

## CHAPTER IV

### MENTAL HEALTH CARE COST

This chapter presents an overview of service care costs calculating by traditional method (TM) and activity based costing method (ABC). It composed of background, methods and materials, results, and summary of mental health service care costs.

#### 1. Background of Thai mental health costing study

Mental health care cost in this study was an amount of resource use in mental health services in the two psychiatric hospitals. Cost is one of the most important dependent variables in the grouping methodology of casemix classification systems. Accurate service costing is necessary in construction model even though cost is not easily calculated.

Previous studies in relation to mental health care cost in Thailand (Phuaphanprasert, et al, 2003); (Silapakit, 2003, pp. 132-44); (Siriwanarangsarn, et al, 2001), have their own different conceptual frameworks and methodologies. All of them used traditional method (TM), which mainly allocates costs by number of services. By this technique, some costs cannot be known e.g., psychotherapy, electroconvulsive therapy. Additionally, TM always gives higher or lower costs than actual number and also gives less accuracy than activity based costing (ABC) method (Hansen & Mowen, 2006. pp. 67-148); (Blocher, Chen & Lin, 2002. pp. 98-152); (Thumanon, 2001). The unknown costs above cannot support the improvement of budget allocation system. Difficulty in data collection and quantitative skills for allocating appropriate resources to psychiatric services make lack of mental health care cost information (Lee et al., 1998). Hospital charges with cost-charge ratio have been frequently used to replace actual cost (Buckingham et al., 2003); (Phuaphanprasert et al., 2003), such as the calibration

of Thai-DRG system. For example, the cost-charge ratio of 2 means that the care cost is 16,000 baht while the charge is 8,000 baht (Siriwanarangsarn et al., 2001); (Chattananont et al., 2001). To overcome weakness mentioned above, mental health care cost in this study needed to get more accurate costing data for constructing a casemix classification model. This chapter presents the mental health cost study models of two public psychiatric hospitals. The cost data in this chapter were further used in constructing and comparing the casemix classification model in the chapters VII-VIII.

## 2. Methods and materials of costing study

### 2.1 Study designs

The cost study was a cross sectional study under the hospital's or service provider's prospective. The study was approved by the Human Research Ethics Committee of Naresuan University. The costing study was conducted from September 2004 to April 2005 and all costs were reported in Thai Baht.

### 2.2 Subjects and sites

The study examined patient data from two adult psychiatric hospitals under Thai mental health department. They were selected because they had good clinical and financial databases, and both hospital top management and operational teams were willing to participate. Suanprung and Nakhon Ratchasima were two of four hospitals that initially passed the study inclusion criteria, however preparation process, the other two hospitals dropped out.

These two hospitals had similar organizational structure composing of 4 major activities: administration, patient service (outpatient, inpatient, and patient in community), drug addict, and research and development. However, it was found that this hospital organizational structure did not support cost study. Therefore, both hospitals reclassified their structures to assist cost identification e.g. excluding non-hospital productive expenses, adding hospital productive expenses, adding additional details of number and service type, changing accounting system from cash basis to accrual basis, etc.

### 2.3 Sources of data

Data for analysis came from 3 sources. The first was the cross-sectional study of inpatients. Input care costs during study period were collected alongside with the mental health status level measured by the Thai Health of the Nation Outcome Scale (T-HoNOS). Clinicians recorded diagnosis, while nurses recorded clinical symptom and functional status scales.

The second source of data was the inpatient treatment file (ITF), a discharge abstract of all completed episodes of inpatient care in Suanprung and Nakhon Ratchasima psychiatric hospitals. From the ITF, patients with complete inpatient diagnosis were included in the analysis.

The third source of data was the cost accounting from the account report. This was used to calculate unit cost for inpatient health services.

### 2.4 Data collection

Various record forms were designed to collect service and accounting data. Accounting data were collected to cover the total direct cost (TDC) of hospital, especially inpatient service cost. Service care data were focusing on service frequency, time consumed by each activity, and operating staff who provide the service.

### 2.5 Statistical technique

Analyses were conducted on cost data to calculate the cost of care for inpatient and to analyze the cost behaviour. First, all inpatient service costs were calculated. Total annual health care costs were determined for individual outputs. Cost data were computed and analyzed using descriptive statistics, such as frequency, percentage, mean, and standard deviation.

## 3. Cost calculation methods

This chapter offers two methodologies for the cost calculated, traditional method (TM) and activity based costing (ABC) method.

### 3.1 Traditional method (TM)

The TM approach is mainly designed using the top-down allocation principle. All costs introduced in the model were totally allocated to the products. The major cost driver of the model was defined by how much time is spent per individual officer for each activity and per specific service. By equaling the total consumed time to 100% and by using percentage of this total time as the cost driver, the top-down approach was introduced at this level. However, the major advantage of such a combined top-down and bottom-up approach lies in the correction of the costs for productivity. Because semi-fixed costs remain constant over a certain range, irrespective of the degree of resource use, a pure bottom-up calculation would result in an overestimation of the costs in the former situation and an underestimation in the latter (because the unused resources would not have been allocated). The use of a mixed top-down and bottom-up model is the major difference between this study calculation system and some other Thai psychiatric unit cost studies, in which the calculation of the service costs, on the basis of department consumption, was solely performed using the top-down principle (Phuaphanprasert et al., 2003); (Department of Defense, 2002); (Tumanon, 2001).

### 3.2 Activity based costing (ABC) method

The ABC method used a mixed top-down and bottom-up approach in the allocation of the semi-fixed costs (i.e., costs that vary stepwise with the number of patients) of labor, material, equipment and space costs. A top-down approach divided the total costs of the overall products. Because the total costs are known and remain constant, the cost of a product is inversely related to the production volume. In a bottom-up approach, conversely, the cost of each final product is calculated on the basis of the activities used. Because the actually delivered production volume, however is not necessarily to the expected one, this might result in higher total department costs than expected. In other words, with unit cost based on the expected production volume, do not necessarily coincide with the actual total department input costs (Hansen et al., 2006, pp. 67-148); (Blocher et al., 2002, pp. 98-152); (Thumanon, 2001).

The steps in studying both TM and ABC have a few different procedures. Process of costing study both methods in this study had 7 steps as summarized in Figures 9 -10.

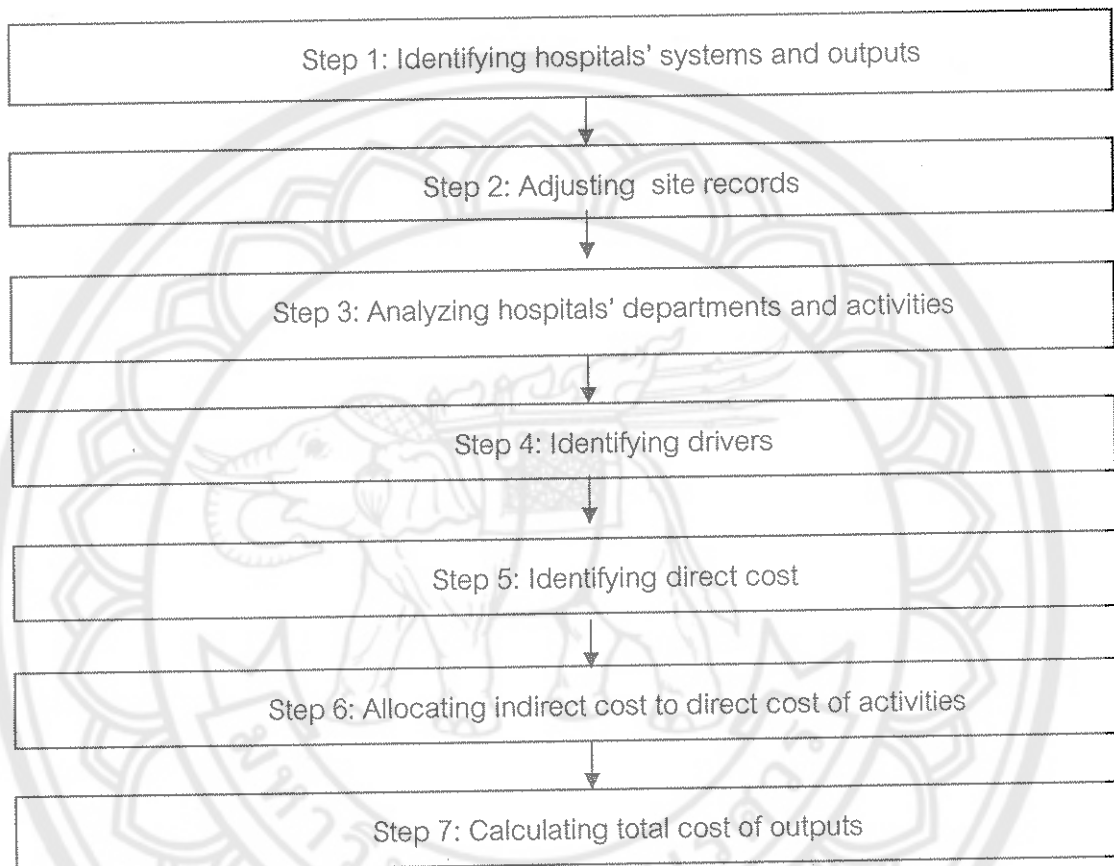


Figure 9 Cost calculation methodology by TM method

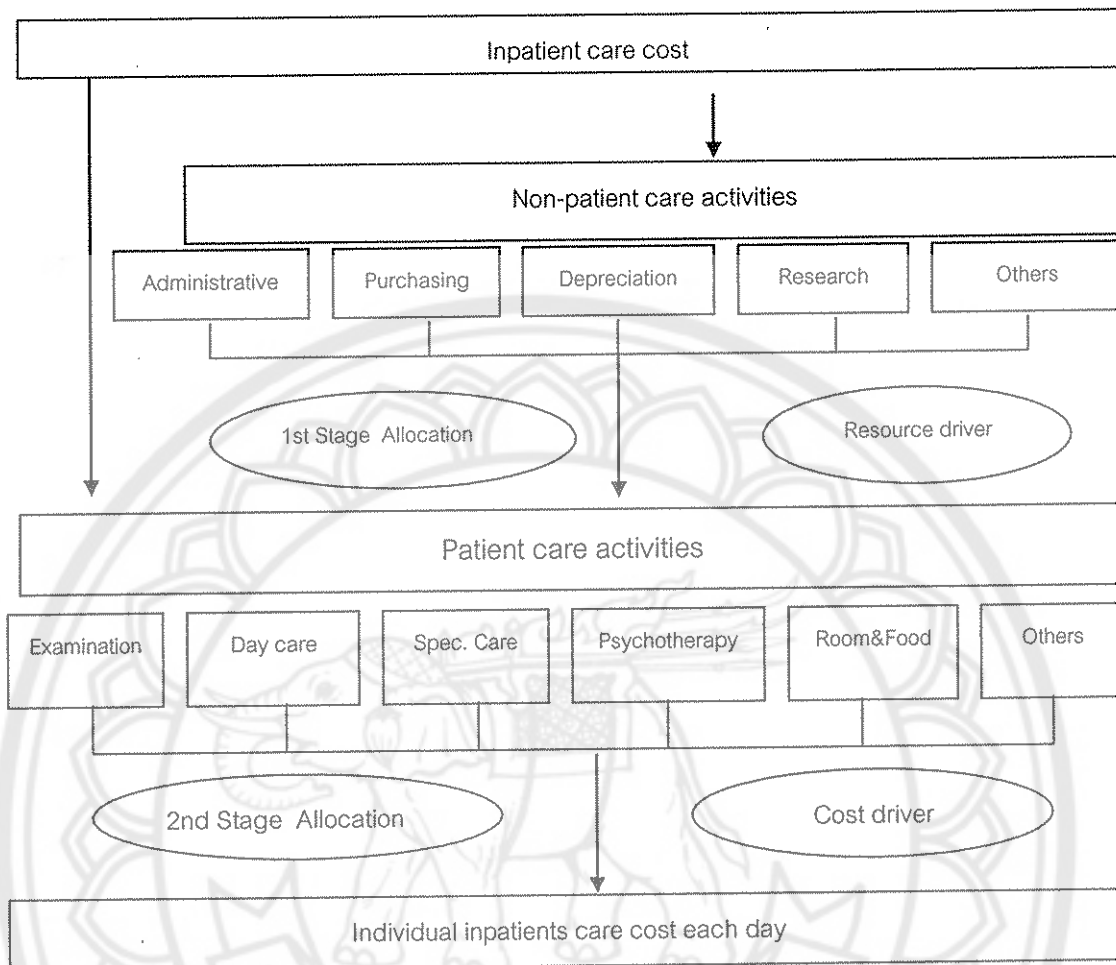


Figure 10 Cost calculation methodology by ABC method

### Step 1: Identifying hospitals' systems and outputs

This step explored and analyzed hospitals' structure and their management system by documentary review and staff interview. Additionally, hospitals' outputs were patient service and non-patient service given by hospitals, especially inpatient services. It identifies all services that associated with parts of production process, and how these services are linked to the consumption of resources and the generation of revenues. The finalized product or service were cost per unit e.g. cost per day, cost per case, cost per each activity, and cost per diagnosis subclass.

### **Step 2: Adjusting site records**

The two psychiatric hospitals operated under the Mental Health Department for the same objectives and target groups. However, they had a few differences so small adjustments were needed before data collection. Their services expenditure records were adjusted to ensure that the costs matched activity. Hospitals with cash basis accounting data had to adjust their accounting system into accrual basis before taking data collection. Adjustments were made to correct misalignments between time reported by staff and salary and wage-related costs at the cost center levels.

### **Step 3: Analyzing hospitals' departments and activities**

The cost of the subjects encompasses all department costs and activity costs e.g. an electro convulsive, a psychotherapy activity, a group therapy, occupational therapy. Cost centers and cost activities were analyzed and identified by reviewing literatures, flow charts of hospitals transactions, and interviewing hospitals' staffs. Then, the study initialize model, adjust, and finally get products, cost centers, and activities which are accepted by all participants. The detail of departments and activities analyzed are described as below.

By TM method, all departments were analyzed into four major cost centers; non-revenue producing cost center (NRPCC), revenue producing cost center (RPCC), patient service (PS), and non-patient service (NPS) as seen below and in Figure 10.

1. Non-Revenue Producing Cost Center (NRPCC) was defined as cost centers involving in management or supporting other cost centers. These cost centers would not directly charge patients for their services.
2. Revenue Producing Cost Center (RPCC) was defined as cost centers that could directly charge patients for their services.
3. Patient Service (PS) was defined as cost centers that patients were receiving hospital services.
4. Non-Patient Service (NPS) was defined as cost centers that were not directly involved with patient service.

By ABC method, all activities were analyzed into three major activities: inpatient treatment related activities (ITRA), non inpatient treatment related activities (NITRA), and support activities (SA).

1. Inpatient Treatment Related Activities (ITRA): ITRA means service activities given to potential patients at inpatient department. All inpatient service activities will be analyzed, reviewed, and classified in accordance with International Classification of Diseases 9<sup>th</sup> Revision Clinical Modification (ICD 9CM). Seventeen ITRA were defined and aggregated in the process of delivering service care to inpatients.

2. Non inpatient-treatment related activities (NITRA): NITRA means service activities which is non-related to inpatient department. Thirteen NITRA are defined and aggregated (D01-D13).

3. Support activities (SA): SA means hospital activities that are not related to hospital outputs or services, which can be subcategorized into 2 groups: hospital supporting activities (H-SA) and department supporting activities (D-SA).

3.1 Hospital-supporting activities (H-SA): were activities performed in many or all other departments in the hospital. Following the practice in the basis of the psychiatric hospital, the model allocated part of these global hospital overhead costs to the inpatient department on the basis of the number of full time equivalences (FTEs) and number of square meters of space.

3.2 Department-Supporting Activities (D-SA): They were activities performed by personal involving the psychiatric department specific to the department but not product specific. Additionally, they were further subdivided into care-related department supporting activities (CRD-SA) and non care-related department supporting activities (NCRD-SA).



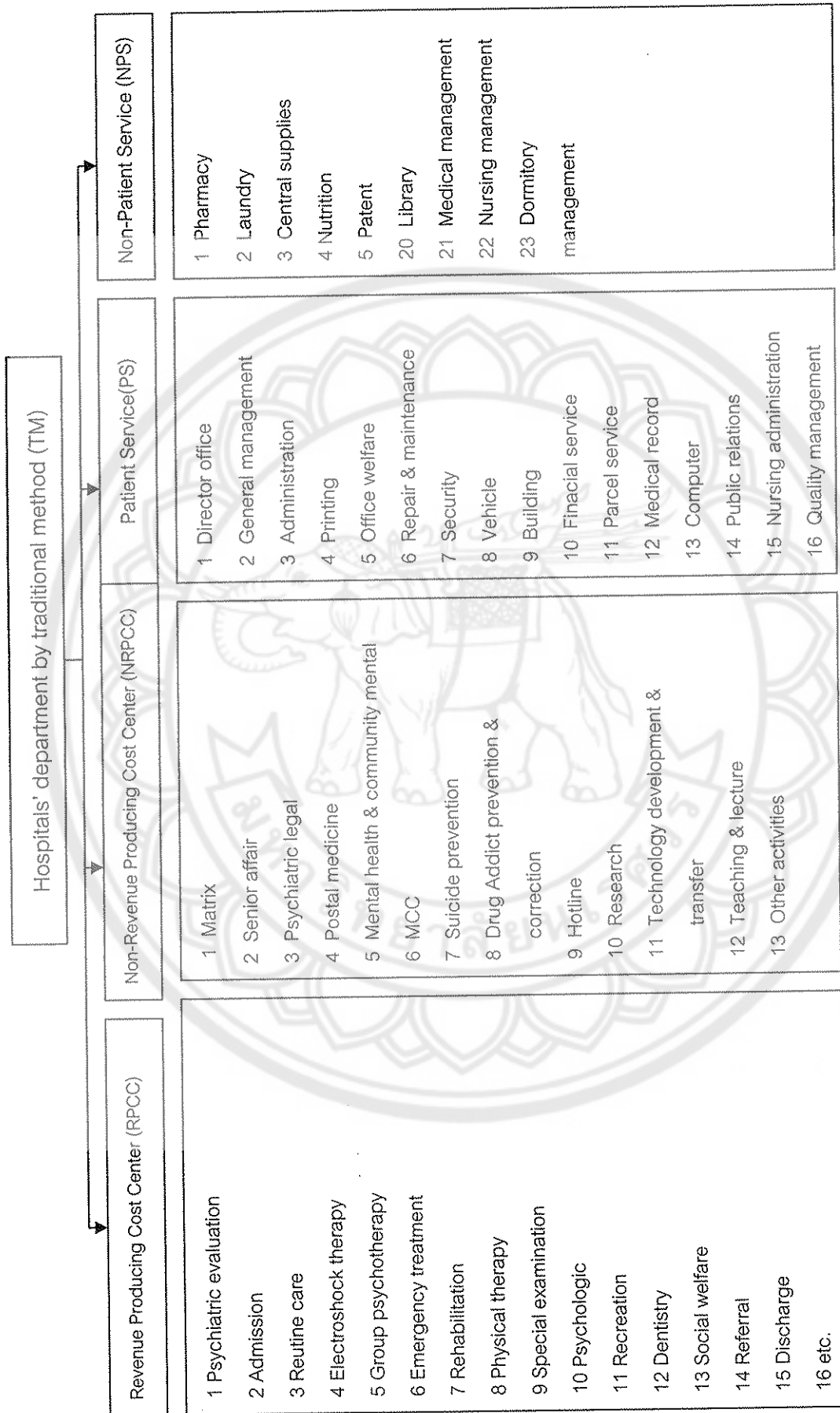


Figure 11 Category of hospitals' department by traditional method (TM)

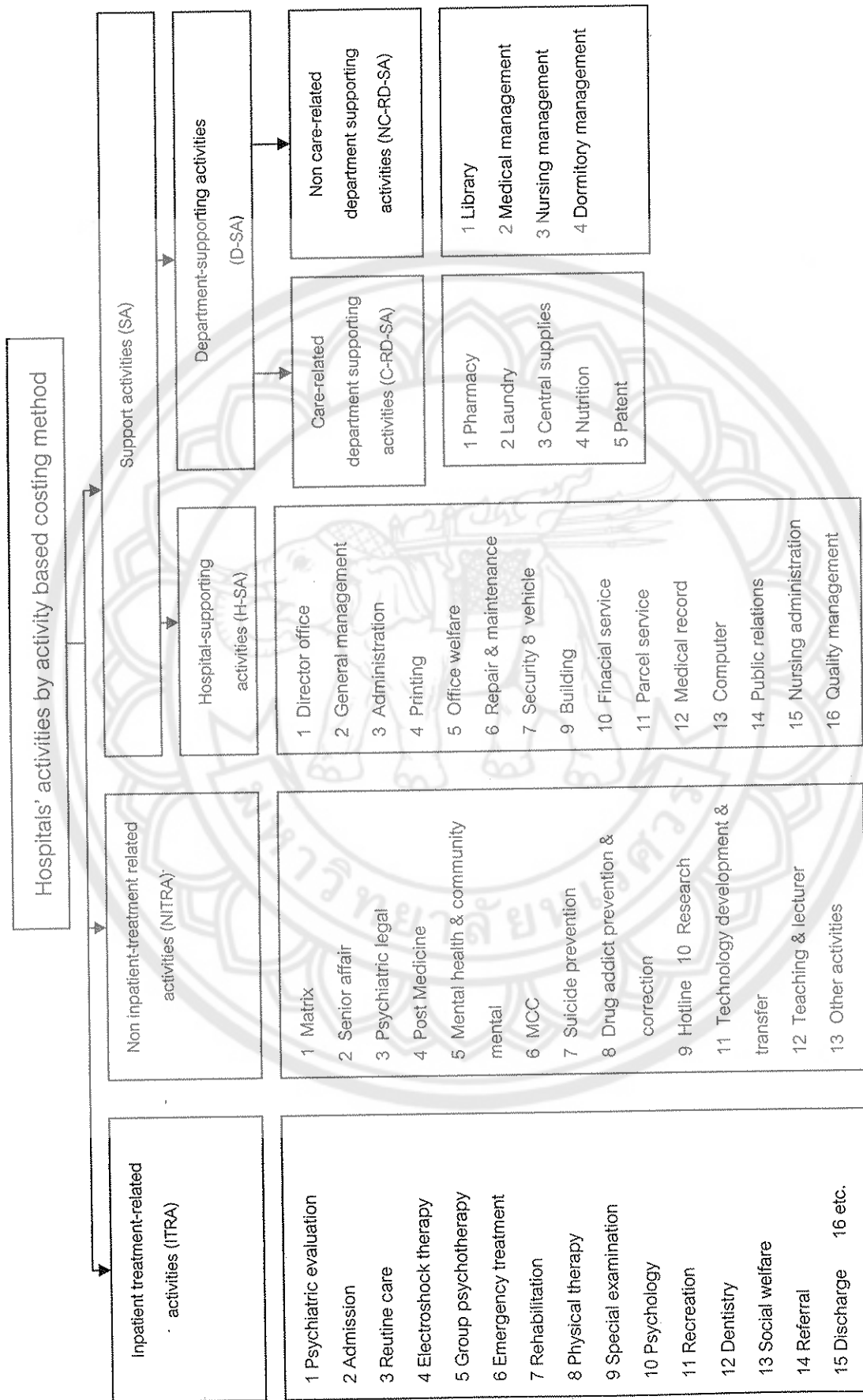


Figure 12 Category of hospitals' activities by activity based costing method (ABC)

#### **Step 4: Identifying drivers [more detail –allocation to disease group]**

Drivers are the key criteria to allocate cost to activities under predetermined criteria. In this study, drivers were classified into 3 levels; cost drivers, resource drivers, and activity drivers. Two-stage allocation procedure was used in TM while three-stage allocation procedure was used. To find actual resource usage in activity centers, it needs different drivers in each step (Schniederjans & Garvin, 1997).

Cost drivers are used to allocate indirect costs to services. This model used three levels of cost drivers by a straightforward principle of time consumption. The definition of time consumed is the cornerstone of the calculation model. The time spent per type of personnel for each activity was defined on the basis of information and interviews and time calculations.

Resource drivers allocated resource budget into activity cost pool in each individual activity center by estimation measure. Due to lack of data on resource use in each activity, estimation measure was employed by directly interviewing staffs in each department and using data record form.

In estimation, specific employee method was used. Acquired data were used to analyze resource driver in terms of workload and time consumption in each activity. Workload and time consumption estimation were allocated to various activities on workload and time use basis. Therefore, activity cost should be very close to actual cost. This method was time consuming, especially in large hospital. The overall organization data could be collected directly through salary and wage system.

Activity drivers allocated cumulative activity cost into cost object. It was the step after resource had been already allocated into activity cost center. Activity driver was reallocated the cumulative activity cost into cost object using direct cost.

#### **Step 5: Identifying direct cost (Distribution of salary and wage-related expenditure to patient care and non-patient care events)**

This step involved the allocation of salary and wage-related costs for the classes of clinical service delivery staff to individual patient events and non-patient care products. For each labor class, total time reported over the six-month study period was split into three 'pools'.

Direct costs were labor costs, material costs, and capital costs directly assigned to the products using the defined consumption of these inputs per product. The direct cost inputs used in ABC model were obtained from the hospitals in 4 months and expressed in Thai Baht. The actual costs were used for all resources. For durable inputs, equivalent annual costs were calculated on the basis of the depreciation of the actual price or the current replacement value.

Labor costs were salaries, wages, welfare and other types of payments to officers. These cost were recorded and traced on individual basis.

Material costs were allocated to activities in a single step using a cost driver that was thought to adequately capture the product complexity. In other words, each product was assigned a proportion of the support costs on the basis of the fractions necessary to deliver that product.

Capital costs composed of space costs and equipment costs. Space costs were allocated to the activities as a function of the activities taking place in the different areas. Because most areas share their space among different activities and other areas are only used a few hours throughout the day and to integrate the productivity factor into the calculation. The calculation of the proportional space cost was subsequently performed in analogy with the cost calculation of wage costs. The time consumption was summed up for the activities performed in a certain area, on the basis of the critical personnel. Equipment costs were allocated using a comparable approach, that is by defining the activities performed with a type of equipment and then linking these to the critical personnel using this equipment.

#### **Step 6: allocating indirect cost to direct cost of activities**

##### **Overhead and infrastructure costs distributed to patient care cost centers**

This step was to distribute the overhead and infrastructure costs to patient care cost centers. This was necessary to gain a true cost of a patient care episode, and involved assigning a share of overhead and infrastructure costs such as cleaning, finance, administration, fuel light and power, to patient care cost centers. The cost centers identified costs into 2 sub-costs of patient service and overhead budget.

### Distribution of overhead and infrastructure costs to patient care and non-patient care events

The outcome of the costing process provided an aggregated cost for each patient care day, defined as a day on which a patient had one or more contacts with one or more staff members.

#### Allocating indirect cost to direct cost of activities

Indirect cost (IDC) in this study were direct cost (DC) of supporting activities (SA). IDC were allocated to ITRA and NITRA on allocation criteria. This study used three step allocation procedure, which used different drivers in each step in order to find resource usage in each activity center as seen in figure 12.

##### 1. First-step cost drivers: allocation of resource costs to activity groups.

Labor costs were allocated to the different activity groups on the basis of the percentage of time spent per personnel to that activity. The defined individual offices' time estimates per activity were used to calculate the percentage of time per activity group. Material cost and capital cost were calculated with the same method. After this step, all activities' direct costs were derived.

##### 2. Second-step cost drivers: allocation of activity group costs to activities.

Total direct cost of supporting activities were allocated to treatment-related activities and non-treatment related activities. This step allocated indirect cost of supporting activities to treatment-related activities and non-treatment-related activities by simultaneous equation method. All activities under allocation criteria of resource drivers temporarily allocated their cost to as well as received allocated cost from other source drivers, the reallocation back and forth by the same ratio until reach its equilibrium. This meant that no cost was left in temporary cost center. By this method, activities cost allocation were close to the actual cost.

##### 3. Third-step cost drivers: allocation of activity costs to products.

The final step between the activities and treatment-related product costs was basically a summation of different calculated activity cost components. Some factors correcting for complexity were nevertheless introduced in this last step. The fraction-related activities were multiplied by the number of fractions necessary to

produce the product. The batch -level, product-level, facility-level activities were multiplied by the number of batch -level, product-level, facility-level in the setup of the treatment. The results added in the treatment-related product cost based on wage, material, equipment, and space consumption.

ABC systems utilized a two stage allocation process. In the first stage, organizational activities (e.g., quality control, purchasing allocation using, product engineering, etc.) were identified. The overhead costs recorded in departmental and general ledger accounts were assigned to activity center cost pools using first-stage cost drivers which reflected the activity's usage of overhead cost. The costs in each activity center cost pool were then assigned to cost objects, usually representing the individual products or services that the firm produced or provided. The second-stage allocation used cost drivers which reflected each product's or service's consumption of the activity cost. (Schniederjans & Garvin, 1997).

#### **Step 7: Calculating total cost of outputs**

The full cost calculation of this output was the last stage allocation. Cost at this level was calculated based on individual patient and later classified into cost per psychiatric disease. Output of this study composed of drug cost, material cost, full cost, cost per day, cost per case, cost per diagnosis subclass, and cost per activity.

## **4. Input overview**

### **4.1 Total direct cost (TDC)**

The total direct cost of the two hospitals during the four-month study period (1 January – 30 April 2004) was 80,794,914 baht. The total direct costs of Suanprung psychiatric hospital and Nakhon Ratchasima psychiatric hospital were 51,944,921 baht (64.29%) and 28,849,994 baht (35.71%), respectively.

### **4.2 Cost structure**

The total direct cost of the two hospitals in four month were classified into labour cost (LC) 49,954,852 baht (61.83%), material cost (MC) 21,295,119 baht (26.36%), and capital cost (CC) 9,544,907 baht (11.81%), respectively.

The total direct cost in the four-month were classified by cost center type, patient service (PS) was the major portion of 39,406,581 baht (48.77%), followed by non-revenue producing cost centre (NRPCC) of 21,486,063 baht (26.59%), revenue producing cost centre (RPCC) 10,393,657 baht (12.86%), and non patient service (NPS) 7,234,083 baht (8.95%), and Outpatient service 2,274,531 baht (2.82%) respectively (see Table 14 and Figure 13).

The ratio of labour cost: material cost: capital cost was equal 5: 2: 1. While the ratio of NRPCC: RPCC : PS : Other PS was 2: 1: 4: 1 (see Table 17).

Table 14 Total cost of the sites in the four-months

	LC	MC	CC	FC	%
NRPCC	13,656,365	3,786,216	4,043,481	21,486,063	26.59
%	63.56	17.62	18.82	100.00	
RPCC	3,753,795	5,821,803	818,022	10,393,657	12.86
%	36.12	56.01	7.87	100.00	
PS	26,326,881	9,631,569	3,448,131	39,406,581	48.77
%	66.81	24.44	8.75	100.00	
Other PS	6,217,811	2,055,531	1,235,272	9,508,613	11.77
%	65.39	21.62	12.99	100.00	
FC	49,954,852	21,295,119	9,544,907	80,794,914	100.00
%	61.83	26.36	11.81	100.00	

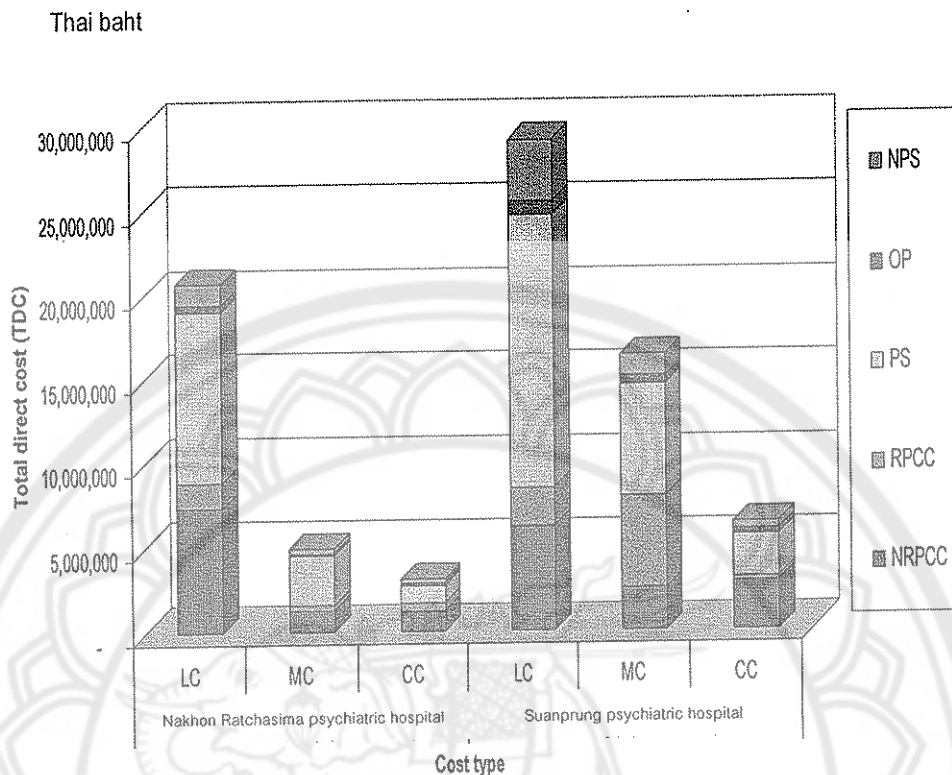


Figure 13 Distribution of total direct cost by hospital

#### 4.3 Staff time record

Figure 14 shows the distribution of staffs' time to allocate inpatient labour cost components of the two psychiatric hospitals. Staff's time was the full time equivalence (FTE) that staff worked for each cost centre. FTEs were computed and presented in proportion to the total direct cost (TDC) in each cost centre and total service costs in each service centre or activity. The total of FTE of the two hospitals during four months of data collection time was 888.78 with 558.20 (62.81%) at Suanprung psychiatric hospital and 330.58 (37.19%) at Nakhon Ratchasima psychiatric hospital. Most of them worked in patient service (PS) 489.95 (55.13%), followed by non revenue producing cost centre (NRPCC) 237.44 (26.72%), revenue producing cost centre (RPCC) 92.85 (10.45%), and non patient service (NPS) 68.54 (7.71%), respectively. Between the two hospital, care cost component pattern were similar.



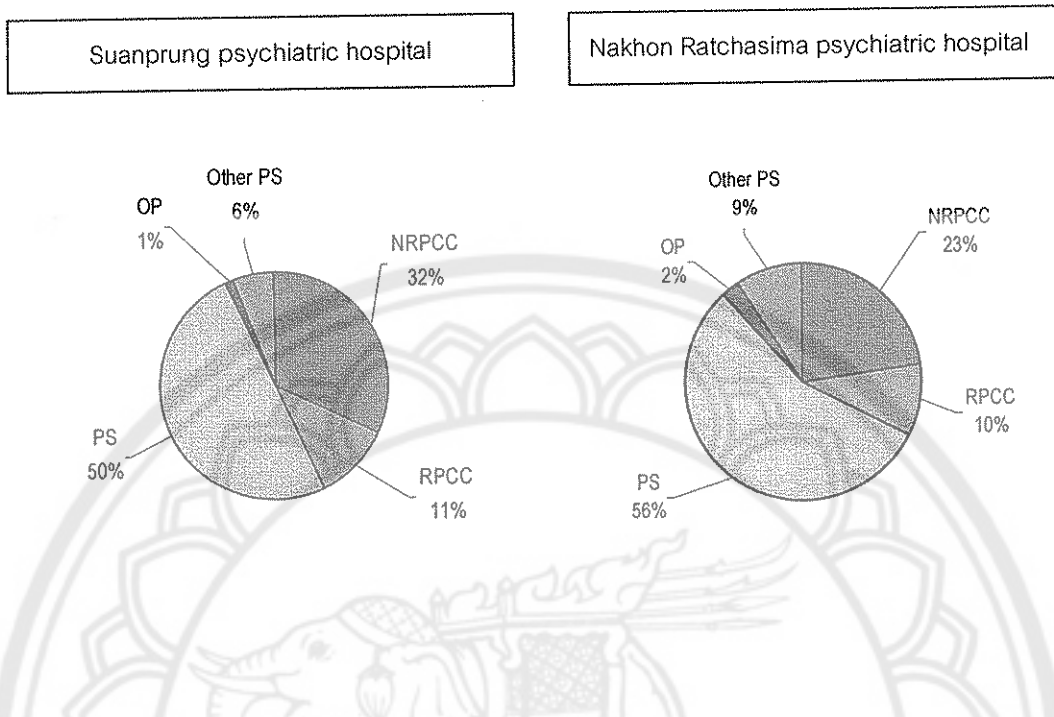


Figure 14 Distribution of full time equivalence (FTE) in each cost center

#### 4.4 Direct cost (DC) of patient service

Table 15 show total direct costs of patient service cost center after indirect cost was allocated from NRPCC and RPCC. In all patient service care cost 64,705,905 Thai baht, the highest was found in day care (44.27%), followed by emergency treatment (8.84%), admission (6.33%), physical therapy (5.59%), group psychotherapy (5.12%), evaluation (5.02%), discharge (4.69%), and rehabilitation (4.39%), respectively.

Table 15 Direct cost (DC) of patient service cost center

(unit: 10,000 Thai baht)

	Activity cost center	Labour cost	Material cost	Capital cost	Total	%
1	Evaluation	240	60	24	325	5.02
2	Admission	288	95	27	410	6.33
3	Day care	1,477	1,084	303	2,865	44.27
4	Electroshock therapy	83	37	24	144	2.22
5	Group psychotherapy	248	60	23	331	5.12
6	Individual psychotherapy	56	13	4	73	1.13
7	Emergency treatment	409	120	43	572	8.84
8	Rehabilitation	189	43	52	284	4.39
9	Physical therapy	264	79	19	362	5.59
10	Special examination	77	65	80	222	3.43
11	Psychologic evaluation & testing	49	7	10	66	1.02
12	Recreation	33	14	7	54	0.83
13	Dentistry	80	16	12	108	1.67
14	Social welfare	14	5	5	24	0.37
15	Referral	95	22	7	124	1.92
16	Other service	107	26	71	205	3.16
17	Discharge	234	50	20	303	4.69
	Total	3,944	1,796	730	6,471	100.00

### 5. Output overview

Table 16 and Figures 15-16 show the number of patient service activities of each sites. Output of the two sites in four months during the study period delivered 3,689 inpatient cases, 2,578 cases (69.88%) at Suanprung psychiatric hospital and 1,111 cases (30.12%) at Nakhon Ratchasima psychiatric hospital. There were 120,765 days hospital stays, 76,586 days (63.42%) at Suanprung psychiatric hospital and 44,179 days (36.58%) at Nakhon Ratchasima psychiatric hospital. In addition to inpatient services

both hospitals provided mental health service care, (service promotion, and prevention in their regions).

Table 16 Number of patient service activities of the sites

	Activity cost center	Nakhon Ratchasima psychiatric hospital		Suanprung psychiatric hospital		Total	
		Batch	unit	Batch	unit	Batch	unit
		1	Evaluation	-	46,994	-	87,961
2	Admission	-	1,111	-	2,578	-	3,689
3	Day care	-	44,179	-	76,586	-	120,765
4	Electroshock therapy	-	11	-	3,486	-	3,497
5	Group psychotherapy	20	1,395	1,048	6,674	1,068	8,069
6	Individual psychotherapy	-	19,843	-	7,460	-	27,303
7	Emergency treatment	-	13,332	-	13,613	-	26,945
8	Rehabilitation	274	4,037	1,267	7,109	1,541	11,146
9	Physical therapy	-	3,895	-	12,667	-	16,562
10	Special examination	-	33,963	-	3,072	-	37,035
11	Psychologic evaluation & testing	-	595	-	490	-	1,085
12	Recreation	-	-	-	56	-	56
13	Dentistry	-	4,029	-	1,541	-	5,570
14	Social welfare	-	-	-	1,693	-	1,693
15	Referral	-	41	-	1,032	-	1,073
16	Other service	-	3	-	366	-	369
17	Discharge	-	1,111	-	2,578	-	3,689

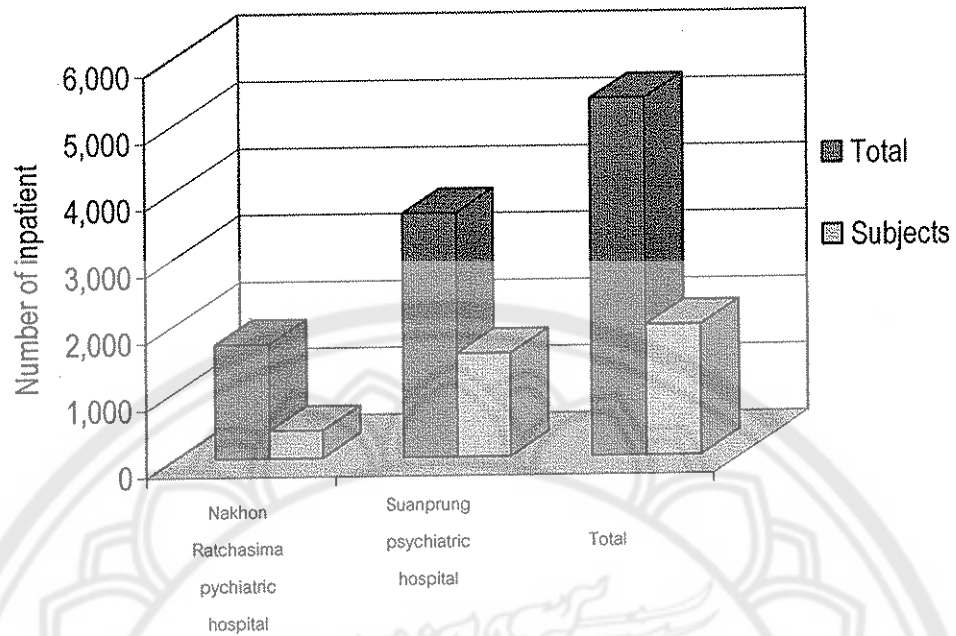


Figure 15 Number of inpatient (case) in the four-months

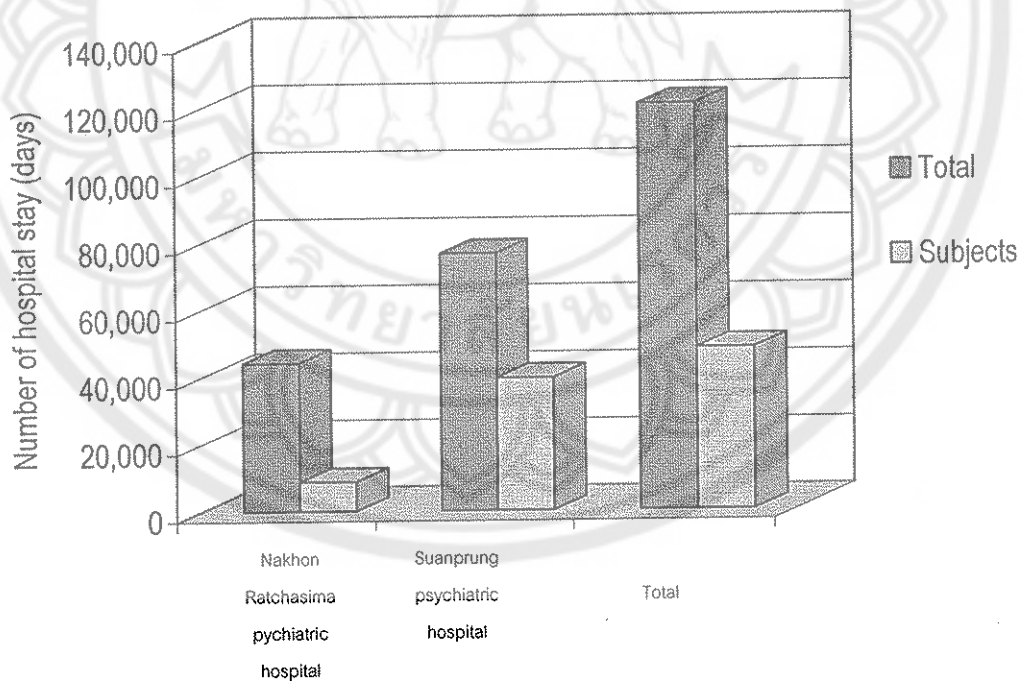


Figure 16 Number of hospital stay in the four-months

## 6. Unit cost of patient service (PS)

### Cost per activity

Table 17 shows cost per activity of inpatient service. While considering on care cost per activity, it found that the highest cost per activity was recreation (9,617 baht), followed by other service (8,219 baht), psychologic evaluation and testing (5,750 baht), day care (1,081 baht), respectively. The lowest cost per activity was evaluation (24 baht), followed by individual psychotherapy (27 baht), emergency treatment (113 baht), social welfare (142 baht), group psychotherapy (164 baht), respectively.

Table 17 Mean activities cost per activity

(unit: baht)

Activity cost center	LC/ MC/ CC			Total
	LC	MC	CC	
1. Evaluation	18	4	2	24
2. Day care	761	250	70	1,081
3. Admission	134	98	27	259
4. Electroshock therapy	350	154	100	605
5. Group psychotherapy	123	30	11	164
6. Individual psychotherapy	21	5	1	27
7. Emergency treatment	81	24	8	113
8. Rehabilitation	521	118	144	783
9. Physical therapy	203	60	15	278
10. Special examination	164	138	170	472
11. Psychologic evaluation & testing	4,248	623	879	5,750
12. Recreation	5,975	2,419	1,223	9,617
13. Dentistry	866	174	126	1,166
14. Social welfare	84	28	30	142
15. Referral	887	206	69	1,162
16. Other service	4,301	1,058	2,860	8,219
17. Discharge	617	132	52	800

### Cost per day

Cost per day of patient care varied significantly between the two sites. An average drug cost per day was 14.34 baht. An average full cost (FC) per day was 696.26 baht, 697.01 baht at Suanprung psychiatric hospital and 693.61 baht at Nakhon Ratchasima psychiatric hospital. An average material cost (MC) per day was 192.15 baht, 192.4 baht at Suanprung psychiatric hospital and 191.42 baht at Nakhon Ratchasima psychiatric hospital.

### Cost per case

Full cost per case was 17,388 baht with 18,071 baht at Suanprung psychiatric hospital and 14,814 baht at Nakhon Ratchasima psychiatric hospital. An average material cost (MC) was 4,799 baht with 4,987 baht at Suanprung psychiatric hospital and 4,088 baht at Nakhon Ratchasima psychiatric hospital (see figure 17).

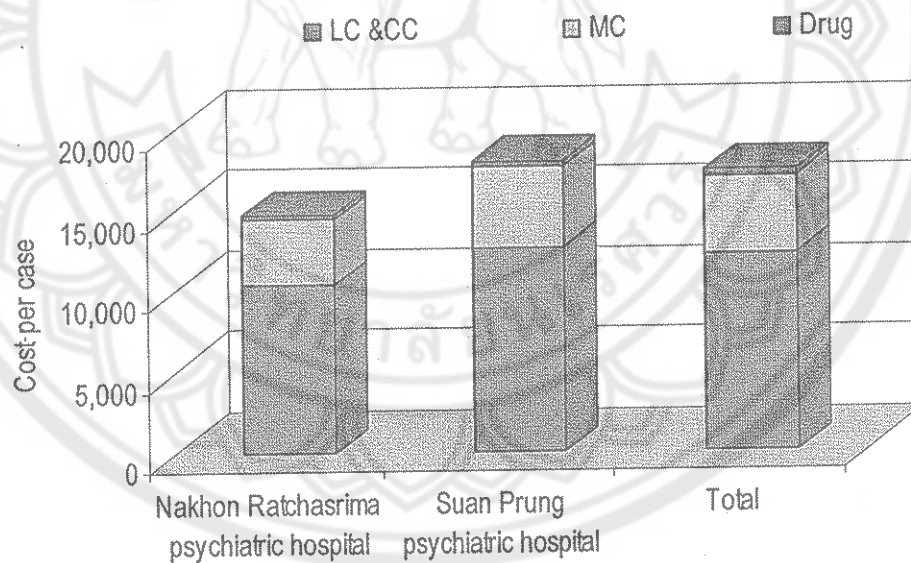


Figure 17 Inpatient care cost per case

### Cost per disease cluster (DC)

Table 18 and Figures 18-19 show the detail of subjects' cost and length of stay (LOS) per disease cluster. From table 19, the highest length LOS was found in schizophrenia patient (29.3 days), followed by drug intoxication and withdrawal (26.7 days), mental retardation (25.3 days), eating and obsessive/compulsive (23.8 days), and infectious and parasitic disease (23.4 days), respectively. The lowest LOS was found in personality disease and acute reaction (2.0 days), followed by anxiety (10.5 days), other drug use disease and dependence (16.6 days), and infectious and parasitic disease (11.7 days), respectively.

From table 18, the highest full cost (FC) was found in schizophrenia patient (20,766 Thai baht), followed by drug intoxication and withdrawal (19,137 baht), mental retardation (17,557 baht), eating and obsessive/compulsive (16,559 baht), and infectious and parasitic disease (16,245 baht), respectively. The lowest FC was found in personality disease and acute reaction patient (1,391 baht), followed by drug anxiety (7,185 baht), Opioid use and dependence (8,112 baht), other drug use disease and dependence (11,560 baht), and Paranoid and acute (11,859 baht), respectively.

The highest drug cost per case was found in dementia and other chronic disturbance (32.3 baht), followed by infectious and parasitic disease (31.6 baht), eating and obsessive/compulsive (27.4 baht), and anxiety (24.2 baht), respectively. The lowest drug cost per disease cluster was found in opioid use disease and dependence and drug intoxication and withdrawal (7.0 baht), alcohol intoxication and withdrawal (8.9 baht), alcohol use disease and dependence (9.1 baht), respectively.

Table 18 Full cost per disease cluster

Disease cluster	Length of stay (LOS)	drug cost per case	Full cost per day	Full cost per case
1. Schizophrenia	29.3	14.1	700	20,766
2. Drug intoxication and withdrawal	26.7	7	703	19,137
3. Mental retardation	25.3	14.7	695	17,557
4. Eating and obsessive/compulsive	23.8	27.4	695	16,559
5. Infectious and parasitic disease	23.4	31.6	695	16,245
6. Dementia and other disturbance	22.2	32.3	683	15,396
7. Other affective and somatoform	21.5	17.8	695	14,918
8. Alc intoxication and withdrawal	21.1	8.9	693	14,709
9. Major affective	20.8	19.9	693	14,438
10. Delirium	19.6	18.5	699	13,826
11. Alc use and dependence	19.5	9.1	692	13,559
12. Paranoid and acute	17.1	14.5	688	11,859
13. Other drug use and dependence	16.6	6.7	695	11,560
14. Opioid use and dependence	11.7	7	695	8,112
15. Anxiety	10.5	24.2	637	7,185
16. Personality and acute reaction	2.0	13.2	695	1,391





## 7. Discussion

The objective of this research was to find service cost of the two public psychiatric hospitals under the Mental Health Department. This prospective study collected data during 4 months. Collected information was categorized into 4 cost centers: Non-revenue producing cost center (NRPCC), revenue-producing cost center (RPCC), patient service (PS), and other service (OS). Cost from temporary units (NRPCC and RPCC) was properly allocated to service centers (PS, OS) by using the simultaneous equation method.

In line with other literature reports (Supeeranun, Mahatnirunkul, & Phuaphanprasert, 2005; Buckingham et al., 2003; Phuaphanprasert, Sanichwannakul & Pannarunothai, 2003; Siriwanarangsarn, Likanapichitkul & Chakapandhu, 2001; Silapakit, 2003), this cost study confirms that the major resource cost of psychiatric inpatient service is labour intensive service that accounted more than 50%, followed by material cost, and investment cost, respectively as shown in Table 19.

Table 19 Cost structure of mental health hospitals

	This study	Siriwanarangsarn, P. et al. (2001)	Supeeranun, A. et al. (2004)
1. Labour cost	61.83	54	48
2. Material cost	26.36	36	41
3. Capital cost	11.81	10	11

Table 20 shows the percentage of cost in each type of cost centers. When comparing hospitals under the department of mental health with similar management structure and management system, PS was the first rank to absorb the cost, followed by NRPCC, RPCC, and OS, respectively. This pattern was similar to the previous study (Supeeranun et al., 2004); (Siriwanarangsarn et al. 2001).

Table 20 Proportion of cost by cost center

Cost center type	This study	Siriwanarangsarn et al., (2001)	Supeeranun et al., (2004)
1. NRPCC	26	44	38
2. RPCC	13	18	11
3. PS	49	38	46
4. OS	12		5

Table 21 shows full cost for inpatient was highest in the study of Supeeranun (Supeeranun et al., 2004) at 20,438 baht per case, followed by Siriwanarangsarn (Siriwanarangsarn et al., 2001) at 19,632 baht per case, and this study at 17,399 baht per case. Similarly, outpatient full cost was highest at 599 baht per visit in Supeeranun, A. et al. (2004), followed by followed by Siriwanarangsarn (Siriwanarangsarn et al., 2001) at 529 baht per visit, and this study at 346 baht per visit.

Table 21 Psychiatric inpatient and outpatient service cost per case

	This study	Siriwanarangsarn et al., (2001)	Supeeranun et al., (2004)
1. Sources	Two psychiatric hospitals	13 psychiatric hospitals under the Mental Health Department	17 psychiatric hospitals under the Mental Health Department
2. Time	2004	2000	2000
3. Method	TM, ABC	TM	TM
4. Inpatient			
4.1 Length of stay	21 days	38 days	31 days
4.2 Full cost	17,399 baht/case	19,632 baht/case	20,438 baht/case
	696 baht/day	513 baht/day	656 baht/day
5. Outpatient			
5.1 Full cost	346 baht/visit	529 baht/visit	599 baht/visit

Table 22 compares cost by disease cluster from two studies. In this study, schizophrenia was the most costly (20,766 baht), followed by drug intoxication and withdrawal (19,137 baht), and mental retardation (17,557 baht), respectively. This is quite different from Supeeranun, A. et al. (2004) which mental retardation (144,281 baht) was the highest, followed by schizophrenia (28,230 baht), and dementia and other disturbance (20,989 baht), respectively. Mental retardation is obviously high because children with mental retardation has to stay at hospital for very a long period of time.

Table 22 Cost by disease cluster

	This study	Supeeranun, A. et al. (2004)
- Sites	2 psychiatric hospitals	17 psychiatric hospitals
- Year	2007	2004
- Disease cluster		
1. Schizophrenia	20,766	28,230
2. Drug intoxication and withdrawal	19,137	18,559
3. Mental retardation	17,557	144,281
4. Eating and obsessive/compulsive	16,559	
5. Infectious and parasitic disease	16,245	
6. Dementia and other disturbance	15,396	20,989
7. Other affective and somatoform	14,918	
8. Alc intoxication and withdrawal	14,709	
9. Major affective	14,438	14,782
10. Delirium	13,826	
11. Alc use and dependence	13,559	12,698
12. Paranoid and acute	11,859	
13. Other drug use and dependence	11,560	
14. Opioid use and dependence	8,112	
15. Anxiety	7,185	8,701
16. Personality and acute reaction	1,391	

## 8. Conclusions

The results from this study confirmed and supported by previous studies. They should be used as a preliminary guide for budget planning and policy formulation for public health towards mental health resources allocation in Thailand.

A number of points for future funding were still skeptical in this cost study. This ABC study was the first to apply to psychiatric hospital to calculate inpatient service care cost, and probably was the first attempt to find cost driver of the model. However, data in the chapter did not reflect the 'good practice' but rather the 'average service'. Concerns were raised by various groups regarding the use of costs as a basis to fund future services, as this may be inconsistent with 'appropriate care'. Consideration should be given before using three cost data for funding.

This study separates costs of each inpatient service care activity from non-inpatient service care activities. Therefore, costs were only inpatient service care activity costs. While in real situation, this could not clearly separate inpatient service care activity costs from others.

However, the cost study has many limitations. Firstly, main difficulty to develop the model was how to identify activities and their drivers. This was overcome by limiting the number of cost drivers through introducing a three allocation step between the activity groups and activities. By doing so, time consumption weighted factors of treatment complexity instead of using a large number of different cost drivers (no verb). It need ongoing refinement to improve its identified cost centers, activities costs, and cost drivers of service in Thai psychiatric hospital and adapt to implement it to routine practice. Secondly, although the detailed definitions and multi-step allocation principle yielded a refined cost calculation, some assumptions made during the development of the model, may result in a slight distortion of the calculated costs. Whatever attempt in correcting limitations would have rendered the model much more complex, requiring program adaptations when applying of the calculated costs. When adopting such a model for daily practice, however, one should be aware of the potentially impeded distortions related to the specificity of the model's design. Thirdly, even there is good

coordination from both staff and hospital, data from records were not completely obtained. Several parts of information were missing due to substantial data collection (database insufficiency and staff non-realization). However, these potential problems were realised and databases from other sources were used. For example, numbers and types of services recorded by staff were rechecked with the daily operation record back-up.

Fourthly, currently in our routine psychiatric practice, there were no computed care costs. Therefore collected data for cost study might be incomplete and contain error in some area. This study tried to reduce error by setting well training lessons for staff, audit in data collection process, and back up data. Before implementing cost calculation in routine service, it is highly recommended staff, environment, and facilities should be well prepared. For example, top management supporting and data correction by computer programs are needed. Cost calculation software should be developed to manage the system and save cost. To eliminate time in cost calculation and to increase ease for officers, software package of costing model for psychiatric care cost is needed. Fifthly, this study did not represent activity services and non patient service activities (consultation liaison, teaching, training, research, community development) that need to be explored for funding propose. Additionally, it covered only specialized mental health hospitals. The costs of others settings (teaching hospitals, primary and secondary care hospitals) should be investigated before any attempt to apply these costs since the cost characteristics are different among type of hospitals.