

## **CHAPTER V**

### **CONCLUSION, DISCUSSION, AND SUGGESTIONS**

#### **Conclusion and Discussion**

The study of unit cost of out-patient and in-patient service of Maharaj Nakhon Si Thammarat hospital between July 1 to December 31, 2003 is aimed at study in the cost structure and unit cost of patient service and calculating the direct cost of hospital which comprises of labor cost, material cost, capital cost, indirect cost and the full cost. Further, it is aimed to analyze the unit cost of patient service area. It also studied the average cost of all cost regardless of the seriousness of illness, symptom, characteristics of patients, type and complexity of medical treatment and diagnosis. It computed the unit cost average from the total number of patients. The target population in this research is the financial data and statistical data from out-patient and in-patient services including all departments which work related to in-patient service in light of administration at Maharaj Nakhon Si Thammarat hospital. In accordance with the agreed determination criteria, all departments had been determined into 82 cost centers in total. It is a prospective study from the service provider's perspective. According to Maharaj Nakhon Si Thamarat hospital's organization structure basing on its function and true relation in providing service and support, the cost centers are classified into four main groups which consisting of non-revenue producing cost center (NRPCC), revenue producing cost center (RPCC), patient service area (PS) and non-patient service area (NPS). The cost data had been gathered through the data collecting form

for labor cost, material cost, capital cost record, working hour of personnel and through the annual report of Maharaj Nakhon Si Thammarat hospital. The cost data will be analyzed to find the total direct cost of each cost center. After that the total direct cost of all non-revenue producing cost center and revenue producing cost center will be allocated to the patient service area and non-patient service area according to the appropriate cost allocation criteria which defined by the service related amongst departments in the hospital. The cost analysis will use the simultaneous equation method to allocate the cost. The entire cost will be distributed to the patient service area (PS) and non-patient service area (NPS) eventually. After that, the unit cost and full cost will be analyzed. The unit cost of out-patient service will use the number of out-patient visit and the in-patient service will use the number of patient day and case to calculate. In this study, the labor cost of Bht 110, 565.89 which belong to Physicians who work at the Primary Care Unit will not be included to the unit cost calculation due to no production for out-patient and in-patient service between the study period. The findings can be summarized according the purpose of study as follows:

### **1. Total direct cost**

The findings shows that the total cost of Maharaj Nakhon Si Thammarat hospital between July 1 to December 31, 2003 was at Bht 377,448,306.94, which consisting of the labor cost at Bht 171, 160,777.22, material cost at Bht 193,611,816.69 and capital cost at 12,675,713.03 respectively. As can be seen from Table 4, the percentage of labor cost, material cost and capital equal to 45.35: 51.29: 3.36 respectively which differed from the other related studies, for example, the research of Walaiporn Patcharanarumol (1997) which studied the unit cost of out-patient and in-

patient services of Khon Khaen hospital in the fiscal year 1996. The result of her study summarized that the percentage of labor cost, material cost and capital cost was at 48: 45: 7 respectively. Another study is the research of Kanjana Tisayaticom (2000) which studied the analysis of cost and unit cost of patient service at Trang hospital in fiscal year 1998, which its result showed that the proportion of labor cost, material cost and capital cost was at 54: 36: 10 per cent. According to the study of unit cost of Trang hospital, the labor cost was higher than material cost and the capital cost was the lowest. In this study, the material cost was higher than labor cost and capital cost for some reasons. The different types of health service provided varied amongst the hospital can be a good reason (Sukalaya Kongsawatt, 1991). Besides this, between the period of study, Maharaj Nakhon Si Thammarat hospital opened two new Private Section Wards at Chalerm Phrabarammee building at 2<sup>nd</sup> floor and Medical Ward No.4 (Private Section) building. Further, the Private Section Ward- Limpichart-Thungcar Harbor was renovated at the same time. These could result in the high percentage in material cost. Another factor was that the computer system had been initially introduced in 2003 so that the hospital cost data collection was gathered more completely and effectively.

When taking the capital cost into account, the finding shows that it got the least proportion. The capital cost includes depreciation cost of building and equipment. When sorting by the type of depreciation cost, it illustrates that the depreciation cost of equipment was greater than the building, which the depreciation cost of equipment was at 6,601,411.97 baht (52.08 per cent) as shown in table 16. The reason is that all buildings in the hospital excluding the provided accommodation for staffs are quite old.

There are 47 out of 53 buildings which their usage life was more than 20 years. Besides, these 47 buildings are not included to the capital cost calculation. In case of the buildings which their usage life are less than 20 years, it will be included to the annual depreciation cost by using the Straight-line method to compute. If any buildings comprised several cost centers utilizing the area, the usage life in each cost center will be used to calculate the proportion and allocate the depreciation cost of that building to each cost center accordingly. The depreciation cost can be achieved by using the proportion of usage multiplied by the depreciation cost of each building. In aspect of equipment depreciation, due to the incompleteness of data collection process, it couldn't be calculated according to the criteria of Central Accounting Department in every single item. As a result, the researcher defined the average usage life of equipment as 5 years. Taking the study of Walaiporn Patcharanarumol (1997), Kanjana Tisayaticom (2000) as an example, those studies did not included the equipment which the usage life over 5 years into the depreciation cost calculation.

The total direct cost of Maharaj Nakhon Si Thammarat hospital disaggregated by the cost center group can be summarized as following:

Non-revenue producing cost center group (NRPCC): the total direct cost of NRPCC was at Bht 75,750,351.71 with the proportion of labor cost, material cost and capital cost at 42.90: 51.47: 5.63 per cent respectively.

Revenue producing cost center group (RPCC): the total direct cost of RPCC was at Bht 188,406,953.33, with the proportion of labor cost, material cost and capital cost at 21.06: 77.37: 1.57 per cent respectively.

Patient Service Area (PS): the total direct cost of PS was at Bht 103,947,621.71, with the proportion of labor cost, material cost and capital cost at 89.42: 7.41: 3.17 per cent respectively.

Non-Patient Service (NPS): the total direct cost of NPS was at Bht 9,343,380.19, with the proportion of labor cost, material cost and capital cost at 64.68: 12.24: 23.08 per cent respectively.

When comparing the total direct cost in each cost center group, it indicates that revenue producing cost center (RPCC) had the highest cost at Bht 188,406,953.33, which the high cost mainly come from the material cost, 77.37 per cent. The total direct cost of patient service area was at Bht 103,947,621.71 which consisting of labor cost 89.42 per cent (Table 5). As illustrated in Table 11, when looking at the cost structure, the labor cost of patient service area was the highest, 54.30 per cent. The material cost of revenue producing cost center was 75.29 per cent (Table 13). This finding is consistent with the studies of Sukalaya Kongsawatt (1991), Walaiporn Patcharanarumol (1997) and Kanjana Tisayaticom (2000) which indicated that the labor cost was the highest in the patient service area and the material cost was the highest in revenue producing cost center. It is because the main responsibility of patient service area is to provide medical care to patients which needs a large number of personnel. For the

revenue producing cost center group, its main role is to provide service and support concerning drug, medical and science material. Examples of department are Pharmacy, Operating Theatre and Laboratory and Pathology. As known, most of medical material and equipment are expensive. As can be seen when analyzing the material cost disaggregated by the type of material, it shows that the cost of drug and medical and science material is the major cost more than a half of the whole material cost, 77.50 per cent (Table 14).

When looking at each cost center group, it is found that the total direct cost of non-revenue producing cost center (NRPCC), revenue producing cost center (RPCC), patient service area (PS) and non-patient service area was at Bht 75,750,351.71, 188,406,953.33, 103,947,621.71, 9,343,380.19 respectively or 20.07 49.91 27.54 and 2.48 per cent respectively.

**1.1 Total direct cost of non-revenue producing cost center (NRPCC)** it was at Bht 75,750,351.71. The highest total direct cost came from General Administration department at Bht 23,250,528.38 (30.69 per cent) which consistent to the study of Kannika Inpra (1996), Walaiporn Patcharanarumol (1997) and Kanjana Tisayaticom (2000) which pointed out that the administrative work in General Administration mainly provide a great amount of support to every department and all personnel in the hospital. The material cost was the highest resulting from the utility expense at Bht 10,232,855.14 ( 5.29 per cent of material cost). The second highest total direct cost came from Dietetics at Bht 13,166,911.39 (17.38 percent), follow by Central Supplies and Office of Infectious Control at Bht 10,294,064.46 (13.59 percent), as its

nature of work consume a lot of supplies. Revenue Collection was lowest at Bht 483,341.08 (0.64 percent).

**1.2 Total direct cost of revenue producing cost center (RPCC):** it was at Bht 188,406,953.33. In-patient Pharmacy was the highest at Bht 59,800,284.47 (31.74 per cent), followed by Out-patient Pharmacy at Bht 53,289,313.08 (28.28 per cent), then Operating Theatre at Bht 24,714,718.18 (13.12 per cent) and Laboratory and Pathology at Bht 19,035,629.65 (10.10 per cent) which consistent to the study of Kannika Inpra (1996), Wilaiporn Patcharanarumol(1997) and Kanjana Tisayaticom (2000) as Maharaj Naknon Si Thammarat hospital is the super tertiary care level hospital with 1,000 bed. This causes a high cost in the Operating Theatre. The main cost of Laboratory and Pathology comes from material cost which consisting of chemical solution used in the laboratory. In addition, the drug expenses and pharmaceutical expenses, which are the vital factor in providing service in hospital, are not distributed to patient service area. The total direct cost of Alternative medical was the lowest at Bht 239,837.31(0.13 per cent).

**1.3 Total direct cost of patient service area (PS):** The total direct cost of patient service area was at Bht 103,947,621.71, which consisting of Out-patient service at Bht 25,842,481.09 and In-patient service at Bht 78,105,140.62.

**1.3.1 Total direct cost of Out-patient service (PS-OPD)** was at Bht 25,842,481.09, which the highest cost came from Accident and Emergency, Forensic Medicine and Cradle Service at Bht 5,307,272.02 (20.54 per cent). This finding is

consistent with the study of Walaiporn Patcharanarumol (1997) which indicated that the total direct cost of Accident department was the highest. The reason is that its function and support related to several departments. Moreover, this cost center also includes Cradle Service unit, which can cause a high labor cost to this department. The labor cost of Accident and Emergency, Forensic Medicine and Cradle Service was at Bht 4,810,495.46. In order to manage the Cradle Service unit more effectively, it is suggested to restructure the Accident and Emergency, Forensic Medicine and Cradle Service cost center by separating the Cradle Service unit from this group and enlarge the unit size to be as a Cradle Service Center. Moreover, the center should be operated by the Administration department which is in the supporting group and defined as a non-revenue producing cost center (NRPCC). By doing so, it will decrease the workload of Accident and Emergency, Forensic Medicine and Cradle Service significantly. Eventually, it will result in a better quality of service and more effective administration of Cradle Service Center. On the other hand, the result of this study is not consistent with the study of Kanjana Tisayaticom, which stated that the highest total direct cost of Trang hospital came from Out-patient service (16 per cent), followed by Accident and Emergency (8.08 per cent) and Dentistry (5.07 per cent) respectively. The result was different from Maharaj Nakhon Si Thammarat hospital because the cost of all Out-patient Center would be summed together as a whole to Out-patient service. This causes Out-patient service has the highest total direct cost at Trang hospital. The second highest cost came from Dentistry at Bht 2,950,525.60 (11.42 per cent), which the material cost was the highest at Bht 796,192.41 (38.51 per cent of total material cost of Out-Patient Service Area). On the contrary, the lowest cost came from OPD-Urological Surgery at Bht 292,035.48 (1.13 per cent) as it was open for service only



two days a week. The cost of OPD- Rehabilitative Medical was at Bht 355,413.17 (1.38 per cent). The cost of Counseling service room was also very low at Bht 417,574.35 (1.62 per cent) as it is a small cost center which there are only two registered nurses work in this unit. The result is totally different from the study of unit cost of Out-patient service of Phrae hospital by Kannika Inpra (1996). Her study showed that the highest total direct cost was from Counseling Service Room as the labor cost had included the labor cost of personnel in the department and other staffs who provide general service for Out-patient service, for example, Head of Out-patient service, Cleaners. Moreover, the unit cost of Accident and Emergency, Dentistry and In-patient service was not included to her study. It can say that the different cost center classification and determination makes a different result between these two studies. In this study, such general services have been included to Office of OPD, which is the non-revenue producing cost center.

1.3.2 Total direct cost of In-patient service (PS-IPD): The total direct cost of In-patient service was at Bht 78,105,140.62 which the highest cost came from Medical Ward No. 1 (Male&Female) with the amount of Bht 6,113,028.64 (7.83 per cent). This result was considerably similar to the study of Walaiporn Patcharanarumol (1997) which indicated that the cost of Female Medical Ward was the highest. Further, the result is also consistent with the study of Kanjana Tisayaticom (2000) that Male Medical Ward had the highest total direct cost. Medical Ward No. 1 is 32-bed ward providing the service for both male and female patients whom need the Artificial Respiration. Those are coma, severity patients so it needs a large number of personnel to take care. The labor cost of Medical Ward No1 was at Bht 5,398,139.96 (7.75 per

cent of labor cost of In-patient service) followed Male Surgery Ward No. 1 at Bht 5,685,987.53 (7.28 per cent). This ward provides treatment and medical care service to the male patients who have got the head injury and all kinds of accidents. It also gives the treatment to the patients who are on Artificial Respiration because all the beds at ICU Ward are occupied, not enough for the patients. So, those coma/traumatic patients are referred to get the treatment at the Male Surgery Ward No. 1 as this ward can be responsible for the great number of patients, 30 severe patients per day approximately. In addition, this Male Surgery Ward No. 1 also provides the treatment for all kinds of injured patients. Hence, it needs a greater number of personnel to take good care of those mentioned patients. This results in the higher percentage of labor cost which makes Male Surgery Ward No. 1 as a second highest, after Medical Ward No. 1. The labor cost of Male Surgery Ward No.1 was at Bht 5,359,363.34 (7.70 per cent of labor cost of In-patient service). The larger size of organization could possibly lower the quality of service. In the future, if this cost center could be separated into two wards to distribute the volume of workload comprehensively. The better quality of medical care service will be achieved consequently. The third highest total direct cost was from Private Section Ward – Limpichart Thungcarharbor at Bht 4,751,956.93 ( 6.08 per cent) since this ward has just been renovated and equipment is all new. Due to the implementation of new equipment, it results in the higher material cost at Bht 690,702.94 (12.25 per cent of material cost of In-patient service) It got the second highest material cost after that the Private Section Ward-Chalerm Phrabaramee ( 2<sup>nd</sup> Fl) which was the highest at Bht 720,061.90 (12.77 per cent of material cost of In-patient service) as this ward was just opened to operate the medical care service and it is the VIP ward. In contrast, the Private Section Ward-Children was lowest at Bht 661,303.27

(0.85 per cent). The reason is that this ward had few patients and the management board is considering improving the organization structure and merges this ward with other departments.

**1.4 Non-patient service (NPS):** The direct cost of Social Medical, Health Education and Medical Education Center were at Bht 5,627,303.45 ( 60.23 per cent), Bht 1,076,032.46 (11.52 per cent) and Bht 2,640,044.28 (28.25 per cent) respectively. This cost center group has the lowest direct cost. It is because there are only three cost centers classified into this group. It has the lowest cost center whereas non-revenue producing cost center, revenue producing cost center and patient service area consisting of 18, 15, and 46 cost centers respectively.

It can be summarized that the total direct cost of Maharaj Nakhon Si Thammarat hospital between July 1 – December 31, 2003, the material cost was higher than labor cost and the capital cost was the lowest . The material cost of revenue producing cost center (RPCC) was the highest (75.29 per cent) and the labor cost of patient service area (PS) was also the highest (54.30 per cent). As a result, to plan any action for ultimate resource management, it needs to take these two cost centers into consideration additionally. For the material cost of revenue producing cost center, Drug expense and Medical material cost was the highest at 77.50 per cent. Generally, this cost is the main cost in operating the service at hospital and patient service need to use the large number of personnel to provide the medical care service to patients. Therefore, to decrease the labor cost, it also need to consider the consequence which can effect to patients. The job which is not related to medical care service can be done by the other personnel

whose labor cost is lower instead and allocating the personnel to suit the quantity of work and type of work in each department can also help decrease the labor cost.

## 2. Indirect Cost

The indirect cost of Patient service area of Maharaj Nakhon Si Thammarat hospital between July 1 – December 31, 2003 was at Bht 262,305,513.23, which comprised non-revenue producing cost center Bht 63,669,515.81 and revenue producing cost center Bht 198,635,997.42 respectively.

**2.1 Indirect cost of Out-patient service:** It indicates that the indirect cost allocated from non-revenue producing cost center (NRPCC) mainly came from Accident and Emergency, Forensic Medicine and Cradle Service. This cost center was the highest at Bht 2,594,456.07 (18.38 per cent) which mainly absorbed the indirect cost from Medical Registry and Statistics. The second highest indirect cost came from OPD-Medical at Bht 1,349,459.73 (9.56 per cent), followed by Specialty Medical Clinic and Psychiatric at Bht 1,118,349.33 (7.92 per cent ) respectively which the indirect cost allocated from Office of OPD Service most. In case of the indirect cost allocated from revenue producing cost center, OPD- Specialty Medical Clinic and Psychiatric got the highest indirect cost at Bht 18,584,720.67 (32.18 per cent), followed by OPD- Medical at Bht 7,551,202.80 (13.08 per cent). So, this makes OPD- Specialty Medical Clinic and Psychiatric have the highest total indirect cost at Bht 19,703,070.00 (27.42 per cent) follow by OPD-Medical at Bht 8,900,662.53 (12.39 per cent). OPD-Medical mainly absorbed the indirect cost from Out-patient Pharmacy. Lastly, the Counseling Service Room has the lowest indirect cost at Bht 64,273.01 (0.09 per cent).

**2.2 Indirect cost of In-patient service (PS: IPD):** The finding shows that the indirect cost allocated from non-revenue producing cost center (NRPCC) mainly Male Surgery Ward No. 1 at Bht 4,583,361.30 (9.25 per cent) follow by Medical Ward No.1 (Male&Female) at Bht 3,775,393.38 (7.62 per cent). The indirect cost was mainly allocated from Central Supplies and IC Office. In light of revenue producing cost center, Male Surgery Ward No. 1 had the highest indirect cost at Bht 15,828,986.45 (11.23 per cent), follow by Medical Ward No. 2 at Bht 13,955,894.02 (9.91 per cent). The allocated indirect cost mainly came from In-patient Pharmacy. The lowest indirect cost allocated from revenue producing cost center was from Private Section Ward – Children at Bht 301,317.49 (0.21 per cent) which close to the indirect cost of Private Section Ward- Chalermphrabaramee, Sick Monk Ward, Private Section Ward No. 5 and Medical Ward No. 4. Those are the cost center which their provided services are not much associated with other departments, for example, Pathology and Radiology. The highest total indirect cost came from Male Surgery Ward No 1 at Bht 20,412,347.75 (10.72 per cent) followed by Medical Ward No.2 at Bht 16,562,138.73 (8.70 per cent). These wards have a very high workload and their provided services are involved with several departments. Private Section Ward-Children has the lowest indirect cost at Bht 601,187.98 (0.32 per cent) followed by Private Section Ward-Chalermphrabaramee at Bht 1,666,639,33 (0.88 per cent) and Sick Monk Ward at Bht 1,709,570.40 (0.90 per cent) respectively.

### 3. Full Cost of Patient Service Area

In the study of full cost of Maharaj Nakhon Si Thammarat, the simultaneous equation method was used to allocate the cost between cost centers. The cost would be distributed from non-revenue producing cost center (NRPCC) and revenue producing cost center (RPCC) which determined as transient cost center. The full cost would be then allocated to patient service area (PS) and non-patient service area (NPS) which determined as absorbing cost center. As general principle, all hospital activities are operated for the purpose of providing service to the patients ultimately. The allocation ratio will help recognize that these cost centers provide support to direct patient service area (Anuwat Supachutikul, 1996). The finding shows that the more support or service which department provides related to other departments, the more cost will be distributed to that department, for example, Maintenance and Design Equipment for Disables and Alternative Medical provide 100 per cent of support to OPD-Rehabilitative Medical and Delivery Room provides support to Postnatal Ward at 97.63 per cent.

The result of the study indicates that the full cost of Maharaj Nakhon Si Thammarat hospital between July 1 – December 31, 2003 was at Bht 377,448,306.94. The total cost of patient service (PS) was at Bht 366,253,134.94, which can be divided into direct cost at Bht 103,947,621.71 and indirect cost at Bht 262,305,513.23. The ratio was 28.38: 71.62 per cent.

Non-patient service area consists of three main cost centers only because they provide the other kinds of health service which not related to out-patient and in-patient

service. Those three cost centers comprise Social Medical, Health Education and Medical Education Center. The full cost of non-patient service was at Bht 11,195,171.99 which classified into direct cost at Bht 9,343,380.19 and indirect cost at Bht 1,851,791.80 . The ratio was 83.46: 16.54 per cent.

The result of Out-patient service and In-patient service which defined as the important hospital unit cost ( Anuwat Supachutikul et al, 1996) could be discussed as following:

**3.1 Full cost of Out-Patient Service:** The out-patient service area of Maharaj Nakhon Si Thammarat hospital can be divided into 21 different cost centers. The finding shows that the full cost of out-patient service was at Bht 97,703,064.26, which consisting of direct cost Bht 25,842,481.09 and indirect cost Bht 71,860,583.17 (Table 21). The ratio was 26.45: 73.55 which consistent to the study of Kanjana Tisayaticom which had the ratio 23.75: 76.25.

When disaggregating the cost by department, it indicates that Specialty Medical Clinic and Psychiatric got the highest full cost at Bht 21,175,243.25 ( 21.67 per cent of Out-patient service cost) which consisting of direct cost Bht 1,472,173.25 (5.65 per cent of Out-patient service cost) and indirect cost Bht 19,703,070.00 (27.42 per cent of total indirect cost of Out-patient service). Specialty Medical Clinic and Psychiatric received cost from other departments, mainly from Out-patient Pharmacy at 34.48 per cent. The second highest full cost came from Accident and Emergency Forensic Medical and Cradle Service at Bht 13,480,000.28 comprising direct cost Bht

5,307,272.02 and indirect cost Bht 8,172,728.26. The full cost of OPD-Medical was at Bht 10,133,621.88, consisting of direct cost Bht 1,232,959.35 and indirect cost Bht 8,900,662.53. The direct cost of the other cost centers in this group is not much different.

**3.2 Full cost of In-patient service.** Maharaj Nakhon Si Thammarat hospital is a super tertiary level hospital, which provides medical care service for patients whose the symptom of illness is severe, serious and complicated. There are 25 units providing in-patient service to patients. The full cost of in-patient service was at Bht 268,550,070.69 which divided into direct cost Bht 78,105,140.62 and indirect cost which allocated from the other departments Bht 190,444,930.05 respectively. When looking at the full cost disaggregated by the cost center, it indicates that the full cost of Male Surgery Ward No. 1 was the highest at Bht 26,098,335.28 which consisting of direct cost Bht 5,685,987.53 and indirect cost Bht 20,412,347.75. This result is different from the study of Walaiporn Patcharanarumol (1997) which indicates that Female Medical Ward had the highest full cost. It is also different from the study of Kanjana Tisayaticom (2000) that the full cost of Obstetric Ward was the highest. The full cost of Male Surgery Ward No. 1 was the highest as it provides the medical care service for male patients who have the head injury and all kinds of serious and traumatic accident. The second highest full cost is from Medical Ward No. 1 at Bht 22,409,892.09 which consisting of direct cost at Bht 6,113,028.64 and indirect cost at Bht 16,296,863.45. This 32- bed ward provides medical care service for both male and female severe patients who need Artificial Respiration. This can cause a high full cost in this department.



#### 4. Unit cost of Out-patient and In-patient service

Generally, the cost of revenue producing cost center (RPCC) and non-revenue producing cost center (NRPCC) will be distributed to Out-patient and In-patient service according to the cost allocation criteria. When considering at Patient service area, the cost will be divided into two types, which are, routine service cost (RSC) and medical care cost (MCC). Routine service cost will not be charged to the patient directly. It is the fixed cost. The medical care cost will be considerably varied to the symptom of illness and it will be charged to patients directly. The cost of out-patient service and in-patient service are regarded as the crucial unit cost of hospital cost (Anuwat Supachutikul et al, 1996). The finding can be summarized as following:

**4.1 The unit cost of out-patient service:** The unit cost of out-patient service per case at Maharaj Nakhon Si Thammarat hospital was at Bht 444.32. When comparing with the study of unit cost of out-patient and in-patient service of the other same size hospitals and *adjust the unit cost to be the value of the year 2003*, it showed that the unit cost of Maharaj Nakhon Si Thammarat hospital between July 1 – December 31, 2003 was higher than the study of Kannika Inpra (1996). The unit cost of out-patient service per visit of Phrae hospital was at Bht 183.93. The study of Walaiporn Patcharanarumol (1997) showed that the unit cost of out-patient service per visit of Khon Khaen hospital was at Bht 282.25. The study of Kanjana Tisayaticom (2000) indicated that the unit cost of out-patient service per visit of Trang hospital was at Bht 205.68. The study of Suwat Mahatnirankul et al, (1998) illustrated that the unit cost of out-patient service per visit of Suanprung hospital was at Bht 316.55. But the unit cost of out-patient service per visit of Maharaj Nakhon Si Thammarat was less than

the study of unit cost of out-patient service per visit of Phra Pokklao hospital by Daolerk Sinthuwanich et al, (2001) which it was at Bht 883.22. When taking the cost factor of unit cost into consideration, it found that the average of medical care cost (MCC) per visit was at Bht 262.60 and the average of routine service cost (RSC) per visit was at Bht 181.72. The ratio was 59: 41 per cent which consistent to the study of Sukalaya Kongsawat (1991). The finding showed that the ratio of medical care cost to routine service cost of out-patient service of Medical department at Chulalongkorn hospital was 64: 36 and the ratio of medical care cost and routine service cost in the study of Kannika Inpra (1996) was 73.60: 26.40.

In term of the unit cost of out-patient service, it presents that the average cost per visit of Hemodialysis is the highest at Bht 3,230.70, OPD- Specialty Medical Clinic and Psychiatric at Bht 1,066.55, and OPD-Urological Surgery at Bht 972.28 respectively. When comparing this finding with the other studies by *adjusting the value of unit cost to the year 2003 value*, it shows that this study is consistent with the study of Kanjana Tisayaticom (2000) which indicates that the cost of Hemodialysis of Trang hospital was Bht 6,268.58. When looking at the unit cost of out-patient service at Phra Pokklao hospital in the study of Daolerk Sinthuwanich (2001), it shows that unit cost of Hemodialysis was the highest at Bht 2,709.29. The unit cost of Hemodialysis is the highest since the dialysis service has a high expense in medical equipment and material. This study is not consistent with Walaiporn Patcharanarumol (1997). The unit of Dentistry was the highest at Bht 637.46 and follow by OPD- Medical at Bht 455.67. However, it is different from the study of Kannika Indpra (1996) which found that OPD-Orthopedic was the highest at Bht 513.70. It can be concluded that the difference

in the type of service and cost classification will result in the different value of unit cost. The second highest unit cost is OPD- Specialty Medical Clinic and Psychiatric as OPD-Specialty Medical Clinic provides special care service for some specific diseases, for instance, Diabetes, Hypertension, Renal disease, Heart disease, Dermatitis. The patients in this group need to get the treatment by taking the drug mainly. In case of OPD-Urological Surgery, its characteristic of diseases needs the high cost treatment and drug.

**4.2 Unit cost of In-patient service:** It shows that the unit cost per case of in-patient service is at Bht 9,093.22, which consisting of medical care cost and routine service cost Bht 4,770.66 and Bht 4,322.56 respectively. When comparing with the other same size hospital and *adjust the unit cost to be the value of the year 2003*. The result is different from the study of Kanjana Tisayaticom (2000) which the unit cost of in-patient service of Trang hospital was at Bht 5,377.86. The medical care cost was at Bht 2,452.10 less than the routine service cost Bht 2,925.76. When looking at the detail of unit cost of in-patient service, it shows that ICU Ward No. 1 was the highest at Bht 36,829.57, follows by ICU Ward No. 2 at Bht 35,410.52 and then Medical Ward No. 1 at Bht 32,572.52. The unit cost of in-patient service per case of Postnatal Ward was the lowest at Bht 2,752.23. The finding is consistent with the study of Kanjana Tisayaticom (2000) which shows that the unit cost of in-patient service per case of ICU Ward at Trang hospital was the highest also. ICU Ward No. 1 of Maharaj Nakhon Si Thammarat hospital was being renovated to be Surgery ICU Ward to provide medical care service for crisis and traumatic patients which need an intensive care, expensive

medical supply, material and equipment, including the special monitoring from the health personnel

**4.3 The average cost of in-patient service per patient day** was at Bht 1,854.51. The highest unit cost of in-patient service per patient day come from Private Section Ward-Chalerm Phrabaramee (2<sup>nd</sup> Fl.) Bht 5,701.68, follows by ICU Ward No. 2 at Bht 5,415.44 since it was being renovated to be Medical ICU Ward, then Medical Ward No. 4 at Bht 4,940.89 and ICU Ward No.1 at Bht 4,311.33 respectively. The average cost per patient day of Postnatal Ward was the lowest at Bht 952.82. This result is different from the study of Walaiporn Patcharanarumol (1997) which the average cost per patient day of Khon Khaen hospital was at Bht 1,485.41. ICU Surgery Ward has the highest average cost per patient day at Bht 5,645.05 which inconsistent with the study of Kanjana Tisayaticom (2000). Her study shows that the highest unit cost per patient day of Trang hospital is from ICU Medical Ward at Bht 5,747.19. If the Private Section Ward-Chalerm Phrabaramee (2<sup>nd</sup> Fl) were not included to this study, the result would consistent with Kanjana's study that the unit cost per patient day of ICU Medical Ward was the highest. Private Section Ward-Chalerm Phrabaramee (2<sup>nd</sup> Fl) provide special service for VIP patient. It was opened for service in September 2003 and the number of patient was very few. This can cause an increase of average cost per patient day. Therefore, if the hospital change the marketing strategy and encourage more patients to use this section, it will result in the lower average cost per patient day.

International Health Policy Program: IHPP with cooperation of National Health Insurance Office conducted the study of unit cost of patient service of health

institutions in fiscal year 2003 by using conventional method. The data was gathered from eight provincial hospitals. This method considered the operating cost only that comprises labor cost, material cost excluding capital cost. The cost calculation is the accounting calculation method, not included any economic cost, such as, opportunity cost. When comparing this conventional method with the finding of this study, it shows that the median of unit cost of out-patient service per visit was at Bht 281 and the unit cost of in-patient service per case was at Bht 5,366. The ratio of unit cost of in-patient service per case to out-patient service per visit in the provincial hospital was 19.03. This means that the cost spent for one in-patient case of provincial hospital is 19.03 folds of cost spent for one out-patient visit. However, the result of study of unit cost of out-patient service and in-patient service of Maharaj Nakhon Si Thammaraj shows that it is higher than the median. The average cost of out-patient per visit is at Bht 444.32 and average cost of in-patient per case is at Bht 9,093.22. And the ratio of unit cost of in-patient service per case to out-patient service per visit of Maharaj Nakhon Si Thammarat hospital was 20.47. Therefore, if the hospital took the median of unit cost of provincial hospital to calculate the unit cost of out-patient service and in-patient service, the unit cost calculated would be less than the actual cost. For some hospitals, which do not have unit cost analysis, they will calculate its unit cost by using the ratio of unit cost of in-patient service per case to out-patient service per visit at 19.03 instead. This calculation is the quick method.

Again, International Health Policy Program calculate the unit cost of out-patient and in-patient service by using the below quick method and data gathered from 0110 Ror Ngor. 5 Report in the fiscal year 2003 which 89 provincial hospitals ( 97 per

cent) under Office of Permanent Secretary of Ministry of Public Health submitted the report to Office of Health System Development, Ministry of Public Health on monthly basis.

$$\text{Unit cost of Out-patient} = \frac{\text{Full Cost}}{\text{Number of out-patient visit} + (\text{Number of in-patient case} \times \text{ratio unit cost IP case/OP visit})}$$

$$\text{Unit cost of in-patient} = \text{unit cost of out-patient per visit} \times \text{ratio unit cost IP case/ OP visit.}$$

It found that the median of Unit cost per out-patient visit was at Bht 409 and in-patient case at Bht 7,777, which are less than the result of the study of unit cost of out-patient and in-patient service of Maharaj Nakhon Si Thammarat hospital.

By using the above quick method from International Health Policy Program, it presents that the unit cost of out-patient visit of Maharaj Nakhon Si Thammarat hospital is at Bht 474 whereas this study, the unit cost of out-patient service by using Conventional Costing was at Bht 444.32. For the unit cost of in-patient service per case was at Bht 9,025 whereas this result of this study was at Bht 9,093.22. The main cost of hospital is from in-patient service so the unit cost of in-patient per case by using the quick method will be less than the unit cost of in-patient service in this study.

In conclusion, this study can be used for further study. The finding of this study can not be the lifetime reference. However, it can be used for the fundamental information to compare the cost calculation method and data for the similar study in the

future. Moreover, if the future study include the actual revenue comparing with unit cost analysis, it will be more beneficial to improve the operating process plan in each department more concisely and plan the investment more effectively.

## **Research Constraints**

In this study, the information system does not support the cost analysis. The research constraints can be summarized as following:

1. The problem occurred between labor cost data collection. Although the computer was in use, a lot of personnel information and data was still not update and it was recorded by several different departments, for example, the information about the personnel internal transfer or on special assignment and retirement. There are no linkages of data between department so it is time-consuming when gathering the data completely.
2. In this study, the labor cost of Physicians would be allocated according to the number of working hour in the schedule whereas the labor cost of Medical Education Center will be allocated according to the number of teaching hour. The problem is that no data validation from the representative of each cost center.
3. Sharing the material amongst several departments can cause a problem in allocating the cost to each cost center, as it is unable to define how much material cost each cost center spent. For example, printing material of out-patient service will be used by all cost centers so the cost will be allocated by using the number of patients in each cost center as a criterion.

4. The data about the utility cost could not be collected from each department directly. In practice, this kind of cost data will be defined as the cost of General Administration first, after that will be allocated to other departments depending on the number of personnel in that department.
5. The equipment record was not recorded completely and clearly. The computer was introduced to help control the equipment record system more efficiently. However, the computer application is not implemented completely yet. It needed to record manually firstly before inputting into the computer again. This causes the data not updated.
6. The problem also occurred between processing the data from the hospital database system. The input data is still not complete and it is time consuming to gather the complete data. The computer was used in some departments only, not every department so there is no linkage of data between departments.

## **Suggestions and Recommendations**

As a super tertiary hospital, Maharaj Nakon Si Thammarat hospital needs to provide the support to the lower level hospital and other health service center. It is very necessary to improve the quality and keep the standard of medical care continuously as it is also the Medical Education Center. Most of Medical student and other health personnel from several institutions need to do their internship at the hospital. So, if the result of this study will be used to improve the quality, effectiveness in health service providing, it needs to take this factor into consideration as the symptom of disease/ illness of patients are always more serious and severe than other lower level hospitals in



the area. The treatment therefore is necessary to use the higher technology and state of art medical equipment to give to patient more than other hospitals. The unit cost of patient service will be high or low depending on some important factors, for example, patients, physicians and hospital itself. In light of the patient factor, it depends on the knowledge in taking care of their own health, the change of disease form from prevented disease to chronic disease and not infected disease and accidents. These small factors cause the change in treatment cost. In term of physician factor, it depends on the symptom diagnosis using the expensive high technology medical equipment and behavior of physician for drug selection. In case of hospital factor, it depends on the health system management.

The unit cost of patient service can be applied in the hospital management, especially the budget planning which currently need to utilize the limited resources ultimately. This will help the hospital administrator have the overview of health service system and control the cost more effectively and clearly. The feasibility in information system management to support the cost analysis system should be considered because the database of out-patient service is available partially but it is still lack the information system management to help utilize the data and information more appropriately and easily. Once the local area network is implemented in the patient service area completely, the cost data can be monitored and analyze more continuously.

## Suggestions in Cost Control

According to the finding of the study, although the cost center classification will be changed in the future, no matter the department will be closed or added, for example, the private section ward, the finding of this study is still important and beneficial to be the fundamental database for the future study. In comparison of the unit cost of Maharaj Nakhon Si Thammarat hospital and the other hospitals, it should be noted that the number of bed, cost center classification, data collection medium, cost allocation criteria, size of hospital and region of hospital location, in each hospital should be at the same level or equivalent. The possible actions should be taken to control cost to utilize the existing resource ultimately without reducing the efficiency in providing the health care service to patients are as following:

1. The policy in drug usage inspection and drug storekeeping should be introduced. The finding shows that the material cost in revenue producing cost center are mainly from Drug expense and Medical and Science Equipment (77.50 per cent). As known, this kind of expense is the hospital operating cost. As a result, it needs some measures to reduce the increase in this kind of cost, for example, defining the treatment and medical care standards, giving the feedback to the physicians, determining the policy in effective, economy and logical drug prescription including defining the drug listing, defining the drug storekeeping. The expiration of drug and medical supplies will cause the waste in cost.
2. The labor cost should be controlled closely, especially the labor cost of Physician and Nurses who provide medical care service to patients. The details of labor cost should be considered, focusing on benefit and welfare,

for example, special allowance and overtime. The manpower in each patient service should be allocated appropriately to suit the type of service and department performance. The work that not relevant to the treatment or medical care service, the non-health related personnel with lower salary should be considered to replace. However, it is noted to be careful about the possible problem in service providing.

3. The policy in utility cost saving should be introduced to save the cost as much as possible by setting up the turn on – turn off time of air conditioners, using the telephone when necessary, etc.
4. The increase in productivity of service by using the state-of-art medical equipment to treat the patient has both benefit and drawback. In the provider's view, it cost a lot of money to invest and it might not be worth in the long run. On the other hand, it will be beneficial to the patients in treatment. As the medical equipment is the high value asset, it is recommended to have the center to take care of it. It is the center, which collect the high technology equipment together and control the disbursement and requisition. Each department can requisition to use and share this equipment. This will help save the resource and cost. If every department has it own equipment, it will increase the hospital cost unnecessarily. For example, setting up the Respiratory Equipment Center, Electrocardiogram Center. It is not necessary that there should be such expensive equipment in every ward. It can be shared between adjacent department. Moreover, there should be the training of product usage and maintenance before using.

5. The cost control of material used is very important. The hospital should consider reducing the quantity of material used and analyzes its waste, the maintenance system, material purchase should be aligned with the plan.
6. The important variable, which can effect the unit cost, is number of out-patient visit, number of patient day. If the hospital agrees to do the unit cost reduction, it is necessary to reduce this variable first for example making appointment with patient whenever necessary only. In case the patients recover from the illness completely, it needs to discharge them to rehabilitate at home. This can do by using the discharge planning. From the result of the study, it is found that the average cost of in-patient service per patient day at Private Section Ward – Chalerm Phrabaramee (2<sup>nd</sup> Fl) was the highest at Bht 5,701.68 because the less number of patients. As a result, if the hospital change the marketing strategy and encourage more patients to use this section, it will result in the lower average cost per patient day.
7. The hospital should implement the cost accounting system in each department and plan the cost analysis continuously on the yearly basis. This will help realize the trend of cost change. In cost data collection, the committee should be established and members should come from every involving department. The responsibility in data collecting in each cost center should be assigned specifically in order to get the most accurate cost data and easily to be analyzed. However, the data collection should be applied to the routine work as much as possible.

8. The training about the cost analysis should be provided for the personnel in each department so that they will have the basic knowledge of public health economic and understand the resource utilization and management better.
9. The analysis of patient service system should be done completely incorporate with the unit cost analysis to consider the effectiveness and efficiency in patient service provision. This will help the good quality health service for patients with least operating cost. This will also help reduce the direct cost which result in the decrease in unit cost accordingly. With the unit cost analysis alone in absence of patient service system analysis, the medical service charge will be still high because the unit cost is still high and no cost reduction is conducted, except the result of patient service system analysis shown that its health care service system is effective. To adjust the higher health service charge to patients, it is necessary to study the patient service procedure and analyze the system in every point more completely.

### **Suggestions for the Next research**

In the study of cost and unit cost of patient service of Maharaj Nakhon Si Thammarat hospital, there are several weaknesses found, for instance, the data collecting. Cost data of Maharaj Nakhon Si Thammarat hospital is scattered. The existing data collected does not support the hospital cost analysis. To get the complete data, it needs to gather from several departments. Therefore, the research has concluded the suggestion and guideline for the cost analysis in the future for any organization or people who would like to use it as a role model for cost analysis as following:

1. To conduct the cost and unit cost analysis correctly and completely, it is supposed to establish the committee to follow up the cost analysis process. The committee establishment should be endorsed by the hospital's director as it will help get the kind cooperation from the other department more effectively. Moreover, the committee members should comprise the personnel/staffs from various departments in order to understand the function, structure, responsibility and the relation between each department better. All involving departments should be educated about the techniques and knowledge about cost and unit cost analysis so that the staffs in each department will understand the attributes of cost data. The most important thing in cost analysis is the correct data collecting and appropriate cost allocation criteria in accordance with the true relation amongst departments.
2. The computer system should be introduced to the data collection. The data system should be consistent in every department. There should be a linkage of information between departments to support the cost analysis of the determined cost center. The database should be updated frequently and correctly. The database of hospital personnel, connection of staff administration system and financial system, including the fringe benefit and welfare should be included in the same database. In addition, the data about staff's internal transfer and equipment record should be done correctly and frequently.
3. There should be a further study of Unit Cost of Diagnosis Related Groups in order to use the information to request for the compensation in case the cost is higher than the standard price.

4. When the cost data is gathered completely and correctly, it is recommended to study the cycle of actual revenue receivable together with the likely revenue receivable in parallel so that it will be beneficial to the operating process development in each department. Moreover, it can help consider the return on investment more effectively when using the information about the expense of each department. In case of the investment on high technology and expensive medical equipment, this information can be a guideline on the return on investment, payback period, medical care service charge rate and etc.
5. After the hospital get the good cost data collecting system, this data can be used as fundamental information to study the health economic in other divines, for example, the study of cost behavior, cost benefit, cost effectiveness.
6. For further more study and useful for Policy Analysis , the variable cost for 1 Episode ought to be calculated. ( Exclude Investment or Salary ). At present, the salary of personnel is allocated by the Ministry of Public Health before the budget allocation according the Universal Healthcare Insurance Policy was introduced.