CHAPTER III

METHODOLOGY

This study intended to explicate responses of hospitals and physicians to payment incentives of different health insurance schemes. Patterns of drug use and diabetic care process were examined to reflect effects of the responses on differences in quality of diabetic care. An overview of the conceptual framework of this study is portrayed in Figure 3.1. Qualitative designs, health care professional reviews and document reviews, were applied for information of hospitals management and policies on drug use and care process. Additionally, from the reviews, perceptions and concerns of physicians on financial problems of hospitals and impacts of the 30-Baht Policy implementation were also obtained. For other parts of the study, quantitative designs were carried out: 1) patterns of drug use study using longitudinal, quasi-experimental, interrupted time series design with segmented regression analysis and 2) patterns of diabetic care process study using cross-sectional design for comparisons among schemes and longitudinal, trend study design for comparisons in each scheme before and after the 30-Baht Policy implementation.

Operationalization of Components in the Framework

All components in the framework were operationalize as follows:

Health insurance schemes and payment mechanisms

In the study, payment incentives of the major health insurance schemes in Thailand were classified into four groups.

1. ***Group I (GB)*** was government budget payment for patients covered by the MWS and HCS before the 30-Baht Policy implementation.
2. ***Group II (CAP:30B)*** was capitation payment for patients covered by the 30-Baht of every disease Policy implemented since 2001-2002.
3. ***Group III (CAP:SSS)*** was capitation payment for patients covered by the SSS.
4. ***Group IV (FFS)*** was fee-for-service payment for patients covered by the CSMBS/SE, PHI, other schemes, and uninsured with out-of-pocket payment.

For the reasons that almost all of patients in ***Group I (GB)*** turned into ***Group II (CAP:30B)*** after the 30-Baht Policy implementation and the indifference in

their incentives, data of patients in these two groups were combined in the data analyses, as the ***CAP:30B-GB*** group. However, analyses of the combined group before and after the 30-Baht Policy implementation were able to explain differences in patterns of drug use and care process between government budget and capitation payments for the 30-Baht patients.

Hospital management and policy on drug use and care process

Aspects of the different management and policies for patients covered by different health insurance schemes were portrayed as follows:

1. Hospital policies on drug uses
   - 1.1. drug formulary list
   - 1.2. applications of restrictions on drug use, especially expensive drugs not in the National Essential List of Drug, 1999 (non-ED drugs)
   - 1.3. generic or therapeutic substitutions
   - 1.4. restriction on period of prescription (visit interval)
2. Hospital policies on laboratory tests and physical examinations
   - 2.1. restrictions on frequencies and types of laboratory tests and physical examinations for diabetic care
   - 2.2. extra payments, out-of-pocket payments by patients themselves, for some certain laboratory tests or physical examinations that the hospitals had no capacity to perform the procedures on their own and had to outsource those procedures to other laboratory facilities.
3. Hospital management
   - 3.1. types of physicians assigned to take care patients: general practitioners (GP) or internal medicine specialists
   - 3.2. specific service settings for patients
   - 3.3. standard treatment guidelines implementation for diabetic care
   - 3.4. extra payment incentives to physicians who take care patients under a particular health insurance scheme

Perceptions and concerns of health care on financial problems of hospitals and impacts of the 30-Baht Policy implementation

These issues were specified as follows:

1. Perceptions of physicians on impacts of the 30-Baht Policy implementation
   - 1.1. burden of a rise in number of patients
   - 1.2. sufficiency of budget allocated to the hospitals
   - 1.3. practice on diabetic care

2. Concerns of physicians for diabetic care in patients with different payment methods in terms of

   2.1. drug use

   2.2. laboratory tests

   2.3. physical examinations

Patterns of drug use and care process

In this study, concepts of dissimilarities of hospital management and policy on drug use and care process among patients covered by health insurance schemes with different payment mechanisms, reflecting potential differences in quality of care among schemes, were studied in terms of prescribing patterns of drug use and care process. The operational definitions of them are as follows:

1. Patterns of drug use were described as types and costs of drug prescribed by physicians for diabetic outpatients under each health insurance scheme in terms of

   1.1. Types of drug prescribed

   - Drugs not listed in the National Essential List of Drug (NEDL), which normally was high cost and/or not so essential for *description*: proportion of charge of all non-ED drugs prescribed per all drugs per visit for diabetic outpatients in each health insurance scheme with monthly comparisons
   - Certain originator drugs, classified according to the Anatomical Therapeutic and Chemical classification system (ATC), which was high cost drugs necessitating for some specific cases *description*: proportion of visits of patients with specific originator drug items prescribed per visits of all patients with drug items in the same ATC group for diabetic outpatients in each health insurance scheme with monthly comparisons, for four drug groups commonly used in diabetic patients: oral antidiabetic drugs, antihypertensive drugs, antihyperlipidemia drugs, and antiplatelet aggregation drugs.

     Although some specific originator drugs in these drug groups were high cost drugs not in the NELD, they had some major roles in some specific conditions of diabetic patients, as recommended in Clinical Practice Recommendations 1999 and Standards of Medical Care for Patients with diabetes Mellitus in 2003 (American Diabetes Association, 1999 and American Diabetes Association, 2003).

     - Oral antidiabetic drugs: Thiazolidinedione (ATC-chemical group code = A10BG)

       This drug group was a high cost single source drug not in the NELD. It has an advantage for increasing peripheral

insulin sensitivity and potential preserving of beta cell in the pancreas.

- Antihypertensive drugs: Angiotensin II antagonists and combinations (ATC-pharmaceutical group code = C09C)

  This drug group was a high cost single source drug not in the NELD with an important role in patients with type 2 diabetes, hypertension, and microalbuminuria. Especially, it was strongly recommended in those patients with nephropathy or renal insufficiency.

- Serum lipid reducing drugs: HMG CoA reductase inhibitors (statins) (ATC- chemical group code = C10AA)

  This drug group had an advantage of reducing LDL cholesterol level and coronary and cerebrovascular events. One of drugs in this group, simvastatin, had a local made brand launched into the drug market in Thailand since around early 2001.

- Antithrombotic drugs: Platelet aggregation inhibitors (ATC-chemical substance code = B01AC04 for clopidogrel and B01AC05 for ticlopidine)

  Platelet aggregation inhibitors were recommended for primary and secondary therapy to prevent cardiovascular events in diabetic patients. Normally, aspirin was the drug of choice in this indication while ticlopidine and clopidogrel, high cost single source drugs, were recommended as an add-on therapy in very high-risk patients or as alternative therapy in aspirin-intolerant patients.

1.2. Charge of drug prescribed

- Average charge of drugs prescribed per visit
  description: total charge of all drugs in all prescriptions divided by number of prescriptions of diabetic outpatients in each health insurance scheme with monthly comparisons.

1.3. Number of drug items prescribed

- Average number of drug items prescribed per visit

  description: total number of all drug items prescribed in all prescriptions divided by number of all visits of diabetic outpatients in each health insurance scheme with monthly comparisons.

2. Patterns of care processes were determined as only for process of care which can be evidently measured. The frequency of essential laboratory test and physical examination for drug use and diabetic complications monitoring were considered to reflect the quality of care process compared to the recommendations of American Diabetes Association (1999 and 2003) which is the well-known clinical practice guidelines. These patterns include

- Percentage of patient who were prescribed HbA1C test at least twice yearly
  description: total number of diabetic outpatients with HbA1C test prescribed at least once yearly divided by total number of diabetic outpatients in each health insurance scheme in each year and multiplied by 100
- Percentage of patient who were prescribed lipid profile test at least once yearly, including total cholesterol, triglyceride, HDL-cholesterol, and LDL-cholesterol tests
  description: total number of diabetic outpatients with lipid profile test prescribed at least once yearly divided by total number of diabetic outpatients in each health insurance scheme in each year and multiplied by 100
- Percentage of patient who were prescribed serum creatinine test at least once yearly
  description: total number of diabetic outpatients with serum creatinine test prescribed at least once yearly divided by total number of diabetic outpatients in each health insurance scheme in each year and multiplied by 100
- Percentage of patient who were prescribed microalbuminuria test at least once yearly
  description: total number of diabetic outpatients with microalbuminuria test prescribed at least once yearly divided by total number of diabetic outpatients in each health insurance scheme in each year and multiplied by 100
- Percentage of patient who were prescribed dilated eye examination at least once yearly
  description: total number of diabetic outpatients with dilated eye examination prescribed at least once yearly divided by total number of diabetic outpatients in each health insurance scheme in each year and multiplied by 100
- Percentage of patient who were prescribed foot examination at least once yearly
  description: total number of diabetic outpatients with foot examination prescribed at least once yearly divided by total number of diabetic outpatients in each health insurance scheme in each year and multiplied by 100
- Average percentage of visits with fasting plasma glucose (FPG) test per all diabetes visits of individual diabetic patient
- Average percentage of visits with blood pressure (BP) measurement per all diabetes visits of individual diabetic patient

These care processed were recommended by the American Diabetes Association (1999 and 2003) to provide annually to every individual diabetic patient

Number of diabetic outpatients

One of the goals of the 30-Baht Policy is to enhance accessibility of Thai citizens to quality care to meet health needs regardless of socio-economic status. Consequently, utilization of health care services may be expanded on both numbers of patients and/or numbers of visits per patient per period of time. To figure out the magnitude of the expansion, two variables including the number of patients per month and the average of visit per patient per month were pondered.

1. Number of patients per month

   description: the total number of diabetic outpatients utilized health care services with prescription drug from hospitals per month.

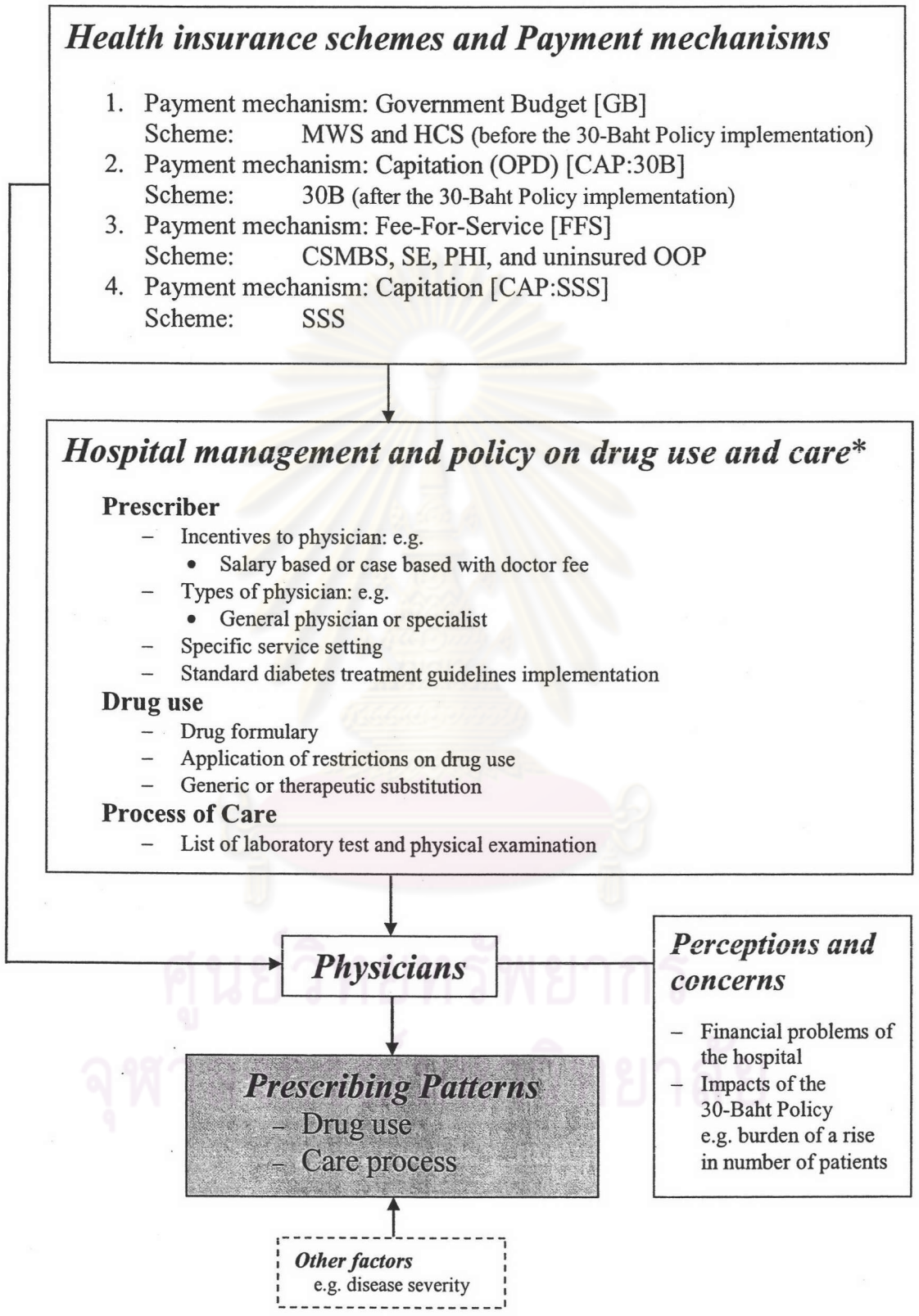
2. Average number of visits per patient per month

   description: the total number of visits of all diabetic outpatients utilized health care services with prescription drug from hospitals per month divided by the total number of diabetic patients utilized health care services with prescription drug from hospitals in the same month.

Other factors influencing patterns of drug use and care process

In addition to the effects of payment incentives of health insurance schemes on prescribing patterns of drug use and care, disease severity may also affect variations in the patterns. The more severe of the disease together with other co-morbidities and complications patients have, the more drugs use according to health needs. Nevertheless, the pertinent clinical data for classification of the severity including diagnosis or stage of the disease, co-morbidity, and complication data were not available in the dispensing database used in this study. According to this limitations, the inclusion criteria for indicating patients with the most akin severity as possible was developed in order to primary control the severity confounder at least. Patients under each health insurance schemes with the same age group of 41 to 60 years old were recruited to the study. For the reason that prevalence of diabetes was elevated in patients with age of more than 40 years old (The Endocrine Society of Thailand, 2003) and, as a general rule, patients in the same age group were possible to have the same disease severity. Patients covered by every health insurance scheme with age more than 60 were excluded because normally the social security schemes cover patients at least until their 60 retirement age.

The overall conceptual framework of the study is shown in Figure 3.1.



Note: A → B means A has an effect on B
A — B means B is an attribute of A

Figure 3.1: Conceptual framework of the study

Subjects of the Study

Four public hospitals with the availability and accessibility of electronic dispensing database, medical record, and key informants and pertinent documents were recruited. Regarding patterns of drug use analysis, drug dispensing data of all diabetic outpatients of each hospital, with the inclusion criterion of ranging in age from 41 to 60, was included in the analysis. The period of data studied was from 1999 to 2003, two years before and after the 30-Baht Policy implementation.

For patterns of care process study, data elements for patterns of care analysis such as ordered HbA1C, normally, do not exist in the dispensing database thus the medical records were reviewed for them. Thirty diabetic outpatients were randomly selected, as representatives, from the list of hospital number (HN) of patients studied in Part II for groups of patients under each health insurance schemes and before and after the 30-Baht Policy implementation.

Methodologies for each Part of the Study

This study was divided into 3 parts: 1) health care professional interviews and document reviews, 2) dispensing database analysis, and 3) medical record reviews. Since the 30-Baht Policy implementation was taken place from in April, 2001 to January, 2002, data employing in every part of the study were recruited from 1999 to 2003 in order to obtain about two years of data before and after the policy implementation.

Part I *Health care professional interviews and document reviews*

- *Study design*: Qualitative methods of health care professional interviews and documentation review were used in this part of the study. Key informants interview and documents review were performed.
- *Objective*:
    1) To obtain documented and non-documented evidence related to hospital management and policies on drug use and care process that may lead to different patterns of drug use and care process among health insurance schemes with different payment incentives

2) To obtain perceptions and concerns perceptions and concerns of health care professionals on financial problems of hospitals and impacts of the 30-Baht Policy implementation

- *Source of data and data collection*: Key informant interviews and document reviews regarding hospital management and policy on drug use and care were performed in each studied hospital.
  - Key informants: secretary of Pharmacy and Therapeutic Committee (PTC), head of pharmacy department, one general practitioner and one specialist who take care of diabetic patients, head of laboratory department, and an officer in charge of the 30-Baht Policy operation were interviewed.
  - Documents: every PTC meeting minute and hospital drug formulary list for patients in every scheme from 1999 to 2003 were reviewed in order to get information that list of drugs and restrictions of drug perescribed for patients in different health insurance schemes are different or not.
- *List of questions for interviews:*
  1) Does the hospital have different official drug formulary list for patients covered by different health insurance schemes? And how are the differences (if any)?
  2) Does the hospital have different non-documented policy on drug use for patients covered by different health insurance schemes? And how are the differences (if any)?
  3) What are rules, both documented and non-documented, of non-ED drugs prescribed for patients?
     Are they different among health insurance schemes?
  4) Are there any generic or therapeutic substitution policies?
     Were they implemented for patients in every health insurance schemes?
  5) Are there any restrictions on number of month supply of drugs prescribed for patients?
     Are they different among health insurance schemes?
  6) Does the hospital have different official list of laboratory and examination procedure ordered for patients covered by different health insurance schemes? And how are the differences (if any)?
  7) Does the hospital have different non-documented policy on laboratory and examination procedure ordered for patients covered by different health insurance schemes?
     And how are the differences (if any)?
  8) Do patients have a chance to request for physicians they want to visit, for example, a request for internal medicine specialist or endocrinologist at the first visit?
     Is it different among health insurance schemes?

9) Does the hospital separate service settings for patients in each scheme?

10) Does the hospital have official standard diabetic treatment guidelines implemented and enforce them on every physician? Are they different among health insurance schemes?

11) Does the hospital provide extra money to physicians who take care of patients in some certain health insurance schemes?

12) What do physicians perceive as momentous impacts of the 30-Baht Policy implementation? For example, increases in number of patients or insufficient budget, etc.
Do the impacts potentially affect quality of diabetic care?

13) What are concerns of physicians on drug prescribed and laboratory tests and physical examinations ordered for patients? Are they different among health insurance schemes?

14) Have physicians treated patients any differently before and after the 30-Baht Policy implementation?

Related health care professionals were inquired about the pertinent questions to each individual. One question might be inquired to more than one person; therefore, the answers were cross-check. If the answers were different, they were investigated for more information.

– *Unit of analysis*: Hospital.

Part II *Dispensing database analysis*

– *Study design*: Quasi-experimental with an interrupted time series design, a longitudinal study, was carried out to determine prescribing patterns of drug use and care process resulting from hospital management and policy together with perceptions and concerns of physicians on drug use. This part of the study provided explanations of patterns of drug use analysis and number of patients received diabetic care from the hospitals.

– *Objectives*:

1) To compare patterns, level and trend, of drug use in terms of types and charges of drugs prescribed within and among each scheme over time before and after the 30-Baht Policy implementation

2) To illustrate dynamic changes of number of patients within and among each scheme over time before and after the 30-Baht Policy implementation

– *Source of data and data collection*: The hospital number (HN) of subjects of diabetic outpatients was used to retrieve all their dispensing data from hospital electronic dispensing database in 1999-2003. The interval of data aggregation was monthly data point for longitudinal study. The assembled data elements were

1) Patient demographic data
   - Age
   - Gender
   - Hospital number; HN as a patient identification (to link with the drug dispensing database)
     Note: patients' first and last name were not identified for a reason of confidentiality in order to protect secret data of patients
   - Type of health insurance scheme
2) Drug dispensing data
   - Trade name
   - Generic name
   - Strength
   - Dosage form
   - Charges of dispensed drugs
3) Hospital data
   - Type of hospital
   - Size of hospital

- *Unit of analysis*: Patient
- *Variable*:
  - Independent variable
    - Variables created for determining of effects of the 30-Baht Policy implementation
      - Baseline trend (BT)
      - Level change after the 30-Baht Policy implementation (LCAP)
      - Trend change after the 30-Baht Policy implementation (TCAP)
    - Types of payment mechanism of health insurance scheme
      - CAP:30B-GB
      - CAP:SSS
      - FFS
  - Dependent variable
    - Average charge of drugs prescribed per visit
    - Average number of drug items per visit for each diabetic patient

- Proportion of charge of non-ED drugs per charge of all drugs prescribed per visit in each month for diabetic outpatients in each health insurance scheme
- Proportion of visits of patients per month with specific originator drug items prescribed for diabetic outpatients in each health insurance scheme
  - Oral antidiabetic drugs: Thiazolidinedione
  - Antihypertensive drugs: Angiotensin II antagonists and combinations
  - Serum lipid reducing drugs: HMG CoA reductase inhibitors (statins)
  - Antithrombotic drugs: Platelet aggregation inhibitors
- Two dependent variables representing a burden of diabetic patient care were also included to link up with possible effects
  - Number of patients per month
  - Average number of visits per patient per month

– *Data analysis*:

- Segmented regression analysis was calculated to identify certain independent variables that influenced each dependent variable over time. The hospital management and policies on drug use along with perceptions and concerns of physicians, from Part I, were linked to explain the rationale behind differences in patterns and charges of drug use. The time series analyses of each independent variable were calculated with a monthly period of each point of time. An example series of each dependent and in dependent variables is shown in Appendix A. The multiple linear regression models were assumed in the analysis. The core model of regression variate and prediction equation to determine changes between before and after the 30-Baht Policy implementation for patients under each scheme were

Regression model:

$$\mathbf{Y_t = \beta_0 + \beta_1 * BT_t + \beta_2 * LCAP_t + \beta_3 * TCAP_t + e_t}$$

Y_t = dependent variable at month t

BT_t = baseline trend at month t; a variable of running number from the first to the last month of the studied data

$LCAP_t$ = level change after the Policy implementation at month t; a dummy variable of "0" for the monthly

period before and "1" for the after the policy implementation with an intent to explicate the immediate change of the dependent variable right after the policy implementation

$TCAP_t$ = trend change after the Policy implementation at month t; a variable of running number from the first month of the policy implementation to the last and "0" for the rest months before the policy implementation with an intent to explicate the immediate change of the dependent variable gradually after the policy implementation

β_0 = regression coefficient of level, intercept, of the dependent variable at the first point of time

β_1 = regression coefficient of baseline trend

β_2 = regression coefficient of level change after the policy implementation

β_3 = regression coefficient of trend change after the policy implementation

e_t = residuals or errors at month t that not explained by the regression equation

Prediction equation:

$$\hat{Y}_t = b_0 + b_1*BT_t + b_2*LCAP_t + b_3*TCAP_t$$

$\hat{Y}_t$ = estimated dependent variable from the regression model at month t

BT_t = baseline trend at month t; a variable of running number from the first to the last month of the studied data

$LCAP_t$ = level change after the Policy implementation at month t; a dummy variable of "0" for the monthly period before and "1" for the after the policy implementation with an intent to explicate the immediate change of the dependent variable right after the policy implementation

$TCAP_t$ = trend change after the Policy implementation at month t; a variable of running number from the first month of the policy implementation to the last and "0" for the rest months before the policy implementation with an intent to explicate the immediate change of the dependent variable gradually after the policy implementation

b_0 = estimated constant level, intercept, of the dependent variable at the first point of time

b_1 = estimated unstandardized regression coefficient of baseline trend calculated from data analyses

b_2 = estimated unstandardized regression coefficient of level change after the policy implementation calculated from the analyses

b_3 = estimated unstandardized regression coefficient of trend change after the policy implementation calculated from the analyses.

In order to expound a quantity of dependent variable changes relying on a change in one unit of the independent variable, unstandardized regression coefficients are able to determine it in the same unit of measure of the independent variable. However, units of each independent variable are normally different. For that reason, standardized regression coefficients are appropriate for direct comparisons of the magnitude of influence among the independent variables on the dependent variable in the same standard unit. The standardized regression model and prediction equation were described as follows:

Standardized regression model:

$$\mathbf{Y_t' = \beta_1'*BT_t' + \beta_2'*LCAP_t' + \beta_3'*TCAP_t' + e_t'}$$

Y_t' = standardized dependent variable at month t

BT_t' = standardized BT_t

$LCAP_t'$ = standardized $LCAP_t$

$TCAP_t'$ = standardized $TCAP_t$

β_1' = standardized regression coefficient of baseline trend

β_2' = standardized regression coefficient of level change after the policy implementation

β_3' = standardized regression coefficient of trend change after the policy implementation

e_t' = standardized residuals or errors that not explained by the standardized regression equation

Standardized prediction equation:

$$\mathbf{\hat{Y}_t' = beta_1*BT_t' + beta_2*LCAP_t' + beta_3*TCAP_t'}$$

$\hat{Y}_t'$ = estimated dependent variable from the regression model at month t

BT_t' = standardized BT_t

$LCAP_t'$ = standardized $LCAP_t$

$TCAP_t'$ = standardized $TCAP_t$

$beta_1$ = estimated standardized regression coefficient of baseline trend calculated from data analyses

$beta_2$ = estimated standardized regression coefficient of level change after the policy implementation calculated from the analyses

$beta_3$ = estimated standardized regression coefficient of trend change after the policy implementation calculated from the analyses.

Regarding comparisons of influence of payment mechanisms on each dependent variable, two dummy variables of fee-for-service-scheme (FFS) and capitation of Social Security Scheme (SSS) were added to the models and prediction equations mentioned above. The differences in the dependent variable relying on the variables of FFS or SSS were compared to the reference of government budget (GB) before the 30-Baht Policy implementation or of capitation of the 30-Baht Policy after the policy implementation.

Regression model:

$$\mathbf{Y_t = \beta_0 + \beta_1 * BT_t + \beta_2 * LCAP_t + \beta_3 * TCAP_t + \beta_4 * FFS + \beta_5 * SSS + e_t}$$

FFS = a dummy variable indicates fee-for-service payment mechanism with the value 1 for fee-for-service (FFS) patients and 0 for other patients

SSS = a dummy variable indicates capitation payment mechanism of Social Security Scheme (CAP:SSS) with the value 1 for Social Security patients and 0 for other patients

β_4 = regression coefficient of FFS variable

β_5 = regression coefficient of SSS variable

Prediction equation:

$$\mathbf{\hat{Y}_t = b_0 + b_1 * BT_t + b_2 * LCAP_t + b_3 * TCAP_t + b_4 * FFS + b_5 * SSS}$$

FFS = a dummy variable indicates fee-for-service payment mechanism with the value 1 for fee-for-service (FFS) patients and 0 for other patients

SSS = a dummy variable indicates capitation payment mechanism of Social Security Scheme (CAP:SSS) with the value 1 for Social Security patients and 0 for other patients

b_4 = estimated unstandardized regression coefficient of FFS variable calculated from data analyses

b_5 = estimated unstandardized regression coefficient of SSS variable calculated from data analyses

Standardized regression model:

$$\mathbf{Y_t' = \beta_1'*BT_t' + \beta_2'*LCAP_t' + \beta_3'*TCAP_t' + \beta_4'*FFS' + \beta_5'*SSS' + e_t'}$$

FFS = standardized FFS

SSS = standardized SSS

β_4' = standardized regression coefficient of FFS

β_5' = standardized regression coefficient SSS

Standardized prediction equation:

$$\mathbf{\hat{Y}_t' = beta_1*BT_t' + beta_2*LCAP_t' + beta_3*TCAP_t' + beta_4*FFS' + beta_5*SSS'}$$

FFS = standardized FFS

SSS = standardized SSS

$beta_4$ = estimated standardized regression coefficient of FFS calculated from the analyses

$beta_5$ = estimated standardized regression coefficient of SSS calculated from the analyses.

Note:

30B-GB = a reference dummy variable indicates government budget payment mechanism before the 30-Baht Policy implementation and capitation payment mechanism of the 30-Baht patients after the policy implementation with the value 0, so it is not present in the models or prediction equations

Concerning the model summary, four parameters were specified: 1) coefficient of determination (R^2), 2) adjusted coefficient of determination (Adj.R^2), 3) Durbin-Watson statistic, and 4) partial F-test for seasonal effects (DeLurgio, 1998 and Taesombut, 2006).

1. Coefficient of determination (R^2)

   This parameter specifies the over model fit with the value range of 0 to 1. The higher R^2 value indicates better explanatory power of the model resulted in greater prediction of the dependent variable. The low value of R^2 in this study may be related to the problems of non-linearity or the autocorrelation of the error terms of the model.

2. Adjusted coefficient of determination (Adj.R^2)

   This parameter represents an amended version of R^2 concerning number of independent variables in the regression model and the sample size. The interpretation of this parameter is likewise the R^2.

3. Durbin-Watson statistic (DW)

   This parameter indicates the autocorrelation of the error terms of the model. The equation for calculation of DW is as follows.

$$DW = \frac{\Sigma (e_t - e_{t-1})^2}{\Sigma e_t^2} \quad \text{at n, k'}$$

   e_t = the error term at time t

   e_{t-1} = the error term at time t-1

   n = number of observation

   k' = number of explanatory variables excluding the constant term

   The range of value of DW calculated is 0 to 4. The statistically significant DW value at $p<0.05$ indicates the autocorrelation.

4. Seasonal effects test

   Partial F-test is performed to determine the inclusion of seasonal variables in this study. The equation for calculation of partial F-test is as follows.

$$F = \frac{(SSE_U - SSE_R)/m}{SSE_U / (n-k)}$$

SSE_U = sum of squared errors with all variables in the relationship or unrestricted SSE (SSE with seasonal variables)

SSE_R = sum of square errors with m variables excluded from the relationship or restricted SSE (SSE without seasonal variables)

m = number of restricted independent variables

k = total number of estimated coefficients

The statistical significance of this partial F-test represents existing of the seasonal effect.

Part III *Medical record reviews*

- *Study design*: Two study designs were employed in this part of the study
  1) Cross-sectional study – for comparisons of patterns of diabetic care process among patients covered by health insurance schemes with different payment incentives in each year before and after the 30-Baht Policy implementation, 1999 and 2003 respectively
  2) Longitudinal, trend study with 2 points of time – for comparisons of patterns of diabetic care process provided to patients in each scheme before and after the 30-Baht Policy implementation
- *Objective*:
  1) To compare patterns of diabetic care process among patients covered by health insurance schemes with different payment incentive according to standard treatment guidelines
  2) To compare patterns of diabetic care process provided to patients in each scheme before and after the 30-Baht Policy implementation according to standard treatment guidelines
- *Source of data and data collection*: Medical records of the sample patients were reviewed for ordering of laboratory tests and physical examinations or print-out of the procedure results.
  1) *Unit of analysis*: Patient
  2) *Variable*:
     - Independent variable
       - Types of payment mechanism of health insurance scheme
         - CAP:30B-GB
         - CAP:SSS
         - FFS

- Year: 1999 for pre 30-Baht Policy implementation and 2003 for post 30-Baht Policy implementation

- Dependent variable
  - Percentage of patient who were prescribed HbA1C test at least once yearly for diabetes progression and effect of treatment monitoring
  - Percentage of patient who were prescribed lipid profile test at least once yearly, including total cholesterol, triglyceride, HDL-cholesterol, and LDL-cholesterol tests for co-morbidity monitoring
  - Percentage of patient who were prescribed serum creatinine test at least once yearly for nephropathy complication monitoring
  - Percentage of patient who were prescribed microalbuminuria test at least once yearly for nephropathy complication monitoring
  - Percentage of patient who were prescribed dilated eye examination at least once yearly for retinopathy complication monitoring
  - Percentage of patient who were prescribed foot examination at least once yearly for foot complication monitoring
  - Average percentage of visits with fasting plasma glucose (FPG) test per all diabetes visits of individual diabetic patient
  - Average percentage of visits with blood pressure (BP) measurement per all diabetes visits of individual diabetic patient

3) *Data analysis*: Yearly comparisons of the nominal dependent variables, for example, percentage of patients under different health insurance schemes who were prescribed HbA1C test at least once yearly were compared using Chi-square statistic to see differences of care process patterns among the schemes, except for the two continuous dependent variables of average percentage of visits with FPG test and BP measurement that using ANOVA statistic for comparisons.