CHAPTER 3

RESEARCH METHODOLOGY

3.1 Research Questions and Objectives

3.1.1 Research Questions

3.1.1.1 Primary Research Question

How much is the unit cost of DRG for appendectomy of King Chulalongkorn Memorial Hospital, during October 1, 2000 to March 31, 2001?

3.1.1.2 Secondary Research Question

- How much is the unit cost of DRG for appendectomy of male patient of King Chulalongkorn Memorial Hospital?

- How much is the unit cost of DRG for appendectomy of female patient of King Chulalongkorn Memorial Hospital?

- How much is the average medical care cost of appendectomy of King Chulalongkorn Memorial Hospital?

- What is the mode of length of stay of appendectomy of King Chulalongkorn Memorial Hospital?

- What is the average operation duration of appendectomy of King Chulalongkorn Memorial Hospital?

3.1.2 Research Objectives

3.1.2.1 General Objectives

To determine the result of unit cost of the DRG for appendectomy of King Chulalongkorn Memorial Hospital, during October 1, 2000 to March 31, 2001.

3.1.2.2 Specific Objectives

- To determine the average medical care cost of appendectomy of King Chulalongkorn Memorial Hospital.

- To determine the average length of stay of appendectomy of King Chulalongkorn Memorial Hospital.

- To determine the average operation duration of appendectomy of King Chulalongkorn Memorial Hospital.

3.2 Conceptual Framework

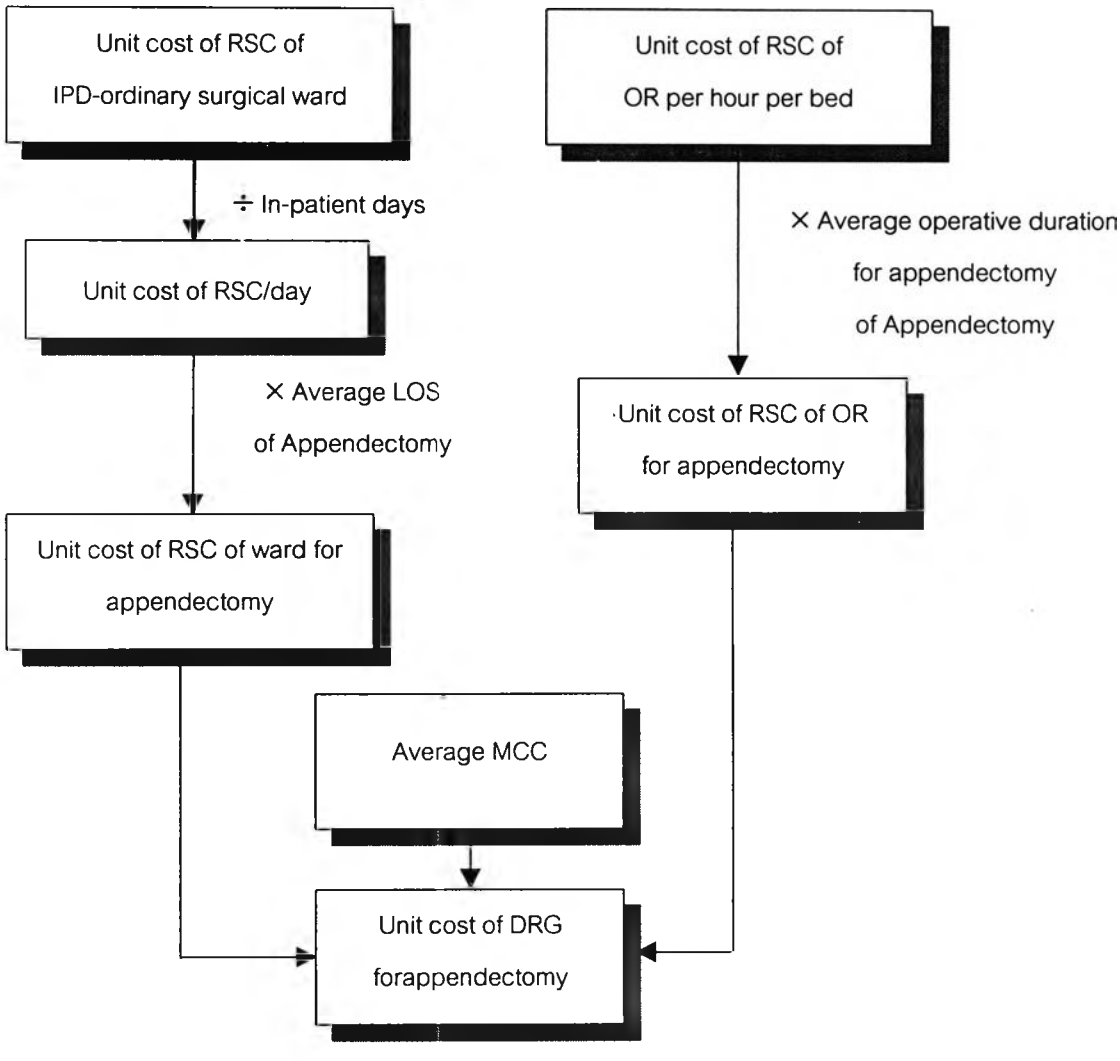


Figure 2: Conceptual Framework

3.3 Scope of This Study

This study was a descriptive study to determine the unit cost of Diagnosis Related Group (DRG) for Appendectomy of King Chulalongkorn Memorial Hospital during October 1, 2000 to March 31, 2001. The patients who received the treatment with Appendectomy in King Chulalongkorn Memorial Hospital during October 1, 2000 to March 31, 2001 were the target population.

3.4 Assumptions

1. The study regarded only for hospital tangible cost. It had no regard for hospital intangible cost and patient perspective.

2. This study asked the permission from King Chulalongkorn Memorial Hospital to utilized some results of the study **"Cost Analysis of Patients Services at King Chulalongkorn Memorial Hospital"** to represented some costs information for this study. It was studied by Pirom Kamolratanakul, Jiruth Sriratanaban, Sureetat Ngamkietphaisan, the duration of the study was from May, 2000- June, 2001.

3. According to the study **"Cost Analysis of Patients Services at King Chulalongkorn Memorial Hospital"**, all materials, drugs and Intravenous fluid that each department requested by using the requisition forms were computed in material cost of the direct cost of the average RSC calculation (Figure 3).

Since the average RSC were already used for the calculation by this study and actually, the appendectomy is a common surgery that generally do not have to use materials much more than the others common surgery, therefore the cost of materials were not mentioned to be calculated again in this study (Figure5).

Similarly to the medicines and materials used by the anesthetists, as they were requested by using the requisition forms of the anesthesiology department so their costs were combined in material cost of the full cost calculation of the anesthesiology department. By the cost analysis method of the mentioned study, the anesthesiology department was gathered in non- revenue producing cost center

(NRPCC) and eventually, its full cost was allocated to each operating room by the allocation ratio to receive the unit cost of RSC of each operating room. For this study, the unit cost of RSC of the emergency operating room was already used for the calculation, therefore the cost of medicines and materials used by the anesthetists were not mentioned again in medical care cost calculation of this study (Fgure3 and 5).

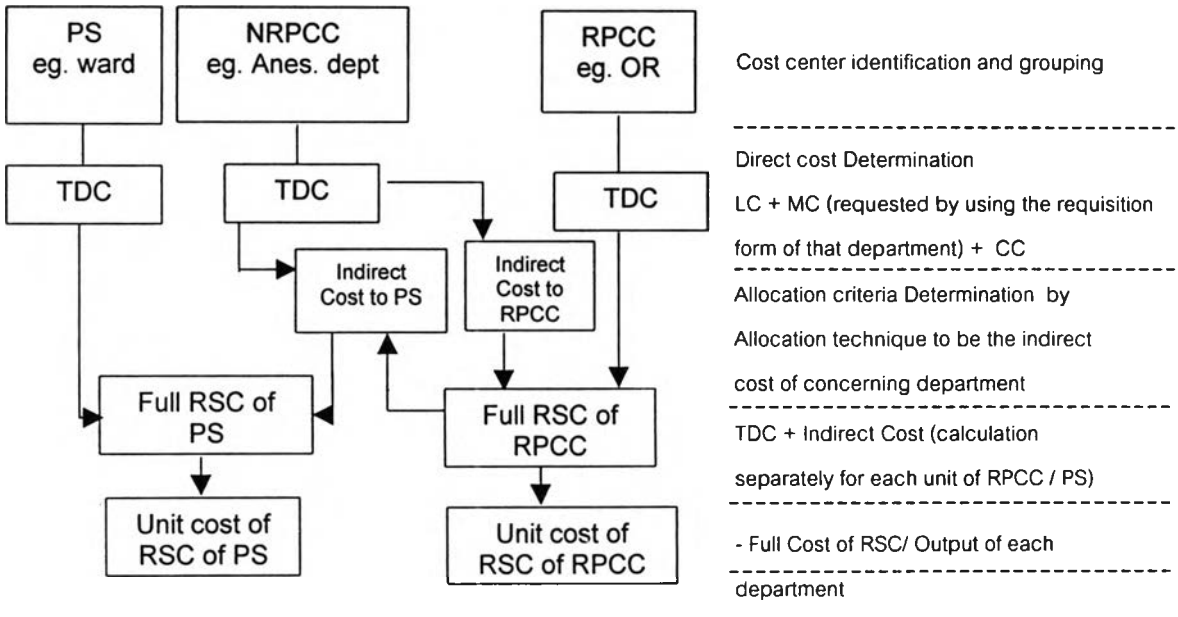


Figure 3: Calculation of the unit cost of RSC of the study "Cost Analysis of Patients Services at King Chulalongkorn Memorial Hospital"

4. Since the most appendicitis patients were operated at the emergency operating room therefore this study used the cost of the emergency operating room (Phor Por Ror 5) for the calculation in the part of operating cost.

5. This study would like the results to be applicable for the majority appendicitis patients so the RSC of the ward used for the calculation came from the ordinary surgical wards (Athorn 1, Panchamarachinee 1). The cost of the medicines used for the calculation most belonged to the local production. The study only used the

cost of the original production when the local medicines were not available in the medicine list of the hospital.

3.5 Keywords

Diagnosis Related Group (DRG), unit cost, Appendectomy,

3.6 Operation Definition

1. Cost: Total expenditure spends to achieve something

2. Cost center: A unit of analysis, in which costs are incurred, it is assigned responsibility for costs. The follows are three cost centers have been settled in this study.

- Non-Revenue Producing Cost Center (NRPCC): A cost center which is responsible for administration and supports the working of other departments but so not make revenue or charge the cost directly to the patient. Its cost must be allocated to revenue centers to be included in the organization's rates.

- Revenue Producing Cost Center (RPCC): A cost center which provides services to patient and make revenue by charging directly to the patient, e.g., x-rays, laboratory.

- Patient Service (PS): A cost center that provides medical care and service directly to the patient. PS for this study are OPD and IPD.

3. Total direct cost (TDC): Cost incurred within each cost center, it is the sum of CC, MC and LC.

- Labor cost (LC): LC is all expenditures spend for personnel's working such as salaries, wages and fringe benefits.

- Capital cost (CC): CC is the depreciation cost of buildings and major movable equipment.

- Material cost (MC): MC is the cost of all materials that all departments request in requisition form [4].

4. Indirect cost: The cost that PS is allocated by NRPCC and RPCC.

5. Full routine service cost: The sum of total direct cost and indirect cost that is allocated by other cost center (NRPCC and RPCC).

6. Cost allocation criteria: The criteria to allocate cost from NRPCC and RPCC to PS.

7. Cost allocation technique: The technique of assigning cost from NRPCC and RPCC to PS.

8. Unit cost of routine service cost : The full cost of PS divided by its relevant output. For this study, it is a cost per hospitalization day.

9. Diagnosis Related Group (DRG): A patient classification scheme that provides a mean of relation the type of patients a hospital treats to the costs incurred by the hospital.

10. Medical care cost (MCC): The expenditures by the hospital that are direct medical supplies, labs, x-rays, investigation, some routine treatments and physical therapy to individual patients, which are classified by DRGs.

11. Overhead cost: Indirect cost allocated to a unit or department from elsewhere in the organization.

3.7 Research Design

This is a descriptive study to manifest the unit cost of DRG for Appendectomy of King Chulalongkorn Memorial Hospital by using the retrospective method.

3.8 The Samples

3.8.1 Target Population

Patients were aged more than 17 years (a criterion of DRGs grouper) who were diagnosed to have acute appendicitis and received appendectomy in King Chulalongkorn Memorial Hospital.

3.8.2 Sample Population

Patients over the age of 17 years (a criterion of DRGs grouper) who were diagnosed to have acute appendicitis and received appendectomy during October 1, 2000 to March 31, 2001 in King Chulalongkorn Memorial Hospital. All had to be sampled by the simple random sampling (probability sampling) technique and meet the eligibility criteria.

3.8.2.1 Inclusion Criteria

Patients over the age of 17 years who were diagnosed to have acute appendicitis and received the appendectomy,

3.8.2.2 Exclusion Criteria

Patients with any of the following characteristics will be excluded from the study:

A. Anti HIV result positive
B. Underlying any serious and chronic disease
C. Got more than one surgery
D. Post operative infection
E. Had been referred to other hospital
F. Had any complication during the admission
G. Were diagnosed ruptured appendicitis
H. Died during the admission
I. Under the second diagnosis of peritonitis
J. Pregnancy
K. Poor condition on the discharging date

3.8.2.3 Reason for Selection of the Sample Population

1. All exclusion criteria influence on the cost obviously.

2. The patients who had any characteristic as anyone of the exclusion criteria will meet the requirements of other DRGs groupers that are not analyzed by this study.

3.8.3 Sample Size Estimation

The following formulas are used for calculating sample size

$$n = \left[(Z^2_{1-\alpha/2})\, \pi(1-\pi) \right] / e^2$$

n = The necessary sample size

α = 1%

$Z^2_{1-\alpha/2}$ = 2.58

e = 0.05

π = The proportion: This study used the proportion of the number of the patients who got appendectomy (= 774 cases) with all patients who got the major surgical treatment in 1999(=16,506 cases). The statistic was recorded by the Registration Department of King of Chulalongkorn Memorial Hospital.

$$n = (2.58)^2 \left[(774 / 16506)(1 - (774/16506)) \right] / (0.05)^2$$

= 120 cases

The sample size of this study is 120 cases

3.8.4 Sampling Technique

The samples were selected by the method of simple random sampling (probability sampling) to prevent the selection bias as no one member of the population had any more chance of being chosen than any other members.

The Steps of Sampling Method

1. The list of all patients who received the appendectomy during October1, 2000 to March31, 2001 was defined by using the statistical record of the Registration Department.

2. Performed the blindly selection of the sample by placing each patient's hospital number on a slip then blindly drew samples equally to the sample size.

3. Examined all records of blindly selected patients, any records which did not fulfill the eligibility criteria has to be excluded.

4. Performed the blindly selection again to replaced the cases that were excluded.

5. Performed step 4 then 5 again and again, until all members fulfilled the eligibility criteria.

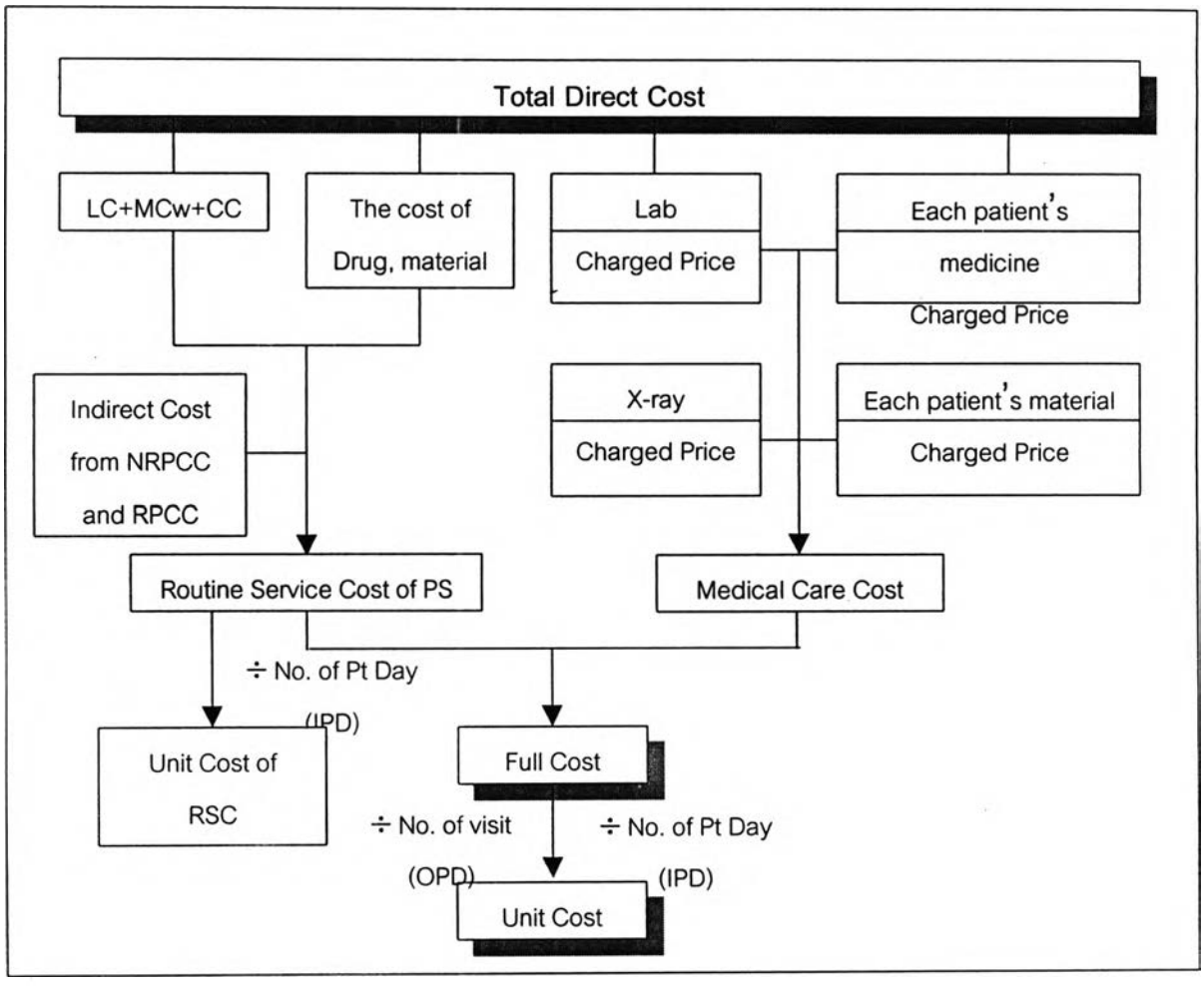
3.9 Data Collection

Data preparation

- Asked the permission from King Chulalongkorn Memorial Hospital ;

- To collected data concerning the medical care costs from In-patient history records of the samples.

- To participated and observed some parts of the study **"Cost Analysis of Patients Services at King Chulalongkorn Memorial Hospital"** (Figure 4) to perceive its design, methodology and analysis and to collect some information needed for this study.



LC	= Labor cost	X-ray	= X-ray
CC	= Capital Cost	IPD	= Inpatient Department
RSC	= Routine Service Cost	OPD	= Outpatient Department
Pt.	= Patient	LAB	= Laboratories

NRPCC =Non Revenue Producing Cost Center

RPCC =Revenue Producing Cost Center

PS = Patient Service center (OPD, IPD)

MCw = Ward Material Cost (The materials that each department requested by using the requisition form)

Figure 4: Conceptual Framework of "Cost Analysis of Patients Services at King Chulalongkorn Memorial Hospital" to determine the unit cost of OPD and IPD of the study

- Defined the unit concerning with this study

(1) IPD-Ordinary surgical wards

- Arthorn 1(AT1): IPD-ordinary female surgical unit
- Panchamarachinee 1 (PM1): IPD-ordinary male surgical unit

(2) Emergency operating room

- Phor Por Ror 5(PH.P.R 5): the emergency operating room

- Collected the results of the study **"Cost Analysis of Patients Services at King Chulalongkorn Memorial Hospital"** to represent some data for this study. The results were collected as the below;

Table 1: Information concerning the RSC of IPD-ordinary surgical wards

Ward	The total patient days (days)	The RSC	
		Full cost (baht)	Unit cost per day (baht)
AT 1	3,667	10,476,548	2,856.98
PM 1	3,450	10,921,007	3,165.51

Table 2: Information concerning the RSC of emergency OR

The emergency OR	The total operating beds	The total operating hour (hours)	The RSC	
			Full cost (baht)	Unit cost per hour per bed (baht)
PH.P.R. 5	6	900	4,560,429	5,067.14

Table 3: **Information concerning allocation ratio from emergency OR to IPD-ordinary surgical wards**

Allocate to	Allocation ratio
AT1	0.00739
PM1	0.01293

- Collected the data from each in-patient history record of the samples. The data collections were composed of sex, age, underlying disease, comorbidities, investigations and results, drugs and materials used, pre and post operative diagnosis, operative method, operative finding, duration of operation, anesthetic method, length of stay, discharge status and diagnosis, post operative complication, referring.

- Interviewed a technician staff of Clinical Pathology Department for the unit cost of material per time of appendicial pathology since it was not studied by the mentioned cost analysis study. He stated that the department had been studied in the early of last year and the result was about 100 baht per time.

3.10 Data Analysis

According to the study **"Cost Analysis of Patients Services at King Chulalongkorn Memorail Hospital"**, the operating rooms were gathered in revenue producing cost center since their services make the revenue for the hospital by charging a fee from the patients. And then, their full costs were allocated by the allocation ratio to be a part of the indirect cost of each OPD and IPD (patient service (PS) center) (Figure3).

In accordance with the conceptual framework of this study (Figure 2), the unit costs of RSC of emergency OR (PH.P.R.5) and IPD-surgical wards (AT1, PM1) are needed to compute separately to bring about the unit cost of appendectomy. Therefore the full cost of RSC of AT1 and PM1 should not have any allocation from OR. PH.P.R. 5 to prevent the repeated calculation. As the full costs of RSC of AT1 and PM1 were brought from the mentioned study, hence the allocation values from OR PH.P.R. 5 to

AT1, PM1 were deducted from the full costs of AT1 and PM1 before using them for the calculation.

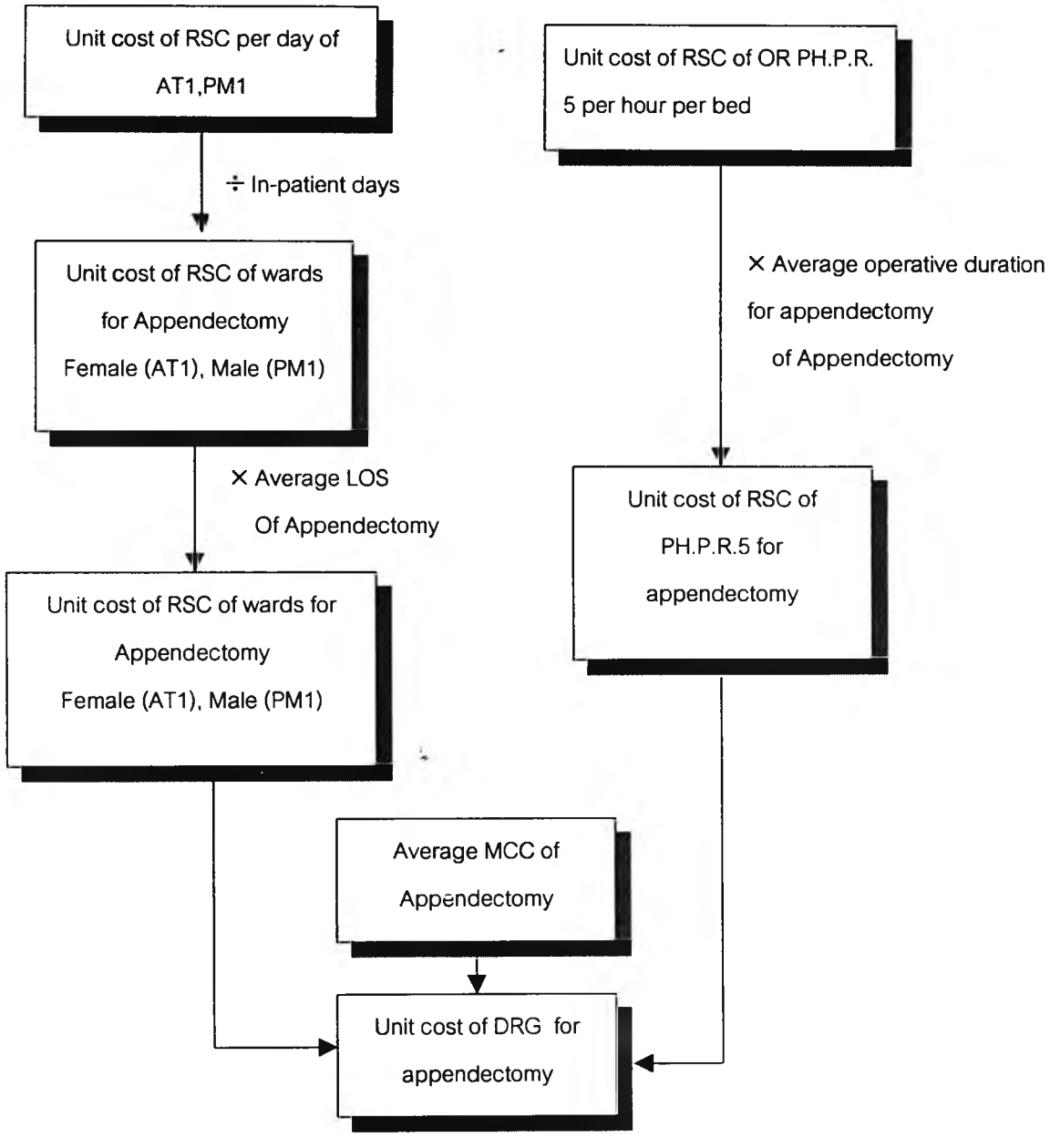


Figure 5: How to determine the unit cost of DRG for appendectomy

3.11 Limitations

1. According to King Chulalongkorn Memorial Hospital is a teaching hospital, the results of the study are supposed to contain the cost of the teaching and training procedure.

2. This study would like the results to be applicable for the general appendicitis patients therefore the results can not be applied for the problem cases.