obtained only antiepileptic injection drugs, which was assumed an acute condition only, were excluded.

5) For patients with lung cancer, ones who had no drug therapy were excluded for the reason that this study focused only on lung cancer patients who were actively

treated with antineoplastic drugs, not patients with end-stage lung cancer without any cancer treatment medications.

Paper medical records

The identification number of patients – the HN or hospital number – was listed from the electronic databases. The stratified random sampling technique was exploited to select samples of patients with AUGIB, epilepsy, and lung cancer from the listed HN. Medical records of the selected patients were reviewed for clinical outcomes of each tracer disease.

Document reviews and in interview

This part of this study was aimed to ascertain the effects of health insurance payment methods on practice patterns and management polices. Some information was obtained from hospital drug formulary and restriction policies in each hospital and others was collected from health professional interviews.

The overall selection processes for health care transaction data of each tracer diseases are illustrated in Exhibition 3.3.
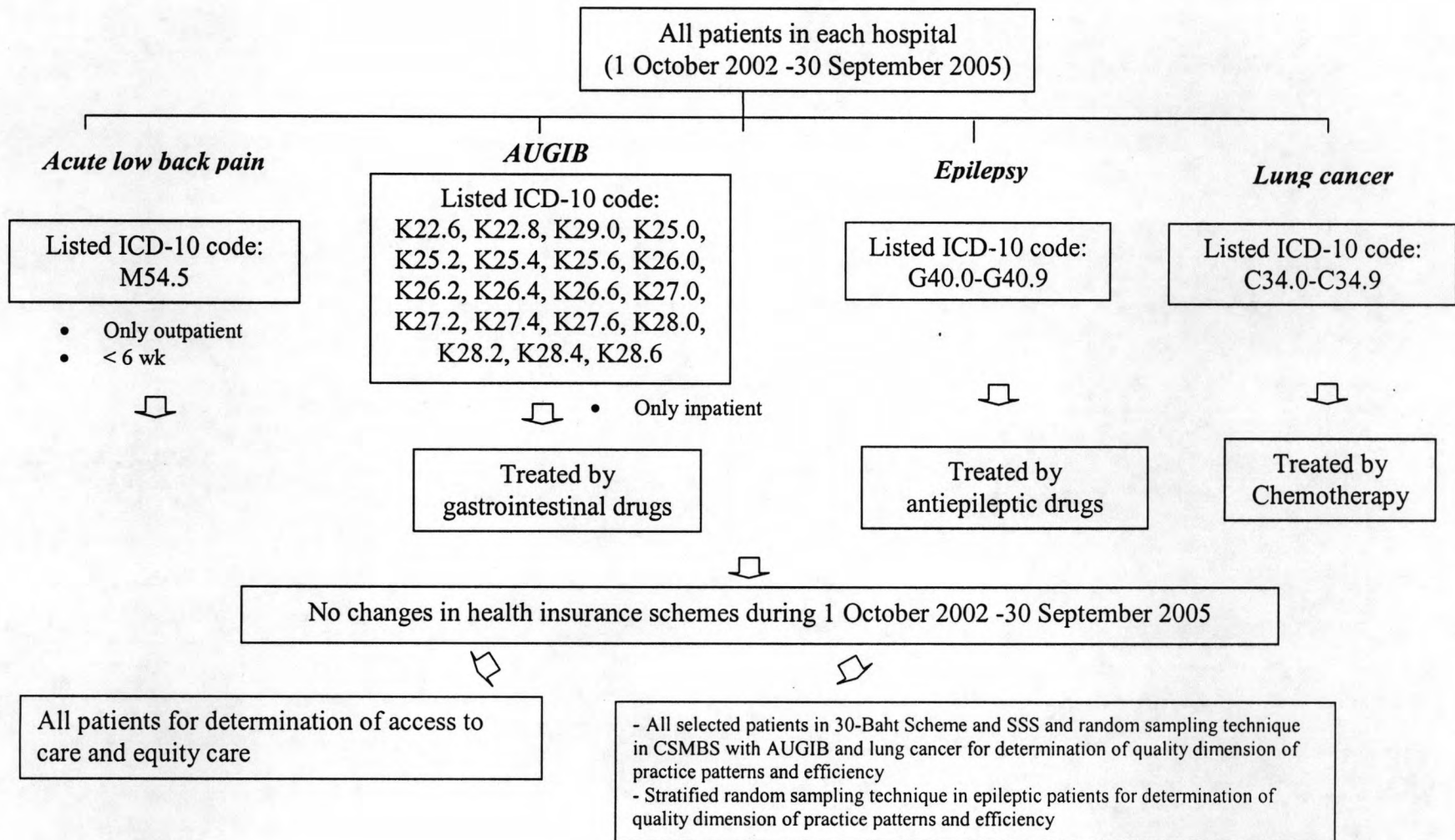
```
                                    ┌─────────────────────────────────────┐
                                    │     All patients in each hospital    │
                                    │ (1 October 2002 -30 September 2005)  │
                                    └─────────────────────────────────────┘
            ┌───────────────────────────────┬──────────────┴──────────────┬──────────────────────┐

      *Acute low back pain*              *AUGIB*                    *Epilepsy*            *Lung cancer*
                                ┌──────────────────────────┐
                                │ Listed ICD-10 code:      │
 ┌───────────────────────┐      │ K22.6, K22.8, K29.0, K25.0, │  ┌────────────────────┐  ┌────────────────────┐
 │ Listed ICD-10 code:   │      │ K25.2, K25.4, K25.6, K26.0, │  │ Listed ICD-10 code:│  │ Listed ICD-10 code:│
 │        M54.5          │      │ K26.2, K26.4, K26.6, K27.0, │  │   G40.0-G40.9      │  │    C34.0-C34.9     │
 └───────────────────────┘      │ K27.2, K27.4, K27.6, K28.0, │  └────────────────────┘  └────────────────────┘
                                │   K28.2, K28.4, K28.6      │
   • Only outpatient            └──────────────────────────┘
   • < 6 wk
```

- Only inpatient

| | Treated by gastrointestinal drugs | Treated by antiepileptic drugs | Treated by Chemotherapy |

No changes in health insurance schemes during 1 October 2002 -30 September 2005

All patients for determination of access to care and equity care

- All selected patients in 30-Baht Scheme and SSS and random sampling technique in CSMBS with AUGIB and lung cancer for determination of quality dimension of practice patterns and efficiency
- Stratified random sampling technique in epileptic patients for determination of quality dimension of practice patterns and efficiency

Exhibit 3.3: The overall selection process for health care transaction data of each tracer diseases

Data Analysis

The elements of collected data were classified into each aspect of hospital behaviors in the study. Summaries of variables from each data sources are described in Table 3.4.

Table 3.4: Summary collecting data and their sources.

Variables	Final selected tracer Diseases	Description	Source of data	Samples
Independent variable 1.Payment methods of health insurance systems	All tracer diseases	Payment methods of each health care transaction data for each visit of each patient	Electronic databases	All selected patients
Dependent variables (hospital behaviors) 1.practice patterns		Hospital behaviors		
1.1. Access to care			Electronic databases	All selected patients
1.1.1. Access to new drugs	Acute low back pain	– COX II inhibitors		
	Epilepsy	– New antiepileptic drugs		
	Lung cancer	– Third generation antineoplastic drugs		
1.1.2. Access to required drugs	AUGIB	– Proton pump inhibitors (PPIs)		
1.1.3. Access to palliative drugs	Lung cancer	– Anti-emetic drugs and G-CSF		
1.1.4. Access to drugs in dosage form with high technology	Acute low back pain	– NSAIDs with sustain release and dispersable tablet		
1.1.5. Access to high cost and high technology equipment	AUGIB	– Diagnosis by gastroscopy		
	Lung cancer	– MRI, CT scan		

Variables	Final selected tracer Diseases	Description	Source of data	Samples
1.2. Equity care	All tracer diseases	– Total costs of drug treatments	Electronic databases	All selected patients
1.3. Quality dimension of practice patterns			Paper medical records	
1.3.1. Adherence to indispensable recommendations of standard practice guidelines	AUGIB	– Diagnosis by gastroscopy and treatment with PPIs		All selected patients (30-Baht scheme and SSS)and random samples (CSMBS)
	Lung cancer	– The first diagnosis by CT scan and treatment with appropriate drug regimens		All selected patients (30-Baht scheme and SSS)and random samples (CSMBS)
1.3.2. Appropriate management of ADRs	Epilepsy	– Withdrawal or decrease dosage of antiepileptic drugs		Stratified random samples
1.4. Efficiency of drug use	All tracer diseases	– Cost of drug treatments – Effectiveness: the desired clinical outcomes at the end of treatments or at the specified period of time	Paper medical records	All selected patients (30-Baht scheme in AUGIB and lung cancer and SSS)and random samples (CSMBS) in epilepsy

Sample size

Sample size was drawn from published table of Krejcie R.V. and Morgan D.W. (1970) [30]

1. Assessments of access to care

Access to care in the study considered right to use new drugs, required drugs, palliative drugs, drugs in dosage form with high technology, and high cost and high technology equipment.

Unit of analysis: Patients who were prescribed drugs or procedures using medical equipment

Statistics: Chi-square statistic with a significance level of 0.05 was applied to determine relationships between proportions of patients who were prescribed sophisticated drugs or procedures using high cost or high technology medical equipment and health insurance payment methods. However, if the expected population values in any cell of Chi-square are close to zero, Monte Calo technique was used to examine the association.

Definition and measurement of access:

1.1. Access to new drugs

Definition of new drugs:

New drugs referred to new generic drugs or new pharmacological groups of drugs. Three tracer diseases with new drugs as follows were involved this assessment

- Acute low back pain: new drugs were COX-II inhibitors, including meloxicam, celecoxib, etoricoxib, and parecoxib
- Epilepsy: new antiepileptic drugs were levetiracetam, lamotrigine, garbapentin, topiramate, and oxcarbazepine
- Lung cancer: new antineoplastic drugs were docetaxel, gemcitabine, paclitaxel, vinorebine, irinotecan, and topotecan

Assessment of access to new drugs:

Comparisons of percentage of patients who were prescribed new drugs and paid by different payment methods of health insurance systems

1.2. Access to required drugs

Definition of required drugs:

Required drugs referred to drug entities or pharmacological groups of drugs which were obligatory recommendations of standard treatment guidelines for every patient with the diseases. Only one tracer disease with required drugs was involved this assessment

– AUGIB: required drugs were proton pump inhibitors (PPIs), including
omeprazole, esomeprazole, and pentoprazole

Assessment of access to required drugs:

Comparisons of percentage of patients who were prescribed required drugs
and paid by different payment methods of health insurance systems

1.3. Access to palliative drugs

Definition of palliative drugs:

Palliative drugs referred to drug entities or pharmacological groups of drugs
prescribed to alleviate the side-effects which were the ADRs of antineoplastic
drugs. Only one tracer disease with palliative drugs was involved this
assessment

– Lung cancer: palliative drugs were anti-emetic drugs, including
dimenhydrinate, domperidone, granisetron, metroclopamide, ondansetron, and
tropisetron, and G-CSF drugs, including filgrastim and lenograstim

Assessment of access to palliative drugs:

Comparisons of percentage of patients who were prescribed required drugs
and paid by different payment methods of health insurance systems

1.4. Access to drugs in dosage form with high technology

Definition of drugs in dosage form with high technology:

Drugs in dosage form with high technology referred to drugs with
sophisticated dosage form, such as sustain release (SR) or control release (CR)
and dispersible tablet of conventional NSAIDs, that improve release of the active
ingredients. Only one tracer disease with drugs in dosage form with high
technology was involved this assessment

– Acute low back pain: drugs in dosage form with high technology were
diclofenac sustain release tablet/capsule, indometacin sustain release capsule
and piroxicam dispersible tablet

Assessment of access to drugs in dosage form with high technology:

Comparisons of percentage of patients who were prescribed drugs in dosage

form with high technology and paid by different payment methods of health insurance systems

1.5. Access to high cost and high technology equipment

Definition of high cost and high technology equipment:

High cost and high technology equipment referred to medical instruments with advanced imaging technology which were extremely expensive. Two tracer diseases with high cost and high technology equipment for medical procedures as follows were involved this assessment

- Lung cancer: High cost and high technology equipment was MRI and CT scan
- AUGIB: High cost and high technology equipment was gastroscope

Assessment of high cost and high technology equipment:

Comparisons of percentage of patients who were prescribed high cost and high technology equipment for medical procedures and paid by different payment methods of health insurance systems

2. Assessments of equity care

Assessments of equity care in this study were to compare distribution of total costs of drug treatments among patients who were paid by different payment methods of health insurance systems. All selected tracer diseases were engaged in these assessments. Shorrocks index of order 2 was applied to measure inequality of drug costs in this study.

In order to calculate total costs of drug treatments of the diseases, treatment duration of each disease were defined as follows:

- AUGIB: Because this disease was an acute illness that required short duration of treatments, the beginning and the ending points of treatments were perceptible to define. Therefore, the treatment duration of this disease was characterized as for each treatment course.

- Epilepsy: For the reason that this disease was a chronic disease that required a lengthy period of continual treatment, the beginning point of treatment was not easy to define for the period of this study. Moreover, there was no ending point of

treatment during this period of time as well. Consequently, the treatment duration of this disease was typified as for each fiscal year.

- Lung cancer: As median survival rate of patients with the final stage of this disease – stage III and IV non-small cell lung cancer and extensive stage small cell lung cancer – was not more than 29 months with the average of about 12 – 24 months. The beginning point of treatment was defined as the first day that patients obtained antineoplastic drugs and the ending point of treatment was defined as the last day of patient's life. Therefore, the treatment duration of this diseases was defined as the duration for each individual patient.

Calculations of the Shorrocks index were to measure inequality of drug treatment costs. In addition, Two-way ANOVA was applied to determine the factors affecting cost distributions including payment method and age group.

The variables of total drug costs per case, age groups, and payment methods were used in the calculations. Descriptions of the variables were

- *Age groups* were classified into eight groups of less than 20, 21 – 30, 31 – 40, 41 – 50, 51 – 60, 61 – 70, 71 – 80, and more than 80

- *Payment methods* were categorized as
  1) Close-ended payment for
     1.1) The 30-Baht Scheme
     1.2) The SSS
  2) Open-ended payment

- *Total drug costs per case* were total costs of drug treatments for each tracer disease. Duration of treatments and items of drug treatments for each disease were identified as follows:
  1) Acute low back pain:
     - Duration of treatments: during the first visit of a treatment course until the end of a treatment course
     - Drug items: antianxiety, antacid, H_2 blocker, proton pump inhibitor, conventional NSAIDs, selective COX I, specific COX II, trapidol, acetaminophen, and muscle relaxant

2) AUGIB:

- Duration of treatments: during the first visit of a treatment course until the end of a treatment course
- Drug items: antacid, H_2 blocker, proton pump inhibitor, **IV** fluid, sandostatin, colloidal substance, vitamin K, factor VII, factor VIII, tranxenamic acid and other alimentary drugs

3) Epilipsy

- Duration of treatments: during October, 1 until September, 30 in each year
- Drug items: antiepileptic drugs

4) Lung cancer

- Duration of treatments: during the first visit of a treatment course until the end of a life, but not over 3 years.
- Drug items: antineoplastic , anti-emetic, G-CSF, and antimicrobial drugs

The steps for the calculation of the Shorrocks in order 2 index were as follows.

1. Sort total costs in ascending order
2. Calculate means of the total costs
3. Calculate the Shorrocks index by using the formula

$$I_2 = (1/2\ N)\ \Sigma\ [(Yi/M)-1]^2$$

Yi = set of drug cost distribution among participants

N = number of participants

M = mean of drug cost

3. Assessments of quality dimension of practice patterns

Quality dimension of practice patterns in the study considered adherence to standard practice guidelines and appropriate patterns of management of ADRs

Unit of analysis: Patients who were prescribed drugs or procedures recommended by standard practice guidelines

Statistics: Chi-square statistic with a significance level of 0.05 was applied to determine relationships between proportions of patients who were prescribed drugs or procedures recommended by standard practice guidelines and health insurance payment methods. However, if the expected population values in any cell of Chi-square are close to zero, Monte Calo test was used to examine the association

3.1. Definition and measurement of adherence to standard treatment guidelines:

Adherence to standard treatment guidelines was practice patterns that complied with required recommendations for every patient. Description of the recommendations for each tracer disease was

- AUGIB: Diagnosis of this disease had to performed by gastroscope. Treatments of this disease had to use PPIs during the admission in the hospitals.

- Lung cancer: Firstly diagnosis of this disease had to performed by chest CT scan. Treatment of this disease had to use the appropriate drug treatment regimen as shown in Table 3.5

Table 3.5: The appropriate drug treatment regimens in lung cancer treatment

Lung cancer	Recommendation
Non small cell lung cancer	-Platinum ± third generation antineoplastic drugs* - Platinum + etoposide** - Platinum ± irinotecan**
Small cell lung cancer	*multi drugs regiments w/o platinum*** - CAV *(Cyclophosphamide+doxorubicin+vincristine)* - Topotecan *multi drugs regiments with platinum* * -Platinum + etoposide - Platinum+irinotecan

* The recommendation of the national collaborating centre for acute care

** The recommendation of the national cancer institute of Thailand

3.2. Definition and measurement of appropriate management of ADRs

Appropriate management of ADRs (Steinhoff, B.J. et al. ,2003) was practice patterns complied with the recommendations that

- For the idiosyncratic reactions such as Stevens-Johnson syndrome, the suspected drugs should be withdrawn

- For rare, serious, or annoying chronic side-effects such as weight gain and hair loss of the suspected drugs with wide therapeutic index, the suspected drugs should be withdrawn or the dosage should be adjusted.

- For rare, serious, or annoying chronic side-effects of the suspected drugs with narrow therapeutic index, the suspected drugs should be withdrawn.

- For acute side-effects such as somnolence of the suspected drugs with high therapeutic index, the suspected drugs should be withdrawn or the dosage should be adjusted.

- For acute side-effects of the suspected drugs with narrow therapeutic index, the suspected drugs should be withdrawn.

4. Assessments of efficiency of drug treatments

Cost-effectiveness technique was used to assess economic efficiency in this study. Costs of drug treatment had the same definition as the total costs of drug treatments in the calculation of Shorrock Index in the assessments of equity care. Effectiveness was the desired outcomes of health care services which were assessed at the end of treatment or at the specific time. The effectiveness of each tracer disease was defined as follows:

4.1 Acute upper gastrointestinal bleeding

Effectiveness of this disease was cured or not-cured. Cured outcome meant gastrointestinal bleeding patients who underwent complete stop bleeding such as having the test result of gastroscope for no bleeding or having the recorded of the cured disease by the physician on the medical records. Nevertheless, patients without the defined cured outcomes were excluded form the study.

4.2 Epilepsy

Effectiveness of epilepsy was observed from seizure frequency during a fiscal year. The desired outcomes recorded on the medical records were seizure free that meant patients had no seizure symptom during a fiscal year. Nevertheless, patients without the defined cured outcomes were excluded form the study.

4.3 Lung cancer

Effectiveness of lung cancer was succeeded with the three major criteria. Firstly, patients must have a completion treatment with antineoplastic drugs. It meant that the patients were not dropped out during the treatment period. Secondly, patients must respond to antineoplastic treatment. It referred that the patients had no progression prognosis such as having brain metastasis after the completion of antineoplastic treatments. Lastly, patients had to survive 1 year later after the antineoplastic treatments.

The formula for calculations of cost-effectiveness ratio was

Cost-effectiveness ratio = drug cost per successfully treatment patients

$$= \frac{\text{Average drug cost}}{\text{No of successfully treatment patients / no. of total patients} *100}$$