

## CHAPTER 3

### RESEARCH METHODOLOGY



#### 3.1 Study Design

This study is retrospective study using the fiscal year 2000 at Pranangklaohospital as a case study. In this study, direct cost and indirect cost will be calculated from provider perspective in fiscal year 2000.

#### 3.2 Operational Definition

**Average cost :** Full costs divided by the number of units of service or patients.

**Casemix :**

Cases in a distinct patient population. Factors that determine case mix include; case type, number of cases, resources used per case, cost per unit of inputs.

**Cost center :** A unit or department in the hospital for which is assigned responsibility for costs.

**Direct cost :** Costs clearly and directly associated with the cost objective. They are generally under the control of the manager who has overall responsibility for the cost objective.

**Cost object (Patient services) :** Any particular item for which we wish to know the cost. It may be a specific patient, a class of patients, a service, a department, or an entire hospital.

**Full cost :** All costs of a cost object ( patient services ) , including both direct costs and an allocated fair share of indirect costs.

**Indirect cost :** Costs that are not directly associated with a cost objective.

**Opportunity costs :** A measure of cost based on the value of the alternatives that are given up in order to use the resource as the hospital has chosen.

**Diagnosis Related Group ( DRG ) :**

A patient classification scheme that provides a clinically meaningful way of relating the number and types of patients treated in a hospital to the resources required by the hospital.

**Length of stay ( LOS ) :**

The length of stay of a patient is calculated by subtracting the date that the patient is admitted from the date of separation. All leave days, including the day the patient went on leave are excluded from the calculation. A same day patient is allocated a length of stay of one day.

**Principal Diagnosis :**

It is the first diagnosis in a patient's record.

**Secondary Diagnosis :**

Any condition additional to the principal diagnosis which affects patient care by requiring clinical evaluation, therapeutic treatment, diagnostic procedures, extended length of stay, or increased nursing care or monitoring.

### 3.3 Cost Allocation Method

Four basic methods of cost allocation techniques are commonly used in cost analysis, These include:

Method 1 : the direct apportionment method

Method 2 : the step-down method

Method 3 : the double distribution method

Method 4 : algebraic or reciprocal method

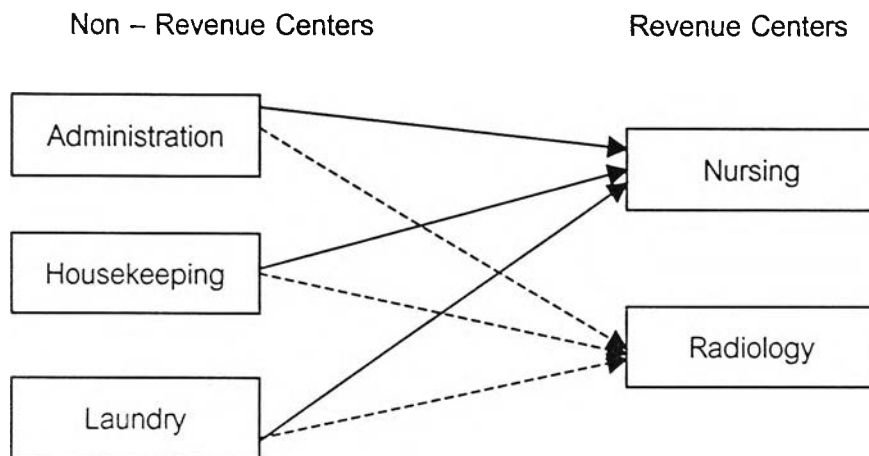
These four methods differ primarily in the manner which costs are allocated from non-revenue cost centers. They differ in terms of which flows are recognized as dominant.( Neumann and others, 1994 ) This study uses the step-down method for cost analysis.

#### 1. The direct apportionment method

In the direct allocation method, the costs of non-revenue are allocated directly to revenue cost centers or to patient services. This method ignores the fact that most non-revenue cost centers also provide services to other non-revenue cost centers as well as revenue centers.

Figure 3.1 illustrates the flow of cost allocations when using the direct allocation method. Costs of non-revenue cost centers are allocated directly to revenue cost centers. This method ignores all of the services provided by non-revenue cost centers to other non-revenue cost centers. The direct allocation method is the least accurate for all methods.

Figure 3.1 : Direct allocation method



## 2. The step-down method

This method compensates for one weaknesses in the direct apportionment method that non-revenue cost centers do provide services to other non-revenue cost centers.

The first step in this process that allocate the administration costs to all other centers that have received the administration services. After this has been done, the administration center is considered to be closed and no further costs allocated to it.

The second step, the process is to allocate the finance costs that now include a portion of administration costs as well to all the remaining centers such as laundry, pharmacy, radiology and patient services. After this allocation has been performed, the finance center is considered closed.

The third step, this step down example ( laundry ) is to allocate from the last remaining non-revenue cost center to the revenue centers ( pharmacy and patient services). At this point, all non-revenue centers are considered closed

since all costs have been now allocated to the revenue centers. Figure 3.2 illustrates the complexity of using the step-down allocation.

Figure 3.2 : Step down allocation method

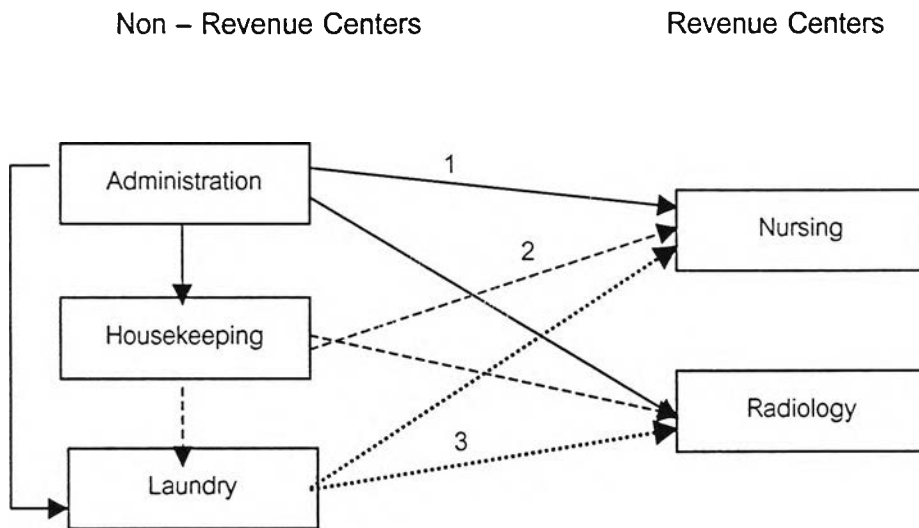


Table 3.1 : Flow the resources among indirect costs

Department	Administration	Cleaning	Pharmacy	Outpatient
Administration	.....	X	X	X
Housekeeping		.....	X	X
Pharmacy			.....	X
Outpatient				X

Note : X denotes flow of resources from non-revenue centers to revenue centers.

### 3. Double distribution method

The distribution method was planned to remedy one of major weakness of the step down method, which is the failure to consider all interrelationships between non-revenue centers. Centers are successively “closed” under the step down method, but in the double distribution method, each center remains “open” and costs can be reallocated to non revenue centers.

This method uses two allocations at which time all non-revenue centers are “closed”. The final allocation is made only to the revenue centers.

The first distribution, all direct and indirect costs of all centers are distribution to the receiving cost centers. Unlike the step down method, the double distribution method allows a backward flow of allocation among the non-revenue centers.

In the second distribution, the costs have been allocated to the non-revenue centers are redistributed to the revenue centers.

4. Algebraic or reciprocal method

This method involves the simultaneous solution of a series of equations. These equations are the mathematical representations of the interrelationships between all non-revenue centers. This result is in the most complete allocation of all costs however it is also the most complex and requires the aid of a computer.

In the algebraic method, it is necessary to state the relationships among the non-revenue centers with a matrix formula. Linear algebra may be used to solve for the total costs of each non-revenue center. The last step of the algebraic method is to allocate the costs from the non-revenue centers to the revenue centers.

Why the step down method analysis is selected for this study. The cost allocation methods analysis, the step down is not the most accurate method, however it is chosen for this study for the following reasons:

1. It is not complicated to do the calculation and does not require a computer program to calculate like the simultaneous equation method.

2. There is allocation from non-revenue cost centers to other non-revenue cost centers downward. This process clearly reveals the proportion of costs allocated from each non-revenue cost center to other non-revenue cost centers and revenue cost centers according to allocation criteria.

3. The result of step down cost analysis has minor differences from simultaneous equation method. ( Howard and Thomas P. 1979 )

### 3.4 Conceptual Framework

This study describes the components of the hospital structure of costs in fiscal year 2000 of Pranangklaio hospital.

Cost components in each center are labor costs, material costs and capital costs. Full costs consists of the direct and indirect costs. The departments are divided into "cost centers" according to the functions performed. Direct costs are those costs that apply to a single cost center. Indirect costs apply to more than one cost center. Each cost center can have both direct and indirect costs. Indirect costs come from cost allocation by using step down method. The unit cost of each patient service is derived by dividing full costs with number of patient services that are OPD visits and IPD days. The figure 3.3 will show all NRPC cost centers, some RPC cost centers and OPD and IPD as well as IPD with DRGs cost 5 common diseases in the next page.

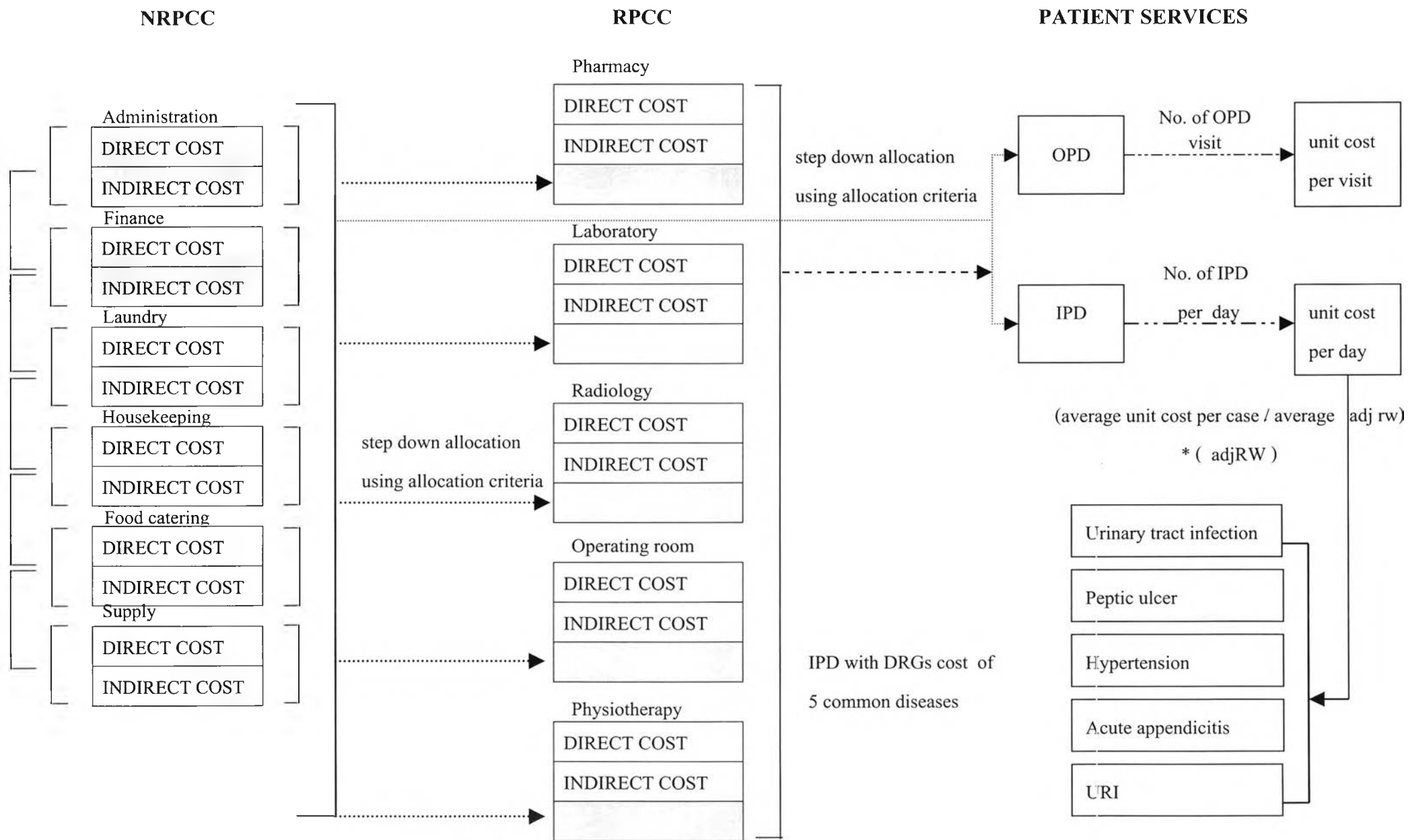


Figure 3.3 : Conceptual framework



### 3.5 Data Collection

Two types of data are used in the study:

#### 1. Primary data

Questionnaires were used to collect the data on labor time of health personnel such as doctors who spend for each cost center.

#### 2. Secondary data

Capital costs, material costs and some labor costs were derived from the hospital recorded documents and database in fiscal year 2000.

Table 3.2 : Data collection methods

Cost component	Unit	Type of data used	Instrument
Labor cost - Salary - Fringe benefits	bath / year	Primary data and secondary data	Questionnaire Record form from financial department
Material cost - Medical material - Non medical material - Supplies	baht / year	Secondary data	Record form
Capital cost - Medical equipments - Office equipments - Building	baht / per	Secondary data	Record form

## 3.6 Data Analysis

### 3.6.1 Cost classification:

3.6.1.1 Cost by activity: are costs reflected to activity ( Creese and Parker,1993). Total costs of health facility is the sum of the costs occur by departments of health facility. In order to calculate the share of each department, services or activity in the total costs of health facility, a distinction must be made between direct costs and indirect costs( Carrin and Elvo,1995).

- Direct cost : are those costs that are clearly and directly associated with the cost objective. They are generally under the control of the director who has overall responsibility for the cost objective.

- Indirect cost: are costs that are not directly associated with a cost objective.

### 3.6.1.2 Cost by inputs

- Capital costs

Capital costs are the costs of any resource, input or expenditure whose benefit last for more than one year ( Philips and others, 1993) such as cost of buildings, cost of major medical equipment .

For the capital costs calculation, an annualization or depreciation procedure is required to estimate the annual costs. The general steps are described as:

1. Obtained the current value of the capital item.

$$C_{2000} = C_t (1 + r)^{2000-t}$$

where;  $C_{2000}$  = current value of capital in year 2000

$C_t$  = purchase value of capital in year t

r = discount rate

t = the year of capital was bought

This study discount rate 7% is used to calculate the capital depreciated cost. (Bangkok bank, Bangkok) .

2. Used the expected years of useful life of the capital item according to estimate useful lives of depreciable hospital assets book.

The useful lives used in this study were 20 years for buildings and 5 years for equipment and vehicles. The equipment was older than useful lives that the value was zero.

3. Derive the annualization factor to use the annualization table to calculate or by using the annualization formula:

$$\text{Annualization formula } E = C / \{ 1 - (1 + r)^{-n} \} / r$$

Where; E = Equivalent annual cost

r = discount rate

n = useful life or life time of asset for depreciation

C = Current value

Each cost center does not use a whole building for area therefore the cost center share of building depreciation. It is computed as follows:

$$Dep_B = Dep_{BT} * ( Area_i / Area_B )$$

where;  $Dep_B$  = building depreciation cost for cost center i

$Dep_{BT}$  = total building depreciation cost

$Area_i$  = cost center area in building

$Area_B$  = total occupied area in building

Total capital depreciation cost that are equipment and building depreciation costs for each cost center can find as follows:

$$CC_i = Dep_E + Dep_B$$

where;  $CC_i$  = total capital depreciation costs for cost center i

$Dep_E$  = total equipment depreciation costs for cost center i

$Dep_B$  = total building depreciation costs for cost center i

- Recurrent costs

Recurrent costs are those costs that do not be used more than one year such as medicine costs. This study will divide the recurrent costs into 2 groups; ( 1 ) material cost and ( 2 ) labor cost.

### 3.6.1.3 Costs by cost center:

- Non- revenue producing cost centers ( NRPPCC)

Non-revenue producing cost centers are cost centers that does not charge directly for their services. They provide supportive services to both other non-revenue producing costs centers and revenue producing cost centers for example, housekeeping, administration and laundry etc. These cost centers do not produce revenue to the hospital. These cost centers are code " A ".

- Revenue producing cost centers ( RPCC )

Revenue producing cost centers are cost centers that are not only to provide services responsible but also generate revenue by those services to the hospital such as radiology, laboratory and physiotherapy etc. These cost centers are code " B ".

- Patient service ( PS )

Patient services are the cost centers that are responsible directly for patient services. It is separated into 2 parts that are outpatient and inpatient. These cost centers are code " C ".

In the table 3.3 is shown all cost centers that are NRPC, RPCC and PS in the below.

Table 3.3 : Cost centers

Code	Department	Code	Department
A 1	Administration	C 9	Dental
A 2	Finance	C 10	Medical ward
A 3	Laundry	C 11	Pediatrics ward
A 4	Housekeeping	C 12	Surgical ward
A 5	Food catering	C 13	Obs/Gyn ward
A 6	Supply	C 14	Surgical ICU
B 1	Operating room	C 15	Medical ICU
B 2	Anesthesiology	C 16	EENT ward
B 3	Laboratory	C 17	Monk ward
B 4	Radiology	C 18	Orthopedic ward
B 5	Pharmacy	C19	Medical private ward
B6	Physiotherapy	C20	Pediatrics private ward
C 1	Emergency room	C21	Surgical private ward
C 2	OPD medicine	C22	Obs- Gyn private ward
C 3	OPD surgery		
C 4	OPD orthopedics		
C 5	OPD obstetrics- gyn		
C 6	OPD pediatrics		
C 7	OPD ENT		
C 8	OPD ophthalmology		

## Cost allocation criteria

The criterion upon which an allocation is made, is showed in the table below.

Table 3.4 : Cost allocation criteria

Cost Center	Allocation criteria
▪ NRPCC	
Administration	Number of personnel
Finance	Number of personnel
Laundry	Weight kilos of laundry
Housekeeping	Square feet of area occupied
Food catering	Meals served to patients
Supply	Proportion of material supplies
▪ RPCC	
Operating Room	surgical cases
Anesthesiology	anesthesia cases
Pharmacy	number of prescriptions
Laboratory	number of tests
Radiology	number of x-ray services
Physiotherapy	number of cases
▪ PS	
OPD	number of visits
IPD	number of admission days

The NRPCC, RPCC criteria of cost allocation are shown in appendix.

### 3.6.2 Sensitivity Analysis

Sensitivity analysis is performed in various scenarios under the assumption "what - if ". Only a single item is changed from its baseline value while hold all other input parameters fixed. Sensitivity is analyzed for the following input parameter scenarios:

- I. Changing discount rate from 7% to 10%

There is only discount rate to be changed that all other input variables remain stable at baseline values.

- II. Increasing and decreasing civil servant labor cost by 10%