COST ANALYSIS OF TEACHING HOSPITAL:
A CASE OF FACULTY OF MEDICINE VAJIRA HOSPITAL

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การวิเคราะห์ต้นทุนของคณะแพทยศาสตร์วชิรพยาบาล

นางสาวกฤติกา โคตรทอง

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิทยาศาสตรมหาบัณฑิต
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กฤติกา โคตรทอง : การวิเคราะห์ต้นทุนของคณะแพทยศาสตร์วชิรพยาบาล (COST ANALYSIS OF TEACHING HOSPITAL: A CASE OF FACULTY OF MEDICINE VAJIRA HOSPITAL) อ.ที่ปรึกษาวิทยานิพนธ์หลัก: รศ. ดร.ศิริเพ็ญ ศุภกาญจนกันติ, 106 หน้า.

การศึกษานี้เป็นการศึกษาต้นทุนของคณะแพทยศาสตร์วชิรพยาบาล ปีงบประมาณ 2558 ในมุมมองของผู้ให้บริการ เพื่อศึกษาโครงสร้างและสัดส่วนของต้นทุนการให้บริการ ต้นทุนต่อ RW และคาดคะเนต้นทุนของกลุ่มโรคที่พบบ่อย 5 อันดับแรกของผู้ป่วยใน โดยได้ทำการศึกษาโครงสร้างองค์กรของคณะฯ เพื่อจัดกลุ่มหน่วยต้นทุนเป็น 3 กลุ่ม ได้แก่ หน่วยต้นทุนที่ไม่ก่อให้เกิดรายได้ หน่วยต้นทุนที่ก่อรายได้และหน่วยต้นทุนสุดท้าย ซึ่งประกอบด้วยหน่วยต้นทุนที่บริการผู้ป่วยภายในโรงพยาบาลได้แก่ผู้ป่วยนอกและผู้ป่วยใน และหน่วยต้นทุนที่ไม่ได้บริการผู้ป่วยภายในโรงพยาบาล ได้แก่ การผลิตนักศึกษาแพทย์และการบริการชุมชนภายนอกโรงพยาบาล โดยกระจายต้นทุนไปยังหน่วยสุดท้ายด้วยวิธี Step-down method และต้นทุนของภาควิชาจะถูกถ่วงน้ำหนักด้วยสัดส่วนงาน ก่อนการกระจายต้นทุน

ผลการศึกษาในส่วนแรกคือการวิเคราะห์ต้นทุน พบว่าต้นทุนทั้งหมดของปีงบประมาณ 2558 เท่ากับ 2,210,211,175 บาท แบ่งเป็นต้นทุนค่าแรง 1,358,985,449 บาท คิดเป็น 61 เปอร์เซ็นต์ ต้นทุนค่าวัสดุ 636,967,811 บาท คิดเป็น 29 เปอร์เซ็นต์ และต้นทุนค่าลงทุน 214,257,915 บาท คิดเป็น 10 เปอร์เซ็นต์ของต้นทุนทั้งหมด ต้นทุนต่อหน่วยการให้บริการได้แก่ ต้นทุนต่อการให้บริการผู้ป่วยนอกเฉลี่ย 2,003 บาทต่อครั้ง โดยหน่วยที่มีต้นทุนสูงที่สุดคือหน่วยผู้ป่วยนอกแผนกนิติเวชวิทยา 5,162 บาทต่อครั้ง ต้นทุนต่อการให้บริการผู้ป่วยในเฉลี่ย 6,712 บาทต่อวันนอน และ 87,647 บาทต่อราย โดยหน่วยที่มีต้นทุนต่อวันนอนสูงที่สุดคือหอผู้ป่วยจักษุวิทยา 20,267 บาทต่อวันนอน และหน่วยที่มีต้นทุนต่อรายสูงที่สุดคือหออภิบาลผู้ป่วยกุมารเวชกรรม 271,009 บาทต่อราย ต้นทุนการให้บริการงานเวชศาสตร์ป้องกัน 1,754 บาท ต่อโครงการ ต้นทุนด้านการศึกษาของคณะฯรวม 93,206,719 บาท และ ต้นทุนของนักศึกษาแพทย์ต่อคน 1,400,364 บาท ต่อระยะเวลาของหลักสูตร 6 ปี ผลการศึกษาในส่วนที่สองคือการวิเคราะห์ต้นทุนต่อ RW และต้นทุนของการรักษาโรคที่พบบ่อย 5 กลุ่มโรค พบว่า ต้นทุนต่อ 1 RW คือ 38,821 บาท ซึ่งสูงกว่าอัตราการเบิกจากรัฐบาล 73 เปอร์เซ็นต์ โดยกลุ่มโรคหัวใจขาดเลือดเรื้อรังมีค่าใช้จ่ายสูงที่สุดคือ 227,865 บาท

โดยสรุป ต้นทุนการให้บริการของคณะแพทยศาสตร์วชิรพยาบาลในปีงบประมาณ 2558 มีสัดส่วนต้นทุนค่าแรงสูงที่สุดคือ 61 เปอร์เซ็นต์และต้นทุนการให้บริการทางการแพทย์ของผู้ป่วยใน สูงกว่าอัตราการเบิกจ่ายจริง 73 เปร์เซ็นต์ โดยกลุ่มโรคหัวใจขาดเลือดเรื้อรังมีค่าใช้จ่ายสูงที่สุด ด้วยเหตุนี้ผู้บริหารของคณะฯจำเป็นต้องวิเคราะห์สาเหตุเพิ่มเติมถึงที่มาของต้นทุน รวมทั้งควรควบคุมและติดตามการใช้ทรัพยากรของหน่วยต้นทุนต่างๆ เพื่อวางแผนจัดการ การทำงานให้เกิดประสิทธิภาพยิ่งขึ้น ทั้งยังสามารถใช้ข้อมูลการศึกษาต้นทุนกลุ่มโรคที่พบบ่อยนี้ เป็นแนวทางกำหนดอัตราการเบิกจ่ายเงินชดเชยในกลุ่มวินิจฉัยโรคร่วมต่อไป

สาขาวิชา เศรษฐศาสตร์สาธารณสุขและการจัดการบริการสุขภาพ ลายมือชื่อนิสิต .....

ลายมือชื่อ อ.ที่ปรึกษาหลัก .....

ปีการศึกษา 2558

5885554529 : MAJOR HEALTH ECONOMICS AND HEALTH CARE MANAGEMENT
KEYWORDS: COST ANALYSIS / TEACHING HOSPITAL

KRITTIKA KHOTTHONG: COST ANALYSIS OF TEACHING HOSPITAL: A CASE OF FACULTY OF MEDICINE VAJIRA HOSPITAL. ADVISOR: ASSOC. PROF.SIRIPEN SUPAKANKUNTI, Ph.D., 106 pp.

This study focused on cost analysis of the Faculty of Medicine Vajira Hospital in the fiscal year 2015. The objectives are the evaluation of service costs and the cost estimation of five most common DRG codes. The faculty's organization is studied for the identification of cost centers and dividing into the non revenue producing cost center (NRPCC), the revenue producing cost center (RPCC), and the final cost center. The final cost center consists of the patient service (PS) cost center and the nonpatient service (NPS) cost center. The full cost are allocated to the final cost center by step-down method.

The results show that the total cost is 2,210,211,175 Baht. The labor cost is 1,358,985,449 Baht, which is sixty one percent. The material cost is 636,967,811 Baht, which is twenty nine percent. The capital cost is 214,257,915 Baht, which is ten percent. The average cost per OPD visit is 2,003 Baht. The forensic OPD has a highest cost, 5,162 Baht per visit. The average cost per inpatient day is 6,712 Baht. The ophthalmologic ward has a highest cost, 20,267 Baht per inpatient day. The average cost per admission is 87,647 Baht. The pediatric intensive care unit has a highest cost, 271,009 Baht per admission. The average cost of health promotion service is 1,754 Baht per project. The total cost of medical education is 93,206,719 Baht and the cost per one student for the whole curriculum is 1,400,364 Baht. The DRGs cost per RW and the estimated cost of five common DRGs are calculated. The result is 38,821 Baht per RW which is higher than the reimbursement rate 73 percent. The chronic ischemic heart disease has highest estimated cost of 227,865 Baht.

In conclusion, the labor cost is the highest cost component, 61 percent. The health care service cost is higher than the reimbursement, 73 percent and the DRG code of chronic ischemic heart disease has highest cost. For these reasons, the faculty manager has to further analyse the resource utilization of each cost center for the efficiency improvement and implying the data cost of each DRG code for the prospective reimbursement from health insurance schemes in the future.

Field of Study: Health Economics and Health Care Management — Student's Signature .....

Advisor's Signature .....

Academic Year: 2015

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I am indebted the dean of Faculty of Medicine Vajira Hospital who a kindly allowed me to study and collect data.

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CHAPTER 1
INTRODUCTION

1.1 Background

Vajira Hospital has been established since 1912. It is the hospital of Bangkok Metropolitan Administration (BMA) before being converted to the autonomy hospital since 2010 and belongs to the Faculty of Medicine Vajira Hospital, Navamindradhiraj University (NMU). The Faculty of Medicine Vajira Hospital is one of four faculties of Navamindradhiraj University which are the Kuakarun Faculty of Nursing, the Institute of Metropolitan Development, the Urban Community College of Bangkok, and the Faculty of Medicine Vajira Hospital. The detail is shown in figure 1.

According to the organizational structure, the faculty's staffs divided into two lines of command which are the BMA system and the university administration system. There are three main departments which are the medical education, Vajira Hospital and the supporting department. The education department is responsible for the medical education. Each academic staff has three functions which are the medical teacher, the physician, and the researcher. Vajira hospital is responsible for the health care provision. The supporting department is responsible for support activities of first two departments. The detail is shown in figure 2.

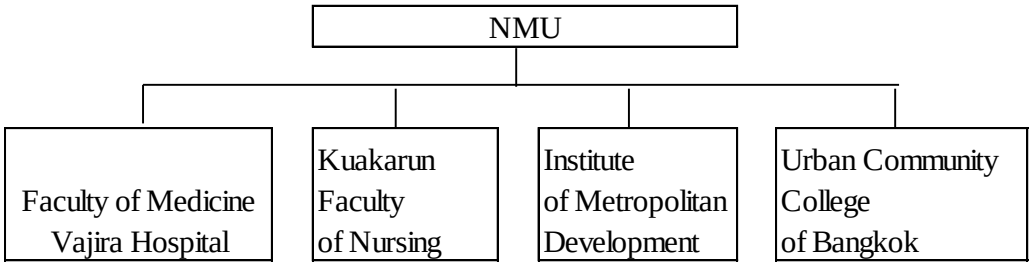

Figure 1 The organizational structure of Navamindradhiraj University

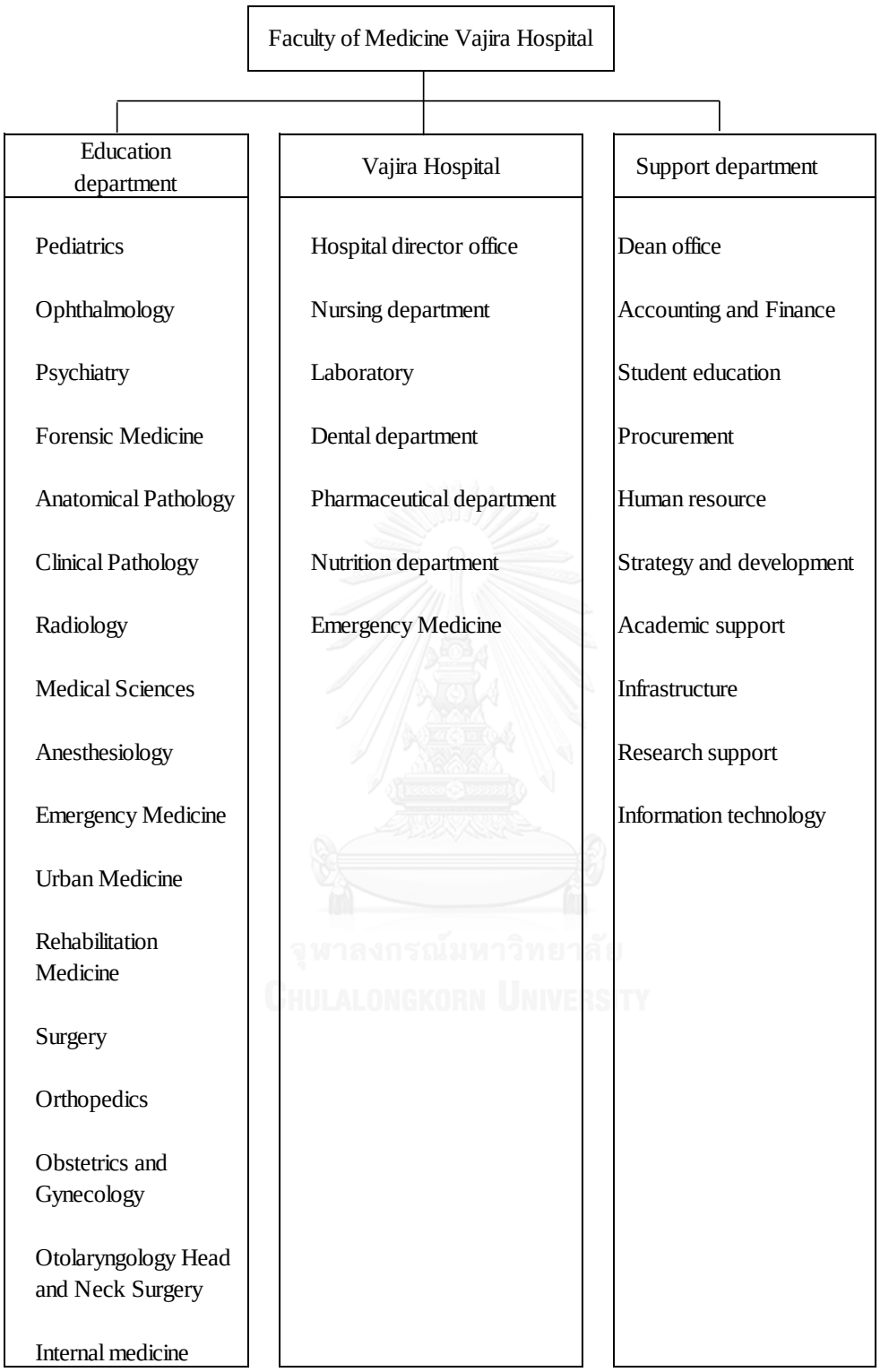

Figure 2 The organizational structure of the Faculty of Medicine Vajira hospital
Source: Navamindradhiraj University Regulation of Department Classification in the Faculty of Medicine Vajira Hospital (2014)

For the medical education curriculum of the Faculty of Medicine Vajira hospital, there are two institutes involving in the curriculum. The first institute is the Faculty of Science Mahidol University, providing the premedical science course for medical students year one and year two. The second institute is the Faculty of Medicine Vajira hospital, providing the preclinical science course for medical students year three and the clinical science course for medical student year four to year six which learn the clinical skill course at Vajira hospital. The details are shown in figure 3.

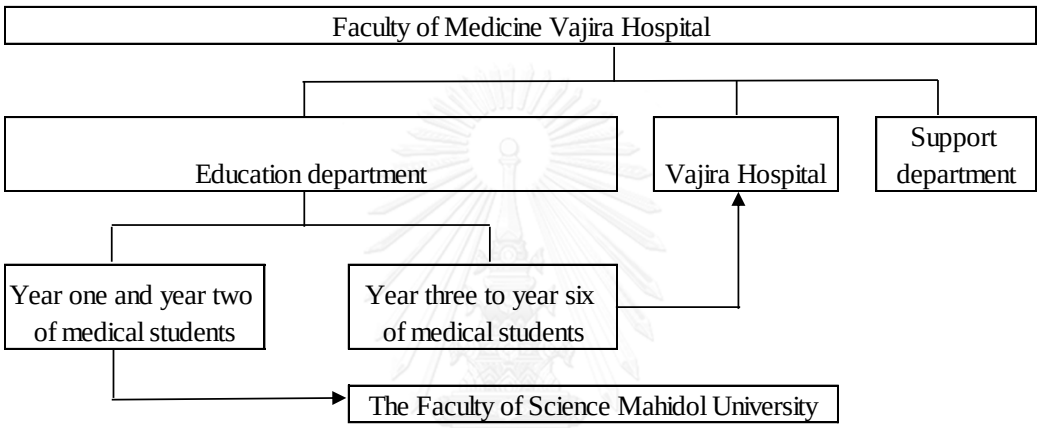

Figure 3 The medical education curriculum

The autonomous conversion since 2010 is its challenge because the budget from the BMA decrease to seventy percent of annual expenses (University of Bangkok Metropolitan Act, 2010, page 6). That is lower than before conversion. The faculty's revenue consists of two parts which are the BMA budget and the faculty service revenues. The details are shown in table 1.

Table 1 the revenues of the Faculty of Medicine Vajira hospital in 2015

Source	Revenue
BMA budget	1,481,991,350
Government subsidy	94,000,000
Maintenance money	886,023,090
Working capital	970,568,453
Total	**3,432,582,893**

Source:
The undocumented financial report of the Faculty of Medicine Vajira hospital

However, the hospital autonomy has advantages for the efficient management and the performance increment (Çınar & Eren, 2013) due to more flexibility leading to tendency to efficient in management. To achieve this purpose the hospital costs play an important role for the hospital to monitor and to develop a hospital plan of management. The analysis of hospital costs has to be done continuously in order to achieve better performance.

1.2 Rationale

Hospitals are the essential part of the health care system because they are the core organizations delivering health care services to patients. They consume excessive resources, especially teaching hospitals, which have many tasks such as educations, researches and medical services including the development. They have to continue development and investment in new technologies, equipment and facilities (James R. Langabeer III & Napiewocki, 2000) to serve the progression of medical education technology. The study of hospital performance will benefit for the health care system development.

All teaching hospitals in Thailand are not-for-profit hospitals and traditionally emphasize on the clinical outcomes, but the aspect of efficiency cannot be ignored because teaching hospitals have rather fixed revenue due to the reimbursement rate regulation of purchasers. An inefficiency of their resource utilization may cause national economic and health care problems. The cost data are helpful for the appropriate decision making for effective management.

Even though there are many studies of hospital costs in Thailand. The studies were done in all level hospitals such as teaching hospitals, tertiary care hospital, secondary care hospital and primary care hospital. All these hospitals belong to the Ministry of Education and Ministry of Public Health. But the teaching hospital cost analysis under the Ministry of Interior has never been studied and Vajira Hospital is the only one teaching hospital of the Ministry of Interior. These are the reasons why Vajira Hospital is the representative of the study.

1.3 Research Question

What are costs of services on the perspective of the provider at the Faculty of Medicine Vajira Hospital in the fiscal year 2015?

1.4 Objective

To evaluate the costs of services on the perspective of the provider at the Faculty of Medicine Vajira Hospital in the fiscal year 2015?

1.5 Specific objectives

1. To determine the cost structure and component of patient and nonpatient services of the Faculty of Medicine Vajira Hospital
2. To calculate total costs and unit costs of patient and nonpatient services at the Faculty of Medicine Vajira Hospital in the fiscal year 2015
3. To analyze the DRGs cost per RW and cost of five most common inpatient diseases of Vajira Hospital in the fiscal year 2015

1.6 Scope of the study

This study concentrates on costs of patient and nonpatient services, DRGs cost per RW and cost of five common inpatient diseases from the perspective of providing at the Faculty of Medicine Vajira hospital in the fiscal year 2015 (1 October 2014 – 30 September 2015). The patient services consist of outpatient and inpatient services. The nonpatient services consist of the health promotion service for the hospital surrounding communities and the medical education for the medical students.

1.7 Possible benefits

The cost analysis of this study is a useful tool for effective management. If the faculty managers truly understand about their costs, they can use cost data for improving efficiency and quality including an investment decision-making (Thomas C. Tsai et al., 2015). A cost data may be used by managers for the gap evaluation between require and available resource, current situation assessment, priority and price setting, determine revenue objective, making cost project, and budgeting leading to the successful organization.

CHAPTER 2
LITERATURE REVIEW

The literature reviews, compose of four topics; Teaching hospitals in Thailand, Hospital cost analysis, Health care schemes in Thailand, and Diagnosis Related Groups (DRGs).

2.1 Teaching hospital in Thailand

The teaching hospital is a hospital that cooperates with a medical school to provide the medical education for students, residents, and fellowships. All of them are tertiary care hospitals, which also provide the services for complicated and rare diseases with the specialized services and high technology equipment. There are eighteen medical faculties from seventeen universities and one medical college in Thailand. The higher education commission (HEC) of Ministry of Education is responsible for the educational quality of these institutes. These faculties are cooperating with the teaching hospitals for the clinical science education. In about twenty years ago the number of teaching hospitals in Thailand was increased to fifty five due to the doctor production policy looking to solve the problem of human resource scarcity in rural areas. All are government-own hospitals and divided into five groups belong to four ministries; the Ministry of Education, the Ministry of Interior, the Ministry of Defense, and the Ministry of Public Health. The details are shown in figure 4.

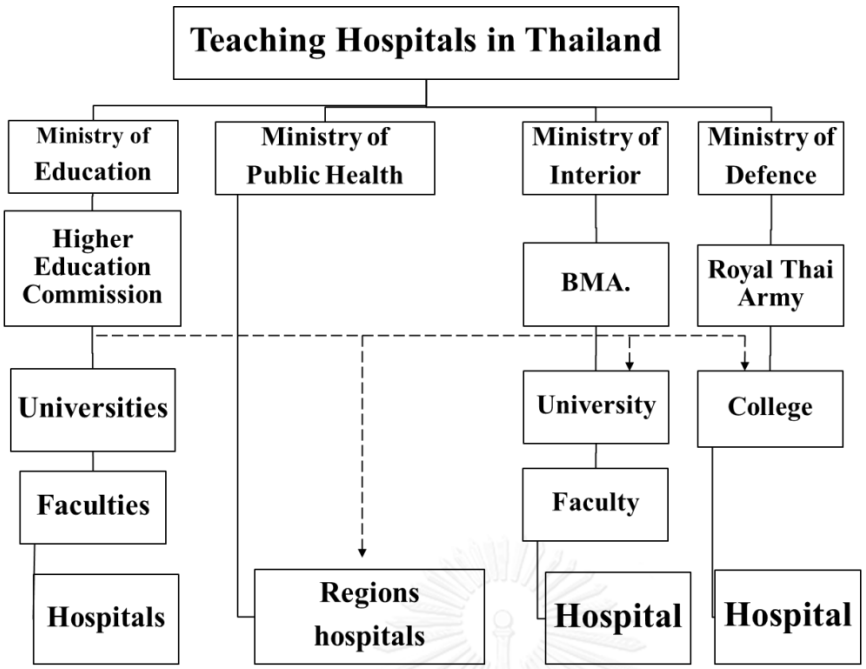

Figure 4 The organizational chart of teaching hospitals in Thailand

From the figure 4, the solid lines show the line of command in the management dimension. The dashed lines show the supervision in the aspect of education quality. Vajira hospital is the only one teaching hospital belongs to the Bangkok Metropolitan Administration (BMA) in the ministry of interior.

The medical curriculum for undergraduate students in Thailand spends six years. It corresponds to the standard criteria for the professionals in medical practice of the Medical Council and the National Education Act B.E. 2542 (Ministry of Education, 2003). The curriculum contents compose of the premedical science education, the preclinical science education, and the clinical science education. The first two modules are provided for the medical student first year to third year and the last module for the fourth year to sixth year. The premedical science education is a general education module such as the social science, languages, and humanities. The preclinical science education is the study of normal structures and functions of body and mind, the cause and mechanism of diseases, and the diagnostic processes in clinics.

The clinical science education is the integration of all knowledge for the improvement of competency, skills, attitude toward health promotion, prevention, treatments, and post-illness rehabilitation (Ministry of Education, 2003). All fourth year to sixth year medical students have to study the clinical sciences in teaching hospitals.

There are two groups of students of the universities belong to the Ministry of Education. The first group which came from the central examination system learns the clinical sciences in university hospitals. The second group which came from the collaborative project to increase production of rural doctors (CPIRD) and the One District, One Doctor project (ODOD) quota learns clinical sciences in region hospitals. There are thirty seven regions hospitals, which are responsible for clinical science teaching. These projects are the government's policy for solving the rural doctor scarcity by providing the medical school quota for high school students. They have to make an agreement to work in the rural hospital after they graduate, three years for CPIRD and twelve years for ODOD (Contract form of CPIRD and ODOD project, the Ministry of Public Health).

Additional the teaching hospitals belong to the Ministry of Defense are providing the clinical science education for their medical students. There is only one teaching hospital in this ministry. These graduated students will be distributed to other army hospitals in Thailand for soldier's health care provision.

According to the standard of commission of higher education the medical students have to learn and train in the real situations at the teaching hospital to ensure that they will gain knowledge with the standard criteria of Thai medical school after they graduate. For this reason the teaching hospitals should have the various types of patients in both simple and complicated diseases including rare diseases for the medical education. Due to their several job functions and the complicated treatment, many studies have shown that as the same diagnosis the teaching hospitals have higher costs than the nonteaching hospitals (Robert Mechanic, Kevin Coleman, & Dobson, 1998). But teaching hospitals have a higher overall survival rate (Ayanian & Weissman, 2002) and higher health care quality (Ashish K. Jha, E. John Orav, Allen Dobson, Robert A. Book, & Epstein, 2009) than lower-cost hospitals.

2.2 Hospital cost analysis

Cost in the definition of economics is the value of the resource utilized to create something such as health care services. The cost data can be rearranged in many ways depend on the objective of the study. The essential factors of cost rearrangement are the situation relavent, the possibility of overall covering, and overlapping of cost category (Creese & Parker, 1994). The cost can be classified by many methods such as by inputs and by activity. The categories of cost classified by input are the capital cost and the recurrent costs. The examples of capital cost are the building cost, the vehicle cost, and the equipment cost. The examples of recurrent costs are the labor cost, the material cost, and the building maintenance cost. Cost classified by activity is the cost that involving to the interested specific service such as the home health care, the vaccination, and the laboratory. Cost of all activities involving to that service will be analyzed. In general, there are four types of cost correlated with the production; the fixed cost, the semi fixed cost, the variable cost, and the total cost (Keawsonti & Kamolratanokul, 1993). The fixed cost is the cost that stable in the short time such as the cost of building and machine. The semi fixed cost is the cost that not correlate to the quantity of production such as the salary cost. But it will be changed if the quantity of production is higher than maximum capacity. The variable cost is the cost that correlates with the quantity of production, such as the material cost. The total cost is the summation of all types of cost. Additional term used for cost analysis is the average cost or the unit cost. The average cost is the cost of producing per one unit. The average cost is equal to the total cost divide by the quantity of output.

For the cost analysis, there are seven steps for calculation as follow (Donald S., Dominic, & Yvonne E., 1998).

1. The final service identification
2. The cost center identification
3. The full cost identification
4. Assignment of input costs
5. Cost allocation
6. Unit cost calculation
7. Results

The first step is the final service identification. The final service is the interesting output of hospital operation. The outputs of patient service are the outpatient department visits, the inpatient days and the admission (Bumrungchuu, 2011; Kodchaporn Lapsuwansakul & Kunkum, 2012 ; Piyanuch Chinakarn, Angun Somsung, & Sri-Chote, 2012; Rewsuwan, 2015; Sukratamornkul, 2010; Thananun Sriprakone, Sirichai Prasertkaew, & Poonkumlung, 2012). The identification of the final service depends on two factors which are the purpose of analysis and the type of data available.

The second step is the cost center identification. The rationale for identifying and grouping the cost center has to correlate with the organizational structure. The cost center should be divided by their work such as the patient service cost center, the intermediate cost center or the revenue producing cost center (RPCC) and the support cost center or non revenue producing cost center (RPCC). The patient service cost center is the direct, patient care department, such as the outpatient department (OPD), the inpatient department (IPD), and emergency room (ER). The intermediate cost center is the supplementary service for the patient care, such as radiodiagnosis, laboratory, and physical therapy. The support cost center is the supporting department for all other departments such as human resource department, accounting department, and procurement department. The cost of NRPCC and RPCC are the indirect costs of the patient service cost center.

The third step is the identification of the full cost of each input. The three main inputs are the labor cost, the material cost, and the capital cost. The labor cost consists of the salary and the fringe benefit. The material cost divides into the medical material and the non-medical material. The capital cost comprises of the building cost, the vehicle cost, and the equipment cost.

The fourth step is the assignment of input cost to cost centers. The cost of inputs will be assigned by the actual cost of each department.

The fifth step is the cost allocation. Costs of non-revenue producing cost center (NRPCC) and revenue producing cost center (RPCC) are allocated to final cost centers. These costs are indirect costs of final cost centers. Then, the full cost of final cost center is the summation of its direct cost and indirect costs which are allocated from NRPCC and RPCC. The intermediate and direct overhead costs will be allocated to final services by the allocation criteria.

There are three methods of cost allocation.

1. The direct method
2. The step-down method
3. The double distribution method
4. The reciprocal method

The direct method is the method that allocates costs of NRPCC and RPCC to the final cost center. The direct method diagram is shown in figure 5.

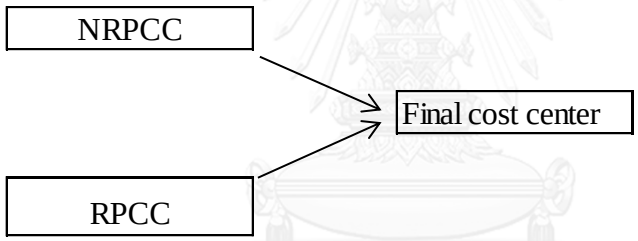

Figure 5 Cost allocation; direct method

Its advantage is the simplicity because costs are allocated to only one location, which is the final cost center. The disadvantage is the low accuracy because the cost of NRPCC does not allocate to the RPCC.

The step-down method is the method that allocates cost of NRPCC to RPCC and final cost center. After that the cost of RPCC will be allocated to the final cost center in one way technique. The step-down method diagram is shown in figure 6.

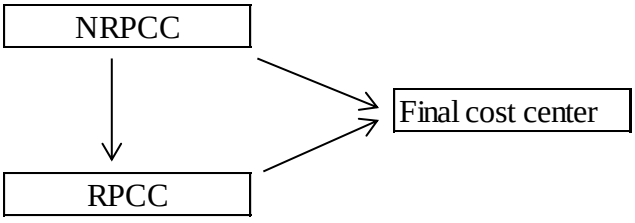

Figure 6 Cost allocation; Step-down method

It is more accurate than the direct method, but it is not the most accuracy method because the cost of the RPCC did not allocate to NRPCC.

The double distribution method is the allocation method that distributes cost for two times using the direct method for the first distribution and the step-down method for the second distribution. For the first distribution, the costs of NRPCC and RPCC are allocated to the final cost center and allocated to each other without limitation. At this point, full costs of NRPCC and RPCC will be obtained which consist of direct and indirect costs. For the second distribution, the full cost of NRPCC and RPCC are allocated to the final cost centers by the step-down method. All costs of NRPCC and RPCC will allocated to the final cost centers and the full costs of the final cost centers will be identified. The double distribution method is shown in figure 7.

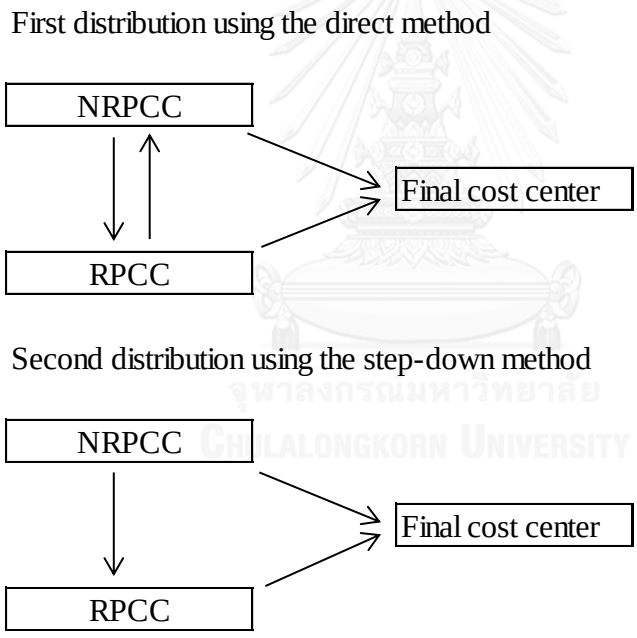

Figure 7 Cost allocation; Double distribution method

The last method is the reciprocal method. The costs of NRPCC and RPCC are allocated to NRPCC, RPCC and final cost centers simultaneously. The allocation criteria are the workload of each department and calculates by linear equations. The reciprocal method diagram is shown in figure 8.

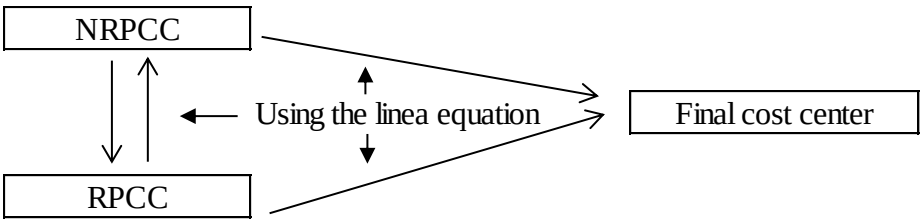

Figure 8 Cost allocation; Reciprocal method

This is the most accuracy method, but it's difficult to calculate because of the complexity. The conclusion of advantages and disadvantages of cost allocation methods is shown in table 2.

Type	Advantages	Disadvantages
Direct	Simplicity	Low accuracy for the complicated organization structure
Step-Down	Most explicitly	Lack of allocation between support departments
Reciprocal	Most accurate	Complexity

Table 2 Cost allocation method; Advantage and Disadvantages

The sixth step is the unit cost calculation. After costs allocation, the direct cost of overhead and intermediate department will be the indirect cost of final service department. The total cost of final services will be identified. The unit cost is calculated by dividing the total cost by the number of outputs. And the last step is the report results.

There are many studies of hospital cost analysis in Thailand. The studies were done in all types of hospitals; teaching hospitals, tertiary care hospitals, secondary care hospitals, and primary care hospital. Seven studies of public hospital cost analysis are reviewed and show that most of them divide cost center into three groups by the revenue producing criteria; NRPCC, RPCC, PS, and allocate costs by the simultaneous equation method (Bumrungchuu, 2011; department, 2008; Kodchaporn Lapsuwansakul & Kunkum, 2012 ; Piyanuch Chinakarn et al., 2012; Rewsuwan, 2015; Sukratamornkul, 2010; Thananun Sriprakone et al., 2012).

All studies are the retrospective study and analyze the hospital's secondary data. They calculate the capital depreciation cost by using straight-line method. The results show that the highest cost component is the labor cost, range from forty four to seventy six percent. The lowest cost component is the capital cost, range from two to six percent. The unit costs per OPD visit are range from 79 Baht to 1,507 Baht. The unit costs per inpatient day are range from 1,075 Baht to 8,141 Baht and unit costs per admission are range from 2,690 Baht to 24,911 Baht. Ayutthaya and Thammasat University hospitals are teaching hospital. They have a higher unit cost per OPD visit than the nonteaching hospital as well as the unit cost of IPD. The teaching and tertiary care hospitals have a higher unit cost per inpatient day and admission than nonteaching hospitals. The detail is shown in table 3

Table 3 Review literature; Hospital cost analysis

Author	Year	Hospital name	Type of hospital	Allocation method	Cost Component (LC:MC:CC)
Jantana Sukratamornkul	2009	Bangkhla	Primary	simultaneous equation	76.32 : 18.66 : 5.02
Moludee Bumrungchuu	2011	Bannangsata	Primary	simultaneous equation	63.18 : 30.49 : 6.33
Wanida Rewsuwan	2015	Wiengpapao	Primary	NA	57.46: 36.82: 5.72
Thananun Sriprakone	2012	Prakhonchai	Secondary	simultaneous equation	55.0 : 40.0 : 5.0
Medical service Department	2008	CharearnkrungPracharuk	Tertiary	simultaneous equation	44.3 : 47.0 : 8.7
Piyanuch Chinakarn	2012	Ayutthaya	Teaching	Cost Project Program	56.30:40.83:2.87
Kodchaporn Lapsuwansakul	2012	Thammasat University	Teaching	simultaneous equation	60.23: 34.48: 05.29

Two studies of medical student cost analysis are reviewed. Soraya Moungkrung (Moungkrung, 2014) studied the production cost of medicine graduates of faculty of medicine, Srinakharinwirot university and shows that the unit cost of medical student production is 169,745 Baht per year. This study uses the weighted cost by task and allocates cost by the direct method. The second is the study of cost per head for producing medicine graduates of Thammasat university (Seekeaw, 2014). The result shows that the unit cost of medical student production is 315,470 Baht per year. This study uses the simultaneous equation method for the cost allocation and does not use the weighted cost by task. The direct cost is the majority of the total cost of both studies, which are seventy seven and sixty one percent, respectively. The detail is shown in table 4.

Table 4 Review literatures; Medical student production cost analysis

Author	Year	University name	Allocation method	Cost component (percent)		Cost per student
				Diect	Indirect	
Soraya Moungkrung	2014	Srinakharinwirot	Direct method	77.61	22.39	1,018,469
Areenut Seekeaw	2014	Thammasat	simultaneous equation	61.06	38.94	1,892,819

2.3 Health care schemes in Thailand

The main groups of patient in Thailand come from the universal health coverage (UC), the civil servant medical benefits scheme (CSMBS) and the social security scheme (SSS). These are three main healthcare schemes in Thailand (Phromporn Pramualratana Suwit Wibulpolprasert, M.D, Health Insurance Systems in Thailand, 2002). All schemes are purchasers of hospital and regulate hospital reimbursement criteria and rates.

The universal health coverage is the national health insurance for Thai citizens. The scheme is managed by the National Health Security Office (NHSO), Ministry of Public Health. The payment mechanisms are the capitation on number of registered persons and DRG case-based payment for inpatient services.

The Civil Servant Medical Benefit Scheme (CSMBS) is the health care scheme provided by government for civil servants and their family. The scheme is managed by the Department of Comptroller General, Ministry of Finance. Its payment mechanisms are fees for services for outpatient services and DRG case-based payment for inpatient services (Phromporn Pramualratana Suwit Wibulpolprasert, M.D, Health Insurance Systems in Thailand, 2002).

The social security scheme (SSS) managed by the social security office, Ministry of Labor. It is the compulsory health insurance for formal sector private employees. It is financed by tripartite which are the employers, the employees, and the government. The payment mechanisms compose of the capitation payment in number of registered, insured person; 1,460 Baht per person per year, paying for high risk adjusted capitation; 432 Baht per person per year, DRG for high cost RW equal to or than more 2; pay 15,000 Baht per AdjRW, and additional payment for special service (Nawarat Boonpiam, Policy and Planning Division Social Security Office, 2015).

2.4 Diagnosis Related Groups (DRG)

The Diagnosis Related Groups (DRGs) are the system of patient classification relating to the type of treatment and the cost incurred by the hospital (Richard F. Averill et al., 2003). All teaching hospitals in Thailand use this system for health care reimbursement from three main schemes. The processes of DRG code and health care reimbursement is shown in Figure 9.

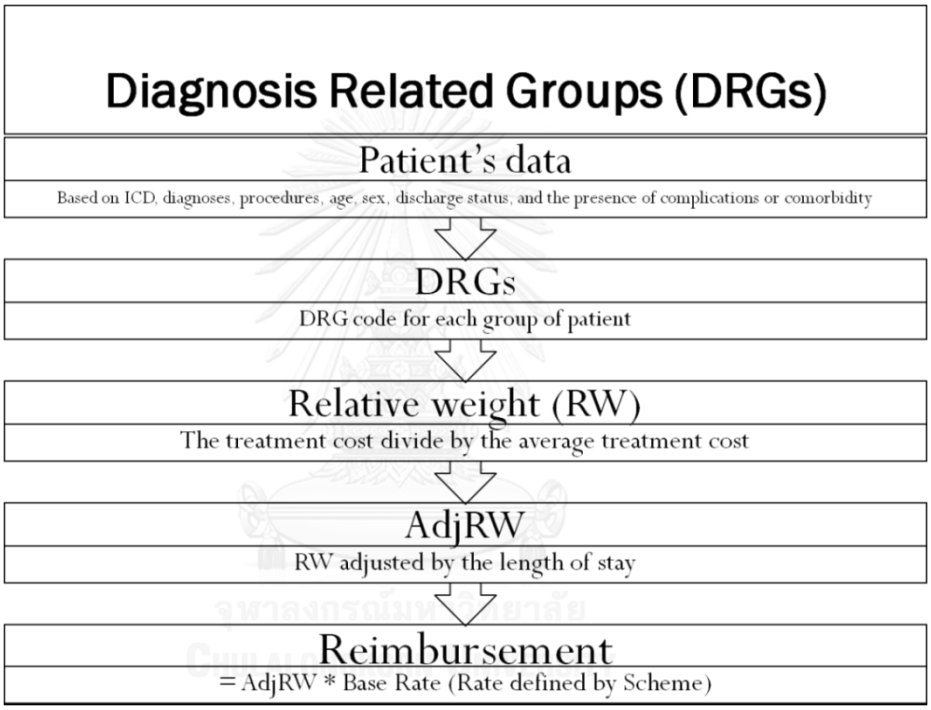

Figure 9 Calculation of DRGs

From figure 9, DRG codes for each group of patient are calculated by several dimensions of patient's data, such as the principal diagnosis, age, sex, and discharge status. Relative weight (RW) is the ratio of treatment cost for any disease with the average cost of treatment for all disease. Adjusted RW (AdjRW) is the relative weight adjusted by the length of stay for weight the severity of disease in the same DRG code. So, the actual cost of treatment for a specific disease is the multiply of average cost per RW with Adj RW.

CHAPTER 3
RESEARCH METHODOLOGY

3.1 Study Design

This is a retrospective study of resource utilization from the provider perspective of the Faculty of Medicine Vajira hospital using the secondary data in the fiscal year 2015. The calculation consists of two parts. The first part is the cost analysis. The second part is the DRGs cost per RW and five common DRGs cost estimation. The full cost will be calculated and allocated by the step-down method. Results of cost calculation consist of total costs and unit costs of patient services and non-patient service, the DRGs cost per RW, and estimated cost of five common DRGs code.

3.2 Cost analysis

The first part of the study is the cost analysis. It will be done step by step (Donald S. et al., 1998). The first step is final service identification. The second step is a cost center grouping and classification. The third step is the full cost collection. The fourth step is an assignment of full cost to cost centers. The fifth step is weighted cost of the education department. The sixth step is cost allocation. The seventh step is the unit cost calculation.

3.2.1 Final service identification

Final services are health care services for patients, hospital surrounding communities, and medical students. The first step of cost analysis is the identification of final service which correlates to the specific objectives of the study and the faculty work flow. The work flow is shown in figure 10.

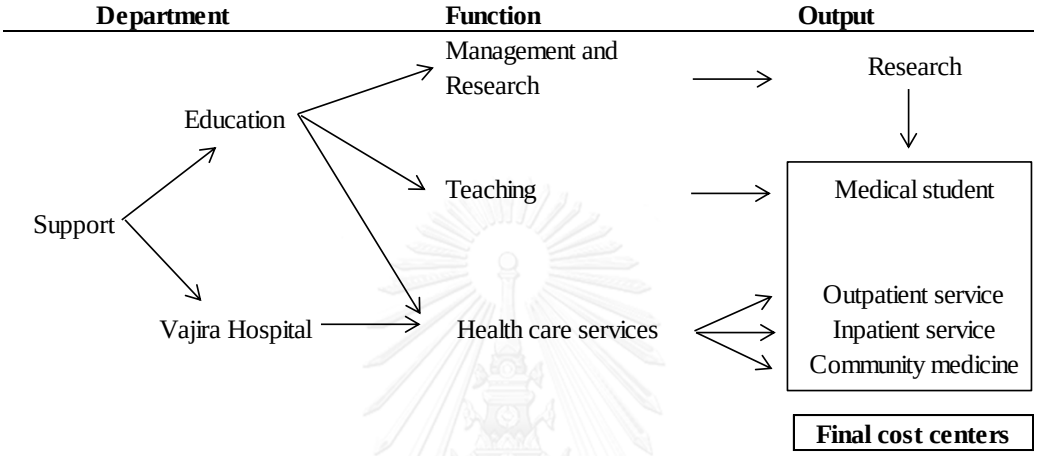

Figure 10 Work flow of the faculty of medicine Vajira hospital

From the organizational structure and workflow, the final services are outpatient services, inpatient services, health promotion services and the medical education. These are the main missions of the faculty. The medical research is not considered as the final service in this study because the knowledge from research results are used for health care service and education improvement.

3.2.2 Cost center grouping and classification

The second step is the grouping and classification of cost centers. The cost center is an every subunit in the faculty that generates cost to achieve its function. To grouping these cost centers, the organizational structure will be studied. The faculty structure comprises of three main departments which are supported departments, education departments, and Vajira hospital. There are several divisions and subdivisions in each department. All divisions of support and education departments are cost centers. Subdivisions are not classified as cost centers, but their cost will be accumulated as division's cost. The details are shown in table 5 and 6.

For Vajira hospital, cost centers compose of subdivisions of hospital director's office and remaining hospital divisions. The cost centers of hospital director's office are grouped due to the availability of data. The details are shown in table 7.

The cost center, namely preventive medicine consists of subdivision occupational medicine, home health care, and community health. The cost center, namely physical therapy consists of subdivision physical therapy and rehabilitation. The cost center, namely operation consists of a subdivision excellent center, laparoscopy, surgical operation, gynecologic operation, orthopedic operation, eye operation, and ear neck throat operation. The cost center, namely OPD composes of thirteen OPDs, radiotherapy and nuclear medicine. The cost center, namely medical instrument composes of a subdivision aseptic instrument, medical instrument, and medical material. The cost centers namely IPD and ICU compose of fourteen inpatient wards.

Table 5 Cost center grouping of support department

Department	Division	Subdivision	Cost center
Support	Dean office	Secretary	Dean office
		Administration	
		Law and lawsuit	
		Public relation	
		Audio-Visual Aids	
		Library	
		Place and environment	
		Security	
		Vehicle	
		Complain solution	
	Accounting and Finance	Finance	Accounting and Finance
		Disburse	
		Account	
		Verify	
		Revenue	
	Medical education center	Pregraduate	Medical education center
		Postgraduate	
		Medical specialist	
		Student affairs	
		Foreign relations	
	Procurement	Procurement 1	Procurement
		Procurement 2	
		Procurement 3	
		Asset	
		Material treasury	
	Human resource	Recruitment	Human resource
		Evaluation	
		Compensation	
		Human development	
		Corporate relation	
		Registration and pension	
	Strategy and development	Strategy	Strategy and development
		Hospital accreditation	
		Education QA	
	Academic support	Training	Academic support
		Academic position	
		Art and gallery	
		Medical illustration	
		Academic printed matter	
	Engineering	Maintenance	Engineering
		Safety engineering	
		Waste treatment	
		Building design	

Table 5 Cost center grouping of support department (cont.)

Department	Division	Subdivision	Cost center
Support	Research support	Administration	Research support
		Ethic	
		Clinical research	
		Publication	
	Information technology	Development	Information technology
		Service	
		Electronic media	

Table 6 Cost center grouping of education department

Department	Division	Cost center
Education	Pediatrics	Pediatrics
	Ophthalmology	Ophthalmology
	Psychiatry	Psychiatry
	Forensic Medicine	Forensic Medicine
	Anatomical Pathology	Anatomical Pathology
	Clinical Pathology	Clinical Pathology
	Radiology	Radiology
	Medical Sciences	Medical Sciences
	Anesthesiology	Anesthesiology
	Emergency Medicine	Emergency Medicine
	Urban Medicine	Urban Medicine
	Rehabilitation Medicine	Rehabilitation Medicine
	Surgery	Surgery
	Orthopaedics	Orthopaedics
	Obstetrics and Gynecology	Obstetrics and Gynecology
	ENT	ENT
	Medicine	Medicine

Table 7 Cost center grouping of Vajira hospital

Department	Division	Subdivision	Cost center
Vajira Hospital	Hospital director office	Occupational medicine	Preventive medicine
		Home health care	
		Community health	
		Physical therapy	Physical therapy
		Rehabilitation	
		Laparoscopy	Operation
		Excellent center	
		Surgery operation	
		OB and GYN operation	
		Eye and ENT operation	
		Orthopaedics operation	
		Aseptic instruments	Medical instrument
		Medical instruments	
		Medical material	
		Medical statistics	Medical statistics
		Laundry	Laundry
		Infectious control	Infectious control
		Social welfare	Social welfare
		Radiodiagnosis	Radiodiagnosis
		Duty stretcher	Duty stretcher
		Anatomical pathology	Anatomical pathology
		Outpatient department	OPD*
		Radiotherapy	
		Nuclear medicine	
		Intensive care units	ICU*
		In-patient department	IPD*
	Nursing department	-	Nursing department
	Laboratory	-	Laboratory
	Dental department	-	Dental department
	Pharmacy	-	Pharmacy
	Nutrition department	-	Nutrition department
	Emergency Medicine	-	Emergency Medicine

Table 7 Cost center grouping of Vajira hospital (cont.)

Patient Services	
Outpatient Services	**Cost center**
OPD surgery	OPD Surgery
OPD neurosurgery	
Wound and Ostomy care	
OPD internal medicine	OPD Medicine
OPD dermatology	
OPD neuromedicine	
OPD oncology	
OPD hematology	
OPD rheumatology	
OPD endocrinology	
OPD infectious diseae	
Hepatobiliary Diseases	
OPD respiratory disease	
OPD nephrology	
OPD cardiovascular disease	
OPD Pedriatrics	OPD Pedriatrics
Well baby clinic	
OPD antenatal care	OPD Obstetric & GYN
OPD family planning	
OPD infertility	
OPD gynecology	
OPD Orthopaedics	OPD Orthopaedics
OPD ENT	OPD ENT
OPD Eye	OPD Eye
OPD Urban Medicine	OPD Urban Medicine
OPD Psychiatrics	OPD Psychiatrics
OPD PM&R	OPD PM&R
OPD Radiotherapy	OPD Radiotherapy
OPD Nuclear medicine	OPD Nuclear medicine
OPD Forensic medicine	OPD Forensic medicine
Emergency Room	Emergency Room
Dental Department	Dental Department

Table 7 Cost center grouping of Vajira hospital (cont.)

Patient Services	
Inpatient Services	**Cost center**
ICU Medicine	Medicine ICU
CCU : Medicine	
ICU : Neurosurgery	Surgery ICU
ICU : Surgery	
CCU : Surgery	
ICU : Neonatal and Pediatric	Pediatric ICU
Neonatal Semi-critical Unit	
Gynecology Ward	OB & Gyn Ward
Obstetric Ward	
Labour Room	
Private Obstetric and Gynecology Ward 1	
Private Obstetric and Gynecology Ward 2	
Female Orthopaedic Ward	Orthopaedic Ward
Male Orthopaedic Ward	
Private Orthopaedic Ward 1	
Male Surgery Ward	Surgery Ward
Female Surgery Ward	
Private Surgery Ward 1	
Private Surgery Ward 2	
Private Surgery Ward 3	
Colorectal Surgery Ward	
Neurosurgery Ward	
Ambulatory Surgery Unit	
General Pediatric Ward	Pediatric Ward
Private Pediatric Ward	
Nursery	

Table 7 Cost center grouping of Vajira hospital (cont.)

Patient Services	
Inpatient Services	**Cost center**
Female Medicine Ward 1	Medicine Ward
Male Medicine Ward 1	
Female Medicine Ward 2	
Male Medicine Ward 2	
Medicine Ward 3	
Private Medicine Ward 1	
Private Medicine Ward 2	
Private Medicine Ward 3	
Private Medicine Ward 4	
Private Medicine Ward 5	
Plastic Surgery and burn Ward	ENT Ward
Ear, Nose and Throat Ward	
Cardiothoracic and Pediatric Surgery Ward	Ophthalmology Ward
Ophthalmology Ward	
Short Stay Unit	Short Stay Unit
Chemotherapy Unit	Chemotherapy Ward
Private Multidisciplinary Ward	Multidisciplinary Ward
ICU : Emergency Medicine	ICU Emergency Medicine

3.2.3 Full cost collection

Third step is the identification of the full costs of inputs. Inputs are labor costs, material costs, and capital costs by using data from accounting and finance, human resource, and procurement division, see details in table 8.

Table 8 Source of full cost data

Input	Category	Source of data
Labor costs	Salary Fringe benefit	Human resource division
	Overtime payment	Accounting and Finance division
Materail costs	Project and materials Supplies in warehouses	Procurement division
Capital costs	Equipment and vehicle Building	Procurement division

The formula of full cost shows as below.

Full cost = Labor cost + Material cost + Capital cost

Labor costs comprise of salary, fringe benefit, and overtime payment. Material costs compose of general supplies, medical supplies, maintenance cost and project cost. A lifetime of supplies is less than one year. The capital costs compose of general equipment, medical equipment, vehicle, and building. The details are shown in Table 9.

Table 9 Capital lifetime

Capital	Lifetime year
Vehicle	5
Equipment	5 and 7
Building	40

A lifetime of equipment will last for more than one year. The cost of land is not included in this study. The lifetime of the building is forty years. The lifetime of general equipment is five years. The lifetime of medical equipment is seven years. The equipment those older than their lifetime is considered cost equal to zero. All hospital's buildings are included in the calculation.

There are twenty four buildings in the faculty which are six under reconstruction buildings and eighteen operated building. The age of building ranges from five years to fifty eight years. The detail shows are shown Table 10.

Table 10 Lists of Building

	Building name	Year of construction	Age (year)	Status
1	Obstetrics Building	1957	58	Operated
2	Medicine Building	1957	58	Under reconstruction
3	Psychiatry Building	1957	58	Under reconstruction
4	Medicine Building	1957	58	Under reconstruction
5	Medicine Building	1957	58	Under reconstruction
6	Medical Supplies Building	1958	57	Operated
7	Administration Building	1959	56	Operated
8	Female Operation Building	1960	55	Under reconstruction
9	Gynecology Building	1960	55	Operated
10	Muslim Bulding	1963	52	Under reconstruction
11	Obstetrics Operation Buildi	1965	50	Operated
12	Medicine Building	1971	44	Operated
13	Medicine Building	1972	43	Operated
14	Medical student dormitory	1973	42	Operated
15	Nurse dormitory	1977	38	Operated
16	Surgery Building	1984	31	Operated
17	Mahavajiravudh Building	1986	29	Operated
18	Welfare Building	1993	22	Operated
19	Laboratory Building	1996	19	Operated
20	Water Filter Building	2001	14	Operated
21	Bejaratana Building	2002	13	Operated
22	Radiology Building	2009	6	Operated
23	Medical student dormitory	2010	5	Operated
24	Medical student dormitory	2010	5	Operated

The current value of equipment and building will be calculated by a formula showing below.

$$\text{Current Value in 2015} = \text{Purchase Value in year t} \times (1+r)^{2015-t}$$

Note:

r = Discount rate
t = The year of bought

The discount rate is 4 percent. It is an average inflation rate in Thailand from 1977 until 2016 (Bureau of Trade and Economic Indices, 2016). The calculation of annual capital cost will be done by an annuity method.

The annual capital cost is calculated by the formula below. The results of annualising factor calculation are shown in table 11.

$$\text{Annual capital cost} = \frac{\text{Current Value in 2015}}{\text{Annualising factor}}$$

$$\text{Annualising factor} = \frac{\text{1- Discount factor}}{r}$$

$$\text{Discount factor} = \frac{1}{(1+r)^n}$$

So;

$$\text{Annual capital cost} = \frac{\text{Current Value in 2015}}{(1-(1+r)^{-n})/r}$$

Note:

r = Discount rate
n = Lifetime year

Table 11 Annualising factor

Capital	Lifetime year	Discount factor	Annualising factor
Vehicle	5	0.82	4.45
Equipment	5	0.82	4.45
	7	0.76	6.00
Building	40	0.21	19.79

3.2.4 Assignment full costs to cost centers

Fourth step is the assignment of full costs to cost centers. The full costs of inputs are distributed to cost centers by the actual utilization. Data of labor and material costs can be obtained from accounting, human resource, and procurement division. Data from the engineering division apply for building costs of each cost center, see details in table 12.

Table 12 Source of cost assignment

Input	Category	Source of data
Labor costs	Salary Fringe benefit	Human resource division
	Overtime payment	Accounting and Finance division
Materail costs	Project and materials purchased in 2015	Procurement division
	Supplies in warehouses	
Capital costs	Equipment and vehicle	
	Building	Engineering division

The direct cost of every cost centers will be identified in this step.

3.2.5 Weighted cost

Because the main duties of education departments is health care services, medical teaching and research. So cost of education departments will be weighted by task proportion before allocation. The fifth step is weighted costs. Their work consists of medical teaching thirty two percent, management and research thirty nine percent and health care services twenty nine percent (Faculty of Medicine Vajira Hospital, 2016). The cost of teaching and management will be accumulated with the medical education cost center and dean office cost center, respectively. The health care service costs will be allocated to final cost centers, see details in table 13.

Table 13 Weighted cost

	Task	Ratio	Gather to
Education department cost	Medical education	0.32	Medical education cost center
	Research and manageme	0.39	Dean office cost center
	Health care service	0.29	Final cost centers

3.2.6 Cost allocation

Sixth step is the allocation cost from NRPCCs to RPCCs and to the final cost centers by the allocation criteria. The step- down method will be used in this study. The allocation criteria show as table 14.

Table 14 Allocation criteria

Support department	**Allocation criteria**
Dean office	Number of employees
Accounting and Finance	Number of employees
Procurement	Number of employees
Human resource	Number of employees
Strategy and development	Number of employees
Academic support	Number of employees
Research support	Number of employees
Information technology	Number of employees
Engineering	Area (sq m)

Education department	**Allocation criteria**
Pediatrics	Service hours
Ophthalmology	Service hours
Psychiatry	Service hours
Forensic Medicine	Service hours
Anatomical Pathology	Service hours
Clinical Pathology	Service hours
Radiology	Service hours
Medical Sciences	Service hours
Anesthesiology	Service hours
Emergency Medicine	Service hours
Urban Medicine	Service hours
Rehabilitation Medicine	Service hours
Surgery	Service hours
Orthopaedics	Service hours
Obstetrics and Gynecology	Service hours
ENT	Service hours
Internal Medicine	Service hours

Table 14 Allocation criteria (cont.)

Vajira Hospital	**Allocation criteria**
Social welfare	Number of patients
Medical statistics	Number of patients
Duty stretcher	Number of patients
Nursing department	Number of patients
Central laboratory	Number of patients
Pharmacy	Number of patients
Radiology	Number of patients
Physical therapy	Number of patients
Nutrition department	Number of patients
Laundry	Number of in-patient days
Infectious control	Number of in-patient days
Medical instruments	Number of in-patient days
Operation	Number of operation cases
Anatomical pathology	Number of operation cases

The number of employees is the allocation criteria of the support departments because their costs are allocated to almost cost centers. The data will be collected from human resource division, hospital director office division, and nursing division. The allocation criterion of engineering division is area. Area means the space using by each cost center in the unit of a square meter. The data will be collected from the engineering division.

After the weighted cost of education departments, their remaining functions are health care services, which are outpatient service, inpatient service, and operation. Service hours are the number of hours spending to health care services. The data will be collected by interview the physician representative.

The costs of NRPCCs and RPCCs of Vajira hospital are allocated to final cost centers by the number of patient, patient day, and operation case. The number of patients means the quantity of outpatient visits and inpatient days because these cost centers work for outpatient and inpatient services. The data will be collected from the medical statistic division. In this step, total costs, indirect cost and direct cost of final cost centers will be obtained.

3.2.7 Unit costs

Seventh step is the calculation of unit costs of final cost centers. The unit cost will be calculated by dividing the total cost by output.

$$\text{Unit Costs} = \frac{\text{Total Costs}}{\text{Output}}$$

The output of OPD is the number of OPD visit. The outputs of IPD are the number of inpatient day and admission. The outputs of nonpatient service are the number of medical student and health promotion project. The details are shown in Table 15.

Table 15 List of outputs

Final cost centers	**Outputs**
OPD	OPD visit
IPD	Inpatient day
	Admission
Preventive medicine	Health promotion project
Medical education center	Medical student

In conclusion, results of calculations are total costs and unit costs of OPD visit, important day, admission, student and health promotion project.

3.3 DRGs Cost Calculation

The objective of DRGs cost calculation is to compare the actual cost and the reimbursement from three main schemes which are the universal coverage scheme (UC), the civil servant medical benefit scheme (CSMBS), and the social security scheme (SSS). The calculation of DRGs comes from patients' data variables such as the principal diagnosis, comorbidity, age, gender, procedure, and discharge status. The DRG code will correlate with its relative weight (RW). The relative weight is the proportion of treatment cost of that code to the average treatment cost of overall codes. The RW will be adjusted by the length of stay (LOS) namely adjust RW (AdjRW) which is used for DRGs cost calculation.

3.3.1 DRGs cost per RW

While Vajira Hospital's DRGs cost per RW rates those determined by schemes are 8,500 Baht for UC scheme, 13,387 Baht for CSMBS, and 10,000 Baht for SSS. The actual DRGs cost per RW can be calculated by dividing average unit cost per admission with average AdjRW (Central office for Healthcare Information, 2002; Faculty of Medicine Naresuan University, 2002; Richard F. Averill et al., 2003). The data of average AdjRW will be collected from the medical statistic division. The formula shows as below.

$$\text{DRGs cost per RW} = \frac{\text{Average unit cost per admission}}{\text{Average AdjRW}}$$

3.3.2 Estimated cost of five common DRGs

Five common DRGs are five common inpatient diseases. These are the important burden of hospital. The estimated cost of five common DRGs is done by multiplying DRGs cost per RW by AdjRW of each DRGs. The five common DRGs show in table 16.

$$\text{Estimated cost of DRGs} = \text{DRGs cost per RW} \times \text{AdjRW}$$

Table 16 Five common DRGs

DRG code	Disease	Average AdjRW
H25	Senile cataract	1.3531
C18	Malignant neoplasm of colon	3.2424
I25	Chronic ischaemic heart disease	5.8696
P59	Neonatal jaundice from other and unspecified causes	0.3009
O99	Other maternal disease classifiable elsewhere but complicating pregnancy, childbirth and the puerperium	0.458

3.4 Conceptual framework

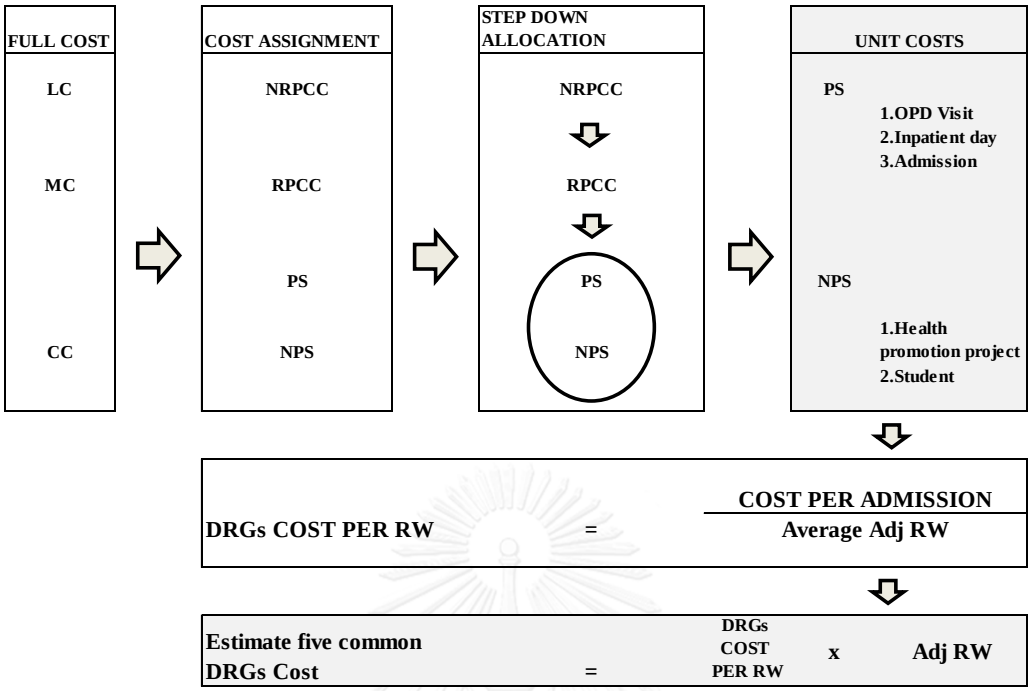

Figure 11 Conceptual framework

The figure shows a conceptual framework. The full costs of all input will be collected and assigned to every cost centers. The full cost composes of the labor cost (LC), the material cost (MC), and the capital cost (CC).

Cost centers are classified by its functions which are non revenue producing cost centers (NRPCC), revenue producing cost centers (RPCC), and final cost centers. Final cost centers are patient services (PS) and nonpatient services (NPS).

The full costs of all cost centers are calculated and allocated to other cost centers by step-down method. NRPCCs allocate their cost to other NRPCCs, RPCCs, and final cost centers. RPCCs allocate their cost to other RPCCs, and final cost centers.

The total costs of each final cost center will be obtained. The unit costs will be done by dividing the total costs with the number of outputs. There are five outputs; outpatient visits, inpatient, day, admission, health promotion project, and medical students.

The DRGs cost per RW multiply with average AdjRW is the average cost per admission. So, the DRGs cost per RW is calculated by dividing the average cost per admission with average AdjRW.

And the estimated cost of five common diseases are calculated by multiplying DRGs cost per RW with AdjRW of those DRGs

3.5 Sensitivity analysis

The sensitivity analyses are done by changing one parameter. This study uses the changing of labor cost, capital costs and weighted costs. The objective of sensitivity analysis is the prediction of uncertainty.

Table 17 Sensitivity analysis

Situation	Capital cost	Labor cost	Weighted cost
1	Discount rate 7%		
2	Discount rate 10%		
3	Rental cost		
4		Salary increase 10%	
5		Salary decrease 10%	
6		Salary increase 15%	
7		Salary decrease 15%	
8			Total cost without weight

First and second situations are the changing of the discount rate of capital cost to seven and ten percent which are the minimum and maximum loan interest rates (Bank of Thailand, 2016). Third situation is the replacement of building cost depreciation to rental cost on the assumption that the data of building cost is not available. Fourth to seventh situations are the changing of labor cost by ten and fifteen percent. The last situation is the cancellation of the step of weighted cost in the assumption that the education department staffs are responsible only health care services.

CHAPTER 4
RESULTS

The results consist of two parts. The first part is the collected data and calculated results of the cost analysis. The second part is the calculation of DRGs cost per RW and estimated five common DRGs costs.

4.1 Cost analysis results

The results will be shown according to steps of cost analysis.

1. Cost centers
2. Full costs
3. Weighted costs
4. Cost allocation
5. Direct and Indirect costs
6. Unit costs

4.1.1 Cost centers

All cost centers are classified into the non revenue producing cost center (NRPCC), the revenue producing cost center (RPCC), the patient service (PS) and the nonpatient service (NPS). The patient and nonpatient services are the final cost centers, receiving costs from NRPCC and RPCC. The final cost centers consist of fifteen outpatient departments (OPD), fourteen inpatient departments (IPD), health promotion services, and the medical education, totally thirty-one final cost centers. The emergency room and dental department are included in outpatient services. The details are shown in table 18.

Table 18 Cost centers

Non-revenue producing cost center (NRPCC)

Support Department	Education department	Vajira Hospital
N 1 Dean office	N 10 Pediatrics	N 27 Social welfare
N 2 Accounting and Finance	N 11 Ophthalmology	N 28 Medical statistics
N 3 Procurement	N 12 Psychiatry	N 29 Infectious control
N 4 Human resource	N 13 Forensic Medicine	N 30 Medical instruments
N 5 Strategy and development	N 14 Anatomical Pathology	N 31 Duty stretcher
N 6 Academic support	N 15 Clinical Pathology	N 32 Laundry
N 7 Engineering	N 16 Radiology	N 33 Nursing department
N 8 Research support	N 17 Medical Sciences	
N 9 Information technology	N 18 Anesthesiology	
	N 19 Emergency Medicine	
	N 20 Urban Medicine	
	N 21 Rehabilitation Medicine	
	N 22 Surgery	
	N 23 Orthopaedics	
	N 24 Obstetrics and Gynecology	
	N 25 ENT	
	N 26 Internal Medicine	

Patient Services		Non-patient Services
Outpatient Services	**Inpatient Services**	
F 1 OPD Surgery	F 16 Medicine ICU	F 30 Preventive medicine
F 2 OPD Urban Medicine	F 17 Medicine Ward	F 31 Medical education center
F 3 OPD Medicine	F 18 Surgery ICU	
F 4 OPD Pedriatrics	F 19 Surgery Ward	
F 5 OPD Orthopaedics	F 20 Pediatric ICU	
F 6 OPD ENT	F 21 Pediatric Ward	
F 7 OPD Eye	F 22 ICU Emergency Medicine	**Revenue producing cost center (RPCC)**
F 8 OPD Obstetric & GYN	F 23 OB & Gyn Ward	
F 9 OPD Psychiatrics	F 24 Orthopaedic Ward	R 1 Operation
F 10 OPD PM&R	F 25 ENT Ward	R 2 Anatomical pathology
F 11 OPD Radiotherapy	F 26 Ophthalmology Ward	R 3 Central laboratory
F 12 OPD Nuclear medicine	F 27 Chemotherapy Ward	R 4 Pharmacy
F 13 OPD Forensic medicine	F 28 Short Stay Unit	R 5 Radiology
F 14 Emergency Room	F 29 Multidisciplinary Ward	R 6 Physical therapy
F 15 Dental Department		R 7 Nutrition department

4.1.2 Full costs

The total cost in the fiscal year 2015 is 2,210,211,175 Baht. The majority of cost is the labor cost, 61 percent and the lowest portion is the capital cost, 10 percent. The full cost and cost components are shown in table 19.

Table 19 Full cost

	Cost (Baht)	Percent
Labor	1,358,985,449	61
Material	636,967,811	29
Capital	214,257,915	10
Total	2,210,211,175	100

Meanwhile the total revenue in the fiscal year 2015 is 3,432,582,893 Baht.

Table 20 Faculty's revenue

Source	Revenue
BMA budget	1,481,991,350
Government subsidy	94,000,000
Maintenance money	886,023,090
Working capital	970,568,453
Total	**3,432,582,893**

Source: The financial report of the Faculty of Medicine Vajira Hospital

From table 20, a source of resources is the BMA. The revenue comprises of the budget from BMA 1,481,991,350 Baht, the government subsidy 94,000,000 Baht, the revenue from faculty services 886,023,090 Baht, and the working capital 970,568,453 Baht. Even though the total revenue is higher than the total cost, 1,222,371,718 Baht, but the revenue from faculty services is lower than the total cost. The summation of revenue from faculty services and the working capital is 1,856,591,542 Baht, which is lower than the total cost 353,619,632 Baht.

Total Revenue		Total cost		
3,432,582,893	-	2,210,211,175	=	1,222,371,717

Revenue from services 886,023,090 + Working capital 970,568,453		Total cost		
1,856,591,543	-	2,210,211,175	=	-353,619,633

Table 21 Full cost ratio

	Cost center	Full cost	Percent
N 1	**Dean office**	**219,023,557**	**9.9**
N 2	Accounting	18,248,407	**0.8**
N 3	Procurement	35,495,852	**1.6**
N 4	Human resource	133,466,189	**6.0**
N 5	Strategy	3,877,350	**0.2**
N 6	Academic support	10,699,415	**0.5**
N 7	Engineering	153,216,871	**6.9**
N 8	Research support	2,094,021	**0.1**
N 9	IT	19,856,534	**0.9**
N 10	Pediatrics	16,941,175	**0.8**
N 11	Ophthalmology	8,102,533	**0.4**
N 12	Psychiatry	5,819,330	**0.3**
N 13	Forensic Medicine	3,998,258	**0.2**
N 14	Anat Pathology	3,970,615	**0.2**
N 15	Clinical Pathology	14,779,797	**0.7**
N 16	Radiology	13,910,011	**0.6**
N 17	Medical Sciences	8,576,259	**0.4**
N 18	Anesthesiology	6,997,236	**0.3**
N 19	Emergency Med	9,961,602	**0.5**
N 20	Urban Medicine	5,422,513	**0.2**
N 21	Rehabilitation	2,244,892	**0.1**
N 22	Surgery	32,440,638	**1.5**
N 23	Orthopaedics	12,082,101	**0.5**
N 24	OB and GYN	13,854,865	**0.6**
N 25	ENT	8,335,282	**0.4**
N 26	Internal Medicine	33,121,129	**1.5**
N 27	Social welfare	4,053,230	**0.2**
N 28	Medical statistics	25,216,350	**1.1**
N 29	Infectious control	755,301	**0.0**
N 30	Medical instruments	28,422,354	**1.3**
N 31	Duty stretcher	9,075,750	**0.4**
N 32	Laundry	13,101,606	**0.6**
N 33	**Nursing department**	**554,131,108**	**25.1**
R 1	Operation	111,420,795	**5.0**
R 2	Anat Pathology	12,366,479	**0.6**
R 3	Central laboratory	110,645,547	**5.0**
R 4	Pharmacy	69,633,332	**3.2**
R 5	Radiology	95,358,536	**4.3**
R 6	Physical therapy	12,753,067	**0.6**
R 7	Nutrition dep.	15,920,770	**0.7**

Table 21 Full cost ratio (cont.)

	Cost center	Full cost	Percent
N 1	**Dean office**	**219,023,557**	**9.9**
N 2	Accounting	18,248,407	**0.8**
N 3	Procurement	35,495,852	**1.6**
N 4	Human resource	133,466,189	**6.0**
N 5	Strategy	3,877,350	**0.2**
N 6	Academic support	10,699,415	**0.5**
N 7	Engineering	153,216,871	**6.9**
N 8	Research support	2,094,021	**0.1**
N 9	IT	19,856,534	**0.9**
N 10	Pediatrics	16,941,175	**0.8**
N 11	Ophthalmology	8,102,533	**0.4**
N 12	Psychiatry	5,819,330	**0.3**
N 13	Forensic Medicine	3,998,258	**0.2**
N 14	Anat Pathology	3,970,615	**0.2**
N 15	Clinical Pathology	14,779,797	**0.7**
N 16	Radiology	13,910,011	**0.6**
N 17	Medical Sciences	8,576,259	**0.4**
N 18	Anesthesiology	6,997,236	**0.3**
N 19	Emergency Med	9,961,602	**0.5**
N 20	Urban Medicine	5,422,513	**0.2**
N 21	Rehabilitation	2,244,892	**0.1**
N 22	Surgery	32,440,638	**1.5**
N 23	Orthopaedics	12,082,101	**0.5**
N 24	OB and GYN	13,854,865	**0.6**
N 25	ENT	8,335,282	**0.4**
N 26	Internal Medicine	33,121,129	**1.5**
N 27	Social welfare	4,053,230	**0.2**
N 28	Medical statistics	25,216,350	**1.1**
N 29	Infectious control	755,301	**0.0**
N 30	Medical instruments	28,422,354	**1.3**
N 31	Duty stretcher	9,075,750	**0.4**
N 32	Laundry	13,101,606	**0.6**
N 33	**Nursing department**	**554,131,108**	**25.1**
R 1	Operation	111,420,795	**5.0**
R 2	Anat Pathology	12,366,479	**0.6**
R 3	Central laboratory	110,645,547	**5.0**
R 4	Pharmacy	69,633,332	**3.2**
R 5	Radiology	95,358,536	**4.3**
R 6	Physical therapy	12,753,067	**0.6**
R 7	Nutrition dep.	15,920,770	**0.7**

Table 21 Full cost ratio (cont.)

	Cost center	Full cost	Percent
F 1	OPD Surgery	2,423,781	**0.1**
F 2	OPD Urban Med	1,114,052	**0.1**
F 3	OPD Medicine	26,440,649	**1.2**
F 4	OPD Pedriatrics	1,761,382	**0.1**
F 5	OPD Orthopaedics	2,273,086	**0.1**
F 6	OPD ENT	633,225	**0.0**
F 7	OPD Eye	2,338,368	**0.1**
F 8	OPD OB & GYN	4,311,914	**0.2**
F 9	OPD Psychiatrics	820,274	**0.0**
F 10	OPD PM&R	971,309	**0.0**
F 11	OPD Radiotherapy	2,259,291	**0.1**
F 12	OPD Nuclear med	981,856	**0.0**
F 13	OPD Forensic	10,432,352	**0.5**
F 14	Emergency Room	36,643,773	**1.7**
F 15	Dental Department	19,709,185	**0.9**
F 16	Medicine ICU	4,872,657	**0.2**
F 17	Medicine Ward	79,649,679	**3.6**
F 18	Surgery ICU	6,912,667	**0.3**
F 19	Surgery Ward	52,448,218	**2.4**
F 20	Pediatric ICU	3,142,438	**0.1**
F 21	Pediatric Ward	6,883,496	**0.3**
F 22	ICU Emer Med	1,992,101	**0.1**
F 23	OB & Gyn Ward	19,513,649	**0.9**
F 24	Orthopaedic Ward	25,081,764	**1.1**
F 25	ENT Ward	7,409,784	**0.3**
F 26	Eye Ward	7,886,132	**0.4**
F 27	Chemo Ward	863,590	**0.0**
F 28	Short Stay Unit	1,487,254	**0.1**
F 29	Multi Ward	2,159,547	**0.1**
F 30	Preventive medicine	5,137,454	**0.2**
F 31	Medical education	12,265,587	**0.6**
	Total	**2,210,211,175**	**100.0**

Twenty five percent of full cost belongs to the nursing department cost center because this cost center has highest labor cost due to most of the staffs in the hospital are under this department. The second is the dean office cost center about ten percent of full cost. The detail of full cost is shown in appendix 12.

4.1.2.1 Labor cost

The labor cost consists of salary, bonus, overtime and part time payments. The detail and proportion of labor cost per year are shown in Table 22.

Table 22 Labor cost ratio

	Cost center	Full labor cost	Percent
N 1	Dean office	122,930,208	9.0
N 2	Accounting	15,539,520	1.1
N 3	Procurement	4,515,360	0.3
N 4	Human resource	4,526,760	0.3
N 5	Strategy	3,427,788	0.3
N 6	Academic support	2,850,120	0.2
N 7	Engineering	12,090,300	0.9
N 8	Research support	947,160	0.1
N 9	IT	2,048,640	0.2
N 10	Pediatrics	15,245,460	1.1
N 11	Ophthalmology	7,254,780	0.5
N 12	Psychiatry	5,748,720	0.4
N 13	Forensic Medicine	3,803,940	0.3
N 14	Anat Pathology	3,723,000	0.3
N 15	Clinical Pathology	8,706,744	0.6
N 16	Radiology	13,190,940	1.0
N 17	Medical Sciences	8,573,808	0.6
N 18	Anesthesiology	5,801,640	0.4
N 19	Emergency Med	8,528,760	0.6
N 20	Urban Medicine	5,320,200	0.4
N 21	Rehabilitation	2,170,800	0.2
N 22	Surgery	30,756,120	2.3
N 23	Orthopaedics	11,493,660	0.8
N 24	OB and GYN	13,465,320	1.0
N 25	ENT	7,991,040	0.6
N 26	Internal Medicine	31,804,860	2.3
N 27	Social welfare	3,195,000	0.2
N 28	Medical statistics	19,471,464	1.4
N 29	Infectious control	522,000	0.04
N 30	Medical instruments	4,884,005	0.4
N 31	Duty stretcher	8,870,400	0.7
N 32	Laundry	4,983,192	0.4
N 33	**Nursing department**	**545,683,256**	**40.2**

Table 22 Labor cost ratio (cont.)

	Cost center	Full labor cost	Percent
R 1	Operation	88,848,819	6.5
R 2	Anat Pathology	7,858,360	0.6
R 3	Central laboratory	40,594,600	3.0
R 4	Pharmacy	46,073,052	3.4
R 5	Radiology	22,806,104	1.7
R 6	Physical therapy	9,678,908	0.7
R 7	Nutrition dep.	9,373,540	0.7
F 1	OPD Surgery	1,961,400	0.1
F 2	OPD Urban Med	369,600	0.03
F 3	OPD Medicine	9,273,240	0.7
F 4	OPD Pedriatrics	1,613,600	0.1
F 5	OPD Orthopaedics	1,392,000	0.1
F 6	OPD ENT	393,600	0.0
F 7	OPD Eye	1,591,600	0.1
F 8	OPD OB & GYN	3,733,200	0.3
F 9	OPD Psychiatrics	514,440	0.04
F 10	OPD PM&R	860,800	0.1
F 11	OPD Radiotherapy	1,815,600	0.1
F 12	OPD Nuclear med	918,400	0.1
F 13	OPD Forensic	9,508,800	0.7
F 14	Emergency Room	30,157,800	2.2
F 15	Dental Department	12,976,392	1.0
F 16	Medicine ICU	1,136,400	0.1
F 17	Medicine Ward	61,183,900	4.5
F 18	Surgery ICU	1,663,200	0.1
F 19	Surgery Ward	5,649,600	0.4
F 20	Pediatric ICU	924,000	0.1
F 21	Pediatric Ward	2,561,600	0.2
F 22	ICU Emer Med	809,100	0.1
F 23	OB & Gyn Ward	10,461,600	0.8
F 24	Orthopaedic Ward	14,085,600	1.0
F 25	ENT Ward	4,313,500	0.3
F 26	Eye Ward	3,186,300	0.2
F 27	Chemo Ward	184,800	0.01
F 28	Short Stay Unit	924,000	0.1
F 29	Multi Ward	1,180,000	0.1
F 30	Preventive medicine	4,358,189	0.3
F 31	Medical education	3,984,840	0.3
Total		**1,358,985,449**	**100.0**

Forty percent of full labor cost is the cost of nursing department consistent with the full cost. The nursing department cost center is the largest department, which distributes staffs to almost cost centers in the hospital. It is the important department in the aspect of highest cost as well as playing an important role in health care services. The hospital manager and the faculty's policy maker should implement the appropriate plan of management to this department for improved efficiency and performance.

The detail of full labor cost is shown in appendix 13. A bonus of 89,981,640 Baht is a fringe benefit for all employees, but the data of cost allocation is not available. Cost of bonus will be included in dean office costs.

The salary of OPD forensic is zero because all workers are the staff of forensic medicine and nursing departments.

The ratios of salary and part time payment are about seventy percent of total labor cost. These are costs of official working hours, which are eight hours per day. The overtime payment is close to thirty percent of total labor cost.

4.1.1.2 Material cost

Material costs comprise of purchase material and material in stock. The cost of the project is included in purchasing material costs. The top three high cost departments are the engineering, the laboratory, and the dean office. The engineering department has highest material cost about twenty two percent of the full material cost due to they are responsible for the maintenance of the whole common area and electric equipment. The detail of material cost is shown in appendix 14. The ratio of material cost is shown in Table 23.

Table 23 Material cost ratio

	Cost center	Full material cost	Ratio
N 1	**Dean office**	**64,891,377**	**10.19**
N 2	Accounting	2,203,110	0.35
N 3	Procurement	30,726,648	4.82
N 4	**Human resource**	**128,799,899**	**20.22**
N 5	Strategy	287,129	0.05
N 6	Academic support	4,206,658	0.66
N 7	**Engineering**	**139,983,615**	**21.98**
N 8	Research support	911,515	0.14
N 9	IT	16,505,875	2.59
N 10	Pediatrics	195,246	0.03
N 11	Ophthalmology	122,720	0.02
N 12	Psychiatry	65,436	0.01
N 13	Forensic Medicine	14,529	0.002
N 14	Anat Pathology	145,400	0.02
N 15	Clinical Pathology	609,877	0.10
N 16	Radiology	57,376	0.01
N 17	Medical Sciences	-	0.00
N 18	Anesthesiology	48,388	0.01
N 19	Emergency Med	90,056	0.01
N 20	Urban Medicine	82,606	0.01
N 21	Rehabilitation	68,696	0.01
N 22	Surgery	271,665	0.04
N 23	Orthopaedics	167,893	0.03
N 24	OB and GYN	255,889	0.04
N 25	ENT	47,990	0.01
N 26	Internal Medicine	264,025	0.04
N 27	Social welfare	270	0.00
N 28	Medical statistics	4,755,040	0.75
N 29	Infectious control	208,946	0.03
N 30	Medical instruments	23,124,846	3.63
N 31	Duty stretcher	185,811	0.03
N 32	Laundry	8,097,599	1.27
N 33	Nursing department	3,411,699	0.54
R 1	Operation	2,489,253	0.39
R 2	Anat Pathology	2,141,613	0.34
R 3	**Central laboratory**	**68,874,360**	**10.81**
R 4	Pharmacy	5,713,867	0.90
R 5	Radiology	55,194,053	8.67
R 6	Physical therapy	700,581	0.11
R 7	Nutrition dep.	6,205,837	0.97

Table 23 Material cost ratio (cont.)

	Cost center	Full material cost	Percent
F 1	OPD Surgery	171,103	0.03
F 2	OPD Urban Med	553,696	0.09
F 3	OPD Medicine	8,629,897	1.35
F 4	OPD Pedriatrics	38,247	0.01
F 5	OPD Orthopaedics	80,110	0.01
F 6	OPD ENT	50,207	0.01
F 7	OPD Eye	534,800	0.08
F 8	OPD OB & GYN	97,543	0.02
F 9	OPD Psychiatrics	299,921	0.05
F 10	OPD PM&R	68,486	0.01
F 11	OPD Radiotherapy	66,761	0.01
F 12	OPD Nuclear med	38,242	0.01
F 13	OPD Forensic	793,605	0.12
F 14	Emergency Room	1,478,697	0.23
F 15	Dental Department	6,213,595	0.98
F 16	Medicine ICU	-	0.00
F 17	Medicine Ward	2,000,208	0.31
F 18	Surgery ICU	-	0.00
F 19	Surgery Ward	34,125,847	5.36
F 20	Pediatric ICU	-	0.00
F 21	Pediatric Ward	1,465,887	0.23
F 22	ICU Emer Med	75,332	0.01
F 23	OB & Gyn Ward	2,608,781	0.41
F 24	Orthopaedic Ward	2,077,607	0.33
F 25	ENT Ward	746,184	0.12
F 26	Eye Ward	40,487	0.01
F 27	Chemo Ward	97,705	0.02
F 28	Short Stay Unit	33,898	0.01
F 29	Multi Ward	121,561	0.02
F 30	Preventive medicine	662,170	0.10
F 31	Medical education	1,669,844	0.26
	Total	**636,967,811**	**100.00**

The medical science department (N17) does not have the material cost because this is the latest department and officially established in 2015. They have a procurement plan in 2016. The material cost data of medicine ICU (F16), surgery ICU (F18) and pediatric ICU (F20) are not available because the materials are bought together with wards (F17, F19, F21).

The limitation of the material cost collection is the overlapping source of data. The material cost of this study has a tendency of underestimation due to incompleteness of data. Even though most of material purchasing is done by the staff of procurement department, but the requested department is not specifically identified. For example the costs of medical materials of ICU are included in the purchase lists of wards resulting to the overestimation of the ward's material cost. The data recording system should be revised for improved accuracy of data collection.

4.1.1.3 Capital cost

The capital costs consist of equipment and building costs and calculated for the year 2015 using a discount rate of four percent. For equipment, there are two groups of lifetime; lifetime five years and lifetime seven years. The equipment those are older than five years and seven years are not included in the calculation because their costs are assumed to be zero. The details are shown in appendix 15.

For building, there are twenty four buildings in the faculty. Total area and purchased value are shown in table 24 and table 25.

Table 24 Purchased value of all buildings

	Building name	Status	Year of construction	Age (year)	Purchased value
1	Obstetrics Building	Existing	1957	58	120,000
2	Medicine Building	Under reconstruction	1957	58	1,360,000
3	Psychiatry Building	Under reconstruction	1957	58	70,000
4	Medicine Building	Under reconstruction	1957	58	299,400
5	Medicine Building	Under reconstruction	1957	58	60,000
6	Medical Supplies Building	Existing	1958	57	525,000
7	Administration Building	Existing	1959	56	5,514,160
8	Female Operation Building	Under reconstruction	1960	55	139,000
9	Gynecology Building	Existing	1960	55	1,500,000
10	Muslim Bulding	Under reconstruction	1963	52	3,215,870
11	Obstetrics Operation Buildi	Existing	1965	50	11,790,000
12	Medicine Building	Existing	1971	44	1,410,000
13	Medicine Building	Existing	1972	43	912,000
14	Medical student dormitory	Existing	1973	42	3,060,000
15	Nurse dormitory	Existing	1977	38	3,465,000
16	Surgery Building	Existing	1984	31	86,000,000
17	Mahavajiravudh Building	Existing	1986	29	128,300,000
18	Welfare Building	Existing	1993	22	1,650,000
19	Laboratory Building	Existing	1996	19	12,500,000
20	Water Filter Building	Existing	2001	14	1,195,000
21	Bejaratana Building	Existing	2002	13	870,908,279
22	Radiology Building	Existing	2009	6	22,361,500
23	Medical student dormitory	Existing	2010	5	14,164,000
24	Medical student dormitory	Existing	2010	5	9,562,000

Table 25 Current value of existing buildings

	Building name	Age (year)	Purchased value	Current value in 2015	Annual building cost
1	Obstetrics Building	58	120,000	1,167,118	58,975
2	Medical Supplies Building	57	525,000	4,909,753	248,093
3	Administration Building	56	5,514,160	49,584,549	2,505,536
4	Gynecology Building	55	1,500,000	12,969,550	655,359
5	Obstetrics Operation Buildi	50	11,790,000	83,787,797	4,233,845
6	Medicine Building	44	1,410,000	7,919,286	400,166
7	Medicine Building	43	912,000	4,925,252	248,876
8	Medical student dormitory	42	3,060,000	15,889,919	802,927
9	Nurse dormitory	38	3,465,000	15,380,489	777,185
10	Surgery Building	31	86,000,000	290,089,473	14,658,387
11	Mahavajiravudh Building	29	128,300,000	400,122,981	20,218,443
12	Welfare Building	22	1,650,000	3,910,366	197,593
13	Laboratory Building	19	12,500,000	26,335,615	1,330,754
14	Water Filter Building	14	1,195,000	2,069,353	104,566
15	Bejaratana Building	13	870,908,279	1,450,126,302	73,275,710
16	Radiology Building	6	22,361,500	28,294,431	1,429,734
17	Medical student dormitory	5	14,164,000	17,232,672	870,777
18	Medical student dormitory	5	9,562,000	11,633,635	587,854

The buildings those are under reconstruction are not included in the calculation. All six under reconstruction buildings are in the process of construction procurement. The total estimated annual value of under reconstruction buildings is 2,189,217 Baht per year. However, land values are not included in the estimation, making this value is underestimated. This result reflects to the opportunity loss of resource usage. The hospital manager should precipitate the budget and procurement process for developing these areas because the further revenue can be earned from these empty spaces.

From the table 25, the annual building costs are calculated from the current value and the annualising factor. The full capital cost consists of equipment and building costs are shown in appendix 16. The ratio of capital cost is shown in Table 26.

The dean office and radiology departments have high capital costs. The dean's office is responsible for all infrastructures in the faculty. The radiology is responsible for radiodiagnosis which has high price equipment. The short stay unit and medical science department are two latest departments which are in process of equipment procurement.

Table 26 Capital cost ratio

	Cost center	Full capital cost	Percent
N 1	**Dean office**	**31,201,972**	**14.56**
N 2	Accounting	505,778	0.24
N 3	Procurement	253,844	0.12
N 4	Human resource	139,530	0.07
N 5	Strategy	162,434	0.08
N 6	Academic support	3,642,637	1.70
N 7	Engineering	1,142,956	0.53
N 8	Research support	235,346	0.11
N 9	IT	1,302,019	0.61
N 10	Pediatrics	1,500,469	0.70
N 11	Ophthalmology	725,032	0.34
N 12	Psychiatry	5,174	0.002
N 13	Forensic Medicine	179,789	0.08
N 14	Anat Pathology	102,215	0.05
N 15	Clinical Pathology	5,463,176	2.55
N 16	Radiology	661,694	0.31
N 17	Medical Sciences	2,451	0.001
N 18	Anesthesiology	1,147,208	0.54
N 19	Emergency Med	1,342,786	0.63
N 20	Urban Medicine	19,707	0.01
N 21	Rehabilitation	5,397	0.003
N 22	Surgery	1,412,853	0.66
N 23	Orthopaedics	420,548	0.20
N 24	OB and GYN	133,656	0.06
N 25	ENT	296,252	0.14
N 26	Internal Medicine	1,052,244	0.49
N 27	Social welfare	857,960	0.40
N 28	Medical statistics	989,846	0.46
N 29	Infectious control	24,356	0.01
N 30	Medical instruments	413,503	0.19
N 31	Duty stretcher	19,540	0.01
N 32	Laundry	20,815	0.01
N 33	Nursing department	5,036,153	2.35

Table 26 Capital cost ratio (cont.)

	Cost center	Full capital cost	Percent
R 1	Operation	20,082,723	9.37
R 2	Anat Pathology	2,366,506	1.10
R 3	Central laboratory	1,176,587	0.55
R 4	Pharmacy	17,846,412	8.33
R 5	Radiology	17,358,379	8.10
R 6	Physical therapy	2,373,578	1.11
R 7	Nutrition dep.	341,393	0.16
F 1	OPD Surgery	291,278	0.14
F 2	OPD Urban Med	190,756	0.09
F 3	OPD Medicine	8,537,512	3.98
F 4	OPD Pedriatrics	109,536	0.05
F 5	OPD Orthopaedics	800,976	0.37
F 6	OPD ENT	189,418	0.09
F 7	OPD Eye	211,968	0.10
F 8	OPD OB & GYN	481,171	0.22
F 9	OPD Psychiatrics	5,913	0.00
F 10	OPD PM&R	42,024	0.02
F 11	OPD Radiotherapy	376,930	0.18
F 12	OPD Nuclear med	25,214	0.01
F 13	OPD Forensic	129,947	0.06
F 14	Emergency Room	5,007,276	2.34
F 15	Dental Department	519,198	0.24
F 16	Medicine ICU	3,736,257	1.74
F 17	Medicine Ward	16,465,571	7.68
F 18	Surgery ICU	5,249,467	2.45
F 19	Surgery Ward	12,672,771	5.91
F 20	Pediatric ICU	2,218,438	1.04
F 21	Pediatric Ward	2,856,009	1.33
F 22	ICU Emer Med	1,107,669	0.52
F 23	OB & Gyn Ward	6,443,268	3.01
F 24	Orthopaedic Ward	8,918,558	4.16
F 25	ENT Ward	2,350,100	1.10
F 26	Eye Ward	4,659,345	2.17
F 27	Chemo Ward	581,085	0.27
F 28	Short Stay Unit	529,356	0.25
F 29	Multi Ward	857,986	0.40
F 30	Preventive medicine	117,095	0.05
F 31	Medical education	6,610,903	3.09
	Total	**214,257,915**	**100.00**

4.1.2 Weighted cost

The full cost of education divisions (cost center N10 to N26) will be weighted by the task proportion because of the multiple job functions. The work requirement is medical teaching 32 percent, management and research 39 percent, and health care services 29 percent.

Table 27 Weighted costs

Ratio		Teaching	Mx and Research	Health care services
Cost center		**0.32**	**0.39**	**0.29**
N 10	Pediatrics	5,421,176	6,607,058	4,912,941
N 11	Ophthalmology	2,592,810	3,159,988	2,349,735
N 12	Psychiatry	1,862,185	2,269,539	1,687,606
N 13	Forensic Medicine	1,279,443	1,559,321	1,159,495
N 14	Anat Pathology	1,270,597	1,548,540	1,151,478
N 15	Clinical Pathology	4,729,535	5,764,121	4,286,141
N 16	Radiology	4,451,203	5,424,904	4,033,903
N 17	Medical Sciences	2,744,403	3,344,741	2,487,115
N 18	Anesthesiology	2,239,116	2,728,922	2,029,198
N 19	Emergency Med	3,187,713	3,885,025	2,888,865
N 20	Urban Medicine	1,735,204	2,114,780	1,572,529
N 21	Rehabilitation	718,366	875,508	651,019
N 22	Surgery	10,381,004	12,651,849	9,407,785
N 23	Orthopaedics	3,866,272	4,712,019	3,503,809
N 24	OB and GYN	4,433,557	5,403,397	4,017,911
N 25	ENT	2,667,290	3,250,760	2,417,232
N 26	Internal Medicine	10,598,761	12,917,240	9,605,127
Total		**64,178,635**	**78,217,712**	**58,161,888**

The total cost of management and research, 78,217,712 Baht, will be accumulated with the cost of dean's office (Cost center N1). The total cost of teaching, 64,178,635 Baht, will be accumulated with the cost of medical education center (Cost center F31). And the health care service cost of all divisions will be allocated to other cost centers by allocation criteria.

4.1.3 Cost allocation

The full cost after weighting with work requirement tasks will be allocated to other cost centers. The allocation criteria shown in chapter three. The direct and indirect costs will be obtained after cost allocating to final cost centers using step- down allocation method. The detail is shown in the appendix 17.

The allocation criteria of education division are service hours which are outpatient service, inpatient service, and operation service. Data are collected by physician interview. The detail is shown in table 28 and table 29.

Table 28Allocation criteria: service hours (Internal medicine and Pediatrics)

	Hour per year	
Education staff	**OPD service**	**IPD service**
First internist	468	390
Second internist	972	172
Pediatrician	546	120
Average	**662**	**227**

These criteria will be applied to internal medicine and pediatrics division because their duties are outpatient and inpatient services.

Table 29 Allocation criteria: service hours (Surgery)

	Hour per year		
Education staff	**OPD service**	**IPD service**	**Operation**
First surgeon	728	312	364
Second surgeon	936	208	364
Ophthalmologist	624	208	312
Average	**763**	**243**	**347**

Five education divisions will apply these allocation criteria. Those divisions are surgery, orthopedics, ophthalmology, ear nose throat, obstetrics and gynecology divisions. Their duties are operating, outpatient and inpatient services.

The remaining education divisions have only one duty which is health care service will allocate all these service cost to their final cost center.

4.1.4 Direct and indirect costs

The proportion of direct and indirect costs of final cost centers is shown in Table 30.

Table 30 Direct and Indirect Cost: OPD

OPD			Direct cost		Indirect cost		Total cost
			Cost	Ratio	Cost	Ratio	
F	1	OPD Surgery	2,423,781	0.03	90,937,342	0.97	93,361,123
F	2	OPD Urban Med	1,114,052	0.03	42,919,529	0.97	44,033,581
F	3	OPD Medicine	26,440,649	0.08	308,445,772	0.92	334,886,421
F	4	OPD Pedriatrics	1,761,382	0.04	39,245,708	0.96	41,007,090
F	5	OPD Orthopaedics	2,273,086	0.03	71,248,382	0.97	73,521,468
F	6	OPD ENT	633,225	0.01	49,489,875	0.99	50,123,101
F	7	OPD Eye	2,338,368	0.05	49,097,771	0.95	51,436,140
F	8	OPD OB & GYN	4,311,914	0.06	68,464,624	0.94	72,776,538
F	9	OPD Psychiatrics	820,274	0.04	19,968,508	0.96	20,788,782
F	10	OPD PM&R	971,309	0.05	20,320,861	0.95	21,292,170
F	11	OPD Radiotherapy	2,259,291	0.06	36,822,858	0.94	39,082,149
F	12	OPD Nuclear med	981,856	0.15	5,546,155	0.85	6,528,011
F	13	OPD Forensic	10,432,352	0.58	7,705,988	0.42	18,138,340
F	14	Emergency Room	36,643,773	0.28	95,208,835	0.72	131,852,608
F	15	Dental Department	19,709,185	0.37	33,966,692	0.63	53,675,877
		Average	**7,540,967**	**0.12**	**62,625,927**	**0.88**	**70,166,893**
		Average (Exclude F13, 14,15)	**3,860,766**	**0.05**	**66,875,616**	**0.95**	**70,736,381**

The cost center F13, F14, and F15 are the top three of higher cost. OPD forensic has a highest direct cost and the labor cost is the highest component (LC: MC: CC, 0.91: 0.08: 0.01). The labor cost of OPD forensic is ninety percent of the total cost because forensic doctors are on duty around-the-clock as well as the emergency room (F14). The dental department (F15) is the minor surgery service. It has higher cost due to the cost of equipment.

Indirect cost is the major part of OPD cost. The average indirect costs of the OPD are eighty eight percent of the total cost. If exclude cost centers those have higher indirect costs, the average indirect cost will be ninety five percent of the total cost.

Table 31 Direct and Indirect Cost: IPD

	IPD	Direct cost		Indirect cost		Total cost
		Cost	Ratio	Cost	Ratio	
F	16 Medicine ICU	4,872,657	0.21	18,810,502	0.79	23,683,159
F	17 Medicine Ward	79,649,679	0.29	194,083,881	0.71	273,733,560
F	18 Surgery ICU	6,912,667	0.21	26,452,199	0.79	33,364,865
F	19 Surgery Ward	52,448,218	0.17	248,709,785	0.83	301,158,003
F	20 Pediatric ICU	3,142,438	0.09	30,462,708	0.91	33,605,146
F	21 Pediatric Ward	6,883,496	0.12	48,784,058	0.88	55,667,554
F	22 ICU Emer Med	1,992,101	0.18	9,118,157	0.82	11,110,258
F	23 OB & Gyn Ward	19,513,649	0.17	92,608,400	0.83	112,122,049
F	24 Orthopaedic Ward	25,081,764	0.22	88,757,791	0.78	113,839,556
F	25 ENT Ward	7,409,784	0.30	17,262,448	0.70	24,672,233
F	26 Eye Ward	7,886,132	0.13	50,724,613	0.87	58,610,745
F	27 Chemo Ward	863,590	0.05	15,667,761	0.95	16,531,351
F	28 Short Stay Unit	1,487,254	0.27	4,036,939	0.73	5,524,193
F	29 Multi Ward	2,159,547	0.18	10,006,864	0.82	12,166,411
	Average	**15,735,927**	**0.19**	**61,106,150**	**0.81**	**76,842,077**
	Average (Ward)	**20,338,312**	**0.19**	**77,064,254**	**0.81**	**97,402,566**
	Average (ICU)	**4,229,966**	**0.17**	**21,210,891**	**0.83**	**25,440,857**

The average indirect cost of IPD is eighty-one percent of the total cost. The indirect cost of ICU is higher than ward two percent.

Table 32 Direct and Indirect Cost: NPS

	NPS	Direct cost		Indirect cost		Total cost
		Cost	Ratio	Cost	Ratio	
F	30 Preventive medicine	5,137,454	0.67	2,514,310	0.33	7,651,764
F	31 Medical education	76,444,223	0.82	16,762,497	0.18	93,206,719

The direct cost is the major part of the nonpatient service cost center. The direct cost of preventive medicine is sixty seven percent of the total cost. The direct cost of medical education center is eighty two percent of the total cost.

4.1.5 Unit costs

The unit costs are calculated by dividing total costs by outputs. The details of unit cost per OPD visit are shown in Table 33.

Table 33 Unit cost: OPD

Cost center		OPD visit	Unit cost per OPD visit
F	1	OPD Surgery	1,594
F	2	OPD Urban Med	1,417
F	3	OPD Medicine	1,532
F	4	OPD Pedriatrics	1,855
F	5	OPD Orthopaedics	1,593
F	6	OPD ENT	1,834
F	7	OPD Eye	1,453
F	8	OPD OB & GYN	1,636
F	9	OPD Psychiatrics	1,691
F	10	OPD PM&R	1,536
F	11	OPD Radiotherapy	1,531
F	12	OPD Nuclear med	2,188
F	13	OPD Forensic	5,162
F	14	Emergency Room	2,553
F	15	Dental Department	2,473
Average			2,003
Average (Exclude F14,15)			1,925
Average (Exclude F13,14,15)			1,655

The unit cost of OPD is 2,003 Baht per visit. The unit costs of emergency room and dental department are 2,553 Baht and 2,473 Baht, respectively. The unit cost of OPD forensic (F13) is highest of 5,162 Baht because the working time of OPD forensic and emergency room (F14) are around-the-clock. If calculated cost for eight hours, the unit cost of OPD forensic and emergency room will be 1,712 Baht and 851 Baht.

Table 34Unit cost: IPD

		Cost center	Unit costs per	
			Inpatient day	Admission
F	16	Medicine ICU	8,954	59,505
F	17	Medicine Ward	4,276	41,306
F	18	Surgery ICU	6,343	218,071
F	19	Surgery Ward	5,746	47,902
F	20	Pediatric ICU	3,394	271,009
F	21	Pediatric Ward	3,318	12,031
F	22	ICU Emer Med	6,235	246,895
F	23	OB & Gyn Ward	7,627	67,543
F	24	Orthopaedic Ward	6,557	75,490
F	25	ENT Ward	10,612	65,969
F	26	Eye Ward	20,267	61,891
F	27	Chemo Ward	3,078	11,724
F	28	Short Stay Unit	4,842	21,495
F	29	Multi Ward	2,726	26,221
		Average	**6,712**	**87,647**
		Average (ward)	**6,905**	**43,157**
		Average (ICU)	**6,232**	**198,870**

The unit cost per inpatient day is 6,712 Baht. The unit cost per admission is 87,647 Baht. The unit costs of the ward are 6,905 Baht per inpatient day and 43,157 Baht per admission. Intensive care units have highest unit costs per admission. The unit costs of ICU are 6,232 Baht per inpatient day and 198,870 Baht per admission.

The unit cost of health promotion is 1,754 Baht per project. Health promotion services are the useful services for health care system because of the low cost.

The total cost of education in 2015 is 93,206,719 Baht. This is the cost of medical education for medical students, residents, and fellowships in 2015. But the data of allocation cost among these three groups are not available. The study assume that this is the cost of medical students year three to year six which study in the Faculty of Medicine Vajira Hospital.

In 2015, there are 314 students in the faculty. They are student year three to year six. The cost per one student per year is 296,837 Baht. This study assumes that costs per year of one medical student from year three to year six are not different, since number of credit and number of students per year remain the same from year to year.

The student year one and year two are studying at the Faculty of Science, Mahidol University. The payment of education for Mahidol university is 18,000,000 Baht in 2015. There are 169 students in year one and year two. The cost per one student per year is 106,509 Baht. The study assumes that this result is the cost per year of one medical student year one and year two. The cost per year of one student is shown in table 35.

Table 35 Medical student cost per year

Medical student year	Cost per year per one student
1	106,509
2	106,509
3	296,837
4	296,837
5	296,837
6	296,837
Total	**1,400,364**

The cost of the medical student is 1,400,364 Baht per one student per six years.

4.2 DRGs cost per RW and estimated DRGs costs

4.2.1 DRGs cost per RW

DRGs cost per RW is calculated by divide cost per admission by average AdjRW. The calculation shows as below.

$$\text{DRGs cost per RW} = \frac{\text{Average unit cost per admission}}{\text{Average AdjRW}}$$

$$\text{Average AdjRW} = \mathbf{2.2577}$$

The DRGs cost per RW calculations are done and show as follows.

*Table **36** DRGs cost per RW*

	Unit cost per admission	**DRGs cost per RW**
Average cost	87,647	38,821
Average ward cost	43,157	19,116
Average ICU cost	198,870	88,085

The average DRGs cost per RW is 38,821 Baht which is higher than the base rate determined by schemes. And if calculated in the aspect of ward cost and ICU cost, the DRGs cost per RW will be 19,116 Baht and 88,085 Baht, respectively. Meanwhile Vajira hospital's DRGs costs per RW that determined by the scheme are higher than these results.

Table 37 DRGs cost per RW by Scheme

Scheme	**DRGs cost per RW by Scheme**
UC	8,500
CSMBS	13,387
SSS	10,000

(*Source: The revenue division, Vajira hospital)*

The comparison between the calculated results and rate by scheme shows as follows.

Table 38 DRGs cost per RW: Cost difference ratio

Studied results	Cost difference ratio			
	UC	CSMBS	SSS	Average
Average cost	0.78	0.66	0.74	0.73
Average ward cost	0.56	0.30	0.48	0.44
Average ICU cost	0.90	0.85	0.89	0.88

The calculated results are higher than the rate of scheme average seventy three percent. The most difference is the rate of UC scheme. If consider about the ward cost and ICU cost, the average cost difference ratios are forty four and eighty eight percent, respectively.

In conclusion, the most burden of inpatient service is ICU which has highest unit cost per admission and the highest cost difference from the reimbursement.

4.2.2 The estimated cost of five common DRGs

The estimated cost of five common DRGs can be calculated by the formula below.

$$\text{Reimbursement} = \text{DRGs cost per RW determined by scheme} \times \text{AdjRW}$$

And;

$$\text{Estimated cost of DRGs} = \text{DRGs cost per RW} \times \text{AdjRW}$$

The estimated costs are calculated by using data from table 37 and table 38. The results are shown in Table 39.

Table 39 Estimated five common DRGs cost

Code	Disease	Average Adj RW	Estimated cost	UC	CSMBS	SSS
H25	Senile cataract	1.3531	52,529	11,501	18,114	13,531
C18	Malignant neoplasm of colon	3.2424	125,874	27,560	43,406	32,424
I25	Chronic ischaemic heart disease	5.8696	227,865	49,892	78,576	58,696
P59	Neonatal jaundice from other and unspecified causes	0.3009	11,681	2,558	4,028	3,009
O99	Other maternal disease classifiable elsewhere but complicating pregnancy, childbirth and the puerperium	0.458	17,780	3,893	6,131	4,580
	Cost difference ratio		**1**	**0.78**	**0.66**	**0.74**

The reimbursement rates are lower than estimated cost 66 to 78 percent. The most difference is the reimbursement from UC scheme. The highest cost is code I25 which is the chronic ischemic heart disease.

4.3 Sensitivity Analysis

The sensitivity analysis result is shown in table 40.

Table 40 Sensitivity analysis results

Setting		Total cost	Cost difference
0	Baseline	2,210,211,175	-
1	Discount rate 7%	2,298,038,888	0.04
2	Discount rate 10%	2,484,505,294	0.11
3	Rental cost	2,651,095,660	0.17
4	Salary increase 10%	2,346,109,720	0.06
5	Salary decrease 10%	2,074,312,630	0.06
6	Salary increase 15%	2,414,058,993	0.08
7	Salary decrease 15%	1,155,137,632	0.48
8	Total cost without weight	2,210,211,175	-

The different costs of all situations are about 4 percent to 48 percent. The most sensitive result is the decrease 15 percent salary and changes cost 48 percent, respectively. The unit costs show as table 41.

Table 41 Sensitivity analysis results: Unit costs of patient service

Setting	**Unit cost**					
	OPD visit		Patient day		Admission	
Baseline	2,003	Difference	6,712	Difference	87,647	Difference
Discount rate 7%	2,042	0.02	7,128	0.06	93,281	0.06
Discount rate 10%	2,141	0.06	7,960	0.16	104,085	0.16
Rental cost	2,221	0.10	8,453	0.21	112,213	0.22
Salary increase 10%	2,145	0.07	7,065	0.05	91,936	0.05
Salary decrease 10%	1,861	0.07	6,360	0.05	83,357	0.05
Salary increase 15%	2,216	0.10	7,241	0.07	94,081	0.07
Salary decrease 15%	1,790	0.11	6,184	0.08	81,212	0.07
Total cost without weight	2,166	0.08	6,816	0.02	85,067	0.03

The different unit costs per OPD visit range from 2 to 11 percent. The most difference is the salary decrease 15 percent setting. The different unit costs per inpatient day range from 2 to 21 percent. The different unit costs per admission range from 3 to 22 percent. The most difference is the rental cost setting.

CHAPTER 5
DISCUSSION AND CONCLUSION

This chapter comprises of the conclusion of study, discussion of the results, recommendation, and limitation of the study.

5.1Conclusion

The main objective of public health system is the improvement of health outcome for all populations in the country. The faculties of medicine are the important organizations in achieving this purpose. They provide health care services for complicated disease and medical education for students. On the other hand, they have a high tendency of resource consumption due to their functions. The cost management is the important tool for preventing an inefficiency of resource utilization. The cost analysis has to be done continuously for quality and efficiency improvement.

This study focused on teaching hospital cost analysis at Vajira hospital, Bangkok, Thailand by using the secondary data since October 1, 2014 to September 30, 2015. The objective of the study is to evaluate the costs of patient services on the perspective of the provider at Vajira Hospital in the fiscal year 2015. The specific objectives are to determine the cost structure and components of outpatient and inpatient care services, to be to calculate total costs and unit costs of patient service, to analyze the DRGs cost per RW and to estimate cost of five most common inpatient diseases.

Vajira hospital is a teaching hospital of the faculty of medicine Vajira hospital. The main functions of faculty are health care services and medical education. The faculty's organization is studied for the identification of cost centers. The cost center is a hospital division, which generates cost for producing hospital services. The cost centers divide into three groups depending on its function; the non-revenue producing cost center (NRPCC), the revenue producing cost center (RPCC), and the final cost center. The final cost center consists of the patient service (PS) cost center and the nonpatient service (NPS) cost center.

The hospital divisions which categorized as NRPCC are supported departments, the education departments, and some divisions of Vajira hospital. All divisions of RPCC are the division of Vajira hospital such as the radiodiagnosis division, the laboratory division, and the physical therapy division. The last group of cost center is the final cost center. The patient service cost centers comprise of outpatient departments (OPD), the dental care department, the emergency medicine and inpatient departments (IPD).

The full cost of every cost center is collected from the hospital's database. Full cost is the summation of labor, material, and capital costs. The calculation of annual capital cost is done by an annuity method and using the average inflation rate of Thailand, 4 percent.

Full costs are allocated to the final cost center by step-down method. But before the cost allocation step, costs of education department have to be weighted, because they responsible for three types of task which are twenty nine percent of health care service, thirty nine percent of research and management, and thirty two percent of medical teaching. And then the cost of research and management will be accumulated with the dean office cost center. The cost of medical teaching will be accumulated with the medical education center. The cost of health care will be allocated to final cost centers by the step-down method.

The results show that the total cost is 2,210,211,175 Baht. The labor cost is 1,358,985,449 Baht, which is sixty one percent. The material cost is 636,967,811 Baht, which is twenty nine percent. The capital cost is 214,257,915 Baht, which is ten percent. The unit cost per OPD visit is 2,003 Baht. The unit cost per inpatient day is 6,712 Baht. The unit cost per admission is 87,647 Baht. The unit cost per medical student per year is 194,181 Baht. The unit cost per health promotion project is 1,754 Baht.

The DRGs cost per RW and the estimated cost of five common DRGs are calculated. The result is 38,821 Baht per RW which is higher than the reimbursement rate seventy five percent. The chronic ischemic heart disease has highest estimated cost of 227,865 Baht.

There are eight settings of sensitivity analysis and cost difference ranging from four percent to forty eight percent. The most sensitive setting is the salary decrease fifteen percent.

5.2 Discussion

The results of calculation show that the majority of the total cost is the labor cost, about sixty one percent and the lowest proportion is the capital cost which is ten percent. These are same as previous studies (Bumrungchuu, 2011; Kodchaporn Lapsuwansakul & Kunkum, 2012 ; Piyanuch Chinakarn et al., 2012; Rewsuwan, 2015; Sukratamornkul, 2010; Thananun Sriprakone et al., 2012).

Human resource is an important factor of health care service because the best quality care are from the good quality worker. However the labor cost has to be controlled by the optimum workload and high performance of staff. From the result of sensitivity analysis, the most sensitive setting is the decrease fifteen percent of salary. The total cost will decrease forty eight percent. There are many ways to decrease full labor cost such as using outsource for the low strategic importance job but a high contribution to operational performance. The other choice is the technology utilization such as the information technology instead of the data recorder. But from the result of this study and previous studies found that the investment cost is the lowest part of all hospitals because their main revenue is the operating cost. The government has to develop the investment plan for public hospitals in the country for the high performance of health care system.

The unit costs of all outputs of this study are higher than all previous studies. The possible reasons are the teaching hospital (Ashish K. Jha et al., 2009; Donald S. et al., 1998) and the Bangkok location. Ayutthaya and Thammasat university hospitals are teaching hospital, but locate at suburban areas. Meanwhile Charearnkrung Pracharuk hospital, which is a nonteaching hospital and locates in the urban area has a higher unit cost per admission than teaching hospitals in the suburban area. So the location is the possible reason of higher cost of this study. The last reason of the high cost of Vajira hospital is the adjustment of wage rate after autonomy converted since 2010. The wage rate is increased for motivating the employee to retire from the civil servant employee and sign up to the faculty employee due to the faculty's management benefit.

5.3 Recommendation

The study of cost analysis is useful to monitor and planning the resource utilization for reducing the risk of loss and promote the revenue gain by the most effective strategy. From the studied result, there are few multiple important issues for the recommendation. The nursing department cost center is the largest department, which distributes staffs to almost cost centers in the hospital. It is the important department in the aspect of highest cost as well as playing an important role in health care services. The hospital manager and the faculty's policy maker should implement the appropriate plan of management to this department for improved efficiency and performance.

The result shows that the reimbursement is lower than cost seventy five percent. This is the important problem for the quality improvement of faculty. The recommendations are increasing efficiency and increase revue. There are many ways for increase efficiency. New technology and outsource utilizations are the best way for solving the problem. Lean office management is the good method for improve efficiency. However the systemic analysis has to be done for the performance improvement. The investment is the good method for increase revenue especially in the urban area. The faculty should develops new services for generate more revenue.

5.4 Limitation of this study

The limitations are the unavailable data of work allocation. Almost of key performance indicators of division are not the work allocation. The second limitation is the inconsistent of division name because the organization structure was changed since 2014 but not complete implement to all division. The third limitation is the manual collected data. Some set of data are collected by paper. It is difficult to analyze the data for cost analysis.

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APPENDIX

Appendix 1 Cost allocation, cost center N1-N3

Cost center		Full cost after weight	Dean office		Accounting		Procurement	
			Number of employees	Cost	Number of employees	Cost	Number of employees	Cost
Total		2,210,211,175	2344	-	2276	-	2257	-
N 1	Dean office	297,241,269	0	297,241,269	0	-	0	-
N 2	Accounting	18,248,407	68	8,623,040	0	26,871,448	0	-
N 3	Procurement	35,495,852	19	2,409,379	19	224,322	0	38,129,554
N 4	Human resource	133,466,189	15	1,902,141	15	177,097	15	253,409
N 5	Strategy	3,877,350	10	1,268,094	10	118,064	10	168,939
N 6	Academic support	10,699,415	12	1,521,713	12	141,677	12	202,727
N 7	Engineering	153,216,871	52	6,594,090	52	613,935	52	878,483
N 8	Research support	2,094,021	4	507,238	4	47,226	4	67,576
N 9	IT	19,856,534	5	634,047	5	59,032	5	84,470
N 10	Pediatrics	4,912,941	25	3,170,235	25	295,161	25	422,348
N 11	Ophthalmology	2,349,735	14	1,775,332	14	165,290	14	236,515
N 12	Psychiatry	1,687,606	9	1,141,285	9	106,258	9	152,045
N 13	Forensic Medicine	1,159,495	6	760,856	6	70,839	6	101,363
N 14	Anat Pathology	1,151,478	7	887,666	7	82,645	7	118,257
N 15	Clinical Pathology	4,286,141	24	3,043,426	24	283,354	24	405,454
N 16	Radiology	4,033,903	24	3,043,426	24	283,354	24	405,454
N 17	Medical Sciences	2,487,115	22	2,789,807	22	259,742	22	371,666
N 18	Anesthesiology	2,029,198	14	1,775,332	14	165,290	14	236,515
N 19	Emergency Med	2,888,865	18	2,282,569	18	212,516	18	304,090
N 20	Urban Medicine	1,572,529	9	1,141,285	9	106,258	9	152,045
N 21	Rehabilitation	651,019	5	634,047	5	59,032	5	84,470
N 22	Surgery	9,407,785	57	7,228,137	57	672,967	57	962,953
N 23	Orthopaedics	3,503,809	20	2,536,188	20	236,129	20	337,878
N 24	OB and GYN	4,017,911	27	3,423,854	27	318,774	27	456,136
N 25	ENT	2,417,232	17	2,155,760	17	200,709	17	287,196

Cost center		Full cost after weight	Dean office		Accounting		Procurement	
			Number of employees	Cost	Number of employees	Cost	Number of employees	Cost
N 26	Internal Medicine	9,605,127	52	6,594,090	52	613,935	52	878,483
N 27	Social welfare	4,053,230	7	887,666	7	82,645	7	118,257
N 28	Medical statistics	25,216,350	43	5,452,805	43	507,677	43	726,438
N 29	Infectious control	755,301	5	634,047	5	59,032	5	84,470
N 30	Medical instruments	28,422,354	22	2,789,807	22	259,742	22	371,666
N 31	Duty stretcher	9,075,750	69	8,749,850	69	814,644	69	1,165,680
N 32	Laundry	13,101,606	36	4,565,139	36	425,032	36	608,181
N 33	Nursing department	554,131,108	24	3,043,426	24	283,354	24	405,454
R 1	Operation	111,420,795	143	18,133,746	143	1,688,320	143	2,415,829
R 2	Anat Pathology	12,366,479	29	3,677,473	29	342,387	29	489,923
R 3	Central laboratory	110,645,547	77	9,764,325	77	909,096	77	1,300,831
R 4	Pharmacy	69,633,332	96	12,173,704	96	1,133,418	96	1,621,815
R 5	Radiology	95,358,536	31	3,931,092	31	366,000	31	523,711
R 6	Physical therapy	12,753,067	29	3,677,473	29	342,387	29	489,923
R 7	Nutrition dep.	15,920,770	37	4,691,948	37	436,838	37	625,075
F 1	OPD Surgery	2,423,781	22	2,789,807	22	259,742	22	371,666
F 2	OPD Urban Med	1,114,052	3	380,428	3	35,419	3	50,682
F 3	OPD Medicine	26,440,649	72	9,130,278	72	850,063	72	1,216,361
F 4	OPD Pedriatrics	1,761,382	11	1,394,904	11	129,871	11	185,833
F 5	OPD Orthopaedics	2,273,086	8	1,014,475	8	94,451	8	135,151
F 6	OPD ENT	633,225	5	634,047	5	59,032	5	84,470
F 7	OPD Eye	2,338,368	8	1,014,475	8	94,451	8	135,151
F 8	OPD OB & GYN	4,311,914	17	2,155,760	17	200,709	17	287,196
F 9	OPD Psychiatrics	820,274	5	634,047	5	59,032	5	84,470
F 10	OPD PM&R	971,309	2	253,619	2	23,613	2	33,788
F 11	OPD Radiotherapy	2,259,291	23	2,916,617	23	271,548	23	388,560

Appendix 1 Cost allocation, cost center N1-N3 (cont.)

	Cost center	Full cost after weight	Dean office		Accounting		Procurement	
			Number of employees	Cost	Number of employees	Cost	Number of employees	Cost
F 12	OPD Nuclear med	981,856	6	760,856	6	70,839	6	101,363
F 13	OPD Forensic	10,432,352	2	253,619	2	23,613	2	33,788
F 14	Emergency Room	36,643,773	95	12,046,894	95	1,121,611	95	1,604,921
F 15	Dental Department	19,709,185	31	3,931,092	31	366,000	31	523,711
F 16	Medicine ICU	4,872,657	51	6,467,280	51	602,128	51	861,589
F 17	Medicine Ward	79,649,679	215	27,264,024	215	2,538,384	215	3,632,191
F 18	Surgery ICU	6,912,667	62	7,862,184	62	731,999	62	1,047,422
F 19	Surgery Ward	52,448,218	197	24,981,455	197	2,325,868	197	3,328,100
F 20	Pediatric ICU	3,142,438	54	6,847,708	54	637,548	54	912,271
F 21	Pediatric Ward	6,883,496	54	6,847,708	54	637,548	54	912,271
F 22	ICU Emer Med	1,992,101	20	2,536,188	20	236,129	20	337,878
F 23	OB & Gyn Ward	19,513,649	75	9,510,706	75	885,483	75	1,267,043
F 24	Orthopaedic Ward	25,081,764	60	7,608,565	60	708,386	60	1,013,635
F 25	ENT Ward	7,409,784	4	507,238	4	47,226	4	67,576
F 26	Eye Ward	7,886,132	4	507,238	4	47,226	4	67,576
F 27	Chemo Ward	863,590	21	2,662,998	21	247,935	21	354,772
F 28	Short Stay Unit	1,487,254	4	507,238	4	47,226	4	67,576
F 29	Multi Ward	2,159,547	4	507,238	4	47,226	4	67,576
F 30	Preventive medicine	5,137,454	10	1,268,094	10	118,064	10	168,939
F 31	Medical education	76,444,223	16	2,028,951	16	188,903	16	270,303

Appendix 2 Cost allocation, cost center N4-N6

Cost center		Human resource		Strategy		Academic	
		Number of employees	Cost	Number of employees	Cost	Number of employees	Cost
	Total	2242		2232		2220	
N 1	Dean office	0	-	0	-	0	-
N 2	Accounting	0	-	0	-	0	-
N 3	Procurement	0	-	0	-	0	-
N 4	Human resource	0	135,798,836	0	-	0	-
N 5	Strategy	10	605,704	0	6,038,152	0	-
N 6	Academic support	12	726,845	12	32,463	0	13,324,841
N 7	Engineering	52	3,149,661	52	140,674	52	312,113
N 8	Research support	4	242,282	4	10,821	4	24,009
N 9	IT	5	302,852	5	13,526	5	30,011
N 10	Pediatrics	25	1,514,260	25	67,632	25	150,055
N 11	Ophthalmology	14	847,986	14	37,874	14	84,031
N 12	Psychiatry	9	545,134	9	24,347	9	54,020
N 13	Forensic Medicine	6	363,422	6	16,232	6	36,013
N 14	Anat Pathology	7	423,993	7	18,937	7	42,015
N 15	Clinical Pathology	24	1,453,690	24	64,926	24	144,052
N 16	Radiology	24	1,453,690	24	64,926	24	144,052
N 17	Medical Sciences	22	1,332,549	22	59,516	22	132,048
N 18	Anesthesiology	14	847,986	14	37,874	14	84,031
N 19	Emergency Med	18	1,090,267	18	48,695	18	108,039
N 20	Urban Medicine	9	545,134	9	24,347	9	54,020
N 21	Rehabilitation	5	302,852	5	13,526	5	30,011
N 22	Surgery	57	3,452,513	57	154,200	57	342,124
N 23	Orthopaedics	20	1,211,408	20	54,105	20	120,044
N 24	OB and GYN	27	1,635,401	27	73,042	27	162,059
N 25	ENT	17	1,029,697	17	45,990	17	102,037

Appendix 2 Cost allocation, cost center N4-N6 (cont.)

Cost center		Human resource		Strategy		Academic	
		Number of employees	Cost	Number of employees	Cost	Number of employees	Cost
N 26	Internal Medicine	52	3,149,661	52	140,674	52	312,113
N 27	Social welfare	7	423,993	7	18,937	7	42,015
N 28	Medical statistics	43	2,604,527	43	116,326	43	258,094
N 29	Infectious control	5	302,852	5	13,526	5	30,011
N 30	Medical instruments	22	1,332,549	22	59,516	22	132,048
N 31	Duty stretcher	69	4,179,358	69	186,663	69	414,150
N 32	Laundry	36	2,180,534	36	97,390	36	216,078
N 33	Nursing department	24	1,453,690	24	64,926	24	144,052
R 1	Operation	143	8,661,567	143	386,853	143	858,312
R 2	Anat Pathology	29	1,756,542	29	78,453	29	174,063
R 3	Central laboratory	77	4,663,921	77	208,305	77	462,168
R 4	Pharmacy	96	5,814,758	96	259,705	96	576,209
R 5	Radiology	31	1,877,682	31	83,863	31	186,068
R 6	Physical therapy	29	1,756,542	29	78,453	29	174,063
R 7	Nutrition dep.	37	2,241,105	37	100,095	37	222,081
F 1	OPD Surgery	22	1,332,549	22	59,516	22	132,048
F 2	OPD Urban Med	3	181,711	3	8,116	3	18,007
F 3	OPD Medicine	72	4,361,069	72	194,779	72	432,157
F 4	OPD Pedriatrics	11	666,274	11	29,758	11	66,024
F 5	OPD Orthopaedics	8	484,563	8	21,642	8	48,017
F 6	OPD ENT	5	302,852	5	13,526	5	30,011
F 7	OPD Eye	8	484,563	8	21,642	8	48,017
F 8	OPD OB & GYN	17	1,029,697	17	45,990	17	102,037
F 9	OPD Psychiatrics	5	302,852	5	13,526	5	30,011
F 10	OPD PM&R	2	121,141	2	5,411	2	12,004
F 11	OPD Radiotherapy	23	1,393,119	23	62,221	23	138,050
F 12	OPD Nuclear med	6	363,422	6	16,232	6	36,013
F 13	OPD Forensic	2	121,141	2	5,411	2	12,004
F 14	Emergency Room	95	5,754,188	95	257,000	95	570,207
F 15	Dental Department	31	1,877,682	31	83,863	31	186,068
F 16	Medicine ICU	51	3,089,090	51	137,969	51	306,111
F 17	Medicine Ward	215	13,022,636	215	581,632	215	1,290,469
F 18	Surgery ICU	62	3,755,365	62	167,726	62	372,135
F 19	Surgery Ward	197	11,932,369	197	532,937	197	1,182,430
F 20	Pediatric ICU	54	3,270,802	54	146,084	54	324,118
F 21	Pediatric Ward	54	3,270,802	54	146,084	54	324,118
F 22	ICU Emer Med	20	1,211,408	20	54,105	20	120,044
F 23	OB & Gyn Ward	75	4,542,780	75	202,895	75	450,164
F 24	Orthopaedic Ward	60	3,634,224	60	162,316	60	360,131
F 25	ENT Ward	4	242,282	4	10,821	4	24,009
F 26	Eye Ward	4	242,282	4	10,821	4	24,009
F 27	Chemo Ward	21	1,271,978	21	56,811	21	126,046
F 28	Short Stay Unit	4	242,282	4	10,821	4	24,009
F 29	Multi Ward	4	242,282	4	10,821	4	24,009
F 30	Preventive medicine	10	605,704	10	27,053	10	60,022
F 31	Medical education	16	969,126	16	43,284	16	96,035

Appendix 3 Cost allocation, cost center N7-N10

	Cost center	Engineering		Research		IT		Pediatrics	
		Area (sq m)	cost	Number of employees	Cost	Number of employees	Cost	Service hours	cost
	Total	68603		2164		2159		889	
N 1	Dean office	0	-	0	-	0	-	0	-
N 2	Accounting	0	-	0	-	0	-	0	-
N 3	Procurement	0	-	0	-	0	-	0	-
N 4	Human resource	0	-	0	-	0	-	0	-
N 5	Strategy	0	-	0	-	0	-	0	-
N 6	Academic support	0	-	0	-	0	-	0	-
N 7	Engineering	0	164,905,826	0	-	0	-	0	-
N 8	Research support	418	1,004,776	0	3,997,948	0	-	0	-
N 9	IT	585	1,406,205	5	9,237	0	22,395,915	0	-
N 10	Pediatrics	936	2,249,929	25	46,187	25	259,332	0	13,088,079
N 11	Ophthalmology	144	346,143	14	25,865	14	145,226	0	-
N 12	Psychiatry	21	50,479	9	16,627	9	93,360	0	-
N 13	Forensic Medicine	96	230,762	6	11,085	6	62,240	0	-
N 14	Anat Pathology	48	115,381	7	12,932	7	72,613	0	-
N 15	Clinical Pathology	188	451,909	24	44,340	24	248,959	0	-
N 16	Radiology	540	1,298,036	24	44,340	24	248,959	0	-
N 17	Medical Sciences	21	50,479	22	40,645	22	228,212	0	-
N 18	Anesthesiology	21	50,479	14	25,865	14	145,226	0	-
N 19	Emergency Med	744	1,788,405	18	33,255	18	186,719	0	-
N 20	Urban Medicine	21	50,479	9	16,627	9	93,360	0	-
N 21	Rehabilitation	8	19,230	5	9,237	5	51,866	0	-
N 22	Surgery	654	1,572,066	57	105,306	57	591,277	0	-
N 23	Orthopaedics	324	778,821	20	36,950	20	207,466	0	-
N 24	OB and GYN	88	211,532	27	49,882	27	280,079	0	-
N 25	ENT	36	86,536	17	31,407	17	176,346	0	-

	Cost center	Engineering		Research		IT		Pediatrics	
		Area (sq m)	cost	Number of employees	Cost	Number of employees	Cost	Service hours	cost
N 26	Internal Medicine	1518	3,648,923	52	96,069	52	539,411	0	-
N 27	Social welfare	21	50,479	7	12,932	7	72,613	0	-
N 28	Medical statistics	221	531,233	43	79,442	43	446,051	0	-
N 29	Infectious control	32	76,921	5	9,237	5	51,866	0	-
N 30	Medical instruments	794	1,908,593	22	40,645	22	228,212	0	-
N 31	Duty stretcher	6	14,423	69	127,476	69	715,756	0	-
N 32	Laundry	528	1,269,191	36	66,509	36	373,438	0	-
N 33	Nursing department	1530	3,677,768	24	44,340	24	248,959	0	-
R 1	Operation	3106	7,466,109	143	264,190	143	1,483,379	0	-
R 2	Anat Pathology	1779	4,276,307	29	53,577	29	300,825	0	-
R 3	Central laboratory	1615	3,882,088	77	142,256	77	798,743	0	-
R 4	Pharmacy	740	1,778,790	96	177,358	96	995,835	0	-
R 5	Radiology	3040	7,307,460	31	57,272	31	321,572	0	-
R 6	Physical therapy	306	735,554	29	53,577	29	300,825	0	-
R 7	Nutrition dep.	384	923,048	37	68,357	37	383,811	0	-
F 1	OPD Surgery	464	1,115,349	22	40,645	22	228,212	0	-
F 2	OPD Urban Med	378	908,625	3	5,542	3	31,120	0	-
F 3	OPD Medicine	3409	8,194,452	72	133,019	72	746,876	0	-
F 4	OPD Pedriatrics	75	180,283	11	20,322	11	114,106	662	9,746,128
F 5	OPD Orthopaedics	459	1,103,330	8	14,780	8	82,986	0	-
F 6	OPD ENT	378	908,625	5	9,237	5	51,866	0	-
F 7	OPD Eye	423	1,016,795	8	14,780	8	82,986	0	-
F 8	OPD OB & GYN	1953	4,694,563	17	31,407	17	176,346	0	-
F 9	OPD Psychiatrics	24	57,690	5	9,237	5	51,866	0	-
F 10	OPD PM&R	360	865,357	2	3,695	2	20,747	0	-
F 11	OPD Radiotherapy	216	519,214	23	42,492	23	238,585	0	-

Appendix 3 Cost allocation, cost center N7-N10 (cont.)

	Cost center	Engineering		Research		IT		Pediatrics	
		Area (sq m)	cost	Number of employees	Cost	Number of employees	Cost	Service hours	cost
F 12	OPD Nuclear med	216	519,214	6	11,085	6	62,240	0	-
F 13	OPD Forensic	72	173,071	2	3,695	2	20,747	0	-
F 14	Emergency Room	552	1,326,881	95	175,511	95	985,462	0	-
F 15	Dental Department	162	389,411	31	57,272	31	321,572	0	-
F 16	Medicine ICU	996	2,394,155	51	94,221	51	529,037	0	-
F 17	Medicine Ward	8971	21,564,220	215	397,208	215	2,230,256	0	-
F 18	Surgery ICU	1310	3,148,939	62	114,544	62	643,143	0	-
F 19	Surgery Ward	9676	23,258,877	197	363,954	197	2,043,536	0	-
F 20	Pediatric ICU	608	1,461,492	54	99,764	54	560,157	0	-
F 21	Pediatric Ward	2158	5,187,335	54	99,764	54	560,157	227	3,341,950
F 22	ICU Emer Med	608	1,461,492	20	36,950	20	207,466	0	-
F 23	OB & Gyn Ward	7812	18,778,250	75	138,561	75	777,996	0	-
F 24	Orthopaedic Ward	2419	5,814,719	60	110,849	60	622,397	0	-
F 25	ENT Ward	360	865,357	4	7,390	4	41,493	0	-
F 26	Eye Ward	504	1,211,500	4	7,390	4	41,493	0	-
F 27	Chemo Ward	432	1,038,429	21	38,797	21	217,839	0	-
F 28	Short Stay Unit	432	1,038,429	4	7,390	4	41,493	0	-
F 29	Multi Ward	432	1,038,429	4	7,390	4	41,493	0	-
F 30	Preventive medicine	60	144,226	10	18,475	10	103,733	0	-
F 31	Medical education	2171	5,218,584	16	29,560	16	165,973	0	-

Appendix 4 Cost allocation, cost center N11-N17

	Cost center	Ophthalmology		Psychiatry	Forensic	Ana Path	Clinical Path	Radiology	Medical Sc
		Service hours	cost	cost	cost	cost	cost	cost	Cost
	Total	1353							
N 1	Dean office	0	-	-	-	-	-	-	-
N 2	Accounting	0	-	-	-	-	-	-	-
N 3	Procurement	0	-	-	-	-	-	-	-
N 4	Human resource	0	-	-	-	-	-	-	-
N 5	Strategy	0	-	-	-	-	-	-	-
N 6	Academic support	0	-	-	-	-	-	-	-
N 7	Engineering	0	-	-	-	-	-	-	-
N 8	Research support	0	-	-	-	-	-	-	-
N 9	IT	0	-	-	-	-	-	-	-
N 10	Pediatrics	0	-	-	-	-	-	-	-
N 11	Ophthalmology	0	6,013,995	-	-	-	-	-	-
N 12	Psychiatry	0	-	3,871,160	-	-	-	-	-
N 13	Forensic Medicine	0	-	-	2,812,307	-	-	-	-
N 14	Anat Pathology	0	-	-	-	2,925,918	-	-	-
N 15	Clinical Pathology	0	-	-	-	-	10,426,251	-	-
N 16	Radiology	0	-	-	-	-	-	11,020,140	-
N 17	Medical Sciences	0	-	-	-	-	-	-	7,751,778
N 18	Anesthesiology	0	-	-	-	-	-	-	-
N 19	Emergency Med	0	-	-	-	-	-	-	-
N 20	Urban Medicine	0	-	-	-	-	-	-	-
N 21	Rehabilitation	0	-	-	-	-	-	-	-
N 22	Surgery	0	-	-	-	-	-	-	-
N 23	Orthopaedics	0	-	-	-	-	-	-	-
N 24	OB and GYN	0	-	-	-	-	-	-	-
N 25	ENT	0	-	-	-	-	-	-	-

Appendix 4 Cost allocation, cost center N11-N17 (cont.)

	Cost center	Ophthalmology		Psychiatry	Forensic	Ana Path	Clinical Path	Radiology	Medical Sc
		Service hours	cost	cost	cost	cost	cost	cost	Cost
N 26	Internal Medicine	0	-	-	-	-	-	-	-
N 27	Social welfare	0	-	-	-	-	-	-	-
N 28	Medical statistics	0	-	-	-	-	-	-	-
N 29	Infectious control	0	-	-	-	-	-	-	-
N 30	Medical instruments	0	-	-	-	-	-	-	-
N 31	Duty stretcher	0	-	-	-	-	-	-	-
N 32	Laundry	0	-	-	-	-	-	-	-
N 33	Nursing department	0	-	-	-	-	-	-	-
R 1	Operation	347	1,542,392	-	-	-	-	-	-
R 2	Anat Pathology	0	-	-	-	2,925,918	-	-	-
R 3	Central laboratory	0	-	-	-	-	10,426,251	-	-
R 4	Pharmacy	0	-	-	-	-	-	-	-
R 5	Radiology	0	-	-	-	-	-	11,020,140	-
R 6	Physical therapy	0	-	-	-	-	-	-	-
R 7	Nutrition dep.	0	-	-	-	-	-	-	-
F 1	OPD Surgery	0	-	-	-	-	-	-	-
F 2	OPD Urban Med	0	-	-	-	-	-	-	-
F 3	OPD Medicine	0	-	-	-	-	-	-	-
F 4	OPD Pedriatrics	0	-	-	-	-	-	-	-
F 5	OPD Orthopaedics	0	-	-	-	-	-	-	-
F 6	OPD ENT	0	-	-	-	-	-	-	-
F 7	OPD Eye	763	3,391,484	-	-	-	-	-	-
F 8	OPD OB & GYN	0	-	-	-	-	-	-	-
F 9	OPD Psychiatrics	0	-	3,871,160	-	-	-	-	-
F 10	OPD PM&R	0	-	-	-	-	-	-	-
F 11	OPD Radiotherapy	0	-	-	-	-	-	-	-

	Cost center	Ophthalmology		Psychiatry	Forensic	Ana Path	Clinical Path	Radiology	Medical Sc
		Service hours	cost	cost	cost	cost	cost	cost	Cost
F 12	OPD Nuclear med	0	-	-	-	-	-	-	-
F 13	OPD Forensic	0	-	-	2,812,307	-	-	-	-
F 14	Emergency Room	0	-	-	-	-	-	-	-
F 15	Dental Department	0	-	-	-	-	-	-	-
F 16	Medicine ICU	0	-	-	-	-	-	-	-
F 17	Medicine Ward	0	-	-	-	-	-	-	-
F 18	Surgery ICU	0	-	-	-	-	-	-	-
F 19	Surgery Ward	0	-	-	-	-	-	-	-
F 20	Pediatric ICU	0	-	-	-	-	-	-	-
F 21	Pediatric Ward	0	-	-	-	-	-	-	-
F 22	ICU Emer Med	0	-	-	-	-	-	-	-
F 23	OB & Gyn Ward	0	-	-	-	-	-	-	-
F 24	Orthopaedic Ward	0	-	-	-	-	-	-	-
F 25	ENT Ward	0	-	-	-	-	-	-	-
F 26	Eye Ward	243	1,080,119	-	-	-	-	-	-
F 27	Chemo Ward	0	-	-	-	-	-	-	-
F 28	Short Stay Unit	0	-	-	-	-	-	-	-
F 29	Multi Ward	0	-	-	-	-	-	-	-
F 30	Preventive medicine	0	-	-	-	-	-	-	-
F 31	Medical education	0	-	-	-	-	-	-	7,751,778

Appendix 5 Cost allocation, cost center N18-N23

	Cost center	Anesth	Emergency	Urban	Rehab	Surgery		Orthopaedics	
		Cost	Cost	Cost	Cost	Service hours	Cost	Service hours	Cost
	Total					1,353		1,353	
N 1	Dean office	-	-	-	-	-	-	-	-
N 2	Accounting	-	-	-	-	-	-	-	-
N 3	Procurement	-	-	-	-	-	-	-	-
N 4	Human resource	-	-	-	-	-	-	-	-
N 5	Strategy	-	-	-	-	-	-	-	-
N 6	Academic support	-	-	-	-	-	-	-	-
N 7	Engineering	-	-	-	-	-	-	-	-
N 8	Research support	-	-	-	-	-	-	-	-
N 9	IT	-	-	-	-	-	-	-	-
N 10	Pediatrics	-	-	-	-	-	-	-	-
N 11	Ophthalmology	-	-	-	-	-	-	-	-
N 12	Psychiatry	-	-	-	-	-	-	-	-
N 13	Forensic Medicine	-	-	-	-	-	-	-	-
N 14	Anat Pathology	-	-	-	-	-	-	-	-
N 15	Clinical Pathology	-	-	-	-	-	-	-	-
N 16	Radiology	-	-	-	-	-	-	-	-
N 17	Medical Sciences	-	-	-	-	-	-	-	-
N 18	Anesthesiology	5,397,795	-	-	-	-	-	-	-
N 19	Emergency Med	-	8,943,420	-	-	-	-	-	-
N 20	Urban Medicine	-	-	3,756,083	-	-	-	-	-
N 21	Rehabilitation	-	-	-	1,855,291	-	-	-	-
N 22	Surgery	-	-	-	-	-	24,489,327	-	-
N 23	Orthopaedics	-	-	-	-	-	-	-	9,022,798
N 24	OB and GYN	-	-	-	-	-	-	-	-
N 25	ENT	-	-	-	-	-	-	-	-

	Cost center	Anesth	Emergency	Urban	Rehab	Surgery		Orthopaedics	
		Cost	Cost	Cost	Cost	Service hours	Cost	Service hours	Cost
N 26	Internal Medicine	-	-	-	-	-	-	-	-
N 27	Social welfare	-	-	-	-	-	-	-	-
N 28	Medical statistics	-	-	-	-	-	-	-	-
N 29	Infectious control	-	-	-	-	-	-	-	-
N 30	Medical instruments	-	-	-	-	-	-	-	-
N 31	Duty stretcher	-	-	-	-	-	-	-	-
N 32	Laundry	-	-	-	-	-	-	-	-
N 33	Nursing department	-	-	-	-	-	-	-	-
R 1	Operation	5,397,795	-	-	-	347	6,280,707	347	2,314,051
R 2	Anat Pathology	-	-	-	-	-	-	-	-
R 3	Central laboratory	-	-	-	-	-	-	-	-
R 4	Pharmacy	-	-	-	-	-	-	-	-
R 5	Radiology	-	-	-	-	-	-	-	-
R 6	Physical therapy	-	-	-	1,855,291	-	-	-	-
R 7	Nutrition dep.	-	-	-	-	-	-	-	-
F 1	OPD Surgery	-	-	-	-	763	13,810,315	-	-
F 2	OPD Urban Med	-	-	3,756,083	-	-	-	-	-
F 3	OPD Medicine	-	-	-	-	-	-	-	-
F 4	OPD Pedriatrics	-	-	-	-	-	-	-	-
F 5	OPD Orthopaedics	-	-	-	-	-	-	763	5,088,245
F 6	OPD ENT	-	-	-	-	-	-	-	-
F 7	OPD Eye	-	-	-	-	-	-	-	-
F 8	OPD OB & GYN	-	-	-	-	-	-	-	-
F 9	OPD Psychiatrics	-	-	-	-	-	-	-	-
F 10	OPD PM&R	-	-	-	-	-	-	-	-
F 11	OPD Radiotherapy	-	-	-	-	-	-	-	-

Appendix 5 Cost allocation, cost center N18-N23 (cont.)

	Cost center	Anesth	Emergency	Urban	Rehab	Surgery		Orthopaedics	
		Cost	Cost	Cost	Cost	Service hours	Cost	Service hours	Cost
F 12	OPD Nuclear med	-	-	-	-	-	-	-	-
F 13	OPD Forensic	-	-	-	-	-	-	-	-
F 14	Emergency Room	-	8,943,420	-	-	-	-	-	-
F 15	Dental Department	-	-	-	-	-	-	-	-
F 16	Medicine ICU	-	-	-	-	-	-	-	-
F 17	Medicine Ward	-	-	-	-	-	-	-	-
F 18	Surgery ICU	-	-	-	-	-	-	-	-
F 19	Surgery Ward	-	-	-	-	243	4,398,305	-	-
F 20	Pediatric ICU	-	-	-	-	-	-	-	-
F 21	Pediatric Ward	-	-	-	-	-	-	-	-
F 22	ICU Emer Med	-	-	-	-	-	-	-	-
F 23	OB & Gyn Ward	-	-	-	-	-	-	-	-
F 24	Orthopaedic Ward	-	-	-	-	-	-	243	1,620,503
F 25	ENT Ward	-	-	-	-	-	-	-	-
F 26	Eye Ward	-	-	-	-	-	-	-	-
F 27	Chemo Ward	-	-	-	-	-	-	-	-
F 28	Short Stay Unit	-	-	-	-	-	-	-	-
F 29	Multi Ward	-	-	-	-	-	-	-	-
F 30	Preventive medicine	-	-	-	-	-	-	-	-
F 31	Medical education	-	-	-	-	-	-	-	-

Appendix 6 Cost allocation, cost center N24-N27

	Cost center	Obst Gyn		ENT		Medicine		Social welfare	
		Service hours	Cost	Service hours	Cost	Service hours	Cost	Number of OPD visit and	cost
	Total	1,353		347		889		849,148	
N 1	Dean office	-	-	-	-	-	-	-	-
N 2	Accounting	-	-	-	-	-	-	-	-
N 3	Procurement	-	-	-	-	-	-	-	-
N 4	Human resource	-	-	-	-	-	-	-	-
N 5	Strategy	-	-	-	-	-	-	-	-
N 6	Academic support	-	-	-	-	-	-	-	-
N 7	Engineering	-	-	-	-	-	-	-	-
N 8	Research support	-	-	-	-	-	-	-	-
N 9	IT	-	-	-	-	-	-	-	-
N 10	Pediatrics	-	-	-	-	-	-	-	-
N 11	Ophthalmology	-	-	-	-	-	-	-	-
N 12	Psychiatry	-	-	-	-	-	-	-	-
N 13	Forensic Medicine	-	-	-	-	-	-	-	-
N 14	Anat Pathology	-	-	-	-	-	-	-	-
N 15	Clinical Pathology	-	-	-	-	-	-	-	-
N 16	Radiology	-	-	-	-	-	-	-	-
N 17	Medical Sciences	-	-	-	-	-	-	-	-
N 18	Anesthesiology	-	-	-	-	-	-	-	-
N 19	Emergency Med	-	-	-	-	-	-	-	-
N 20	Urban Medicine	-	-	-	-	-	-	-	-
N 21	Rehabilitation	-	-	-	-	-	-	-	-
N 22	Surgery	-	-	-	-	-	-	-	-
N 23	Orthopaedics	-	-	-	-	-	-	-	-
N 24	OB and GYN	-	10,628,668	-	-	-	-	-	-
N 25	ENT	-	-	-	6,532,910	-	-	-	-

Appendix 6 Cost allocation, cost center N24-N27 (cont.)

	Cost center	Obst Gyn		ENT		Medicine		Social welfare	
		Service hours	Cost	Service hours	Cost	Service hours	Cost	Number of OPD visit and	cost
N 26	Internal Medicine	-	-	-	-	0	25,578,485	-	-
N 27	Social welfare	-	-	-	-	0	-	-	5,762,768
N 28	Medical statistics	-	-	-	-	0	-	-	-
N 29	Infectious control	-	-	-	-	0	-	-	-
N 30	Medical instruments	-	-	-	-	0	-	-	-
N 31	Duty stretcher	-	-	-	-	0	-	-	-
N 32	Laundry	-	-	-	-	0	-	-	-
N 33	Nursing department	-	-	-	-	0	-	-	-
R 1	Operation	347	2,725,904	347	6,532,910	0	-	-	-
R 2	Anat Pathology	-	-	-	-	0	-	-	-
R 3	Central laboratory	-	-	-	-	0	-	-	-
R 4	Pharmacy	-	-	-	-	0	-	-	-
R 5	Radiology	-	-	-	-	0	-	-	-
R 6	Physical therapy	-	-	-	-	0	-	32,878	223,128
R 7	Nutrition dep.	-	-	-	-	0	-	-	-
F 1	OPD Surgery	-	-	-	-	0	-	58,584	397,582
F 2	OPD Urban Med	-	-	-	-	0	-	31,067	210,837
F 3	OPD Medicine	-	-	-	-	662	19,047,196	218,572	1,483,345
F 4	OPD Pedriatrics	-	-	-	-	0	-	22,104	150,009
F 5	OPD Orthopaedics	-	-	-	-	0	-	46,139	313,124
F 6	OPD ENT	-	-	763	14,364,871	0	-	27,333	185,496
F 7	OPD Eye	-	-	-	-	0	-	35,411	240,318
F 8	OPD OB & GYN	763	5,993,846	-	-	0	-	44,475	301,831
F 9	OPD Psychiatrics	-	-	-	-	0	-	12,292	83,420
F 10	OPD PM&R	-	-	-	-	0	-	13,866	94,102
F 11	OPD Radiotherapy	-	-	-	-	0	-	25,530	173,260

	Cost center	Obst Gyn		ENT		Medicine		Social welfare	
		Service hours	Cost	Service hours	Cost	Service hours	Cost	Number of OPD visit and	cost
F 12	OPD Nuclear med	-	-	-	-	0	-	2,983	20,244
F 13	OPD Forensic	-	-	-	-	0	-	3,514	23,848
F 14	Emergency Room	-	-	-	-	0	-	51,654	350,551
F 15	Dental Department	-	-	-	-	0	-	21,705	147,302
F 16	Medicine ICU	-	-	-	-	0	-	2,645	17,950
F 17	Medicine Ward	-	-	-	-	227	6,531,289	64,010	434,406
F 18	Surgery ICU	-	-	-	-	0	-	5,260	35,697
F 19	Surgery Ward	-	-	-	-	0	-	52,415	355,716
F 20	Pediatric ICU	-	-	-	-	0	-	9,900	67,187
F 21	Pediatric Ward	-	-	-	-	0	-	16,776	113,851
F 22	ICU Emer Med	-	-	-	-	0	-	1,782	12,094
F 23	OB & Gyn Ward	243	1,908,918	-	-	0	-	14,700	99,762
F 24	Orthopaedic Ward		-	-	-	0	-	17,361	117,821
F 25	ENT Ward	-	-	243	4,574,920	0	-	2,325	15,779
F 26	Eye Ward	-	-	-	-	0	-	2,892	19,627
F 27	Chemo Ward	-	-	-	-	0	-	5,371	36,450
F 28	Short Stay Unit	-	-	-	-	0	-	1,141	7,743
F 29	Multi Ward	-	-	-	-	0	-	4,463	30,288
F 30	Preventive medicine	-	-	-	-	0	-		-
F 31	Medical education	-	-	-	-	0	-		-

Appendix 7 Cost allocation, cost center N28-N31

	Cost center	Medical statistics		Infectious control		Medical instruments		Duty stretcher	
		Number of OPD visit and	cost	Number of patient day	cost	Number of patient day	cost	Number of OPD visit and	cost
	Total	849,148		201,041		201,041		849,148	
N 1	Dean office	-	-	-	-	-	-	-	-
N 2	Accounting	-	-	-	-	-	-	-	-
N 3	Procurement	-	-	-	-	-	-	-	-
N 4	Human resource	-	-	-	-	-	-	-	-
N 5	Strategy	-	-	-	-	-	-	-	-
N 6	Academic support	-	-	-	-	-	-	-	-
N 7	Engineering	-	-	-	-	-	-	-	-
N 8	Research support	-	-	-	-	-	-	-	-
N 9	IT	-	-	-	-	-	-	-	-
N 10	Pediatrics	-	-	-	-	-	-	-	-
N 11	Ophthalmology	-	-	-	-	-	-	-	-
N 12	Psychiatry	-	-	-	-	-	-	-	-
N 13	Forensic Medicine	-	-	-	-	-	-	-	-
N 14	Anat Pathology	-	-	-	-	-	-	-	-
N 15	Clinical Pathology	-	-	-	-	-	-	-	-
N 16	Radiology	-	-	-	-	-	-	-	-
N 17	Medical Sciences	-	-	-	-	-	-	-	-
N 18	Anesthesiology	-	-	-	-	-	-	-	-
N 19	Emergency Med	-	-	-	-	-	-	-	-
N 20	Urban Medicine	-	-	-	-	-	-	-	-
N 21	Rehabilitation	-	-	-	-	-	-	-	-
N 22	Surgery	-	-	-	-	-	-	-	-
N 23	Orthopaedics	-	-	-	-	-	-	-	-
N 24	OB and GYN	-	-	-	-	-	-	-	-
N 25	ENT	-	-	-	-	-	-	-	-

	Cost center	Medical statistics		Infectious control		Medical instruments		Duty stretcher	
		Number of OPD visit and	cost	Number of patient day	cost	Number of patient day	cost	Number of OPD visit and	cost
N 26	Internal Medicine	-	-	-	-	-	-	-	-
N 27	Social welfare	-	-	-	-	-	-	-	-
N 28	Medical statistics	-	35,938,943	-	-	-	-	-	-
N 29	Infectious control	-	-	-	2,017,264	-	-	-	-
N 30	Medical instruments	-	-	-	-	-	35,545,132	-	-
N 31	Duty stretcher	-	-	-	-	-	-	-	25,443,750
N 32	Laundry	-	-	-	-	-	-	-	-
N 33	Nursing department	-	-	-	-	-	-	-	-
R 1	Operation	-	-	-	-	-	-	-	-
R 2	Anat Pathology	-	-	-	-	-	-	-	-
R 3	Central laboratory	-	-	-	-	-	-	-	-
R 4	Pharmacy	-	-	-	-	-	-	-	-
R 5	Radiology	-	-	-	-	-	-	-	-
R 6	Physical therapy	32,878	1,391,513	-	-	-	-	32,878	985,152
R 7	Nutrition dep.	-	-	-	-	-	-		-
F 1	OPD Surgery	58,584	2,479,482	-	-	-	-	58,584	1,755,403
F 2	OPD Urban Med	31,067	1,314,865	-	-	-	-	31,067	930,887
F 3	OPD Medicine	218,572	9,250,739	-	-	-	-	218,572	6,549,260
F 4	OPD Pedriatrics	22,104	935,519	-	-	-	-	22,104	662,321
F 5	OPD Orthopaedics	46,139	1,952,765	-	-	-	-	46,139	1,382,502
F 6	OPD ENT	27,333	1,156,829	-	-	-	-	27,333	819,002
F 7	OPD Eye	35,411	1,498,719	-	-	-	-	35,411	1,061,050
F 8	OPD OB & GYN	44,475	1,882,339	-	-	-	-	44,475	1,332,643
F 9	OPD Psychiatrics	12,292	520,241	-	-	-	-	12,292	368,316
F 10	OPD PM&R	13,866	586,858	-	-	-	-	13,866	415,479
F 11	OPD Radiotherapy	25,530	1,080,520	-	-	-	-	25,530	764,977

Appendix 7 Cost allocation, cost center N28-N31 (cont.)

	Cost center	Medical statistics		Infectious control		Medical instruments		Duty stretcher	
		Number of OPD visit and	cost	Number of patient day	cost	Number of patient day	cost	Number of OPD visit and	cost
F 12	OPD Nuclear med	2,983	126,251	-	-	-	-	2,983	89,382
F 13	OPD Forensic	3,514	148,725	-	-	-	-	3,514	105,293
F 14	Emergency Room	51,654	2,186,180	-	-	-	-	51,654	1,547,753
F 15	Dental Department	21,705	918,632	-	-	-	-	21,705	650,366
F 16	Medicine ICU	2,645	111,946	2,645	26,540	2,645	467,650	2,645	79,254
F 17	Medicine Ward	64,010	2,709,129	64,010	642,282	64,010	11,317,313	64,010	1,917,987
F 18	Surgery ICU	5,260	222,622	5,260	52,779	5,260	929,996	5,260	157,610
F 19	Surgery Ward	52,415	2,218,388	52,415	525,937	52,415	9,267,254	52,415	1,570,556
F 20	Pediatric ICU	9,900	419,003	9,900	99,338	9,900	1,750,373	9,900	296,642
F 21	Pediatric Ward	16,776	710,020	16,776	168,332	16,776	2,966,087	16,776	502,674
F 22	ICU Emer Med	1,782	75,421	1,782	17,881	1,782	315,067	1,782	53,396
F 23	OB & Gyn Ward	14,700	622,156	14,700	147,501	14,700	2,599,039	14,700	440,469
F 24	Orthopaedic Ward	17,361	734,779	17,361	174,202	17,361	3,069,518	17,361	520,203
F 25	ENT Ward	2,325	98,402	2,325	23,329	2,325	411,073	2,325	69,666
F 26	Eye Ward	2,892	122,400	2,892	29,019	2,892	511,321	2,892	86,655
F 27	Chemo Ward	5,371	227,320	5,371	53,893	5,371	949,622	5,371	160,936
F 28	Short Stay Unit	1,141	48,291	1,141	11,449	1,141	201,735	1,141	34,189
F 29	Multi Ward	4,463	188,890	4,463	44,782	4,463	789,082	4,463	133,729
F 30	Preventive medicine	-	-	-	-	-	-	-	-
F 31	Medical education	-	-	-	-	-	-	-	-

Appendix 8 Cost allocation, cost center N32-R2

	Cost center	Laundry		Nursing		Operation		Ana path lab	
		Number of patient day	cost	Number of OPD visit and	cost	Number of OR case	cost	Number of OR case	cost
	Total	201,041		816,270		15,996		15,996	
N 1	Dean office	-	-	-	-	-	-	-	-
N 2	Accounting	-	-	-	-	-	-	-	-
N 3	Procurement	-	-	-	-	-	-	-	-
N 4	Human resource	-	-	-	-	-	-	-	-
N 5	Strategy	-	-	-	-	-	-	-	-
N 6	Academic support	-	-	-	-	-	-	-	-
N 7	Engineering	-	-	-	-	-	-	-	-
N 8	Research support	-	-	-	-	-	-	-	-
N 9	IT	-	-	-	-	-	-	-	-
N 10	Pediatrics	-	-	-	-	-	-	-	-
N 11	Ophthalmology	-	-	-	-	-	-	-	-
N 12	Psychiatry	-	-	-	-	-	-	-	-
N 13	Forensic Medicine	-	-	-	-	-	-	-	-
N 14	Anat Pathology	-	-	-	-	-	-	-	-
N 15	Clinical Pathology	-	-	-	-	-	-	-	-
N 16	Radiology	-	-	-	-	-	-	-	-
N 17	Medical Sciences	-	-	-	-	-	-	-	-
N 18	Anesthesiology	-	-	-	-	-	-	-	-
N 19	Emergency Med	-	-	-	-	-	-	-	-
N 20	Urban Medicine	-	-	-	-	-	-	-	-
N 21	Rehabilitation	-	-	-	-	-	-	-	-
N 22	Surgery	-	-	-	-	-	-	-	-
N 23	Orthopaedics	-	-	-	-	-	-	-	-
N 24	OB and GYN	-	-	-	-	-	-	-	-
N 25	ENT	-	-	-	-	-	-	-	-

Appendix 8 Cost allocation, cost center N32-R2 (cont.)

	Cost center	Laundry		Nursing		Operation		Ana path lab	
		Number of patient day	cost	Number of OPD visit and	cost	Number of OR case	cost	Number of OR case	cost
N 26	Internal Medicine	-	-	-	-	-	-	-	-
N 27	Social welfare	-	-	-	-	-	-	-	-
N 28	Medical statistics	-	-	-	-	-	-	-	-
N 29	Infectious control	-	-	-	-	-	-	-	-
N 30	Medical instruments	-	-	-	-	-	-	-	-
N 31	Duty stretcher	-	-	-	-	-	-	-	-
N 32	Laundry	-	22,903,098	-	-	-	-	-	-
N 33	Nursing department	-	-	-	563,497,077	-	-	-	-
R 1	Operation	-	-	-	-	-	177,572,859	-	-
R 2	Anat Pathology	-	-	-	-	-	-	-	26,441,946
R 3	Central laboratory	-	-	-	-	-	-	-	-
R 4	Pharmacy	-	-	-	-	-	-	-	-
R 5	Radiology	-	-	-	-	-	-	-	-
R 6	Physical therapy	-	-	-	-	-	-	-	-
R 7	Nutrition dep.	-	-	-	-	-	-	-	-
F 1	OPD Surgery	-	-	58,584	40,442,394	-	-	-	-
F 2	OPD Urban Med	-	-	31,067	21,446,536	-	-	-	-
F 3	OPD Medicine	-	-	218,572	150,887,186	-	-	-	-
F 4	OPD Pedriatrics	-	-	22,104	15,259,092	-	-	-	-
F 5	OPD Orthopaedics	-	-	46,139	31,851,215	-	-	-	-
F 6	OPD ENT	-	-	27,333	18,868,837	-	-	-	-
F 7	OPD Eye	-	-	35,411	24,445,337	-	-	-	-
F 8	OPD OB & GYN	-	-	44,475	30,702,503	-	-	-	-
F 9	OPD Psychiatrics	-	-	12,292	8,485,558	-	-	-	-
F 10	OPD PM&R	-	-	13,866	9,572,140	-	-	-	-
F 11	OPD Radiotherapy	-	-	25,530	17,624,169	-	-	-	-

	Cost center	Laundry		Nursing		Operation		Ana path lab	
		Number of patient day	cost	Number of OPD visit and	cost	Number of OR case	cost	Number of OR case	cost
F 12	OPD Nuclear med	-	-	2,983	2,059,260	-	-	-	-
F 13	OPD Forensic	-	-	3,514	2,425,826	-	-	-	-
F 14	Emergency Room	-	-	51,654	35,658,395	-	-	-	-
F 15	Dental Department	-	-	21,705	14,983,650	-	-	-	-
F 16	Medicine ICU	2,645	301,325	2,645	1,825,927	-	-	-	-
F 17	Medicine Ward	64,010	7,292,181	64,010	44,188,134	-	-	-	-
F 18	Surgery ICU	5,260	599,232	5,260	3,631,145	-	-	-	-
F 19	Surgery Ward	52,415	5,971,249	52,415	36,183,737	6,945	77,096,993	6,945	11,480,327
F 20	Pediatric ICU	9,900	1,127,833	9,900	6,834,284	-	-	-	-
F 21	Pediatric Ward	16,776	1,911,164	16,776	11,581,005	-	-	-	-
F 22	ICU Emer Med	1,782	203,010	1,782	1,230,171	-	-	-	-
F 23	OB & Gyn Ward	14,700	1,674,661	14,700	10,147,876	2,359	26,187,445	2,359	3,899,509
F 24	Orthopaedic Ward	17,361	1,977,809	17,361	11,984,849	2,815	31,249,537	2,815	4,653,293
F 25	ENT Ward	2,325	264,870	2,325	1,605,021	525	5,828,066	525	867,843
F 26	Eye Ward	2,892	329,464	2,892	1,996,439	3,352	37,210,817	3,352	5,540,973
F 27	Chemo Ward	5,371	611,878	5,371	3,707,772	-	-	-	-
F 28	Short Stay Unit	1,141	129,986	1,141	787,668	-	-	-	-
F 29	Multi Ward	4,463	508,436	4,463	3,080,950	-	-	-	-
F 30	Preventive medicine	-	-	-	-	-	-	-	-
F 31	Medical education	-	-	-	-	-	-	-	-

Appendix 9 Cost allocation, cost center R3-R6

	Cost center	Central laboratory		Pharmacy		Radiology		Physical therapy	
		Number of OPD visit and	cost	Number of OPD visit and	cost	Number of OPD visit and	cost	Number of OPD visit and	cost
	Total	816,270		816,270		816,270		154,676	
N 1	Dean office	-	-	-	-	-	-	-	-
N 2	Accounting	-	-	-	-	-	-	-	-
N 3	Procurement	-	-	-	-	-	-	-	-
N 4	Human resource	-	-	-	-	-	-	-	-
N 5	Strategy	-	-	-	-	-	-	-	-
N 6	Academic support	-	-	-	-	-	-	-	-
N 7	Engineering	-	-	-	-	-	-	-	-
N 8	Research support	-	-	-	-	-	-	-	-
N 9	IT	-	-	-	-	-	-	-	-
N 10	Pediatrics	-	-	-	-	-	-	-	-
N 11	Ophthalmology	-	-	-	-	-	-	-	-
N 12	Psychiatry	-	-	-	-	-	-	-	-
N 13	Forensic Medicine	-	-	-	-	-	-	-	-
N 14	Anat Pathology	-	-	-	-	-	-	-	-
N 15	Clinical Pathology	-	-	-	-	-	-	-	-
N 16	Radiology	-	-	-	-	-	-	-	-
N 17	Medical Sciences	-	-	-	-	-	-	-	-
N 18	Anesthesiology	-	-	-	-	-	-	-	-
N 19	Emergency Med	-	-	-	-	-	-	-	-
N 20	Urban Medicine	-	-	-	-	-	-	-	-
N 21	Rehabilitation	-	-	-	-	-	-	-	-
N 22	Surgery	-	-	-	-	-	-	-	-
N 23	Orthopaedics	-	-	-	-	-	-	-	-
N 24	OB and GYN	-	-	-	-	-	-	-	-
N 25	ENT	-	-	-	-	-	-	-	-

	Cost center	Central laboratory		Pharmacy		Radiology		Physical therapy	
		Number of OPD visit and	cost	Number of OPD visit and	cost	Number of OPD visit and	cost	Number of OPD visit and	cost
N 26	Internal Medicine	-	-	-	-	-	-	-	-
N 27	Social welfare	-	-	-	-	-	-	-	-
N 28	Medical statistics	-	-	-	-	-	-	-	-
N 29	Infectious control	-	-	-	-	-	-	-	-
N 30	Medical instruments	-	-	-	-	-	-	-	-
N 31	Duty stretcher	-	-	-	-	-	-	-	-
N 32	Laundry	-	-	-	-	-	-	-	-
N 33	Nursing department	-	-	-	-	-	-	-	-
R 1	Operation	-	-	-	-	-	-	-	-
R 2	Anat Pathology	-	-	-	-	-	-	-	-
R 3	Central laboratory	-	143,203,530	-	-	-	-	-	-
R 4	Pharmacy	-	-	-	94,164,925	-	-	-	-
R 5	Radiology	-	-	-	-	-	121,033,395	-	-
R 6	Physical therapy	-	-	-	-	-	-	-	24,816,946
R 7	Nutrition dep.	-	-		-		-	-	-
F 1	OPD Surgery	58,584	10,277,770	58,584	6,758,251	58,584	8,686,612	-	-
F 2	OPD Urban Med	31,067	5,450,285	31,067	3,583,890	31,067	4,606,496	-	-
F 3	OPD Medicine	218,572	38,345,501	218,572	25,214,471	218,572	32,409,021	-	-
F 4	OPD Pedriatrics	22,104	3,877,848	22,104	2,549,918	22,104	3,277,497	-	-
F 5	OPD Orthopaedics	46,139	8,094,463	46,139	5,322,596	46,139	6,841,315	46,139	7,402,759
F 6	OPD ENT	27,333	4,795,205	27,333	3,153,135	27,333	4,052,833	-	-
F 7	OPD Eye	35,411	6,212,381	35,411	4,085,014	35,411	5,250,608	-	-
F 8	OPD OB & GYN	44,475	7,802,537	44,475	5,130,637	44,475	6,594,583	-	-
F 9	OPD Psychiatrics	12,292	2,156,465	12,292	1,418,005	12,292	1,822,611	-	-
F 10	OPD PM&R	13,866	2,432,602	13,866	1,599,582	13,866	2,055,997	13,866	2,224,726
F 11	OPD Radiotherapy	25,530	4,478,893	25,530	2,945,141	25,530	3,785,491	-	-

Appendix 9 Cost allocation, cost center R3-R6 (cont.)

	Cost center	Central laboratory		Pharmacy		Radiology		Physical therapy	
		Number of OPD visit and	cost	Number of OPD visit and	cost	Number of OPD visit and	cost	Number of OPD visit and	cost
F 12	OPD Nuclear med	2,983	523,327	2,983	344,119	2,983	442,308	-	-
F 13	OPD Forensic	3,514	616,484	3,514	405,375	3,514	521,042	-	-
F 14	Emergency Room	51,654	9,061,996	51,654	5,958,807	51,654	7,659,058	-	-
F 15	Dental Department	21,705	3,807,849	21,705	2,503,889	21,705	3,218,334	-	-
F 16	Medicine ICU	2,645	464,029	2,645	305,127	2,645	392,190	-	-
F 17	Medicine Ward	64,010	11,229,689	64,010	7,384,195	64,010	9,491,158	64,010	10,270,066
F 18	Surgery ICU	5,260	922,796	5,260	606,794	5,260	779,933	-	-
F 19	Surgery Ward	52,415	9,195,503	52,415	6,046,596	52,415	7,771,896	-	-
F 20	Pediatric ICU	9,900	1,736,821	9,900	1,142,064	9,900	1,467,934	-	-
F 21	Pediatric Ward	16,776	2,943,122	16,776	1,935,280	16,776	2,487,481	-	-
F 22	ICU Emer Med	1,782	312,628	1,782	205,572	1,782	264,228	-	-
F 23	OB & Gyn Ward	14,700	2,578,916	14,700	1,695,792	14,700	2,179,660	-	-
F 24	Orthopaedic Ward	17,361	3,045,753	17,361	2,002,765	17,361	2,574,223	17,361	2,785,481
F 25	ENT Ward	2,325	407,890	2,325	268,212	2,325	344,742	2,325	373,034
F 26	Eye Ward	2,892	507,362	2,892	333,621	2,892	428,815	-	-
F 27	Chemo Ward	5,371	942,269	5,371	619,599	5,371	796,391	5,371	861,749
F 28	Short Stay Unit	1,141	200,173	1,141	131,626	1,141	169,183	1,141	183,067
F 29	Multi Ward	4,463	782,973	4,463	514,852	4,463	661,757	4,463	716,065
F 30	Preventive medicine	-	-		-		-		-
F 31	Medical education	-	-		-		-		-

Appendix 10 Cost allocation, cost center R7 and Total costs

	Cost center	Nutrition department		Total cost
		Number of patient day	cost	
	Total	201,041		
N 1	Dean office	-	-	-
N 2	Accounting	-	-	-
N 3	Procurement	-	-	-
N 4	Human resource	-	-	-
N 5	Strategy	-	-	-
N 6	Academic support	-	-	-
N 7	Engineering	-	-	-
N 8	Research support	-	-	-
N 9	IT	-	-	-
N 10	Pediatrics	-	-	-
N 11	Ophthalmology	-	-	-
N 12	Psychiatry	-	-	-
N 13	Forensic Medicine	-	-	-
N 14	Anat Pathology	-	-	-
N 15	Clinical Pathology	-	-	-
N 16	Radiology	-	-	-
N 17	Medical Sciences	-	-	-
N 18	Anesthesiology	-	-	-
N 19	Emergency Med	-	-	-
N 20	Urban Medicine	-	-	-
N 21	Rehabilitation	-	-	-
N 22	Surgery	-	-	-
N 23	Orthopaedics	-	-	-
N 24	OB and GYN	-	-	-
N 25	ENT	-	-	-

Appendix 10 Cost allocation, cost center R7 and Total costs (cont.)

	Cost center	Nutrition department		Total cost
		Number of patient day	cost	
N 26	Internal Medicine	-	-	-
N 27	Social welfare	-	-	-
N 28	Medical statistics	-	-	-
N 29	Infectious control	-	-	-
N 30	Medical instruments	-	-	-
N 31	Duty stretcher	-	-	-
N 32	Laundry	-	-	-
N 33	Nursing department	-	-	-
R 1	Operation	-	-	-
R 2	Anat Pathology	-	-	-
R 3	Central laboratory	-	-	-
R 4	Pharmacy	-	-	-
R 5	Radiology	-	-	-
R 6	Physical therapy	-	-	-
R 7	Nutrition dep.	-	25,613,127	-
F 1	OPD Surgery	-	-	93,361,123
F 2	OPD Urban Med	-	-	44,033,581
F 3	OPD Medicine	-	-	334,886,421
F 4	OPD Pedriatrics	-	-	41,007,090
F 5	OPD Orthopaedics	-	-	73,521,468
F 6	OPD ENT	-	-	50,123,101
F 7	OPD Eye	-	-	51,436,140
F 8	OPD OB & GYN	-	-	72,776,538
F 9	OPD Psychiatrics	-	-	20,788,782
F 10	OPD PM&R	-	-	21,292,170
F 11	OPD Radiotherapy	-	-	39,082,149

Appendix 10 Cost allocation, cost center R7 and Total costs (cont.)

		Cost center	Nutrition department		Total cost
			Number of patient day	cost	
F	12	OPD Nuclear med	-	-	6,528,011
F	13	OPD Forensic	-	-	18,138,340
F	14	Emergency Room	-	-	131,852,608
F	15	Dental Department	-	-	53,675,877
F	16	Medicine ICU	2,645	336,980	23,683,159
F	17	Medicine Ward	64,010	8,155,034	273,733,560
F	18	Surgery ICU	5,260	670,137	33,364,865
F	19	Surgery Ward	52,415	6,677,802	301,158,003
F	20	Pediatric ICU	9,900	1,261,285	33,605,146
F	21	Pediatric Ward	16,776	2,137,304	55,667,554
F	22	ICU Emer Med	1,782	227,031	11,110,258
F	23	OB & Gyn Ward	14,700	1,872,817	112,122,049
F	24	Orthopaedic Ward	17,361	2,211,835	113,839,556
F	25	ENT Ward	2,325	296,211	24,672,233
F	26	Eye Ward	2,892	368,448	58,610,745
F	27	Chemo Ward	5,371	684,279	16,531,351
F	28	Short Stay Unit	1,141	145,366	5,524,193
F	29	Multi Ward	4,463	568,597	12,166,411
F	30	Preventive medicine	-	-	7,651,764
F	31	Medical education	-	-	93,206,719

Appendix 11 Total cost of final cost centers

	Direct cost	Indirect cost	Total cost
OPD Surgery	2,423,781	90,937,342	93,361,123
OPD Urban Med	1,114,052	42,919,529	44,033,581
OPD Medicine	26,440,649	308,445,772	334,886,421
OPD Pedriatrics	1,761,382	39,245,708	41,007,090
OPD Orthopaedics	2,273,086	71,248,382	73,521,468
OPD ENT	633,225	49,489,875	50,123,101
OPD Eye	2,338,368	49,097,771	51,436,140
OPD OB & GYN	4,311,914	68,464,624	72,776,538
OPD Psychiatrics	820,274	19,968,508	20,788,782
OPD PM&R	971,309	20,320,861	21,292,170
OPD Radiotherapy	2,259,291	36,822,858	39,082,149
OPD Nuclear med	981,856	5,546,155	6,528,011
OPD Forensic	10,432,352	17,156,484	18,138,340
Emergency Room	36,643,773	121,420,255	131,852,608
Dental Department	19,709,185	17,032,104	53,675,877
Medicine ICU	4,872,657	3,973,974	23,683,159
Medicine Ward	79,649,679	268,860,903	273,733,560
Surgery ICU	6,912,667	(46,284,814)	33,364,865
Surgery Ward	52,448,218	294,245,337	301,158,003
Pediatric ICU	3,142,438	(18,843,072)	33,605,146
Pediatric Ward	6,883,496	52,525,116	55,667,554
ICU Emer Med	1,992,101	4,226,761	11,110,258
OB & Gyn Ward	19,513,649	110,129,949	112,122,049
Orthopaedic Ward	25,081,764	94,325,906	113,839,556
ENT Ward	7,409,784	(409,532)	24,672,233
Eye Ward	7,886,132	51,200,961	58,610,745
Chemo Ward	863,590	8,645,219	16,531,351

Appendix 12 Full cost

	Cost center	Labor cost	Material cost	Capital cost	Full cost
N 1	Dean office	122,930,208	64,891,377	31,201,972	219,023,557
N 2	Accounting	15,539,520	2,203,110	505,778	18,248,407
N 3	Procurement	4,515,360	30,726,648	253,844	35,495,852
N 4	Human resource	4,526,760	128,799,899	139,530	133,466,189
N 5	Strategy	3,427,788	287,129	162,434	3,877,350
N 6	Academic support	2,850,120	4,206,658	3,642,637	10,699,415
N 7	Engineering	12,090,300	139,983,615	1,142,956	153,216,871
N 8	Research support	947,160	911,515	235,346	2,094,021
N 9	IT	2,048,640	16,505,875	1,302,019	19,856,534
N 10	Pediatrics	15,245,460	195,246	1,500,469	16,941,175
N 11	Ophthalmology	7,254,780	122,720	725,032	8,102,533
N 12	Psychiatry	5,748,720	65,436	5,174	5,819,330
N 13	Forensic Medicine	3,803,940	14,529	179,789	3,998,258
N 14	Anat Pathology	3,723,000	145,400	102,215	3,970,615
N 15	Clinical Pathology	8,706,744	609,877	5,463,176	14,779,797
N 16	Radiology	13,190,940	57,376	661,694	13,910,011
N 17	Medical Sciences	8,573,808	-	2,451	8,576,259
N 18	Anesthesiology	5,801,640	48,388	1,147,208	6,997,236
N 19	Emergency Med	8,528,760	90,056	1,342,786	9,961,602
N 20	Urban Medicine	5,320,200	82,606	19,707	5,422,513
N 21	Rehabilitation	2,170,800	68,696	5,397	2,244,892
N 22	Surgery	30,756,120	271,665	1,412,853	32,440,638
N 23	Orthopaedics	11,493,660	167,893	420,548	12,082,101
N 24	OB and GYN	13,465,320	255,889	133,656	13,854,865
N 25	ENT	7,991,040	47,990	296,252	8,335,282
N 26	Internal Medicine	31,804,860	264,025	1,052,244	33,121,129
N 27	Social welfare	3,195,000	270	857,960	4,053,230
N 28	Medical statistics	19,471,464	4,755,040	989,846	25,216,350
N 29	Infectious control	522,000	208,946	24,356	755,301
N 30	Medical instruments	4,884,005	23,124,846	413,503	28,422,354
N 31	Duty stretcher	8,870,400	185,811	19,540	9,075,750
N 32	Laundry	4,983,192	8,097,599	20,815	13,101,606
N 33	Nursing department	545,683,256	3,411,699	5,036,153	554,131,108
R 1	Operation	88,848,819	2,489,253	20,082,723	111,420,795
R 2	Anat Pathology	7,858,360	2,141,613	2,366,506	12,366,479
R 3	Central laboratory	40,594,600	68,874,360	1,176,587	110,645,547
R 4	Pharmacy	46,073,052	5,713,867	17,846,412	69,633,332
R 5	Radiology	22,806,104	55,194,053	17,358,379	95,358,536
R 6	Physical therapy	9,678,908	700,581	2,373,578	12,753,067
R 7	Nutrition dep.	9,373,540	6,205,837	341,393	15,920,770

Appendix 12 Full cost (cont.)

	Cost center	Labor cost	Material cost	Capital cost	Full cost
F 1	OPD Surgery	1,961,400	171,103	291,278	2,423,781
F 2	OPD Urban Med	369,600	553,696	190,756	1,114,052
F 3	OPD Medicine	9,273,240	8,629,897	8,537,512	26,440,649
F 4	OPD Pedriatrics	1,613,600	38,247	109,536	1,761,382
F 5	OPD Orthopaedics	1,392,000	80,110	800,976	2,273,086
F 6	OPD ENT	393,600	50,207	189,418	633,225
F 7	OPD Eye	1,591,600	534,800	211,968	2,338,368
F 8	OPD OB & GYN	3,733,200	97,543	481,171	4,311,914
F 9	OPD Psychiatrics	514,440	299,921	5,913	820,274
F 10	OPD PM&R	860,800	68,486	42,024	971,309
F 11	OPD Radiotherapy	1,815,600	66,761	376,930	2,259,291
F 12	OPD Nuclear med	918,400	38,242	25,214	981,856
F 13	OPD Forensic	9,508,800	793,605	129,947	10,432,352
F 14	Emergency Room	30,157,800	1,478,697	5,007,276	36,643,773
F 15	Dental Department	12,976,392	6,213,595	519,198	19,709,185
F 16	Medicine ICU	1,136,400	-	3,736,257	4,872,657
F 17	Medicine Ward	61,183,900	2,000,208	16,465,571	79,649,679
F 18	Surgery ICU	1,663,200	-	5,249,467	6,912,667
F 19	Surgery Ward	5,649,600	34,125,847	12,672,771	52,448,218
F 20	Pediatric ICU	924,000	-	2,218,438	3,142,438
F 21	Pediatric Ward	2,561,600	1,465,887	2,856,009	6,883,496
F 22	ICU Emer Med	809,100	75,332	1,107,669	1,992,101
F 23	OB & Gyn Ward	10,461,600	2,608,781	6,443,268	19,513,649
F 24	Orthopaedic Ward	14,085,600	2,077,607	8,918,558	25,081,764
F 25	ENT Ward	4,313,500	746,184	2,350,100	7,409,784
F 26	Eye Ward	3,186,300	40,487	4,659,345	7,886,132
F 27	Chemo Ward	184,800	97,705	581,085	863,590
F 28	Short Stay Unit	924,000	33,898	529,356	1,487,254
F 29	Multi Ward	1,180,000	121,561	857,986	2,159,547
F 30	Preventive medicine	4,358,189	662,170	117,095	5,137,454
F 31	Medical education	3,984,840	1,669,844	6,610,903	12,265,587
	Total	1,358,985,449	636,967,811	214,257,915	2,210,211,175
	Ratio	61%	29%	10%	100%

Appendix 13 Full labor cost

	Cost center	Salary	OT	Part time	Full labor cost
N 1	Dean office	32,948,568	*****bonus	89,981,640	122,930,208
N 2	Accounting	14,724,480	815,040	-	15,539,520
N 3	Procurement	4,515,360	-	-	4,515,360
N 4	Human resource	4,526,760	-	-	4,526,760
N 5	Strategy	3,427,788	-	-	3,427,788
N 6	Academic support	2,850,120	-	-	2,850,120
N 7	Engineering	12,090,300	-	-	12,090,300
N 8	Research support	947,160	-	-	947,160
N 9	IT	2,048,640	-	-	2,048,640
N 10	Pediatrics	15,245,460	-	-	15,245,460
N 11	Ophthalmology	7,254,780	-	-	7,254,780
N 12	Psychiatry	5,748,720	-	-	5,748,720
N 13	Forensic Medicine	3,803,940	-	-	3,803,940
N 14	Anat Pathology	3,723,000	-	-	3,723,000
N 15	Clinical Pathology	8,706,744	-	-	8,706,744
N 16	Radiology	13,190,940	-	-	13,190,940
N 17	Medical Sciences	8,573,808	-	-	8,573,808
N 18	Anesthesiology	5,801,640	-	-	5,801,640
N 19	Emergency Med	8,528,760	-	-	8,528,760
N 20	Urban Medicine	5,320,200	-	-	5,320,200
N 21	Rehabilitation	2,170,800	-	-	2,170,800
N 22	Surgery	30,756,120	-	-	30,756,120
N 23	Orthopaedics	11,493,660	-	-	11,493,660
N 24	OB and GYN	13,465,320	-	-	13,465,320
N 25	ENT	7,991,040	-	-	7,991,040
N 26	Internal Medicine	31,804,860	-	-	31,804,860
N 27	Social welfare	1,671,600	1,523,400	-	3,195,000
N 28	Medical statistics	9,391,464	5,868,000	4,212,000	19,471,464
N 29	Infectious control	397,200	-	124,800	522,000
N 30	Medical instruments	4,646,005	238,000	-	4,884,005
N 31	Duty stretcher	8,870,400	-	-	8,870,400
N 32	Laundry	4,983,192	-	-	4,983,192
N 33	Nursing department	385,824,756	159,494,500	364,000	545,683,256
R 1	Operation	9,257,619	76,159,200	3,432,000	88,848,819
R 2	Anat Pathology	6,042,960	1,139,400	676,000	7,858,360
R 3	Central laboratory	24,033,000	15,851,800	709,800	40,594,600
R 4	Pharmacy	27,390,252	11,038,800	7,644,000	46,073,052
R 5	Radiology	10,669,704	9,791,200	2,345,200	22,806,104
R 6	Physical therapy	9,678,908	-	-	9,678,908
R 7	Nutrition dep.	9,135,540	238,000	-	9,373,540
F 1	OPD Surgery	924,000	-	1,037,400	1,961,400
F 2	OPD Urban Med	369,600	-	-	369,600
F 3	OPD Medicine	3,908,400	-	5,364,840	9,273,240
F 4	OPD Pedriatrics	1,478,400	-	135,200	1,613,600

Appendix 13 Full labor cost (cont.)

	Cost center	Salary	OT	Part time	Full labor cost
F 5	OPD Orthopaedics	924,000	-	468,000	1,392,000
F 6	OPD ENT	393,600	-	-	393,600
F 7	OPD Eye	369,600	-	1,222,000	1,591,600
F 8	OPD OB & GYN	2,032,800	-	1,700,400	3,733,200
F 9	OPD Psychiatrics	514,440	-	-	514,440
F 10	OPD PM&R	184,800	-	676,000	860,800
F 11	OPD Radiotherapy	1,690,800	-	124,800	1,815,600
F 12	OPD Nuclear med	554,400	-	364,000	918,400
F 13	OPD Forensic	-	9,508,800	-	9,508,800
F 14	Emergency Room	12,805,080	12,984,720	4,368,000	30,157,800
F 15	Dental Department	12,430,392	-	546,000	12,976,392
F 16	Medicine ICU	1,136,400	-	-	1,136,400
F 17	Medicine Ward	4,942,800	53,121,100	3,120,000	61,183,900
F 18	Surgery ICU	1,663,200	-	-	1,663,200
F 19	Surgery Ward	3,621,600	-	2,028,000	5,649,600
F 20	Pediatric ICU	924,000	-	-	924,000
F 21	Pediatric Ward	2,457,600	-	104,000	2,561,600
F 22	ICU Emer Med	554,400	254,700	-	809,100
F 23	OB & Gyn Ward	3,196,800	7,264,800	-	10,461,600
F 24	Orthopaedic Ward	1,690,800	11,146,800	1,248,000	14,085,600
F 25	ENT Ward	951,600	3,361,900	-	4,313,500
F 26	Eye Ward	554,400	2,631,900	-	3,186,300
F 27	Chemo Ward	184,800	-	-	184,800
F 28	Short Stay Unit	924,000	-	-	924,000
F 29	Multi Ward	369,600	290,400	520,000	1,180,000
F 30	Preventive medicine	4,358,189	-	-	4,358,189
F 31	Medical education	3,984,840	-	-	3,984,840
	Total	843,746,909	382,722,460	132,516,080	1,358,985,449
	Ratio	62%	28%	10%	100%

Appendix 14 Full material cost

	Cost center	Purchased material	Stock material	Full material cost
N 1	Dean office	63,833,390	1,057,987	64,891,377
N 2	Accounting	1,923,699	279,411	2,203,110
N 3	Procurement	30,369,786	356,863	30,726,648
N 4	Human resource	128,795,470	4,429	128,799,899
N 5	Strategy	164,907	122,221	287,129
N 6	Academic support	4,142,827	63,831	4,206,658
N 7	Engineering	139,742,623	240,992	139,983,615
N 8	Research support	773,946	137,569	911,515
N 9	IT	16,433,628	72,246	16,505,875
N 10	Pediatrics	-	195,246	195,246
N 11	Ophthalmology	-	122,720	122,720
N 12	Psychiatry	-	65,436	65,436
N 13	Forensic Medicine	-	14,529	14,529
N 14	Anat Pathology	-	145,400	145,400
N 15	Clinical Pathology	-	609,877	609,877
N 16	Radiology	-	57,376	57,376
N 17	Medical Sciences	-	-	-
N 18	Anesthesiology	-	48,388	48,388
N 19	Emergency Med	-	90,056	90,056
N 20	Urban Medicine	-	82,606	82,606
N 21	Rehabilitation	-	68,696	68,696
N 22	Surgery	-	271,665	271,665
N 23	Orthopaedics	-	167,893	167,893
N 24	OB and GYN	-	255,889	255,889
N 25	ENT	-	47,990	47,990
N 26	Internal Medicine	-	264,025	264,025
N 27	Social welfare	-	270	270
N 28	Medical statistics	4,009,400	745,640	4,755,040
N 29	Infectious control	158,695	50,251	208,946
N 30	Medical instruments	22,429,615	695,231	23,124,846
N 31	Duty stretcher	185,811	-	185,811
N 32	Laundry	7,930,793	166,806	8,097,599
N 33	Nursing department	3,009,607	402,092	3,411,699
R 1	Operation	2,220,635	268,617	2,489,253
R 2	Anat Pathology	2,139,583	2,030	2,141,613
R 3	Central laboratory	68,467,188	407,172	68,874,360
R 4	Pharmacy	2,278,969	3,434,898	5,713,867
R 5	Radiology	54,791,096	402,957	55,194,053
R 6	Physical therapy	427,782	272,799	700,581
R 7	Nutrition dep.	5,641,779	564,058	6,205,837
F 1	OPD Surgery	-	171,103	171,103
F 2	OPD Urban Med	484,741	68,955	553,696
F 3	OPD Medicine	7,779,884	850,012	8,629,897
F 4	OPD Pedriatrics	-	38,247	38,247

Appendix 14 Full material cost (cont.)

	Cost center	Purchased material	Stock material	Full material cost
F 5	OPD Orthopaedics	-	80,110	80,110
F 6	OPD ENT	-	50,207	50,207
F 7	OPD Eye	529,786	5,014	534,800
F 8	OPD OB & GYN	-	97,543	97,543
F 9	OPD Psychiatrics	299,921	-	299,921
F 10	OPD PM&R	-	68,486	68,486
F 11	OPD Radiotherapy	-	66,761	66,761
F 12	OPD Nuclear med	-	38,242	38,242
F 13	OPD Forensic	750,091	43,514	793,605
F 14	Emergency Room	930,289	548,408	1,478,697
F 15	Dental Department	6,133,878	79,716	6,213,595
F 16	Medicine ICU	-	-	-
F 17	Medicine Ward	-	2,000,208	2,000,208
F 18	Surgery ICU	-	-	-
F 19	Surgery Ward	32,508,996	1,616,851	34,125,847
F 20	Pediatric ICU	-	-	-
F 21	Pediatric Ward	885,624	580,263	1,465,887
F 22	ICU Emer Med	-	75,332	75,332
F 23	OB & Gyn Ward	1,910,097	698,685	2,608,781
F 24	Orthopaedic Ward	1,679,687	397,920	2,077,607
F 25	ENT Ward	695,270	50,914	746,184
F 26	Eye Ward	-	40,487	40,487
F 27	Chemo Ward	-	97,705	97,705
F 28	Short Stay Unit	-	33,898	33,898
F 29	Multi Ward	-	121,561	121,561
F 30	Preventive medicine	565,616	96,554	662,170
F 31	Medical education	1,226,005	443,839	1,669,844
	Total	616,251,115	20,716,696	636,967,811
	Ratio	97%	3%	100%

Appendix 15 Full equipment cost

			Annual equipment cost		
		Cost center	Lifetime five years	Lifetime seven years	Full annual equipment cost
N	1	Dean office	8,794,444	327,468	9,121,912
N	2	Accounting and Finance	211,127	-	211,127
N	3	Procurement	229,321	-	229,321
N	4	Human resource	95,934	-	95,934
N	5	Strategy	-	-	-
N	6	Academic support	3,630,377	1,755	3,632,131
N	7	Engineering	688,141	-	688,141
N	8	Research support	68,077	-	68,077
N	9	Information technology	246,199	-	246,199
N	10	Pediatrics	300,399	53,133	353,532
N	11	Ophthalmology	63,069	589,804	652,873
N	12	Psychiatry	-	-	-
N	13	Forensic Medicine	6,526	-	6,526
N	14	Anatomical Pathology	96,612	-	96,612
N	15	Clinical Pathology	3,372,822	2,068,408	5,441,230
N	16	Radiology	-	-	-
N	17	Medical Sciences	-	-	-
N	18	Anesthesiology	470,412	640,150	1,110,562
N	19	Emergency Medicine	-	-	-
N	20	Urban Medicine	9,184	-	9,184
N	21	Rehabilitation Medicine	4,463	-	4,463
N	22	Surgery	271,593	-	271,593
N	23	Orthopaedics	23,531	-	23,531
N	24	OB and GYN	132,327	-	132,327
N	25	ENT	-	278,212	278,212
N	26	Internal Medicine	815,729	-	815,729
N	27	Social welfare	-	847,437	847,437
N	28	Medical statistics	879,101	-	879,101
N	29	Infectious control	11,551	-	11,551
N	30	Medical instruments	282,180	-	282,180
N	31	Duty stretcher	5,001	3,709	8,711
N	32	Laundry	5,290	-	5,290
N	33	Nursing department	403,662	1,093,930	1,497,593
R	1	Operation	4,482,621	10,179,989	14,662,610
R	2	Anatomical pathology	1,558,626	600,213	2,158,838
R	3	Central laboratory	90,907	897,156	988,064
R	4	Pharmacy	762,432	15,748,414	16,510,845
R	5	Radiology	2,083,743	13,844,902	15,928,645
R	6	Physical therapy	2,366	2,335,492	2,337,858
R	7	Nutrition department	167,615	162,487	330,102
F	1	OPD Surgery	58,764	-	58,764
F	2	OPD Urban Medicine	-	1,338	1,338

Appendix 15 Full equipment cost (cont.)

			Annual equipment cost		
		Cost center	**Lifetime five years**	**Lifetime seven years**	**Full annual equipment cost**
F	3	OPD Medicine	29,629	2,355,250	2,384,879
F	4	OPD Pedriatrics	66,286	5,667	71,953
F	5	OPD Orthopaedics	-	-	-
F	6	OPD ENT	-	-	-
F	7	OPD Eye	-	-	-
F	8	OPD Obstetric & GYN	-	-	-
F	9	OPD Psychiatrics	-	-	-
F	10	OPD PM&R	-	-	-
F	11	OPD Radiotherapy	-	-	-
F	12	OPD Nuclear medicine	-	-	-
F	13	OPD Forensic medicine	-	-	-
F	14	Emergency Room	821,018	3,189,997	4,011,015
F	15	Dental Department	154,305	283,714	438,019
F	16	Medicine ICU	17,490	1,921,166	1,938,656
F	17	Medicine Ward	155,845	118,682	274,527
F	18	Surgery ICU	26,549	2,936,907	2,963,456
F	19	Surgery Ward	766,086	50,100	816,186
F	20	Pediatric ICU	12,135	1,108,973	1,121,107
F	21	Pediatric Ward	157,910	53,772	211,682
F	22	ICU Emergency Medicine	-	10,338	10,338
F	23	OB & Gyn Ward	544,231	5,184,703	5,728,934
F	24	Orthopaedic Ward	13,363	5,941,049	5,954,412
F	25	ENT Ward	513,572	1,395,399	1,908,971
F	26	Ophthalmology Ward	2,403,258	1,638,505	4,041,763
F	27	Chemotherapy Ward	43,929	7,800	51,729
F	28	Short Stay Unit	-	-	-
F	29	Multidisciplinary Ward	65,804	12,500	78,304
F	30	Preventive medicine	56,180	42,250	98,430
F	31	Medical education center	431,081	-	431,081

Appendix 16 Full capital cost

	Cost center	Annual cost		Full capital cost
		Equipment	Building	
N 1	Dean office	9,121,912	22,080,059	31,201,972
N 2	Accounting	211,127	294,651	505,778
N 3	Procurement	229,321	24,523	253,844
N 4	Human resource	95,934	43,596	139,530
N 5	Strategy	-	162,434	162,434
N 6	Academic support	3,632,131	10,506	3,642,637
N 7	Engineering	688,141	454,815	1,142,956
N 8	Research support	68,077	167,269	235,346
N 9	IT	246,199	1,055,820	1,302,019
N 10	Pediatrics	353,532	1,146,937	1,500,469
N 11	Ophthalmology	652,873	72,159	725,032
N 12	Psychiatry	-	5,174	5,174
N 13	Forensic Medicine	6,526	173,263	179,789
N 14	Anat Pathology	96,612	5,603	102,215
N 15	Clinical Pathology	5,441,230	21,946	5,463,176
N 16	Radiology	-	661,694	661,694
N 17	Medical Sciences	-	2,451	2,451
N 18	Anesthesiology	1,110,562	36,646	1,147,208
N 19	Emergency Med	-	1,342,786	1,342,786
N 20	Urban Medicine	9,184	10,523	19,707
N 21	Rehabilitation	4,463	934	5,397
N 22	Surgery	271,593	1,141,260	1,412,853
N 23	Orthopaedics	23,531	397,017	420,548
N 24	OB and GYN	132,327	1,329	133,656
N 25	ENT	278,212	18,040	296,252
N 26	Internal Medicine	815,729	236,515	1,052,244
N 27	Social welfare	847,437	10,523	857,960
N 28	Medical statistics	879,101	110,745	989,846
N 29	Infectious control	11,551	12,805	24,356
N 30	Medical instruments	282,180	131,324	413,503
N 31	Duty stretcher	8,711	10,829	19,540
N 32	Laundry	5,290	15,525	20,815
N 33	Nursing department	1,497,593	3,538,560	5,036,153

Appendix 16 Full capital cost (cont.)

Cost center			Annual cost		Full capital cost
			Equipment	Building	
R	1	Operation	14,662,610	5,420,113	20,082,723
R	2	Anat Pathology	2,158,838	207,668	2,366,506
R	3	Central laboratory	988,064	188,523	1,176,587
R	4	Pharmacy	16,510,845	1,335,567	17,846,412
R	5	Radiology	15,928,645	1,429,734	17,358,379
R	6	Physical therapy	2,337,858	35,720	2,373,578
R	7	Nutrition dep.	330,102	11,291	341,393
F	1	OPD Surgery	58,764	232,514	291,278
F	2	OPD Urban Med	1,338	189,418	190,756
F	3	OPD Medicine	2,384,879	6,152,633	8,537,512
F	4	OPD Pedriatrics	71,953	37,583	109,536
F	5	OPD Orthopaedics	-	800,976	800,976
F	6	OPD ENT	-	189,418	189,418
F	7	OPD Eye	-	211,968	211,968
F	8	OPD OB & GYN	-	481,171	481,171
F	9	OPD Psychiatrics	-	5,913	5,913
F	10	OPD PM&R	-	42,024	42,024
F	11	OPD Radiotherapy	-	376,930	376,930
F	12	OPD Nuclear med	-	25,214	25,214
F	13	OPD Forensic	-	129,947	129,947
F	14	Emergency Room	4,011,015	996,261	5,007,276
F	15	Dental Department	438,019	81,179	519,198
F	16	Medicine ICU	1,938,656	1,797,601	3,736,257
F	17	Medicine Ward	274,527	16,191,044	16,465,571
F	18	Surgery ICU	2,963,456	2,286,010	5,249,467
F	19	Surgery Ward	816,186	11,856,585	12,672,771
F	20	Pediatric ICU	1,121,107	1,097,331	2,218,438
F	21	Pediatric Ward	211,682	2,644,327	2,856,009
F	22	ICU Emer Med	10,338	1,097,331	1,107,669
F	23	OB & Gyn Ward	5,728,934	714,334	6,443,268
F	24	Orthopaedic Ward	5,954,412	2,964,146	8,918,558
F	25	ENT Ward	1,908,971	441,130	2,350,100
F	26	Eye Ward	4,041,763	617,582	4,659,345
F	27	Chemo Ward	51,729	529,356	581,085
F	28	Short Stay Unit	-	529,356	529,356
F	29	Multi Ward	78,304	779,682	857,986
F	30	Preventive medicine	98,430	18,666	117,095
F	31	Medical education	431,081	6,179,823	6,610,903
		Total	112,533,583	101,724,332	214,257,915
		Ratio	53%	47%	100%

Appendix 17 Allocation criteria

	Cost center	Number of employees	Area (sq m)
N 1	Dean office	127	12,176
N 2	Accounting	68	588
N 3	Procurement	19	834
N 4	Human resource	15	87
N 5	Strategy	10	90
N 6	Academic support	12	90
N 7	Engineering	52	252
N 8	Research support	4	418
N 9	IT	5	585
N 10	Pediatrics	25	936
N 11	Ophthalmology	14	144
N 12	Psychiatry	9	21
N 13	Forensic Medicine	6	96
N 14	Anat Pathology	7	48
N 15	Clinical Pathology	24	188
N 16	Radiology	24	540
N 17	Medical Sciences	22	21
N 18	Anesthesiology	14	21
N 19	Emergency Med	18	744
N 20	Urban Medicine	9	21
N 21	Rehabilitation	5	8
N 22	Surgery	57	654
N 23	Orthopaedics	20	324
N 24	OB and GYN	27	88
N 25	ENT	17	36
N 26	Internal Medicine	52	1,518
N 27	Social welfare	7	21
N 28	Medical statistics	43	221
N 29	Infectious control	5	32
N 30	Medical instruments	22	794
N 31	Duty stretcher	69	6
N 32	Laundry	36	528
N 33	Nursing department	24	1,530
R 1	Operation	143	3,106
R 2	Anat Pathology	29	1,779
R 3	Central laboratory	77	1,615
R 4	Pharmacy	96	740
R 5	Radiology	31	3,040
R 6	Physical therapy	29	306
R 7	Nutrition dep.	37	384
F 1	OPD Surgery	22	464
F 2	OPD Urban Med	3	378
F 3	OPD Medicine	72	3,409

Appendix 17 Allocation criteria (cont.)

	Cost center	Number of employees	Area (sq m)
F 4	OPD Pedriatrics	11	75
F 5	OPD Orthopaedics	8	459
F 6	OPD ENT	5	378
F 7	OPD Eye	8	423
F 8	OPD OB & GYN	17	1,953
F 9	OPD Psychiatrics	5	24
F 10	OPD PM&R	2	360
F 11	OPD Radiotherapy	23	216
F 12	OPD Nuclear med	6	216
F 13	OPD Forensic	2	72
F 14	Emergency Room	95	552
F 15	Dental Department	31	162
F 16	Medicine ICU	51	996
F 17	Medicine Ward	215	8,971
F 18	Surgery ICU	62	1,310
F 19	Surgery Ward	197	9,676
F 20	Pediatric ICU	54	608
F 21	Pediatric Ward	54	2,158
F 22	ICU Emer Med	20	608
F 23	OB & Gyn Ward	75	7,812
F 24	Orthopaedic Ward	60	2,419
F 25	ENT Ward	4	360
F 26	Eye Ward	4	504
F 27	Chemo Ward	21	432
F 28	Short Stay Unit	4	432
F 29	Multi Ward	4	432
F 30	Preventive medicine	10	60
F 31	Medical education	16	2,171
	Total	2,471	82,720

Appendix 18 Number of outputs

	Cost center	NO. of OPD visit
R 6	Physical therapy	32,878
F 1	OPD Surgery	58,584
F 2	OPD Urban Med	31,067
F 3	OPD Medicine	218,572
F 4	OPD Pedriatrics	22,104
F 5	OPD Orthopaedics	46,139
F 6	OPD ENT	27,333
F 7	OPD Eye	35,411
F 8	OPD OB & GYN	44,475
F 9	OPD Psychiatrics	12,292
F 10	OPD PM&R	13,866
F 11	OPD Radiotherapy	25,530
F 12	OPD Nuclear med	826
F 13	OPD Forensic	1,961
F 14	Emergency Room	51,654
F 15	Dental Department	21,705
	Total	644,397

	Cost center	NO. of operation case
F 19	Surgery Ward	6,945
F 23	OB & Gyn Ward	2,359
F 24	Orthopaedic Ward	2,815
F 25	ENT Ward	525
F 26	Eye Ward	3,352
	Total	15,996

	Cost center	NO. of inpatient day
F 16	Medicine ICU	2,645
F 17	Medicine Ward	64,010
F 18	Surgery ICU	5,260
F 19	Surgery Ward	52,415
F 20	Pediatric ICU	9,900
F 21	Pediatric Ward	16,776
F 22	ICU Emer Med	1,782
F 23	OB & Gyn Ward	14,700
F 24	Orthopaedic Ward	17,361
F 25	ENT Ward	2,325
F 26	Eye Ward	2,892
F 27	Chemo Ward	5,371
F 28	Short Stay Unit	1,141
F 29	Multi Ward	4,463
	Total	201,041

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